NOTICE INVITING TENDER

FOR

COMPOSITE MECHANICAL ERECTION WORKS

FOR

OFFSITE & UTILITIES

AT

GORAKHPUR, UTTAR PRADESH

NIT NO. : PNPM/EM250/E/G-601

PREPARED AND ISSUED BY

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

January, 2019

LETTER INVITING BID

NIT NO. : PNPM/EM250/E/G-601

SUBJECT : TENDER DOCUMENT FOR COMPOSITE MECHANICAL ERECTION WORKS FOR OFFSITE & UTILITIES OF AMMONIA-UREA FERTILIZER COMPLEX AT GORAKHPUR, UTTAR PRADESH

(OPEN DOMESTIC COMPETITIVE BIDDING)

Dear Sir(s),

Projects and Development India Limited (PDIL), hereinafter referred to as CONSULTANT on behalf of Hindustan Urvarak & Rasayan Ltd. (HURL), hereinafter referred as OWNER, has the pleasure of inviting eligible bidders to submit Bid ONLINE through Central Public Procurement (CPP) Portal in Single Phase Two Bid System, for the subject Project in compliance with the NIT. The entire set of Bidding documents is also placed on the website at HURL website www.hurl.net.in, PDIL website www.pdilin.com, and CPP Portal http://eprocure.gov.in/cppp/

BRIEF SCOPE OF WORK:

Scope of work shall consist of but not limited to the followings:- Procurement, Supply, Fabrication, Erection, Inspection (as applicable), Insurance, Transportation of all Equipments / Piping materials to work Site, Storage, Construction and Erection of all Civil and Structural as required, Piping fabrication & Erection, Equipment Erection & Alignment, Electrical and Instrumentation works (if any), Assembly and Installation, Obtaining all necessary Statutory Approvals, Testing, Mechanical Completion, Pre-Commissioning, Commissioning for the entire Unit.

The scope of work shall also include any other item of work required to complete the work in all respects as per the specifications, drawings and instructions of Engineer-in-charge whether specifically mentioned or not in the tender documents.

REFER PART-II, TECHNICAL PART FOR DETAILED SCOPE OF WORK

NIT Document consists of:

PART-I : COMMERCIAL PART
PART-II : TECHNICAL PART

SALIENT FEATURES OF NIT :		
1.	NIT NO.	**PNPM/EM250/E/G-601**
2.	Issue Date	18.01.2019
3.	Last Date & Time for **Submission of Technical & Commercial Bid and Priced Bid** (ONLINE through CPP)	**07.02.2019, at 12:00 hrs. (IST)**
4.	Date & Time of opening of EMD and Technical and Commercial Bid	08.02.2019, at 12:00 hrs. (IST) onwards, at PDIL, Noida
5.	Earnest Money Deposit (EMD)	**Rs. 27,28,750.00** (Rupees Twenty Seven Lakh Twenty Eight Thousand Seven Hundred and Fifty only)
6.	Submission of EMD, in Original, at PDIL Noida	On or before Bid Submission Date i.e. 07.02.2019.
7.	Time Schedule	Mechanical Completion: 12 Months from Effective Date of Contract Commissioning: 14 Months from Effective Date of Contract
8.	**Address for Communication with**	
8.1.	Projects & Development India Limited (PDIL)	Projects & Development India Limited, Project Management Department PDIL Bhawan, A-14, Sector-1, Noida, U.P., India Kind Attention: Mr. Sumit Kumar Project Manager Tel no. : 0120-2529842, Extn. 374 Fax no. : +91-120-2529801 E-mail : sumit.kumar@pdilin.com
8.2.	Hindustan Urvarak & Rasayan Limited (HURL)	Hindustan Urvarak & Rasayan Ltd., Core-4, 9th Floor, Scope Minar, Laxmi Nagar District Centre, Delhi-92 Kind Attention : Mr. Suhas Varadkar Chief Manager Tel no. : 011-22502267 Email : suhasvaradkar@hurl.net.in
8.3.	Contact Person for Site visit	Contact Person: Mr. Subodh Dixit Senior Project Manager, HURL Fertlizer Plant (FCI), Gorakhpur Mob.: +91-551-2261758 E-mail: subodhdixit@hurl.net.in
8.4.	NIT overview on websites	"Letter Inviting Bid" & "Instruction to Bidders" is available at following websites: HURL (www.hurl.net.in) PDIL (www.pdilin.com) CPP Portal (www.eprocure.gov.in)

The bidder shall submit the bid ONLINE through Central Public Procurement (CPP) Portal. However, Earnest Money Deposit (EMD) in Original / Documentary evidences regarding EMD Exemption along with No Deviation Certificate and Integrity Pact shall be submitted at PDIL, Noida on or before Bid Submission Date.

MSEs (Micro & Small Enterprises) are also exempted from submission of EMD in accordance with the provisions of PPP-2012. MSEs (Micro & Small Enterprises) are exempted from submission of EMD in accordance with the provisions of PPP-2012. However, Traders/Dealers/Distributors/Stockiest/Wholesaler are not entitled for exemption of EMD.

Owner/Consultant reserves the right to accept/reject any or all Bids without assigning any reason whatsoever.

Bids complete in all respects should reach on or before the Bid Due Date and time. Bids through Fax / E-mails will not be accepted. OWNER / CONSULTANT take no responsibility for delay, loss or non-receipt of Bid sent by post/courier. Please be noted that all the dates mentioned herewith are firm and OWNER / CONSULTANT expect strict adherence since this is a priority project.

Transfer of Bidding Document is not permissible.

Bidder may depute their representative with proper authorization letter to attend Technical and commercial opening of bids.

Eligible bidders are requested to confirm their intention, within seven (07) days from the placement of NIT at CPP Portal, to participate in subject bidding through a letter or fax message

Thanking you,

For & on behalf of
Hindustan Urvarak & Rasayan Limited

SUMIT KUMAR
PROJECT MANAGER

MASTER INDEX

NIT NO. : PNPM/EM250/E/G-601
NIT DESCRIPTION : TENDER DOCUMENT FOR **COMPOSITE MECHANICAL ERECTION WORKS** FOR OFFSITE & UTILITIES OF AMMONIA-UREA FERTILIZER COMPLEX AT GORAKHPUR

PART-II : TECHNICAL

SECTIONS TO PART-II

PART-I

COMMERCIAL

SECTION-1.0

INSTRUCTION TO BIDDERS

PART-I : COMMERCIAL

SECTION – 1.0

INSTRUCTIONS TO BIDDERS

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INSTRUCTION TO BIDDERS

1.0 INTRODUCTION

1.1. Government of India has formed a joint venture company of M/s. National Thermal Power Corporation Ltd. (NTPC), M/s. Coal India Limited (CIL), M/s. Indian Oil Corporation Ltd. (IOCL) & FCIL/HFCL by name M/s Hindustan Urvarak & Rasayan Ltd. (HURL) hereinafter also referred to as "OWNER", for setting up a brown field Ammonia Urea Complex along with its associated offsite & utility facilities at existing fertilizer complex of FCIL, Gorakhpur, in the State of Uttar Pradesh.

1.1.1 Projects & Development India Ltd. (PDIL) has been appointed as Consultant for providing Engineering Consultancy Services and Project Management Services for the aforesaid project.

1.2 LOCATION OF THE PROJECT SITE

The existing Gorakhpur Fertilizer unit of FCIL is located at about 12 km north from Gorakhpur town in eastern part of Uttar Pradesh on NH-28. It has good connectivity both by road and rail. The nearest airport Gorakhpur Air Port which is 21 km from Gorakhpur Fertiliser unit and has flights to and from Delhi via Lucknow and Kolkata via Patna.

2.0 SCOPE OF WORK

Scope of work shall consist of but not limited to the followings:- Procurement, Supply, Fabrication, Erection, Inspection (as applicable), Insurance, Transportation of all Equipments / Piping materials to work Site, Storage, Construction and Erection of all Civil and Structural as required, Piping fabrication & Erection, Equipment Erection & Alignment, Electrical and Instrumentation works (if any), Assembly and Installation, Obtaining all necessary Statutory Approvals, Testing, Mechanical Completion, Pre-Commissioning, Commissioning for the entire Unit.

The scope of work shall also include any other item of work required to complete the work in all respects as per the specifications, drawings and instructions of Engineer-in-charge whether specifically mentioned or not in the tender documents.

FOR DETAILED SCOPE OF WORK, PLEASE REFER PART-II (TECHNICAL)

3.0 BIDDING DOCUMENTS (NIT)

3.1 The bidder is expected to examine the bidding documents, including LIB and all instructions, Pre-Qualification Criteria mentioned there in, Forms, Annexure, Terms and Conditions of Contract, Specifications, Drawings and other documents and to fully familiarize itself with the requirements of the bidding documents. Failure to furnish all the information required by the Bidding Documents or the submission of a bid not substantially responsive to the Bidding Documents in every respect may result in the rejection of the Bid.

In case of any inconsistency, in the interpretation of meaning of any part of this Tender Documents, the BIDDER shall give his best endeavor to resolve the inconsistency by expressing his assumption through his proposal to OWNER.

3.2 Unincorporated Joint venture / Consortium bids shall not be accepted.

4.0 AMENDMENT OF BIDDING DOCUMENTS

Bidders shall examine the Bidding documents thoroughly and incase of any apparent conflict, discrepancy or error in the Bidding documents, the same shall be brought to the OWNER's notice (for suitable clarification/amendment, as required) in the form of queries, preferably 3 days prior to the deadline for submission. In response to the same, the OWNER/CONSULTANT shall issue the clarification.

At any time prior to the deadline for submission of bids, the OWNER may, for any reason whether at its own initiative or in response to a clarification or modification requested by any prospective Bidder(s), modify the Bidding documents, if required.

Notice of issuance of any Amendment to the bidding document (Corrigendum/Addendum/Amendment) if any, shall be uploaded on PDIL website and shall not be advertised in press. The same shall also be notified in the websites of HURL. Bidders are therefore advised to visit the website regularly for downloading the details of amendment to bidding document. The Bidders will be required to acknowledge notification of any such amendment to the Bidding documents. Bidders shall confirm the inclusion of Addendum/Corrigendum in their bid and shall follow the instructions issued along with addendum/corrigendum.

In order to afford Bidders reasonable time to take the amendment, issued prior to submission of Bids, into account in preparing their Bids, OWNER may, at its discretion, extend the deadline for the submission of Bids.

5.0 LANGUAGE OF THE BID

The Bid prepared by the Bidders and all correspondence and documents relating to the Bid exchanged by the Bidder and the CONSULTANT/ OWNER shall be written in the English language and all units shall be in Metric system. Any printed literature furnished by the Bidder may be written in another language, provided that such literature is accompanied by an English translation, in which case, for purpose of interpretation of the Bid, the English translation shall govern.

6.0 TIME SCHEDULE

6.1 Bidder shall be required to complete the WORK under the CONTRACT in accordance with the following:

Mechanical Completion	**12 Months** from Effective Date of Contract
Commissioning	**14 Months** from Effective Date of Contract

6.2 The **"Effective Date of Contract"** shall be the date of issuance of LOI (Letter of Intent) by the Owner/Consultant.

6.3 The basic consideration and essence of the Contract is the strict adherence to the time schedules for performing the specified works as stipulated in the Contract.

7.0 SIGNATURE ON BIDS

7.1 The Bid must contain the name, designation and place of business of the person or persons making the Bid and must be signed and sealed, on each page (necessarily serially numbered), by the Bidder with his usual signature. The names of all persons signing should

also be typed or printed below the signature. The Bidder shall submit authority letter / Power of Attorney / Board Resolution in favour of the authorized signatory(s) of the Bid. The Bidder's name stated on the proposal shall be the exact legal name of the Bidder.

7.2 Bids by bodies corporate/ limited Companies must be signed with the legal name of the Corporation/Limited Company by the President, Managing Director or by the Company Secretary or any other person or persons holding Power of Attorney for signing their Bid.

7.3 Bidder must submit Power of Attorney issued by the Board of Directors / CEO / MD / Company Secretary of the Bidder/ all partners in case of Partnership Firm / Proprietor in favor of the authorized employee(s) of the Bidder, in respect of the particular tender for signing the Bid and all subsequent communications, agreements, documents etc. pertaining to the tender and to act and take any and all decision on behalf of the Bidder, is to be submitted.

The authorized employee(s) of the Bidder shall be signing the Bid and any consequence resulting due to such signing shall be binding on the Bidder.

7.4 Bid shall contain no cuttings, erasures or overwriting except as necessary to correct errors made by the Bidder in which case each such corrections or other changes in the Bid documents shall carry the initials of the person(s) signing the Bid.

7.5 Bids not conforming to the above requirements of signing may be disqualified.

8.0 PRE-QUALIFICATION CRITERIA (PQC)

Evaluation of Technical and Commercial offers shall be carried out for only those Bidders who shall meet the Pre-qualification Criteria.

8.1 TECHNICAL CRITERIA

8.1.1 BIDDER shall have experience of successful completion of the **Similar Works*** as listed below during last 07 (Seven) years ending last day of the month previous to the one on which NIT is invited.

***Similar Works means:** The bidder shall have successfully carried out the Supply, Fabrication, Erection and Installation of Piping & Equipments / Machinery in the field of Fertilizers / Oil & Gas / Refinery / Power Plant / Petrochemicals / Hydrocarbons / Steel Plant.

Bidder meeting the criteria above must have executed:

a. One completed work costing not less than **INR 17.45 Cr**

OR

b. Two completed work each costing not less than **INR 10.90 Cr**

OR

c. Three completed work each costing not less than **INR 8.70 Cr**

To meet the criteria (8.1.1) above, the bidder shall submit photo copies as a documentary proof of the following documents:

i. Work Orders with full technical details including Detailed Scope of the Work and Completion Period.

ii. Completion Certificate from end user/owner regarding satisfactory completion indicating LOA / Work Order no., Name of Work, Contract Value, Scope of Work, Contract period and actual Date of Completion.

For clause 8.1.1, a Job executed by a Bidder for its own plant/ project cannot be considered as experience for the purpose of meeting PQC of the tender. However, jobs executed for Subsidiary / Fellow subsidiary / Holding company will be considered as experience for the purpose of meeting PQC 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 executed for Subsidiary / Fellow subsidiary / Holding company. Such Bidders to submit these documents in addition to the documents specified to meet PQC.

8.2 FINANCIAL CRITERIA

8.2.1 Average Annual financial turnover during three (03) financial years i.e. **2017-18, 2016-17, and 2015-16** of the bidder meeting the requirement as per clause above experience criteria should be at least **INR 6.50 Crore**.

8.2.2 Net Worth of the Company should be positive during the last financial year ending **31st March 2018**.

8.2.3 The Bidder will submit Solvency certificate not more than six months old from the date of issue of NIT from their Banker for a value not less than **INR 8.70 Crore** or minimum credit ratings of "A" from ICRA/CRISIL etc OR equivalent reputed institutions, OR financing / unutilized credit limits from bank of value not less than **INR 8.70 Crore** valid as on date of issue of NIT.

To meet the criteria (8.2.1 & 8.2.2) above, bidder shall submit Audited Annual Statements (Balance Sheet and Profit & Loss account) of the company for three (3) financial years **i.e. 2017-18, 2016-17 and 2015-16.**

8.3 AUTHENTICATION OF ALL DOCUMENTS SUBMITTED AGAINST PQC

Technical Criteria : All documents in support of technical criteria of PQC to be furnished by the bidder shall necessarily be :

Duly certified / attested by Chartered Engineer and Notary Public with legible stamp.

Financial Criteria : All documents in support of financial criteria of PQC to be furnished by the bidder shall necessarily be:

Shall submit "Details of Financial capability of Bidder" in prescribed format (as per Annexure-1.21), **duly signed & stamped by a Chartered Accountant.** Further, a copy of Audited Annual Financial Statements submitted in bid shall be duly certified / attested by **Notary Public with legible stamp.**

Note: The Authentication of PQC Documents of the Bidders Qualified may be checked through Original documents.

9.0 EARNEST MONEY DEPOSIT (EMD)

9.1.1 Bids must be accompanied with 'Earnest Money Deposit (EMD) / Bid Security' in the form of 'Demand Draft' or 'Banker's Cheque' or 'Bank Guarantee'. The amount of EMD shall be as indicated in the LIB (Letter Inviting Bid). The Bidder shall furnish as part of his Bid, EMD in the form of a Bank guarantee. The bidder shall furnish as part of his bid, EMD in the form of a Bank guarantee.

9.1.2 In case EMD is submitted in form of BG, then the EMD offered shall be an irrevocable Bank Guarantee, issued by any scheduled nationalized bank (refer Annexure-1.25 for the list of approved banks) on a stamp paper of appropriate value. Performa of the Bank guarantee is enclosed as Annexure-1.11.

9.1.3 The Bank Guarantee shall be valid for a period of 90 days beyond validity of the Bid. The amount shall be as indicated in the Letter Inviting Bid for this NIT. The Bank Guarantee shall be extended suitably if there is a delay in awarding the contract. The relevant extension shall be on Bidders' account.

OR

EMD can also be furnished in the form of Demand Draft in favour of **M/s. Hindustan Urvarak & Rasayan Limited, payable at Delhi** for value as outlined in the Letter Inviting Bid (LIB) for this NIT.

EMD will not carry any interest.

Please note Bank Details for EMD:

Account Name:	Hindustan Urvarak & Rasayan Limited
Current Account Number:	36245010741
Branch Code:	17313
IFSC Code:	SBIN0017313
Branch Address:	State Bank of India, Corporate Accounts Group-II, Redfort Capital Parsvnath Towers, 4th and 5th Floor, Bhai Veer Singh Marg, Gole Market, New Delhi-110001.

9.1.4 MSEs (Micro & Small Enterprises) are also exempted from submission of EMD in accordance with the provisions of PPP-2012. However, Traders/Dealers/Distributors/ Stockiest/Wholesaler are not entitled for exemption of EMD.

9.1.4.1 The bidders shall submit the following documents in support of claiming the exemption of EMD:

a) Documentary evidence that the bidder is a Micro or Small Enterprises registered with District Industries Centers or Khadi and Village Industries Commission or Khadi and Village Industries Board or Coir Board or National Small Industries Corporation or Directorate of Handicrafts and Handloom or MSEs who are having Udyog Aadhaar Memorandum or any other body specified by Ministry of Micro, Small and Medium Enterprises.

b) The above document submitted by the bidder shall be duly certified (in original) by Notary or the Statutory Auditor of the bidder or a practicing Chartered Accountant (not being an employee or a Director or not having any interest in the bidder's company/firm) where audited accounts are not mandatory as per law or duly notarized by any Notary Public in the bidder's country.

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

9.2 The bid must be accompanied by EMD along with No Deviation Certificate and Integrity Pact, all in original. The owner allows only those bids to be opened whose EMD in original Documentary evidences (as per clause no 9.1.4 & 9.1.4.1) in support of claiming EMD exemption for MSE has been received by the owner before the Techno-Commercial bid opening.

9.3 The EMD of unsuccessful Bidders will be returned by OWNER/CONSULTANT without any interest as promptly as possible on acceptance of Bid of the successful Bidder or when the Bidding process is cancelled by OWNER/CONSULTANT, as the case may be. Bidders may indicate the name and address in whose favour the said EMD shall be returned.

9.4 The successful Bidder's EMD will be discharged upon the Bidder accepting and signing the Contract and furnishing the Security cum Performance Bank Guarantee.

9.5 The EMD shall be forfeited and appropriated by OWNER/CONSULTANT without prejudice to any other right or remedy to OWNER under the following conditions:

a) If a Bidder withdraws his Bid during its validity or extended validity period, if any.
b) If the bid is varied or modified unilaterally by the bidder during the validity or extended validity period.
c) Any effort by the bidder to influence the Owner on bid evaluation, bid comparison or contract award decision.
d) In the case of a successful Bidder, if the Bidder fails to duly sign the CONTRACT within the stipulated timeframe, and/or meet the stipulations for signing the CONTRACT within the said timeframe.

OR

If the successful bidder is seeking modifications to the agreed terms and conditions after issue of Letter of Intent ("LOI") and prior to signing of the Contract.

OR

If the successful bidder fail to furnish Security cum Performance Bank Guarantee within 30 days of issuance of the LOI.

9.6 Bidders shall submit their EMD in original / Documentary evidences regarding EMD Exemption along with **No Deviation Certificate (as per given format- Annexure-1.3)** and **Integrity Pact (as per given format- Annexure-1.17)**, at following address.

The envelope shall be super scribed with:

"Composite Mechanical Erection Works for Offsite & Utilities at Gorakhpur, Uttar Pradesh"

Projects & Development India Ltd.
(A Govt. of India Enterprise)
PDIL Bhawan, A-14, Sector-1,
Noida-201301, UP, India

Kind Attention : Mr. Sumit Kumar, Project Manager
EPBX No. + 91-120-2529842 / 43 / 47 / 51 / 53 / 54 Extn. 374
Fax no. + 91-120-2529801 / 91
E-mail : sumit.kumar@pdilin.com

10.0 COMPLIANCE TO ALL THE PROVISIONS OF THE BIDDING DOCUMENT / NIL DEVIATION

10.1 The Bidders are advised that while making their Bid and quoting rates/prices, all conditions may appropriately be taken into consideration. **Any deviation, whatsoever, is not permitted** by the Owner to the provisions of Bidding Documents and its subsequent Amendment(s) / Clarification(s) / Addenda / Errata if any, issued by the Employer. Bidders are required to certify their full compliance to the complete Bidding Documents and its subsequent Amendment(s) / Clarification(s) / Addenda / Errata if any, issued by the owner by submitting the **'No Deviation Certificate' as per Annexure-1.3** in the tender documents. **In case the Certificate as per Annexure-1.3 duly signed and stamped is not furnished, the bid shall be rejected**.

Acceptance of above shall be considered as Bidder's confirmation that any deviation to the Bidding Documents found anywhere in their Bid Proposal, implicit or explicit shall stand unconditionally withdrawn, without any cost implication whatsoever to owner, failing which the bid shall be rejected and bid security shall be forfeited.

11.0 COST OF BIDS

11.1 The Bidder shall bear all costs associated with the preparation and submission of the Bid, and OWNER / CONSULTANT will, in no case be responsible or liable for these costs, regardless of the conduct or outcome of the bidding process.

12.0 MODIFICATION AND WITHDRAWAL OF BIDS

12.1 The Bidder may modify or withdraw its Bid after the Bid's submission, but before the last date and time of Bid submission as specified in this NIT provided that written notice of the modification or withdrawal is received by OWNER/ CONSULTANT prior to the deadline prescribed for submission of Bids.

12.2 A withdrawal notice may also be sent by E-mail in signed and scanned form not later than the deadline for submission of Bids.

12.3 Deleted

12.4 No bid may be withdrawn in the interval between the deadline for the submission of bids and the expiration during the validity or agreed extension validity period duly agreed by the bidder. Withdrawal or unsolicited modification of a bid during this interval shall result in the Bidder's forfeiture of its EMD.

13.0 INFORMATION REQUIRED WITH THE BID

13.1 All technical information shall be furnished as per PART-II, Technical. In addition, the bidder shall ensure that Technical and Unpriced Commercial Bid has been submitted.

13.2 Requirement of Manpower / Equipment / Tools & Tackles for timely completion of the project.

13.2.1 Bidder shall furnish tentative month wise manpower requirement till completion of the job.

13.2.2 Bidder shall also furnish a tentative break up of equipments, tools & tackles for timely execution of job.

14.0 PRELIMINARY EXAMINATION

14.1 Full compliance to the complete provisions of the Bidding Documents and its subsequent Amendment(s) / Clarification(s) / Addenda / Errata if any, issued by the owner will be checked first in terms of para clause 10.0 above and other requirements of the bidding documents in respect of No deviation Certificate and Integrity pact. In case those documents duly signed and stamped are not found in separate envelope / techno-commercial bid and / or they are not found as per format of the bidding document, the bidder will be asked to furnish the same as per the format before price bid opening. Failure to comply with this requirement, the bid shall be rejected.

14.2 The Owner/Consultant will examine the bids to determine whether they are complete, whether any computational errors have been made, whether the documents have been properly signed, whether validity of the Bid is in conformity with ITB and whether the bids are generally in order.

14.3 Prior to the detailed evaluation, the Owner/Consultant will determine the substantial responsiveness of the bids, in line with clause 21.0 of ITB.

14.4 A Bid determined as substantially non-responsive is liable to be rejected by the Owner/Consultant and may not subsequently be made responsive by the Bidder by correction of the non-conformity.

14.5 The Owner/Consultant may waive any minor informality or non-conformity or irregularity in a Bid, which does not constitute a material deviation in line with clause 21.0 of ITB.

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15.0 LOCAL CONDITIONS

15.1 It will be imperative on each Bidder to fully make aware himself of all local conditions and factors which may have any effect on the execution of the works covered under these specifications and documents. Bidder shall inspect the site, examine and obtain at its cost and responsibility, all information required and satisfy himself regarding all matters and things such as access to site, communications, transport, right of way, the type and number of equipment and facilities required for the work, availability of local labour, materials and their rates, local working conditions, weather, flood levels, sub-soil conditions, natural drainage, and all information that may be necessary for preparing its Bid, performance of work and other obligations and related matters. By submitting the Bid the Bidder shall be deemed to have acknowledged and agreed that ignorance of the site and other said conditions shall not be basis for any claim for compensation or extension of time or loss of profits etc. and the OWNER shall not be liable on account thereof in any manner whatsoever to the Bidder or any person claiming through or under the Bidder.

15.2 Bidders must before submission of their Bids, acquaint themselves with all applicable regulatory and other legal requirements pertaining to insurance and health, safety and environment requirement in India and rules related to work permit and visa requirements in India or in any way or manner affecting the performance of Scope of Work, the Contractor and the Plant operation and performance including social security, safety, pollution control, permits, licenses, and the other statutory requirements and regulations. The submission of a Bid by the Bidder will be construed as evidence that such an examination was made and the Bidder shall not raise at any time later any claims/disputes against the Owner and the Owner shall not be liable for the same in any manner whatsoever.

15.3 Deleted

15.4 The Owner shall not entertain any request for clarification from the bidder, regarding such local conditions.

15.5 The Bidder shall be deemed to have prepared the Bid on the basis of its independent judgment and to have made all necessary allowances and provisions to ensure that the PROJECT will meet all technical specification prescribed hereunder in the tender document and will be entirely suitable for the purpose for which it is intended. Accordingly, at the time of submission the Bid Price will, without extra price and/or extension of time, be held to include everything implicitly or otherwise required or necessary for the proper and timely completion of the WORK in accordance with the CONTRACT. Further, in case of any contract awarded under these specifications and documents, neither any change in the time schedule of the Contract nor any financial adjustments arising thereof shall be permitted by the Owner, which are based on the lack of such clear information or its effect on the cost of the works to the Bidder.

15.6 Visit to site at BIDDER's cost and expense.

16.0 PRICE BASIS & CURRENCY OF BIDS

16.1 The Bidder shall quote in Indian Rupees only.

16.2 The price/Unit Rates quoted by the Bidder shall be **FIXED & FIRM** and shall be valid until completion of the Contract, pursuant hereto and shall not be subject to variation / escalation on any account except as otherwise specifically provided in the Contract documents. Firm rate shall not be subject to any escalation on any account. Bids with variable rates/prices shall be disqualified.

16.3 Site is located at Gorakhpur, U.P., India and the bidder are required to check & confirm before bidding for applicability of all taxes & duties for the procurement of supply and service by them for the execution of contract.

16.4 The Bidders shall quote in their proposals, the firm Price/Rate for the entire scope of work as per Schedule of Rates (SOR), inclusive of all taxes, statutory levies, cess, duties, TPI charges, packing & forwarding, municipal taxes, royalties, custom duty and customs related duties or any other charges etc., excluding GST.

16.5 All bank charges of bidders bankers shall be to the Bidder's account and all Bank charges of Owner's bankers shall be to Owner's account.

16.6 Income Tax, or any other tax and surcharge as applicable shall be deducted at source from the bills of the contractor and a certificate to that effect shall be issued by the Owner.

17.0 DELETED

18.0 NUMBER OF BIDS

18.1 A bidder shall on no account submit more than one bid either directly or indirectly.

18.2 A bidder shall be deemed to have submitted an indirect bid if a subsidiary of the bidder is also a direct or indirect bidder in an independent bid or if the bidder or its subsidiary has with its consent been indicated as a sub-contractor in any other bid or even if not so indicated has entered into any arrangement (whether disclosed or undisclosed) with any other bidder

or with a sub-contractor of that bidder for the performance of any work for that other bidder upon an award of the work to that other bidder.

18.3 If a bidder makes more than one bid and/or directly or indirectly participates in another bid as contemplated under Clause 18.2 above, all the bids of the bidder, including the bid of the bidder in whose bid the first named bidder has directly or indirectly participated, may be considered as cartel bids and may be rejected. If the factum of such bid(s) is discovered after the notification of award, the resultant contract shall be liable to be terminated pursuant to the provisions for termination contained in the General Conditions of Contract.

19.0 CONFIDENTIALITY OF DOCUMENTS

Bidders shall treat the bidding documents and contents therein as strictly confidential.

20.0 TAXES AND DUTIES

20.1 The Prices/Rates shall include all taxes, statutory levies, cess, duties, TPI charges, packing & forwarding, municipal taxes, royalties, custom duty and customs related duties or any other charges etc., excluding GST. Reimbursement of GST shall be based on GST Invoice submitted by the contractor (18% maximum).

20.2 Bidders are required to ascertain themselves the prevailing rates of applicable taxes & duties including income tax rates as applicable on the scheduled date of submission of bids and Owner would not undertake any responsibility whatsoever in this regard. However, due to any subsequent change in law, liability of the Owner as regards to payment of duties and taxes would be governed by Clause-13.0 of SCC.

20.3 Please note that the responsibility of payment of above taxes thereupon lies with the Service Provider only. Contractor providing taxable service shall issue an Invoice as per the law, a Bill or as the case may be, a Challan which is signed, serially numbered and in accordance with GST rules. The invoice shall also contain the following:

(a) Name, Address & GST Registration No. of such Person/Contractor
(b) Name & Address of the Person/Contractor receiving Taxable Service
(c) Description, Classification & Value of Taxable Service provided like HSN/SAC Code.
(d) GST Amount & Cess thereupon, if any.

Payments to Service Provider for claiming GST amount will be made provided the above formalities are fulfilled. Further, OWNER may seek copies of challan and certificate from Chartered Accountant for deposit / submission of Return of GST thereupon collected from Owner.

Any changes in statutory rules and regulations under GST regime shall be followed by Contractor.

Refer Annexure-1.20 of PART-I (Commercial) for General Guidelines for Goods & Service Tax (GST).

21.0 DETERMINATION OF BID'S RESPONSIVENESS

21.1 The Owner's determination of a bid's responsiveness is to be based on the contents of the bid itself without recourse to extrinsic evidence. If a bid is not substantially responsive, it will be rejected by the Owner, and may not subsequently be made responsive by the Bidder by correction of the nonconformity.

21.2 It is important that Bidder clearly demonstrates his experience and capability, giving OWNER/CONSULTANT a high level of confidence that if awarded, the Bidder will be able to perform the works within the stipulated Time Schedule and quoted rate/price and meeting all other requirements listed in the Bidding document.

21.3 Bidder is requested to furnish the complete and correct information required for evaluation of his Bid. If the information with regard to resources and concurrent commitments or any other information/documentation forming basis of evaluation is found incomplete/incorrect, the same may be considered as adequate ground for rejection of the Bid.

21.4 Examination of bids and determination of responsiveness

21.4.1 The owner's determination of bid's responsiveness is based on the content of the bid only. Prior to the detailed evaluation of Bids, the Owner will determine whether each Bid:-

(a) Meets the "Pre-Qualification Criteria" of the Bidding Documents;
(b) Has been properly signed;
(c) Is accompanied by the required 'Earnest Money, No Deviation Certificate and Integrity Pact
(d) Is substantially responsive to the requirements of the Bidding Documents; and
(e) Provides any clarification and/or substantiation that the Owner may require to determine responsiveness pursuant to Clause-21.3.2 of this ITB.

21.3.2 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 Owner 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.

21.3.3 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 Owner'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.

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

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

22.0 SUBMISSION OF BIDS

22.1 The Bid shall be submitted in electronic format (through CPP portal) as per time schedule mentioned in the Letter Inviting Bid.

The Bidder shall submit Original Bid Security / EMD along with the No deviation Certificate and Integrity Pact, in physical form, only at the address mentioned at Clause 9.0 of Instruction to Bidders.

22.2 **Instruction for Online Submission of Bid**

Instructions to the Bidders to submit the bids online through the Central Public Procurement Portal for e-Procurement at *https://eprocure.gov.in/eprocure/app*

1) Possession of valid Digital Signature Certificate (DSC) and enrolment/registration of the contractors/bidders on the e-procurement / e-tender portal is a prerequisite for e-tendering.
2) Bidder should do the enrolment in the e-procurement site using the “Click here to Enroll” option available on the home page. Portal enrolment is generally free of charge. During enrolment/registration, the bidders should provide the correct/true information including valid email id. All the correspondence shall be made directly with the contractors/bidders through email id provided.
3) Bidder need to login to the site thro’ their user ID/ password chosen during enrolment/registration.
4) Then the Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by SIFY / TCS / nCode / eMudra or any Certifying Authority recognized by CCA India on eToken / SmartCard, should be registered.
5) The DSC that is registered only should be used by the bidder and should ensure safety of the same.
6) Bidder may go through the NIT / tenders published on the site and download the required NIT documents/schedules for the tenders he/she is interested.
7) After downloading / getting the NIT/ Tender document/schedules, the Bidder should go through them carefully and then submit the documents as asked, otherwise bid will be rejected.
8) If there are any clarifications, this may be obtained online thro’ the tender site, or thro’ the contact details. Bidder should take into account the corrigendum published before submitting the bids online.
9) Bidder then logs in to the site through the secured log in by giving the user id/ password chosen during enrolment/registration and then by giving the password of the e-Token / Smart Card to access DSC.
10) Bidder selects the tender which he/she is interested in by using the search option & then moves it to the ‘my tenders’ folder.
11) From my tender folder, he / she selects the tender to view all the details indicated.
12) It is construed that the bidder has read all the terms and conditions before submitting their offer. Bidder should go through the tender schedules carefully and upload the documents as asked otherwise, the bid will be rejected.
13) 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/zip/dwf formats. If there is more than one document, they can be clubbed together and can be provided in the requested format. Each document to be uploaded through online for

the tenders should be less than 2 MB. If any document is more than 2MB, it can be reduced through zip/rar and the same can be uploaded, if permitted. Bidders Bid documents may be scanned with 100 dpi with black and white option. However of the file size is less than 1 MB the transaction uploading time will be very fast.

14) If there are any clarifications, this may be obtained through the site, or during the pre-bid meeting if any. Bidder should take into account the corrigendum published from time to time before submitting the online bids.

15) The Bidders can update well in advance, the documents such as certificates, annual report details etc., under My Space option and these can be selected as per tender requirements and then send along with bid documents during bid submission. This will facilitate the bid submission process faster by reducing upload time of bids.

16) Bidder should submit the EMD, No Deviation Certificate and Integrity Pact as specified in the tender. The original of these documents should be posted/couriered/given in person to the Tender Inviting Authority, within the bid submission due date & time for the tender. Scanned copy of these documents should be uploaded as part of the offer.

17) While submitting the bids online, the bidder reads the terms & conditions and accepts the same to proceed further to submit the bid packets.

18) The bidder has to select the payment option as offline to pay the Tender FEE/ EMD as applicable and enter details of the instruments.

19) The details of the DD/any other accepted instrument, physically sent, should tally with the details available in the scanned copy and the data entered during bid submission time. Otherwise submitted bid will not be acceptable.

20) The bidder has to digitally sign and upload the required bid documents one by one as indicated. Bidders to note that the very act of using DSC for downloading the bids and uploading their offers shall be deemed to be a confirmation that they have read all sections and pages of the bid document including General conditions of contract without any exception and have understood the entire document and are clear about the requirements of the tender requirements.

21) The bidder has to upload the relevant files required as indicated in the cover content. In case of any irrelevant files, the bid will be rejected.

22) If the price bid format is provided in a spread sheet file like BoQ_xxxx.xls, the rate offered should be entered in the allotted space only and uploaded after filling the relevant columns. The Price Bid / BOQ template must not be modified/ replaced by the bidder; else the bid submitted is liable to be rejected for this tender.

23) The bidders are requested to submit the bids through online e-tendering system to the Tender Inviting Authority (TIA) well before the bid submission end date & time (as per Server System Clock). The TIA will not be held responsible for any sort of delay or the difficulties faced during the submission of bids online by the bidders at the eleventh hour.

24) After the bid submission (i.e. after Clicking “Freeze Bid Submission” in the portal), the acknowledgement number, given by the system should be printed by the bidder and kept as a record of evidence for online submission of bid for the particular tender and will also act as an entry pass to participate in the bid opening date.

25) The time settings fixed in the server side & displayed at the top of the tender site, will be valid for all actions of requesting, bid submission, bid opening etc., in the e-tender system. The bidders should follow this time during bid submission.

26) All the data being entered by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered will not viewable by

unauthorized persons during bid submission & not be viewable by any one until the time of bid opening.

27) 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 openers public keys. Overall, the uploaded tender documents become readable only after the tender opening by the authorized bid openers.

28) The confidentiality of the bids is maintained since the secured Socket Layer 128 bit encryption technology is used. Data storage encryption of sensitive fields is done.

29) The bidder should logout of the tendering system using the normal logout option available at the top right hand corner and not by selecting the (X) exit option in the browser.

Note: A bidder shall submit only one bid in the same bidding process. A Bidder who submits more than one bid will cause all their bids disqualified in the said bidding process.

22.3 The Bidder is expected to examine all instructions, forms/annexure, terms and conditions in the NIT. The NIT together with all its attachments thereto, shall be considered to be read, understood and accepted by the Bidders. Failure to furnish all information required or submission of a Bid not responsive to the NIT in every respect will be at the Bidder's risk and may result in the rejection of the Bid.

22.4 **Pre-qualification Bid and Technical & Commercial Bid** to be submitted as specified below.

PART-A : PRE-QUALIFICATION BID (Refer Clause 8.0)

i.	Letter of Submission
ii.	Pre Qualification Criteria in favour of **Experience Criteria as per Exhibit-1** along with Copies of Work Orders, Certificates from End User/OWNER and completion certificates in support of prequalification requirement.
iii.	Pre Qualification Criteria in favour of **Financial criteria as per Exhibit-2** along with copies of Work Orders, Completion/ Acceptance certificates and Annual audited Report for the last three financial years. Annual Reports shall be a verifiable statement of annual accounts certified by a Chartered Accountant or Public Accountant in the form of printed annual reports or similar document.
iv.	**Format for Financial Capability of Bidder** as per Annexure-1.21
v.	**Solvency Certificate** from Bidder's bankers as per Annexure-1.18. Date of Issue of this certificate should not more than six months old from the date of issue of NIT.

PART-B : TECHNICAL AND COMMERCIAL BID

i)	Photocopy of Earnest money Deposit (EMD)
ii)	Power of Attorney of Bid Signatory from the Competent Authority as per Annexure-1.26
iii)	Tender Acceptance Letter as per Annexure-1.1

iv)	Commercial Questionnaire as per Annexure-1.2
v)	No Deviation Certificate as per Annexure-1.3
vi)	Details of Similar Works Executed as per Annexure-1.4
vii)	Current Commitments of the Bidder as per Annexure-1.5
viii)	Deployment Schedule of Supervisory Personnel as per Annexure-1.6
ix)	Deployment Schedule of Construction Equipment as per Annexure-1.7
x)	Details of Equipment Proposed to be used for this work as per Annexure-1.8
xi)	Contents of Bid and Check List as per Annexure-1.9
xii)	A declaration shall be submitted as per Annexure-1.14 to the effect that Bidder have or had not been banned or blacklisted/del-listed by any PSU / Government Organizations.
xiii)	Declaration by Bidder regarding Bidding Document as per Annexure-1.16
xiv)	Photocopy of Integrity Pact as per Annexure-1.17
xv)	EFT details as per Annexure-1.19
xvi)	A declaration shall be submitted to the effect that Bidder submitting their Bid is not under liquidation, court receivership or similar proceedings as per Annexure-1.22
xvii)	Declaration by bidder for Past Safety Record as per Annexure-1.24
xviii)	Bidder to furnish PAN Number, TIN Number, PF/ESI Number, GST Number, Labor License Registration Number, Latest Income Tax Clearance Certificate / ITR etc. along with the bid.
xix)	**Price confirmation copy** - A Photocopy of the Schedule of Rates, to be submitted strictly as per **Section-5 of Part-II, Technical**, prices being blanked out and in place indicating "**Quoted**" against each head**,** shall be submitted duly signed and stamped.
xx)	Master Index along with a copy of complete set of Bidding Documents of all technical and commercial amendments/addendums if any issued, duly signed and stamped on each page as a token of having received and read all parts of the bidding document and having accepted and considered the same in preparing their bid.
xxi)	Any other information required in the Bidding Documents or considered relevant by the Bidder.

For convenience, the Bid shall be compiled in the form of Specific Sections conforming to the above. In case of non-submission of above documents or submission of incomplete documents, the OWNER/CONSULTANT reserves the right not to evaluate such offers further and not to enter into correspondence in this regard after opening the Technical and Commercial Bid.

22.5 **PRICED BID**

22.5.1 Priced Bid, duly filled in and completed in all respects as per **Section-5 of Part-II, Technical** given in the Bidding Documents.

22.5.2 Priced Bid shall be submitted duly signed and stamped on each page. This part shall not contain any condition whatsoever failing which the Bids shall be liable to be rejected. In case

of any correction, the bidder shall put its signature and its stamp. Eraser fluid will not be allowed for making any correction.

If the bidder has indicated "Not Applicable/Not Quoted" in the price bid, their bid will liable to be rejected and will not considered for price evaluation. However, if the bidder has indicated "Nil / Blank", it will be consider as "Nil Percentage" and the Estimated Amount will be considered for evaluation and award, in case the bidder becomes successful.

22.5.3 Rate/Prices must be strictly filled in format for "Schedule of Rates as per Section-5 of Part-II, Technical" enclosed as part of bidding document. If quoted in separate typed sheets and any variation in description, unit is noticed, the bid is liable to be rejected. In any case Bidder shall be presumed to have quoted against the description of work and the same shall be binding on the Bidder.

22.6 **Bidders shall indicate the PERCENTAGE RATE ABOVE (+) OR BELOW (-) on the Estimated Amount provided in the Schedule of Rates.** The Quoted Percentage indicated by the bidder should be strictly quoted as specified in Section-5 of Part-II, Technical otherwise the bid may be rejected.

21.7 Bidder is requested to Quote the Percentage (Above or Below) within 2 Decimal places. However, Digits beyond 2 decimal places will be ignored.

23.0 DEADLINE FOR SUBMISSION OF BIDS

23.1 Bids must be uploaded at CPP Portal within the time and date as specified in the Letter Inviting Bid.

23.2 The OWNER/ CONSULTANT may extend this deadline for the submission/uploading of Bids by amending the NIT documents in accordance with Clause No. 4.0 above. In such case all rights and obligations of the OWNER and Bidders under this NIT shall be subject to the extended deadline.

24.0 POLICY FOR BID UNDER CONSIDERATION

Bids shall be deemed to be "Under Consideration" immediately after they are opened and until such time that the official intimation of award / rejection is made by the OWNER / CONSULTANT to the Bidders. While the bids are under consideration, bidders and/or their representatives or other interested parties are advised to refrain from contacting by any means, the OWNER / CONSULTANT and/or his employees / representatives on matters related to the bids under consideration.

The OWNER / CONSULTANT, if necessary may obtain clarifications on the bids by requesting for such information from any or all the Bidders, either in writing or through personnel contact as may be necessary. **The Bidder will not be permitted to change the substance of the bid after the bid had been opened.**

25.0 EFFECT AND VALIDITY OF BID

25.1 The submission of any bid connected with these documents and specifications shall constitute an agreement that the Bidder shall have no cause of action or claim against the OWNER/ CONSULTANT for rejection of his bid. The OWNER / CONSULTANT shall always be at liberty to reject or accept any bid or bids at his sole discretion and any such action will not be called into question and the Bidder shall have no claim in that regard against the OWNER/ CONSULTANT.

25.2 The bids should be kept **valid for acceptance** for a period of **120 Days** from the date of **opening of Technical and Commercial Unpriced Bids**. A Bid valid for shorter period may be rejected by the Owner as being non-responsive.

Under the exceptional circumstances, prior to expiry of the original Bid validity period, the OWNER/CONSULTANT may request the Bidder for a specified extension in the period of validity. The request and the responses thereto shall be made in writing or by telefax or by E-mail.

25.3 In the event of OWNER/ CONSULTANT seeking extension of period of validity of the Priced Bids, the validity of EMD shall also be suitably extended.

25.4 A Bidder agreeing to the request of OWNER/CONSULTANT seeking extension will not be required nor permitted to modify his bid, and will be required to extend the validity of his EMD correspondingly. However, Bidders request for revision/adjustment of Priced Bid under such circumstances may be considered by the OWNER/ CONSULTANT. The provisions of Clause-9.0 regarding discharge and forfeiture of EMD shall continue to apply during the extended period of Bid Validity.

26.0 COMPLETE SCOPE OF SUPPLIES / WORK

26.1 The complete scope of supplies and work/services has been defined in the bidding documents. Only those bidders who take complete responsibility and who bid for the complete scope of supplies and work/services as contained in the bidding document shall be considered for further evaluation subject to meeting Pre-Qualification Criteria.

26.2 If the contractor is required to engage a sub-contractor for any part of work, then such sub-contractors shall have prior proven experience of similar work and shall require specific approval by OWNER.

26.3 If a proposed sub-contractor has been approved by the OWNER, the CONTRACTOR shall not replace such approved sub-contractor with another sub-contractor without obtaining the OWNER's prior approval for the proposed replacement.

27.0 OPENING OF BIDS

27.1 Owner / Consultant will open Bids in the presence of Bidder's representatives who choose to attend at Date and time specified on cover page of NIT or as informed by Owner / Consultant. The Bidder's representative(s) present during the Bids opening shall sign a Bids opening record sheet evidencing their attendance.

27.2 The Owner / Consultant shall allow only those bids for opening whose original EMD, has been received by the Owner / Consultant before the Techno-Commercial bid opening. However, after opening of Techno-commercial unpriced Bid, if there is any discrepancy found in the EMD, Bidder shall be asked to rectify the same, as per the requirement of Bidding document, before the date of opening of the Price Bid. In case the Bidder fails to rectify the EMD before the date of opening of the Price Bid, its Bids will be rejected.

27.3 The Bids shall be opened in **Central Public Procurement Portal for e-Procurement at *https://eprocure.gov.in/eprocure***:.

27.3.1 STAGE-I: OPENING & REVIEW OF PRE-QUALIFICATION BID, TECHNICAL AND COMMERCIAL BIDS

OWNER / CONSULTANT after opening, will first review Pre-qualification requirement. The Techno-Commercial examination will ascertain that the bidder fully meets the Qualifying Requirements, stipulated for the works in ITB (Clause-8.0) to the Owner/Consultant's satisfaction. It will be based upon an examination of documentary evidence of Bidder's qualifications submitted by the Bidder in the bid, as well as such other information as the Owner deems necessary and appropriate.

Technical and Commercial Bids shall be evaluated only for those bidders whose bid is found to be Pre-qualified based on the Pre-qualification Criteria.

Discussions with Bidders during Techno-Commercial Evaluation:

During evaluation and comparison of Technical and Commercial Bids, OWNER/CONSULTANT may, at its discretion, ask the Bidder for clarification on its Bid. The request for such clarification and the response shall be in writing either through fax or email. Further, OWNER / CONSULTANT may ask BIDDER to visit OWNER's/ CONSULTANT's office for Technical, Commercial or Financial discussions/clarifications.

BIDDER is expected to undertake such visits and participate in such meetings as and when called by the OWNER/CONSULTANT. All costs related to such visits shall be borne by BIDDER.

Consequent upon the discussions, if required, OWNER/CONSULTANT may issue final amendment/clarification to the NIT document.

Bidders shall be required to submit their unconditional acceptance to such amendment/clarification failing which Price Bid shall not be considered for opening.

Bidder may be given a chance to furnish supplementary price bid, indicating the price implication, if any, in view of such amendment/clarification.

The price implication (positive/negative) shall be given in the prescribed Format, to be provided along with the request letter for submission of Supplementary Price (to be intimated later as per requirement) super scribed as "SUPPLEMENTARY PRICE BID for NIT No.:.....". The same shall be considered along with the original price bid for the purpose of evaluation.

After opening of the Price Bid, no change in the quoted rate/price shall be offered or permitted.

27.3.2 **STAGE – II: OPENING OF PRICE BID**

The date of the opening of the Price Bid shall be intimated to technically and commercially acceptable Bidders. The price bids of such shortlisted Bidders will be opened in the presence of Bidder's representative who chooses to attend, on the date and time to be intimated. The bidder's name, bid price and such other details as the OWNER at its discretion may consider appropriate, will be announced at the opening of price bids.

The evaluation of the priced Bids shall be done as described under Clause No. 29.0 of the ITB.

27.3.3 If the Bids as judged by the OWNER are unresponsive, the NIT may be declared void and a new procedure for selection of CONTRACTOR as deemed appropriate by OWNER may be adopted.

28.0 CORRECTION OF ERRORS

Bids determined to be substantially responsive will be checked by the Owner/Consultant for errors.

Errors will be corrected by the Owner/Consultant as follows:

i) In case of any difference in the Quoted Percentage in Figures and in Words, the Percentage Quoted in Words shall prevail.

ii) All errors in totaling of the amount column and in carrying forward total shall be corrected.

The amount stated in the summary of Schedule of Rate will be adjusted in accordance with the above procedure for the correction of errors. If the Bidder does not accept the derived corrected value, the Bid will be rejected, and the EMD shall be forfeited.

29.0 EVALUATION AND COMPARISON OF BIDS

29.1 General

29.1.1 The OWNER wishes to finalise the award of work of the facilities covered under this bidding documents within a limited time schedule. The bidders are advised to submit their bids complete in all respects conforming to all terms and conditions of the bid document.

29.1.2 Bids shall be evaluated based on the information / documents available in the bid. Hence bidders are advised to ensure that they submit appropriate and relevant supporting documentation along with their proposal in the first instance itself. Bids not complying with the requirements of Bid Documents are liable to be rejected. Bidders are advised to fill up all Annexure carefully and provide reference to all relevant documents given in their bid offer.

29.1.3 **Bidders shall indicate the PERCENTAGE RATE ABOVE (+) OR BELOW (-) on the Estimated Amount provided in the Schedule of Rates.** The Quoted Percentage indicated by the bidder should be strictly quoted as specified in Section-5 of Part-II, Technical otherwise the bid may be rejected. Any conditional discount offered by the bidder shall not be considered for the purpose of evaluation, however, the same shall be considered for purpose of award.

The comparison shall be on the basis of Total Evaluated Cost derived by Quoted Percentage (Above or Below) in SCHEDULE OF RATES (Section-5 of Part-II, Technical) corrected pursuant to Clause No. 24.0 of the ITB. The Owner's evaluation will also include the costs resulting from application of the evaluation procedures described in ITB Clause 30.2. Any adjustments in price that result from the below procedures as per ITB Clause 30.2 shall be added, for the purposes of comparative evaluation only.

29.1.4 The work is not bifurcated. Hence, evaluation of bids shall be done as per clause no. 29.0. The order will be placed on overall lowest basis.

29.2 The financial comparison for selection of Lowest (L-1) Bidder / Contractor shall be arrived by using the following methodology:

29.2.1 TOTAL EVALUATED PRICE: Total Evaluated Price shall be derived after Multiplying a Factor (i.e. 1 ± Quoted Percentage Rate indicated by the bidder for the items/100) by Estimated Amount plus charges towards GST. GST @ 18% shall be considered for evaluation. Reimbursement of GST shall be based on GST Invoice submitted by the contractor (18% maximum).

29.2.2 If two or more bidders emerge as the Lowest evaluated bidders after evaluation, in such an event, Revised Percentage (which should be lower than Original Quoted Percentage) will be sought from those bidders and Re-evaluation will be carried out for selection of Lowest (L-1) Bidder.

30.0 REBATE

No suo-moto reduction in price(s) by Bidders is permissible after opening of the price bid. If any Bidder unilaterally reduces the price(s) / percentage quoted by him in his bid after opening of price bids, such reduction shall not be considered for comparison of prices but shall be binding on the Bidder if he happens to be selected for award of work.

31.0 CONTACTING OWNER

A Bidder shall not contact the OWNER/CONSULTANT on any matter relating to his bid from the time of priced bid opening to the time that the Contract is awarded, unless requested to do so in writing. Any effort by a Bidder to influence the OWNER/CONSULTANT in the OWNER's/ CONSULTANT's decisions in respect of bid evaluation or contract award will result in the rejection of that Bid.

32.0 AWARD OF CONTRACT

32.1 Subject to ITB Clause 34.0, the OWNER will award the CONTRACT to the successful bidder whose Technical and Commercial bid has been determined to be qualified, substantially responsive further provided that the Bidder is determined to be qualified to perform the CONTRACT satisfactorily.

32.2 After selection, Letter of Intent s ("LOIs") as per mode of contracting shall be released by the OWNER to the selected Bidder. The selected bidder will return the duplicate copy duly signed & stamped as token of acceptance within 15 days.

32.3 The Bidder shall enter into a Contract Agreement with the OWNER as per Clause 33.0, failing which the Bid Security/EMD is liable to be forfeited.

33.0 SIGNING OF CONTRACT

33.1 At the same time as the OWNER notifies the successful Bidder that its Bid has been accepted, the OWNER will send to the Bidder a draft of the Contract provided in the Bidding Documents, incorporating all agreements between the parties.

33.2 Within Thirty (30) days of receipt of the CONTRACT, the successful Bidder shall sign and date the Contract Agreement and return it to the OWNER. Cost of execution of the Contract, including payment of stamp duty thereon, shall be borne by the Bidder. The successful Bidder shall provide 10 DVDs of scanned signed Contract Agreement apart from 3 sets of Original Contract Agreement.

34.0 OWNER'S RIGHT TO ACCEPT / REJECT BIDS

34.1 The OWNER reserves the right to accept or reject any Bid and to annul the bidding process and reject all Bids at any time prior to award of Contract without thereby incurring any liability to the affected bidder(s) or any obligation to inform the affected bidder(s) of the ground of OWNER's action.

34.2 It is observed that many bidders indulge in trading in contracts by entering into undisclosed back-to-back arrangements for the whole or a substantial portion of a CONTRACTOR's

obligations under the contract. If a bidder proposes to enter into any such arrangements upon a successful award of work or has in place any such arrangement which will become operative upon the award of work, the bidder must make a complete disclosure of such arrangement or proposed arrangement in its proposal, and all provisions applicable to sub-contractor(s) in terms of bidding documents shall apply to such arrangements.

34.3 If the existence of such an undisclosed arrangement is reasonably apprehended by the OWNER in the case of a bidder, the OWNER may reject such bidder's bid as not responsive.

34.4 If such an undisclosed arrangement is discovered after the award of work, such arrangement(s) shall be deemed to constitute an assignment of contract and a ground of termination pursuant to the provisions of termination under the General Conditions of Contract.

34.5 Owner/Consultant reserves the right to accept or reject any tender in whole or part and/or accept other than the lowest quotation without assigning any reason. The whole work may be split up between two or more contractors if considered expedient by the Owner/Consultant on their sole and absolute discretion. The bidder shall have no claim in this regards whatsoever.

35.0 CONTRACT SECURITY CUM PERFORMANCE BANK GUARANTEE (CPBG)

35.1 As a Contract Security, a successful Bidder, to whom the work is awarded, shall be required to furnish a Security cum Performance Bank Guarantee in the form attached as Annexure-1.12 within thirty (30) days of issuance of LOI. This Bank Guarantee shall be an irrevocable Bank Guarantee, issued by any scheduled nationalized bank on a non judicial stamp paper of appropriate value. The Bank Guarantee amount shall be equal to ten per cent (10%) of the TOTAL CONTRACT PRICE and it shall guarantee the faithful performance of the CONTRACT in accordance with the terms and conditions specified in these documents and specifications. The Performance Bank Guarantee shall be valid for a period till Project Completion Date / Preliminary Acceptance of Work by Owner plus Defect Liability period of 12 months plus a claim period of 06 months. In case of breach of contract the guarantee amount shall be payable to the Owner without any conditions whatsoever.

35.1.1 The Bidder is required to furnish the requisite CPBG as mentioned in GCC/SCC.

35.1.2 In case of breach of contract the guarantee amount shall be encashed by the Owner without any conditions whatsoever.

35.2 Failure of the successful Bidder to comply with the requirement of Clause 35.1 hereof shall constitute sufficient grounds for forfeiture of Bid Security/EMD without prejudice to its rights and remedies as set forth in this NIT or otherwise in law.

36.0 INCOME TAX & CORPORATE TAX

36.1 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.

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

36.3 **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.

Accordingly, supplier/ contractor/ service provider/ consultant should mention their PAN no. in their invoice/ bill for any transaction exceeding Rs.2 lakhs. As provided in the notification, in case supplier/ contractor/ service provider/ consultant do not have PAN no., they have to submit declaration in Form 60 along with invoice/ bill for each transaction.

Payment of supplier/ contractor / service provider/ consultant shall be processed only after fulfillment of above requirement.

37.0 GENERAL INSTRUCTIONS

37.1 Transfer of Bid submitted by one BIDDER to another is not permitted. No alteration in the essence of a Bid, once submitted, shall be permitted.

37.2 OWNER/CONSULTANT reserves the right to verify all statements/information submitted to confirm the Bidder's claim on experience on the performance of equipment offered and capabilities of the Bidder to perform the Scope of Work. OWNER/CONSULTANT may inspect similar facilities built by the Bidder. Bidder shall co-ordinate and arrange for visit. However all expenses of such visit of OWNER's Officials / OWNER's Representative will be borne by OWNER.

37.3 OWNER/CONSULTANT shall not entertain any correspondence with any Bidder on acceptance or rejection of any Bid.

37.4 Oral statements made by the Bidder at any time regarding any matter including quality, or arrangement of the equipment or any other matter will not be considered and will not be binding on the OWNER/CONSULTANT.

37.5 Standard catalogue pages and other documents of the Bidder may be used in the Bid to provide additional information and data as deemed necessary by the Bidder.

37.6 Bidder will furnish the Bid with all relevant information's as called for. Bids with incomplete information are liable for rejection.

37.7 If at any later date, it is found that documents, information and data submitted by the Bidder in the Bid, and based on which the Bidder has been considered eligible or successful or has been awarded the Contract is incorrect or false to the extent that had the correct or true information been made available to the OWNER at the time of Bid evaluation, the bid would have been declared ineligible or unsuccessful, the Bidder shall be forthwith disqualified or, as the case may be, the contract awarded based on such incorrect or false information shall be cancelled and the EMD/PBG shall be liable to be forfeited.

38.0 INTEGRITY PACT

Bidders are required to unconditionally accept the "Integrity Pact (IP)", as per Annexure-1.17, (executed on plain paper) and submit the same duly signed on all pages by the bidder's authorized signatory along with the EMD / Documentary evidences in support of EMD exemption for MSEs. In case, Annexure-1.17 duly signed & stamped is not found in the sealed envelope / techno-commercial bid and / or is not found as per the format required as per the bidding document, the bidder will be asked to furnish the same before price bid opening. Failure to comply with this requirement, the bid shall be rejected.

39.0 BIDDER TO QUOTE FOR ALL ITEMS

The bidders shall quote their rates with reference to each item and must tender for each and all the items shown in the attached Schedule of Rates (SOR).

40.0 BIDDER TO SIGN ALL PAGES

All pages of the tender documents shall be signed and stamped by the bidder.

41.0 ERASURES AND ALTERATIONS

Tenders containing erasures and alterations in the tender documents may be rejected. All rates shall be indicated both in words and figures. Where there is a difference between the rates quoted in words and figures, the rates given in words shall prevail.

42.0 INCOMPLETE AND LATE TENDER

Unsolicited / Incomplete/late tenders are liable to rejection without any further reference.

43.0 EXECUTION OF CONTRACT

The successful bidder shall be required to execute contract with Owner within reasonable time.

44.0 RATES FOR EXTRA ITEMS

Rates for additional, altered or substituted work shall be determined by the Engineer-in-Charge as follows:-

a) If the rate for the additional, altered or substituted item of work is not specified in the said schedule of quantities, the rate of that item shall be derived from the rate for the nearest similar item specified therein.

b) If the rate for any additional, altered of substituted item of work cannot be determined in the manner specified in sub para (a), the contractor shall within 7 days of the date of receipt of the order to carry out the said work, inform the Engineer-in-charge of the rate which he proposes to Claim for such item of work, supported by analysis of the rate claimed by the rate of labour and materials. In the event of the contractor failing to inform the Engineer-in-Charge within the stipulated period of time and rate which he proposes to claim, the rate for such item shall be determined by the labour and materials and quantum of labour and materials as per actual observation, provided all these elements are justifiable, plus 15% to cover the contractor's profit and over head.

c) If any altered, additional or substituted item of work ordered comprises of more than one part/sub item and each part/sub item could be priced in different manners according to the principles laid in sub para a to b, the decision of the Engineer-in-Charge as the appropriate principle of pricing applicable to the particular part/sub item shall be final.

d) No deviation from specifications stipulated in this contract shall be made or additional items of work shall be carried out by the contractor unless the rates of such substituted, altered or additional items have been approved in writing by the Engineer-in-Charge failing which Owner shall not be liable to pay any claim on this account.

SECTION-2.0

GENERAL CONDITIONS OF CONTRACT (GCC)

PART-I : COMMERCIAL

SECTION – 2.0

GENERAL CONDITIONS OF CONTRACT

TABLE OF CONTENT

GENERAL CONDITIONS OF CONTRACT (GCC)

1.0 SCOPE OF CONTRACT

The detailed Scope of Contract refers as mentioned in Letter Inviting Bid (LIB), Instruction to Bidders (ITB) and Part-II, Technical.

1.1 All EQUIPMENTS to be supplied and WORK to be carried out under the CONTRACT shall conform to and comply with the provisions of relevant regulations/acts of Government of India as may be applicable to the type of EQUIPMENT/WORK carried out and necessary certificates shall be furnished.

1.2 The CONTRACTOR shall provide cross-sectional drawings wherever applicable to identify the spare part numbers and their location. The sizes of bearings, their make & number shall also be furnished.

1.3 Specifications, design and drawings issued to the CONTRACTOR along with tender specifications and CONTRACT are not sold or given but loaned. These remain property of OWNER or his assignees and are subject to recall by OWNER. The CONTRACTOR, his employees, and SUB-CONTRACTOR and his employees shall not make use of the drawings, specifications and technical information for any purpose at any time except for manufacture against the CONTRACT and shall not disclose, the same to any person, firm or corporate authorities, without written permission of OWNER. All such details shall be kept confidential.

1.4 CONTRACTOR shall pack, protect, mark and arrange for despatch of EQUIPMENT as per instructions given in the 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 and its Appendices
b) Letter of Intent (LOI)
c) Special Conditions of Contract and amended/ clarification, if any.
d) General Conditions of Contract and amended/ clarification, if any.
e) Part-II, Technical of the NIT documents and amended/ clarification, if any.
f) Technical Specifications and Drawings and amended/ clarification, if any.
g) The Bid and Schedule of Rates including Supplementary Price, if any.
h) Integrity Pact (IP) signed between the Owner and the Bidder/Contractor
i) Instruction to Bidders

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 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 and / or the agreed variations or if any provision of the SPECIAL CONDITIONS OF CONTRACT is repugnant to or at variance with any provision(s) of the agreed variations, and the two cannot be reconciled or otherwise co-exist, then unless a different intention appears, the provision(s) of the SPECIAL CONDITIONS OF CONTRACT shall be deemed to override the provision(s) of GENERAL CONDITIONS OF CONTRACT and the provision(s) of the agreed variations shall be deemed to override the provision(s) of the SPECIAL 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 and/or agreed variations or to the extent that such repugnancy in the SPECIAL CONDITIONS OF CONTRACT cannot be reconciled with the agreed variations, as the case may be.

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 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 practise shall be binding on the CONTRACTOR.

2.1.5 In the event of any ambiguity or conflict between the CONTRACT DOCUMENTS listed in clause 2.0 above, the order of precedence shall be the order in which the CONTRACT DOCUMENTS are listed in Clause 2.0 above.

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 discernible 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 Project Manager/Engineer Incharge 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 Project Manager/ Engineer Incharge for his decision as aforesaid prior to commencing the relative work or supply, the CONTRACTOR shall perform the said work or make the said supply, as the case may be, at his own risk, and the provisions of Clause 2.1.9 hereof 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 Project Manager/ Engineer Incharge 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 Project Manager/ Engineer Incharge 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.

2.1.9 In the event of the CONTRACTOR performing or executing any work or making any supply at variance with the decision of the Project Manager/ Engineer Incharge as aforesaid, then such work shall, if the Project Manager/ Engineer Incharge so consider necessary, be deemed to be a defective work/ supply and the provision of Clause 15.0 of GCC and associated clauses there under shall apply thereto.

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 Project Manager/ Engineer Incharge on behalf of the OWNER and CONTRACTOR'S authorized representative as an agreed variation and amendment of the relative term(s) in the CONTRACT documents.

2.4 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 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 a 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 the specification in response to this NIT.

4. **'BIDDER'** shall mean the firm/party who quotes in response to an invitation to bid, from the OWNER.

5. **'CHANGE ORDER'** means an order by which a change is ordered or other notification made to the CONTRACTOR in accordance with the 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) AIEE Codes
   d) American Society of Testing of Materials (ASTM) Codes
   e) Other internationally applicable standards and/or Regulations the subject matter of the CONTRACT.
   f) Indian Employees Provident Fund Act,
   g) Pollution Control norms of INDIA
   h) Contract Labour
   i) Minimum Wages Act
   j) Any other labour laws of INDIA applicable during execution of contract.
   k) Any other codes/standards specified in the contract documents.

7. **'COMMERCIAL OPERATION'** shall mean the condition of operation in which the complete equipment covered under the CONTRACT is officially declared by the OWNER to be available for continuous operation at different loads upto and including rated capacity after completion of COMMISSIONING as per CONTRACT. Such declaration by the OWNER however, shall not relieve or prejudice the CONTRACTOR any of his obligations under the CONTRACT.

8. **'COMMERCIAL USE'** shall mean that use of the PLANT, which the CONTRACT contemplates or of which it is commercially capable.

9. **'COMMISSIONING'** shall mean the putting into operation of PLANT by CONTRACTOR with the assistance from OWNER'S Personnel.

10. Deleted

11. **'CONSULTANT'** shall mean the agency nominated/appointed by the OWNER for the project/job/WORKS.

12. The **'CONTRACT'** shall mean the written agreement made between the OWNER and the CONTRACTOR for the execution of the WORK, including all attachments and annexure thereto and all documents incorporated by reference therein.

13. **'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.

14. '**CONTRACT PERIOD'** shall mean the time period (as extended by the OWNER from time to time wherever appropriate) during which the CONTRACT shall be

executed as agreed to between CONTRACTOR and the OWNER in the CONTRACT.

15. '**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.

16. '**CONTRACTOR'S SOFTWARE'** means standard Software owned by the CONTRACTOR.

17. **'CONTRACTOR'S WORKS' OR 'MANUFACTURER'S WORKS'** shall mean the place or places of work used by the CONTRACTOR/SUB-CONTRACTOR or their collaborator (s) for the manufacture of EQUIPMENT or performance of WORKS.

18. **'COST'** means the cost properly incurred by the CONTRACTOR in carrying out any of his obligations under the Contract, and 'Costs' shall be construed accordingly.

19. **'DAY'** shall mean a calendar day of 24 hours.

20. Deleted

21. **'DEFECT'** means any work done or any Material or the PLANT or any part of it which does not comply with the CONTRACT, provided that such matter shall not be a Defect if it is caused by:

    a) normal wear and tear;

    b) a failure by the PURCHASER to operate and maintain the PLANT in accordance with any operating and maintenance manuals provided by the CONTRACTOR and/or with good engineering practice

22. **'DEFECT LIABILITY PERIOD'** shall mean a period of 12 months commencing from the date of PRELIMINARY ACCEPTANCE. CONTRACTOR shall warrant that the equipment and material supplied under the CONTRACT shall be new and free from any defect or deficiency with respect to design, material and workmanship. In the event of any, defect or deficiency arising during the DEFECTS LIABILITY PERIOD, CONTRACTOR shall repair or replace the defective or deficient EQUIPMENT and MATERIALS at its own cost. In such event the DEFECT LIABILITY PERIOD for the particular equipment which is repaired/ replaced shall be extended for another 12 months from the date of acceptance by OWNER of such replaced/repaired equipment/material. However, extended DEFECTS LIABILITY PERIOD shall have an upper limit of 36 months for extended DEFECTS LIABILITY PERIOD, starting from the PRELIMINARY ACCEPTANCE.

23. **'DOCUMENTATION'** means any relevant documents in paper or electronic form, including drawings, technical software, images, designs, manuals or records.

24. **'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.

25. **'EFFECTIVE DATE OF CONTRACT'** - The date of issue of LOI shall be considered as EFFECTIVE DATE of the CONTRACT.

26. **'ENGINEER'S INSTRUCTIONS'** shall mean any drawings and/or instructions in writing, details, directions and explanations issued by the OWNER from time to time during the CONTRACT PERIOD to the CONTRACTOR/ SUB-CONTRACTOR for carrying out the WORK.

27. **'EXTENDED PERFORMANCE TEST PERIOD'** has the meaning stated in Clause 18 of Special Conditions of Contract.

28. **'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.

29. **'FINAL ACCEPTANCE'** shall mean that date when all of the conditions set forth in Clause as specified in SPECIAL CONDITIONS OF CONTRACT (SCC) have been satisfied, all liabilities and obligations under this CONTRACT have been discharged, except those specially to be continued or performed after FINAL ACCEPTANCE, and OWNER has issued the FINAL ACCEPTANCE CERTIFICATE to CONTRACTOR.

30. **'FINAL ACCEPTANCE CERTIFICATE'** shall mean that certificate issued by the PROJECT MANAGER or OWNER to the CONTRACTOR subject to Clause 19 of SCC at the end of the DEFECTS LIABILITY PERIOD.

31. **'FINAL COMPLETION'** shall mean the completion of guarantee tests and handing over of the PLANTS and facilities to OWNER.

32. **FINAL PROPOSAL** means the document containing up to date technical offer of CONTRACTOR and technical information, data, etc., including drawings as agreed to in writing between the CONTRACTOR and OWNER, which is annexed to CONTRACT.

33. **'FORCE MAJEURE'** has the meaning stated in Sub-clause 35.0 of GCC.

34. **'GCC' or GENERAL CONDITIONS OF THE CONTRACT** shall mean all the terms and conditions forming part of this agreement as defined in the Part I Section 2

35. **'GUARANTEED COMPLETION DATE'** shall mean the date corresponding to the Complete Time/Completion Schedule from effective date as mentioned at Clause 6.0 of ITB, subject to any extensions expressly provided for within which date CONTRACTOR shall have achieved PRELIMINARY ACCEPTANCE and upon which OWNER has issued the PRELIMINARY ACCEPTANCE CERTIFICATE.

36. '**INDIAN AGENT'** shall mean the person, firm or company nominated as such by the CONTRACTOR to represent the CONTRACTOR for this CONTRACT in India.

37. **'INITIAL OPERATION'** shall mean the first integral operation of the complete EQUIPMENT covered under the CONTRACT with sub-systems and supporting equipment in service or available for service and shall be undertaken as part of COMMISSIONING after completion of start-up activities.

38. **'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.

39. **'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.

40. '**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.

41. **'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.

42. **MECHANICAL COMPLETION"** shall mean completion of erection to such an extent that the 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 after HAZOP Studies and in accordance with all applicable codes, and laws.

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) Boilers are hydrostatically or pneumatically tested. All non-operating preferring checks are made in accordance with the manufacturer's instructions.

D) Compressor, Pumps, Machinery etc. are cold aligned. Couplings are assembled and guards installed.

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. Air lines are leak tested.

F) Relief valves are installed, prior to this they should 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 and start up.

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) PRECOMMISSIONING has been completed.

N) The PLANT is ready to take feed

43. **'MONTH'** shall mean the calendar month.

44. **'NOTICE OF AWARD OF THE CONTRACT'/'LETTER OF INTENT'** shall mean the official notice issued by the OWNER notifying the CONTRACTOR that his bid has been accepted, subject to such conditions as may have been stated therein as agreed on between CONTRACTOR and OWNER and that the CONTRACTOR is required to sign the CONTRACT Agreement.

45. **'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/ email to the last known private or business address/email 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.

46. '**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.

47. **'OWNER'** shall mean the M/s. Hindustan Urvarak & Rasayan Ltd. having its registered office at Kolkata, India.

48. **'PERFORMANCE & GUARANTEE TEST RUN (PGTR)'** shall mean all operational checks and tests required to determine and demonstrate capacity, efficiency and operating characteristics as specified in the CONTRACT documents of the EQUIPMENT by the CONTRACTOR, before the PLANT is taken over under guarantee by the OWNER.

49. **'PLANT'** shall mean the Offsite & Utilities Area within the Battery Limit as defined in PART-II, TECHNICAL.

50. '**PRELIMINARY ACCEPTANCE'** shall mean that following milestones have been achieved (i) MECHANICAL COMPLETION has occurred, (ii) PRE-COMMISSIONING and COMMISSIONING of the PLANT have been accomplished, (iii) the sustained load test has been passed, (iv) the PLANT has passed all performance tests and is in compliance with all applicable LEGISLATIONS (v) OWNER has accepted the PLANT (vi) CONTRACTOR and OWNER agree that the PLANT is ready for normal continuous operation (vii) all Government approvals required to operate and maintain the PLANT have been obtained by OWNER (viii) OWNER has confirmed that the PLANT conforms with the requirement under the

WORK (ix) OWNER has received all DOCUMENTS required hereunder for OWNER to start up, operate and maintain the PLANT (x) 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 (xi) all special tools and spare parts purchased by CONTRACTOR as provided herein have been delivered to OWNER; and (xii) CONTRACTOR has completed the training program of OWNERS personnel as required under this CONTRACT.

51. '**PRELIMINARY ACCEPTANCE CERTIFICATE'** shall mean that certificate issued by the Project Manager/Engineer Incharge or OWNER to the CONTRACTOR following satisfaction of conditions under PRELIMINARY ACCEPTANCE, the acceptance of which commences the DEFECT LIABILITY PERIOD.

52. **"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.

53. **'PROJECT'** shall mean the Project specified in the Technical specification.

54. **'PROJECT MANAGER/ENGINEER INCHARGE'** shall mean the person designated by the OWNER and shall include those who are expressly authorised by the OWNER to act for and on his behalf for operation of this CONTRACT.

55. Deleted.

56. **'PURCHASER'** shall mean OWNER

57. **'SCC' or SPECIAL CONDITIONS OF THE CONTRACT** shall mean all the terms and conditions forming part of this agreement as defined in the Part-I, Section-3.

58. **'SITE'** shall mean and include the land and other places on, into or through which the EQUIPMENT and related facilities/PLANT shall be erected/established 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.

59. **'SOFTWARE'** means all forms of software and firmware and their documentation.

60. **'SPECIFICATION'** shall mean collectively all the terms and stipulations in conditions of the CONTRACT, 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.

61. **'START UP'** shall mean bringing the equipment covered under the CONTRACT from an inactive condition, when construction is essentially complete, to the state ready for initial operation. The start-up shall include preliminary inspection and checkout of EQUIPMENT and supporting sub-systems; perform calibration and corrective action and chemical cleaning of the PLANT/system/equipment covered under the CONTRACT.

62. **'SUB-CONTRACTOR'** 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.

63. '**TAKE OVER', 'TAKING OVER' AND 'TAKEN OVER'** shall mean

(i) OWNER taking possession of and use of the PLANT following issue of PRELIMINARY ACCEPTANCE CERTIFICATE.
(ii) OWNER, by exercising the option, takes possession of the PLANT after one (01) failed PERFORMANCE & GUARANTEE TESTS for reason attributable to CONTRACTOR.

64. **'TEMPORARY WORKS'** means all temporary WORKS and structures of every kind construed at the SITE and required for the provision and construction of the PLANT.

65. **'TEST ON COMPLETION'**, shall mean all such tests as prescribed in NIT/CONTRACT Documents to be performed by the CONTRACTOR have been carried out satisfactorily.

66. **'THIRD PARTY SOFTWARE'** means standard Software which is owned by a third party.

67. **'TOTAL CONTRACT PRICE' or 'CONTRACT PRICE'** shall mean the total price (including Duties, Cesses, Levies etc but excluding GST) payable to the CONTRACTOR for the full and proper performance of it's contractual obligations under the CONTRACT.

68. **'GST'** means any tax or cess or both imposed on the supply of goods or services or both under GST Law.

GST Laws' means IGST Act, GST (Compensation to the States for Loss of Revenue) Act, CGST Act, respective UTGST Act and respective SGST Act, 2017 and all related legislations, Rules, Notifications, Orders, etc.

69. **'WEEK'** shall mean continuous period of 7 (Seven) DAYS.

70. **'WORK' OR 'WORKS'** means the design, engineering and other services to be 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.

71. **'WRITING'** shall include any manuscript, typewritten or printed statement, under or over signature and/or seal as the case may be.

72. **MUTUALLY AGREED DAMAGES (MAD)** means the predefined mutually agreed rates between OWNER and CONTRACTOR as detailed in NIT representing the CONTRACTOR's liability (without possibility to recourse at law) for the delay in

achieving GUARANTEED COMPLETION DATE and/or for the failure to meet guaranteed Work Cost Guarantee provided under Clause 31 of GCC for reasons attributable to the CONTRACTOR.

73. **'SECURITY CUM PERFORMANCE BANK GUARANTEE'** shall mean a bank guarantee to be furnished by CONTRACTOR in the format attached herewith and further described in Clause 8 herein below.

74. **'SUB-CONTRACT'** shall mean any subcontract issued by CONTRACTOR after acceptance of its BID for the execution of WORKS.

75. **'NOTICE INVITING TENDER (NIT) / BIDDING DOCUMENT /'** means Tender Documents issued originally along with subsequent Addendum / Amendment(s), if any, issued thereafter.

4.0 CONTRACT CONFIRMATION

4.1 Within fifteen (15) days from date of receipt of the CONTRACT, CONTRACTOR shall sign the CONTRACT and return it to the OWNER. The copy of the CONTRACT shall be signed by an authorised officer of the CONTRACTOR in whose name Power of Attorney has been issued.

4.2 After CONTRACT confirmation/signing, the terms and conditions contained therein take precedence over CONTRACTOR's bid conditions and all previous correspondence.

4.3 If after award of CONTRACT, the CONTRACTOR does not acknowledge receipt of award of CONTRACT and/or fails to deposit the SECURITY CUM PERFORMANCE BANK GUARANTEE within the time period specified in the CONTRACT, the OWNER reserves the right to cancel the CONTRACT and forfeit the EMD without prejudice to various rights and remedies the OWNER may be entitled to as per terms and conditions of CONTRACT and without being liable in any manner whatsoever to the CONTRACTOR.

5.0 MODIFICATIONS IN CONTRACT

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

5.2 OWNER shall not be bound by any printed conditions, provisions in the CONTRACTOR'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.

6.0 USE OF CONTRACT DOCUMENTS AND INFORMATION

6.1 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.

6.2 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.

6.3 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.

7.0 PATENT INFRINGEMENT AND INDEMNIFICATION

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 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 and/or any other process licenser'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 Clause-7.1.4, 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.

7.1.8 Notwithstanding any other provisions under this CONTRACT, the liabilities arising on account of patent infringement shall be unlimited and all costs to these liabilities shall be borne by CONTRACTOR.

7.2 INDEMNITIES

7.2.1 INDEMINIFICATION 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), of whatsoever kind and nature 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 (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 relating to WORK (v) any breach of CONTRACT with any SUB-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 .However the CONTRACTOR shall indemnify the owner 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 after PRELIMINARY ACCEPTANCE..

CONTRACTOR shall ensure that in addition to “Erection All risk policy” the coverage in respect of Workmen Compensation, Mediclaim Policy, Professional Indemnity (with the amount of minimum excess) has been appropriately taken.

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 except GST, shall be deemed to be included in TOTAL 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 help in obtaining permits for CONTRACTOR's personnel to undertake any WORK in India in connection with CONTRACT.

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 SECURITY CUM PERFORMANCE BANK GUARANTEE

8.1 Within 30 days after receipt of CONTRACT by CONTRACTOR, the CONTRACTOR shall furnish to the OWNER a SECURITY CUM PERFORMANCE BANK GUARANTEE in the form of a bank guarantee for faithful completion of Project, as per terms and conditions of the CONTRACT, issued by any of the Banks as per List attached as Annexure-1.25 for an amount equivalent to 10% of the TOTAL CONTRACT PRICE.

8.2 The proceeds of SECURITY CUM PERFORMANCE BANK GUARANTEE 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.

8.3 The SECURITY CUM PERFORMANCE BANK GUARANTEE shall be denominated in the currency/currencies of the CONTRACT.

8.4 The SECURITY CUM PERFORMANCE BANK GUARANTEE in the form of a bank guarantee shall be valid for the duration upto the DEFECT LIABILITY PERIOD plus 06 months. The SECURITY CUM PERFORMANCE BANK GUARANTEE 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 SECURITY CUM PERFORMANCE BANK GUARANTEE will be discharged by the OWNER against the failure of CONTRACTOR in performing it'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 SECURITY CUM PERFORMANCE BANK GUARANTEE 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 SECURITY CUM PERFORMANCE BANK GUARANTEE, then the CONTRACTOR shall arrange to get the SECURITY CUM PERFORMANCE BANK GUARANTEE extended for the period asked for by OWNER. In case SECURITY CUM PERFORMANCE BANK GUARANTEE 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 SECURITY CUM PERFORMANCE BANK GUARANTEE. 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 CONTRACT shall be deemed to be 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 SECURITY CUM PERFORMANCE BANK GUARANTEE whole or part of the value of SECURITY CUM PERFORMANCE BANK GUARANTEE. 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 SECURITY CUM PERFORMANCE BANK GUARANTEE shall be refunded after CONTRACT has been successfully completed and certificate to this effect has been issued by OWNER. It shall be lawful for OWNER if any differences or dispute is likely to arise to defer payment of the SECURITY CUM PERFORMANCE BANK GUARANTEE or any portion thereof which may be due for release until such differences and dispute has been finally settled or adjusted. SECURITY CUM PERFORMANCE BANK GUARANTEE amount shall not bear any interest.

NOTE

1) Any bank guarantee such as SECURITY CUM PERFORMANCE BANK GUARANTEE shall be issued by any of the Banks as per List attached as Annexure-1.25.

2) The non-judicial Stamp paper of Rupees Two hundred only or equivalent document value prevailing in the country of the CONTRACTOR shall have to be purchased in the name of the bankers executing the bank guarantee and not in the name of the CONTRACTOR.

9.0 CONTRACT AGREEMENT

9.1 On acceptance of the BID, the BIDDER shall be informed about it and he will be required to give his acceptance in writing within 15 (fifteen) days. Thereafter a contract agreement shall be finalised between the OWNER and the BIDDER and signed within 15 days of acceptance by the BIDDER. The date of issue of LOI shall be considered as EFFECTIVE DATE of the CONTRACT.

9.2 The CONTRACT will be signed in triplicate, one copy each for CONTRACTOR, OWNER's Head Office and SITE office. Bidder to provide 10 DVDs of scanned signed Contract Agreement apart from 3 sets of Original Contract Agreement. All expenses for the preparation and stamping of CONTRACT shall be borne by the CONTRACTOR.

10.0 MANNER OF EXECUTION OF CONTRACT

10.1 All documents as per Clause 2.0 of GCC shall be included in the CONTRACT document and detailed specifications be inserted as mutually agreed between OWNER and CONTRACTOR.

10.2 Every page of the CONTRACT agreement shall be initialled by the authorised representatives of OWNER and CONTRACTOR under the Seal of their respective Companies.

10.3 The CONTRACT agreement shall be prepared on stamp paper as per specified Form of Contract as per Annexure- 1.15.

10.4 The CONTRACTOR shall present the above CONTRACT so prepared in three copies along with proper power of attorney and other requisite material on the day of signing the agreement.

10.5 One signed copy shall be returned to CONTRACTOR while the other two including the original shall be retained by OWNER.

10.6 Deleted

10.7 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 EFFECTIVENESS AND JURISDICTION OF CONTRACT

11.1 The CONTRACT shall be considered as having come into force from the EFFECTIVE DATE of the CONTRACT.

11.2 The laws applicable to this CONTRACT shall be the laws in force in India from time to time and shall be subject to the jurisdiction of the Court in Delhi.

12.0 ASSIGNMENT OR SUBLETTING OF CONTRACT AND SUB-CONTRACTING

12.1 Neither CONTRACTOR nor OWNER shall assign CONTRACT or any part of it or any share of interest therein, without the prior written consent of the other Party. This consent shall not be unreasonably denied.

12.2 CONTRACTOR shall not subcontract the whole or any part of WORK without the prior written consent of OWNER provided always that CONTRACTOR may subcontract any part of WORK to any of its affiliates or subsidiaries in which event CONTRACTOR shall remain fully responsible to OWNER for the WORK performed by such affiliates or subsidiaries.

12.3 **Sub-Contracts and Purchase Orders**

12.3.1 **General**

All vendors, suppliers, consultants and SUB-CONTRACTORS 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"/ “VENDORS”, and any such SUBCONTRACTS, purchase orders and similar purchase forms and arrangement entered into by or on behalf of CONTRACTOR with SUB CONTRACTORS/VENDERS are herein referred to as "SUBCONTRACTS" provided that none of OWNER's CONTRACTORS or SUBCONTRACTORS shall be deemed to be a SUBCONTRACTORS under of the CONTRACTOR. The CONTRACTOR shall be obligated to select SUBCONTRACTORS it retains in connection with the performance by CONTRACTOR of the WORK from a SUBCONTRACTORS list which would be finalised and approved by the OWNER in the FINAL PROPOSAL. 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 SUBCONTRACTOR.

12.3.2 **Approval of Major SUB-CONTRACTOR/VENDOR**

12.3.2.1 The vendor list for procurement of EQUIPMENT and the list of SUB-CONTRACTOR shall be as attached in the NIT. Any changes/ Additions to such list of VENDOR/SUB-CONTRACTOR shall require the prior approval of OWNER. CONTRACTOR shall provide name, address, fax/telex number and name of contact person of major VENDOR/SUB-CONTRACTOR for use in future, to OWNER. VENDORS, SUBCONTRACTORS as per agreed vendor list are not subject to approval.

12.3.2.1.1 A. Deleted.

B. As it is not possible to ascertain credentials of all the vendors suggested by BIDDERS at his stage, following prequalification criteria, shall be adopted:

The BIDDER should specify, while pre-qualifying the vendors, that during the past 15 years the vendor should have supplied at least two similar PLANT equipments or machinery. The BIDDER should satisfy themselves that sufficient documentary proof is submitted by the vendors in support of this criterion.

The BIDDER 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 SUBCONTRACT 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/VENDORS and shall be responsible for all design; 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/ VENDORS.

(c) If CONTRACTOR fails to correct, or commence to correct and prosecute the correction with due diligence of deficient or defective work performed by any SUB-CONTRACTOR/VENDOR 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/VENDORS to perform the SUB-CONTRACTS in accordance with the relevant requirements of the CONTRACT including FINAL PROPOSAL, all LEGISLATIONS/ applicable laws and applicable permits, prudent utility practice, good engineering practices, the requirements of the NIT, and all Warranties of SUB-CONTRACTORS/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/VENDOR and any other person to whom any amount is due from CONTRACTOR for services, equipment, construction equipment, materials or supplies otherwise related to or in connection with 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/VENDORS such directives and impose such restrictions as may be required to obtain such compliance herewith and with the terms of the SUBCONTRACTS.

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 will be purchased in compliance with CONTRACT Technical Specification and Requirements in order to allow the PLANT to achieve the Guarantee and Warrantee as provided for in the CONTRACT, unless otherwise agreed with Owner. Any residual warranty from sub-CONTRACTOR/vendor shall be passed to the OWNER after expiry of DEFECT LIABILITY PERIOD.

(b) Neither CONTRACTOR nor its SUBCONTRACTORS/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/vendor shall be passed to the OWNER after expiry of DEFECT LIABILITY PERIOD.

(c) Nothing in this clause shall derogate from the obligations of CONTRACTOR to provide the Guarantees and Warranties described in, and to comply with the provisions hereinabove.

(d) CONTRACTOR shall, based on its 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/VENDORS to be covered by the insurance specified in the CONTRACT, during the time in which they are engaged in performing WORK.

(g) CONTRACTOR shall require all SUB-CONTRACTORS/VENDORS to release and waive any and all rights of recovery against OWNER including its affiliates, subsidiaries, employees, successors, permitted assigns, insurers and underwriters) and against CONTRACTOR and all other SUB-CONTRACTORS/ VENDORS which the releasing SUB-CONTRACTOR/ VENDOR may otherwise have or acquire, in or from or in any way connected with any loss covered by policies of insurance maintained or required to be maintained pursuant to this the CONTRACT (other than third party liability insurance policies) or because of deductible clauses in or inadequacy of limits of any such policies of insurance. CONTRACTOR shall further require all SUB-CONTRACTORS/VENDORS to include in all policies of insurance maintained by the SUB-CONTRACTORS/VENDORS clauses providing that each underwriter shall release and waive all of its rights of recovery, under subrogation or otherwise, against OWNER, its promoters, affiliates, subsidiaries, employees, successors, permitted assigns, insurers and underwriters, and against CONTRACTOR and all other SUB-CONTRACTORS/VENDORS.

(h) OWNER shall not be deemed by virtue of the CONTRACT to have any contractual obligation to or relationship with any SUB-CONTRACTOR/VENDOR.

12.3.2.5 **CONTRACTOR's Liability for approved SUBCONTRACTOR**

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/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/VENDORS shall not relieve CONTRACTOR of any duties, liabilities or obligations under this CONTRACT.

12.3.3 All WORK performed or EQUIPMENT supplied by SUB-CONTRACTOR/ 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/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/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

12.3.3.5 Include a price list (which shall be valid for a period of at least for 12 months from the date of COMMISSIONING) covering all mandatory spares and replacement parts relating to the subject matter of such PURCHASE ORDER or SUB-CONTRACT.

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**

12.3.5.1 It is within the discretion of CONTRACTOR, that CONTRACTOR shall agree to hold all SUBCONTRACTOR/ 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 and WORK performed under this CONTRACT shall conform to the standards mentioned in the technical specifications and when no applicable standard is mentioned, the standards shall conform to International Standards proposed by the BIDDER and approved by the OWNER. "

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, excepting what is herein provided, be given by OWNER/ CONSULTANT

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

C) 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 number shall be shown on all invoices, communications, packing lists, containers and bills of lading etc.

15.0 INSPECTION, TESTING AND EXPEDITING

15.1 The OWNER or his representatives shall have their right to inspect and/or to test the – EQUIPMENTS, MATERIALS and WORK to conform to the specifications laid down in the

CONTRACT. The SPECIAL CONDITIONS OF CONTRACT and/ or the TECHNICAL SPECIFICATIONS shall specify what inspections and test the OWNER require and where they are to be conducted. The OWNER shall notify the CONTRACTOR in writing of the identity of any other representatives 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.

15.2 The inspections and tests may be conducted on the premises of the CONTRACTOR or his SUB-CONTRACTOR at any stage of completion and/or at the good's final destination. When conducted on the premises of the CONTRACTOR or his SUBCONTRACTOR, all reasonable facilities and assistances including access to drawings and production data shall be furnished to the inspector at no charge to the OWNER.

15.3 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 above mentioned institutions will not be considered a case of 'Force Majeure'. In case of the EQUIPMENT, MATERIALS and /or WORKS fail to pass the inspection performed by OWNER or by INSPECTOR and re-inspection is to be carried out, then any cost be incurred by OWNER or INSPECTOR for carrying out such re-inspection shall be borne and paid by CONTRACTOR, any delay due to failure of such re-inspection shall be to the account of CONTRACTOR and shall not become a reason for extension of time.

15.4 Participation or presence of OWNER 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.

15.5 Copies of all test results/report of the tests shall be furnished promptly by the CONTRACTOR to the OWNER.

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 to meet the GUARANTEED COMPLETION DATE quoted in months from the date of notification of award.

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, construction 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 four copies (of which one shall be reproducible) to OWNER.

16.1.4 The time schedule network/bar chart shall be updated at least every month using the latest 'Project Management software', i.e. / MS Projects (latest version), acceptable to the OWNER.

16.2 **Progress Trend Chart/Monthly Report**

16.2.1 CONTRACTOR shall report fortnightly to OWNER, the progress of the execution of CONTRACT and achievement of targets set out in time bar chart.

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 Deleted.

16.2.8 Deleted

16.2.9 The time for completion and phased time schedule shall be subject to and in accordance with the provision of Sub-Clauses 16.2.10, and 16.2.12 below.

16.2.10 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.

16.2.11 Deleted.

16.2.12 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 GUARANTEED COMPLETION DATE, the provisions of Clause 34 of GCC shall apply.

17.0 CONTRACTOR TO INFORM HIMSELF FULLY

17.1 **CONTRACTOR to Inform Himself**

17.1.1 The CONTRACTOR shall be deemed to have carefully examined the specification thoroughly and to have removed any doubts he may have had as to the meaning of the Specification and in addition to have fully informed himself as to the SITE and local conditions affecting the carrying out of the CONTRACT and to have made due allowance in his offer. If he shall have any doubt as to the meaning of any portion of the CONTRACT documents, he shall, at the time of BID submit the particulars in writing to the OWNER. The OWNER will provide necessary clarifications in WRITING to the CONTRACTOR. The soil investigation report furnished in the technical part is to be considered for preparation of bid.

17.2 **Discrepancies in Documents**

17.2.1 If the CONTRACTOR finds any discrepancies between the SPECIFICATION, drawings or schedules he shall immediately refer them to the OWNER for decision. Figured dimensions on the drawings shall be followed. Dimensions shall not be scaled unless permission is given in writing by the OWNER.

17.3 Any information otherwise obtained from the OWNER shall not in any way relieve the CONTRACTOR of his responsibility to fulfil his obligations under the CONTRACT.

18.0 SUITABILITY OF PLANT FOR INTENDED PURPOSE

18.1 It is a condition of the CONTRACT and the CONTRACTOR warrants that the PLANT will be suitable in all respects for the purpose mentioned or inherent in the specification.

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 fifteen (15) days after receipt of any requirement or direction of OWNER which he considers will render the PLANT unsuitable in any respect or is not in accordance with the meaning and intent of the CONTRACT otherwise prevent the CONTRACTOR from carrying out the CONTRACT 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 decision and the decision shall become final and binding.

19.0 FEES FOR ROYALITIES AND PATENT RIGHTS

19.1 Payment Due to be Included in CONTRACT PRICE

19.1.1 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.

19.2 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 COMPLIANCE WITH LAWS, 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 from owner. If the CONTRACTOR does not receive such instructions from owner 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.

21.0 TIME - PROJECT SCHEDULE

21.1 The time and the date of completion of the WORKS as stipulated in the CONTRACTOR's proposal and accepted by the OWNER shall be deemed to be of the utmost importance. The CONTRACTOR shall so organise his resources and perform his work as to complete it not later than the date agreed to.

21.2 The CONTRACTOR shall submit the schedule in MS Projects/Primavera within thirty (30) days or as specified elsewhere after EFFECTIVE DATE of the CONTRACT.

The MS Project level 3 pert 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) civil & erection and (iv) Pre-Commissioning, Commissioning, sustained load test, testing etc.

BIDDER shall be contractually obliged to issue a primavera level 3 pert schedule, provided that such schedule shall not (i) accelerate the OWNER obligations (to be agreed upon prior to Contract award) (ii) change the agreed GUARANTEED COMPLETION DATE.

21.3 The above PERT network / Bar Chart shall be periodically reviewed and reports shall be submitted by the CONTRACTOR as directed by the OWNER.

21.4 CONTRACTOR shall give the WORK the highest priority and no other work of CONTRACTOR shall take precedence over the WORK, nor shall CONTRACTOR make any allocation of its resources which would have the effect of delaying the timely performance of the WORK.

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) Deleted

b) Design and Engineering

c) Supply of all PLANT, Equipment, Bulk Materials, consumables, Chemicals, Lubricants, etc.

d) Supply of spares as per Part-II-Technical

e) Civil and Structural WORKS,

f) Custom Clearance, Port Handling and onward despatch to SITE and forwarding charges,

g) Freight up to SITE,

h) Unloading, storage at SITE, SITE Assembly, Civil/Structural Work, Erection, PRE-COMMISSIONING and COMMISSIONING until PRELIMINARY ACCEPTANCE OF PLANT.

i) Insurance.

j) All duties, Levies, Cess, Custom Duty etc. including but excluding GST, as applicable in India and outside India for execution of work and for supply of goods & services under CONTRACT

k) Inspection and expediting charges

l) 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.

o) All the costs related to obtaining all statutory clearances required for the execution of the PROJECT and completion of the PROJECT till the PRELIMINARY ACCEPTANCE of the PLANT by OWNER.

p) The other costs not mentioned but necessary for the completion of the scope as per NIT/CONTRACT conditions.

22.2 OWNER shall pay to CONTRACTOR the Contract price/rates as applicable, 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. The CONTRACT PRICE is fixed and firm and not subject to any escalation during the contract period unless and otherwise specified in the CONTRACT documents.

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 and their agents 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.

22.5 The price/rate quoted by the CONTRACTOR in his bid with additions and deletions as may be agreed upon before signing of the CONTRACT, for the entire scope of the work as indicated in Clause 2.0 of ITB and Clause 1.0 of GCC.

22.6 The price quoted shall be firm and fixed without any escalation whatsoever on any account except the statutory variations in Taxes or introduction of any new taxes, duties, cesses levied by the Government of India within GUARANTEED COMPLETION DATE and otherwise specified in the CONTRACT.

22.7 Deleted.

22.8 The prices indicated for spare parts in the item wise lists shall be fixed and not subject to any escalation.

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.

Income Tax including withholding tax (if any) along with surcharge of Income Tax & cess as applicable at the prevailing rate on the gross amount billed shall be deducted from the CONTRACTOR'S bill as per applicable laws and price quoted by BIDDER shall be deemed to include the same.

24.0 Deleted

25.0 PAYMENT TERMS

25.1 The payment to CONTRACTOR for the performance of the WORKS under the CONTRACT will be made by OWNER as per the guidelines & conditions specified herein in Annexure-1.10 of PART-I, Commercial i.e. PAYMENT TERMS.

25.2 Schedule of Payment

The CONTRACTOR shall submit one progressive bill every month based on the billing schedule duly certified by OWNER with related documents.

25.3 Due Date for Payment

OWNER will make progressive payments as and when the payment is due as per the terms of payment set forth in the CONTRACT. Payment will become due and payable by OWNER within 30 days from the date of receipt of CONTRACTOR'S bill/invoice by OWNER provided the documents submitted are complete in all aspects and are submitted as per billing schedule.

The monthly invoice shall be submitted for certification of OWNER's Representative as per the mutually agreed Billing schedule. The monthly invoice shall be in a form mutually agreed between OWNER and CONTRACTOR and shall provide the details of the supplies or services performed within the provisions of GST Laws. Each Monthly Invoice shall be accompanied with a certification by CONTRACTOR as to the invoice's truth and accuracy and should be signed by the CONTRACTOR Project Manager. Each Monthly Invoice shall

set forth the gross amount due to CONTRACTOR in respect of the WORK done and the net amount to be paid after adjusting Mobilisation Advance and any MAD under this CONTRACT due to OWNER and any other amounts owed by CONTRACTOR to OWNER.

In the event the Monthly Invoice submitted by CONTRACTOR is not accompanied by all relevant and requisite documents, details, and such items as required under this CONTRACT, OWNER shall return such incomplete invoice within a period of fifteen (15) days from the date of receipt of such invoice. In such event, the payment period of (30) days for such invoice shall commence on the date of its proper resubmission.

In the event OWNER has an objection in a monthly invoice or a portion of such invoice, OWNER shall notify CONTRACTOR of such objection within fifteen (15) days following OWNER's receipt of such Monthly Invoice. OWNER shall pay to CONTRACTOR any amount of such invoice that is not in dispute by the due date, however the last payment shall not become due until CONTRACTOR has furnished to OWNER (i) certification that CONTRACTOR has fulfilled all of its obligations under this CONTRACT through such date. The last payment shall be made within eight four (84) days (as per the provisions of sub-clause 56.4.5) after receipt by OWNER of the last invoice, complete in all respects.

26.0 TAXES, PERMITS & LICENCES

The CONTRACTOR shall be liable and pay all taxes, duties, levies, lawfully assessed against the OWNER or the CONTRACTOR or the SUBCONTRACTOR 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/sub-CONTRACTOR 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.

26.1 Deleted

26.2 Deleted

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.

27.2 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/trailor 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. CONTRACTOR shall the follow the guidelines of Ministry of Road Transport and Highways (MORTH), India, for the shipping/transportation of the all packages/ consignments.

27.5 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. The CONTRACTOR shall be solely responsible for proper storage and preservation of all EQUIPMENTS, MATERIALS & machineries etc.

27.6 The CONTRACTOR shall be solely responsible for generation of E-way bills, wherever applicable, for all the packages and containers as required under the GST Laws.

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 or its equivalents and third party liability insurance policies with reputed underwriters to cover ALL RISK whatsoever during the whole period starting with dispatch of GOODS from CONTRACTOR's warehouses/ Ex WORKS 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 PRELIMINARY ACCEPTANCE.

28.1.1 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 part 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.

a. Workmen's Compensation Insurance to the limit to which compensation may be payable under the laws of Republic of India.

b. Third Party Insurance for body injury and property damage to the limit of not less than Rs. 10,00,000/- (Rupees Ten Lakh Only) in accident at each job site and to a limit not less than Rs 1,00,00,000/- (Rupees One Crore Only) for all accidents at all job sites. Provided that the limits specified above shall operate only as a specification of minimum limits for insurance purposes, but shall not anywise limit the CONTRACTOR'S liability in terms of this clause or otherwise to the limit(s) specified.

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 and OWNER´s acceptance shall not be unreasonably withheld. However, irrespective of such acceptance, the responsibility to maintain adequate insurance coverage at all times including third party liability during the period of contract shall be as of CONTRACTOR alone. The CONTRACTOR's failure in this regard shall not relieve him of any of his contractual responsibilities and obligations. The insurance covers to be taken by the CONTRACTOR shall be in the joint names of OWNER and the CONTRACTOR. The CONTRACTOR shall, however, be authorised to deal directly with insurance company or companies and shall be responsible in regard to maintenance of all insurance covers.

28.4 All insurance including marine insurance 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 up to 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/ 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.

28.5 Any loss or damage to the EQUIPMENT during handling, transportation, storage, erection, putting the EQUIPMENT into satisfactory operation and all activities to be performed till the successful completion of trial operation of the PLANT shall be to the account of the CONTRACTOR. The CONTRACTOR shall be responsible for reference of all claims and make good the damages or loss by way of repairs and/or replacement of the equipment, damaged or lost. The transfer of title shall not in any way relieve the CONTRACTOR of the above responsibility during the period of CONTRACT. The CONTRACTOR shall provide the OWNER with copies of all insurance policies and documents taken out by him in pursuance of the CONTRACT. Such copies of documents shall be submitted to the OWNER immediately after such insurance coverage. However, if Marine cargo insurance or Third party liability Insurance is a part of their global policies; insurer certificate (including the main terms of policy) shall be submitted by CONTRACTOR. The CONTRACTOR shall also

inform the OWNER in the writing at least thirty (30) days in advance regarding the expiry/ cancellation and/or change in any of such documents and ensure revalidation, renewal etc. as may be necessary well in time. However adequacy, credibility and maintenance of Insurance policies is the sole responsibility of CONTRACTOR and CONTRACTOR shall keep the OWNER indemnified against any such failure.

28. 6 License /facilities, to the extent it remains the responsibility of the OWNER, in respect of supplies to be made by the foreign CONTRACTOR from outside India required for purposes of replacement of equipment lost in transit and /or during erection and /or during storage shall be made available by the OWNER. CONTRACTOR shall however, be required to follow the procedure as may be laid down by the Owner to facilitate him arranging such license /facilities. 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 OWNERS. The workman compensation policy taken by the SUB-CONTRACTOR of the CONTRACTOR shall be passed on to the OWNER.

28.7 All cost on account of insurance liabilities covered under the CONTRACT will be to the CONTRACTORs account and will be included in the TOTAL 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.

28.8 Irrespective of single or separate insurances, the CONTRACTOR shall take the same in the joint name of CONTRACTOR and OWNER, with OWNER as primary beneficiary and CONTRACTOR as joint beneficiary, to cover all risk including marine cum erection insurance (MCE), workmen compensation / Employees State Insurance (ESI) under ESI Act 1948 for CONTRACTOR's personnel, fire risk policy etc. till handing over of PLANT to OWNER duly commissioned and tested. However, for CONTRACTOR's EQUIPMENT, CONTRACTOR can be the sole beneficiary.

28.9 All the equipment being supplied by the owner/consultant free of cost for installation of the equipment, cabling, earthing and lightning protection etc. By the contractor, covered by this specification shall be kept insured by the contractor against loss, damage, theft, pilferage, fire etc. From the point of unloading at site upto the time of taking over by the Employer including handling, in plant transportation, storage, installation, testing, and commissioning, etc. And the contractor shall be fully responsible for making good of any loss or damage at is own cost within a reasonable time as mutually agreed upon by the Owner / Consultant and the contractor. Any loss /damage shall be brought to the consultant/owner's notice immediately. The premium paid by the contractor to the insurance company for such insurance (only for equipment/item supplied by Owner) shall be reimbursed by the Owner to the contractor at actual against documentary proof to be furnished by the Contractor. The Contractor shall obtain competitive quotation for such insurance and shall take prior approval from the Employer before taking the insurance. The insurable value of the equipment being procured by the Owner will be intimated to the Contractor for the purpose of insurance.

28.9.1 It will be the responsibility of the Contractor to lodge, pursue and settle all claims with the Insurance Company in case of any damage, loss, theft, pilferage, fire, etc. And the Owner shall be kept informed about it. The losses, if any, will have to be borne by the Contractor, if the claims are not lodged and pursued properly or in the time or if the same are not settled by the Insurance Company.

29.0 GUARANTEES / DEFECT LIABILITY PERIOD

29.1 It shall be a condition of the CONTRACT and the CONTRACTOR shall guarantee that the PLANT shall achieve the requirement as set forth herein and as per PART-II, Technical of NIT shall form part of the CONTRACT.

29.2 The CONTRACTOR shall guarantee that the PLANTs, EQUIPMENT, MATERIALS and machineries will be new and in accordance with the CONTRACT documents and free from defects in design, material & workmanship and shall give DEFECT LIABILITY PERIOD of Twelve (12) calendar months commencing immediately upon PRELIMINARY ACCEPTANCE as specified in SCC. The CONTRACTOR's liability shall be limited to the replacement of any defective parts in the equipment of his own manufacture or those of his SUBCONTRACTOR or re-performance of the WORK under normal use and arising from faulty design, materials and/ or workmanship provided always that such defective parts are not repairable at the SITE and are not in the meantime essential in the commercial use of the PLANT. Such replaced defective parts shall be returned to the CONTRACTOR unless otherwise arranged.

29.3 After the issue of the PRELIMINARY ACCEPTANCE CERTIFICATE, 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.

29.4 Deleted

29.5 Deleted

29.6 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.

29.7 The acceptance of the equipment by the OWNER shall in no way relieve the CONTRACTOR of his obligation under this clause.

29.8 In the case of those defective parts which are not repairable at SITE but are essential for the commercial use of the equipment and machineries, the CONTRACTOR shall mutually agree to a programme of replacement or renewal which will minimise interruption to the maximum extent, in the operation of the equipment and machineries.

29.9 At the end of the DEFECTS LIABILITY PERIOD or the extended DEFECTS LIABILITY PERIOD, the CONTRACTOR's liability ceases. In respect of goods/ EQUIPMENTS supplied by the SUB-CONTRACTORS to the CONTRACTOR where a long guarantee (more than 12 months) is provided by such CONTRACTORs, the OWNER shall be entitled to the benefit of such longer guarantees.

29.10 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.

29.11 The provisions of Clause 48 of GCC including the cost of transport, insurance etc. shall be implemented at the CONTRACTOR's expenses.

29.12 The provisions contained in Clause 48 of GCC will not be applicable. a) If after handing over of the PLANT the OWNER has not operated the equipment according to generally approved industrial practices and in accordance with the conditions of operation specified and in accordance with operation and maintenance manuals if any; b) In cases of normal wear and tear of the parts to be specifically mentioned by the CONTRACTOR in the offer.

29.13 **Guarantees for Time of Completion**

The CONTRACTOR shall guarantee the date of PRELIMINARY ACCEPTANCE of the WORKS calculated from the EFFECTIVE DATE OF CONTRACT, for the purpose of determining pre-determined MUTUALLY AGREED DAMAGES on account of delay in GUARANTEED COMPLETION DATE . No damages will be levied on account of delay in GUARANTEED COMPLETION DATE for the reasons not attributable to the CONTRACTOR.

29.14 **Performance Guarantees**

CONTRACTOR shall guarantee the performance of PLANT as specified in the Technical Documents Part-II, Technical.

29.15 **Design and Vendors'/ Sub-CONTRACTORs' Guarantees**

29.15.1 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.

29.15.2 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 12 (Twelve) MONTHS from the date of PRELIMINARY ACCEPTANCE of PLANTS.

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 guarantee tests.

30.2 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 MUTUALLY AGREED DAMAGES (MAD)

31.1 For Delay in Completion

31.1.1 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 and more defined in Clause 21 hereinabove. 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.

31.1.2 However, it is not incumbent upon the PROJECT MANAGER 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.

31.1.3 The time stipulated in the CONTRACT for the execution and completion of the WORKS is the essence of CONTRACT and shall be deemed to be of utmost importance of the CONTRACT. In the event the CONTRACTOR fails to achieve PRELIMINARY ACCEPTANCE within the GUARANTEED COMPLETION DATE from the EFFECTIVE DATE OF CONTRACT then the CONTRACTOR shall pay to the OWNER as MAD at the rate of 0.5% of the TOTAL CONTRACT PRICE for every complete week or part thereof subject to a maximum of 5% of the TOTAL CONTRACT PRICE.

31.1.4 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, this clause will be applicable after expiry of such extended period.

31.1.5 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 delay upto 10 weeks from the GUARANTEED COMPLETION DATE. If the GUARANTEED COMPLETION DATE is delayed beyond 10 weeks then the OWNER shall have the right to terminate the CONTRACT as per the provisions of Clause 34.2 of GCC.

31.2 Deleted

32.0 OVERALL CEILING ON TOTAL LIABILITY

32.1 The maximum overall liability under the CONTRACT shall be limited to 10% of TOTAL CONTRACT PRICE, excluding liabilities for extra cost incurred due to Termination of CONTRACT and carrying out balance work at the risk and cost of the CONTRACTOR, re-

engineering, make good, mechanical warranty and patent infringement as per relevant Clauses of CONTRACT.

32.2 Notwithstanding anything contained elsewhere in CONTRACT or implied to the contrary:

a) CONTRACTOR shall, in no circumstances, be liable in respect of any indirect or consequential loss or loss of profit suffered by OWNER in connection with or arising out of performance of WORK under CONTRACT.

b) OWNER shall, in no circumstances, be liable in respect of any indirect or consequential loss or loss of profit suffered by CONTRACTOR in connection with or arising out of performance of WORK by CONTRACTOR under the CONTRACT.

33.0 TIME EXTENSION OF CONTRACT

33.1 Deleted.

33.2 The CONTRACTOR shall promptly notify the PROJECT MANAGER 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.

33.3 If the CONTRACT is delayed at any time in the commencement or during the progress of the WORK by any act, delay or neglect of the OWNER or his employees, or by any other CONTRACTOR employed by the OWNER or by FORCE MAJEURE, the time of completion shall be extended by the Project Manager/Engineer Incharge in writing for a reasonable period as may be mutually agreed upon application from the CONTRACTOR immediately on occurrence of such special circumstances but not later than 5 working days and not towards the end of the CONTRACT period.

33.4 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 90 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 attributable to OWNER.

34.0 TERMINATION OF CONTRACT

34.1 **Termination due to Legal Incapacity**

If the CONTRACTOR goes into liquidation or has an administrative 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.

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) Entrust the whole or part of the remaining work to any agency for undertaking the balance WORK at the risk and COST of Contractor not withstanding any provision of the contract in respect of confidentiality and license clauses

And / or

b) Terminate the CONTRACT and encash the SECURITY CUM PERFORMANCE BANK GUARANTEE and any bank guarantee for advance payment.

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

34.3.1 OWNER shall have right to suspend making any payments to the CONTRACTOR 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 person or persons 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 which 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 be retained by the OWNER and applied in payment of such deficiency.

In addition the OWNER shall be entitled:

a) 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;

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 34.4.2 the 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 the issue of the certificate of taking over, the OWNER shall ascertain the cost of the WORK to the OWNER comprising payments to the CONTRACTOR and costs incurred by the OWNER in carrying out of the work taken out of the CONTRACTOR's hands, 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 certified be greater than the amount 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 a debt due by the CONTRACTOR to the OWNER and which may be recovered as provided in sub clause 34.4.1 of this clause or in any Court of Competent jurisdiction in 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 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 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 The jobs that are complete and ready for handover, within 30 days after the CONTRACTOR's receipt of notice of termination shall be paid by OWNER at the CONTRACT terms and prices. For the remaining jobs, the OWNER may opt:

a) To have any portion completed at the CONTRACT terms and prices; and/or

b) To cancel the remainder and pay to the CONTRACTOR a mutually agreed amount for partially completed jobs and for materials and parts previously procured by the CONTRACTOR, in which event such goods shall be the property of the OWNER.

34.7.3 **Termination for Insolvency**

OWNER may at any time terminate CONTRACT giving written notice to CONTRACTOR, without compensation 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.

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 WORK already performed or of obligations assumed by CONTRACTOR prior to the date of termination, except as otherwise agreed by OWNER in writing.

35.0 FORCE MAJEURE

35.1 Neither CONTRACTOR nor OWNER shall be considered in default in the performance of their obligations under CONTRACT, as long as such performance is prevented or delayed for reasons such as acts of God, severe earthquake, typhoon or cyclone (except monsoon), floods, lightening, land slide, fire or explosions, plague or epidemic, strikes of a whole

National category of workers and concerted act of workmen or other industrial disturbances (lasting more than 14 consecutive calendar DAYs), lockouts (lasting more than 10 consecutive calendar DAYs), sabotage, blockade, war, riots, invasion, act of foreign enemies, hostilities (whether war be declared or not), civil war, rebellion, revolution, insurrection or military or usurped power of confiscation or trade embargoes or destruction or requisition by order of any Government or any Public Authority, provided notice of any such cause is given forthwith and in any event not later than one week (7) DAYs of the happening of the event by the party claiming the benefit of this Clause to the other specifying the matter constituting FORCE MAJEURE explaining to what extent contractual obligations will thereby be prevented or delayed and the further period for which it is estimated that such prevention or delay will continue. CONTRACTOR shall provide justificatory documents countersigned by the local Chamber of Commerce. Notwithstanding the forgoing, FORCE MAJEURE shall not include (a) weather conditions reasonably to be expected for the climate in the geographic area of the SITE including but not limited to the monsoon season, (b) the occurrence of any manpower or material shortages unless such a shortage is itself caused by an event of FORCE MAJEURE, or (c) any delay, default or failure (direct or indirect) in obtaining materials, or in any SUB-CONTRACTOR/VENDOR or worker performing any WORK or any other delay, default or failure (financial or otherwise) attributable to SUB-CONTRACTOR/Vendor/worker, unless such delay, default or failure results from any act, event or condition which would, with respect to such SUB-CONTRACTOR/VENDOR/ worker, constitute an event of force majeure.

35.2 If the CONTRACTOR suffers delay in the due execution of the contractual obligations due to delays caused by FORCE MAJEURE as defined above, the GURANTEED COMPLETION DATE 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 and no longer duration than is reasonably necessitated by the Force Majeure act, circumstance or event , provided that on the occurrence of any such contingency, the CONTRACTOR immediately reports to the OWNER in writing, the cause of delay and likely duration of cause of delay with requisite documentary evidence.

35.3 For variation in the scope of work resulting into additional 25% in estimated contract value, no extension in completion time shall be admissible. Notwithstanding any other provision in the contract, the Owner/Consultant may at any time of its own initiative or at the request of the contractor, if satisfied of the existence of any ground(s) may extend the completion period by duration as deemed reasonable. The decision of the Owner/Consultant in this regard shall be final and binding upon the contractor.

35.4 Should one or both the Parties be prevented from fulfilling the contractual obligations by a state of FORCE MAJEURE lasting continuously for a period of 6 weeks, the two Parties shall consult each other regarding the future implementation of the CONTRACT. The mere shortage of labour, materials or utilities shall not constitute FORCE MAJEURE unless caused by circumstances which are themselves FORCE MAJEURE.

35.5 CONTRACTOR and OWNER shall endeavour to prevent, overcome or remove the causes of FORCE MAJEURE.

35.6 No ground for exemption can be invoked if CONTRACTOR has failed to give timely notice by registered letter/ Email and subsequently supported it by documentary evidence.

35.7 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.

The non-performance of any obligation of either Party that was required to be performed prior to the occurrence of a Force Majeure shall not be excused as a result of such Force Majeure

35.8 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 one year 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 and shall be detailed at the time of CONTRACT closure.

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 have 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:

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 CONTRACT 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.

39.2 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 30 Days 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 40.0 below.

40.0 ARBITRATION

40.1 Except where otherwise provided in CONTRACT, all questions and disputes relating to CONTRACT, design, DRAWINGS, specifications, payments, instructions, orders or any other matter concerning WORK or the execution or failure to execute the same, whether arising during the progress of WORK or after completion or abandonment thereof or otherwise which cannot be settled amicably, shall be referred to arbitration. The arbitration shall be conducted under the rules and regulations of the Arbitration and Conciliation Act, 1996 and any statutory amendments thereto and shall take place in Delhi/Uttar Pradesh in accordance with Indian Law. The arbitration award given by the arbitrator shall be final and binding on both parties. Without prejudice to other provisions under above Act., it is agreed that there shall be a panel of arbitrators consisting of 3 members – one from each party and 3rd jointly nominated by these 2 selected arbitrators.

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

40.3 **Arbitration [Applicable for Public Sector Unit)**

In case the Contractor is an Indian Public Sector Enterprise/ Govt. Deptt. (but not a State Govt. Undertaking or Joint Sector Undertaking which is not a subsidiary of Central Govt. Undertaking), the dispute arising between the Owner and the Consultant shall be referred for resolution to a Permanent Arbitration Machinery (PAM) of the Department of Public Enterprises, Govt .of India.

41.0 GOVERNING LAWS, LANGUAGE AND MEASURES

41.1 The applicable law shall be Indian Law and shall be subject to the jurisdiction of the Court in Uttar Pradesh. 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.

41.2 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 guarantee period as provided for under the clause entitled guarantee.

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 it may have hereunder.

45.0 OWNER'S DECISION

45.1 In respect of all matters which are left to the decision of the OWNER including the granting or withholding of the certificates, the OWNER shall, if required to do so, by the CONTRACTOR, give in writing a decision thereon.

45.2 In each case involving a financial commitment the written APPROVAL of the OWNER alone shall be binding.

45.3 In matters of difference of opinion on a decision passed by the OWNER to the CONTRACTOR stipulations of Clause 39.0 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.

46.1.1 The Parties shall deal fairly, openly and in good faith with each other. Subject to Clause 53 (Secrecy), each Party shall disclose information which the other might reasonably need to 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 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 and offer them every facility for the execution of their several WORKS simultaneously with CONTRACTOR's work. 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 there of OWNER may provide such facilities at CONTRACTOR's cost.

The CONTRACTOR shall agree to cooperate with the OWNER and other CONTRACTORs and freely exchange with them such technical information 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 WORK

47.1 The OWNER reserves the right to suspend and reinstate execution of the whole or any part of the WORK without invalidating the provisions of the CONTRACT. Orders for suspension or reinstatement of the WORKS will be issued by the OWNER to the CONTRACTOR in writing. The time for completion of the WORKS will be extended for a period equal to the duration of the suspension.

47.2 If such suspension of WORK by OWNER delays or is likely to delay the progress of WORK or the carrying out of WORK under CONTRACT resulting in additional expenses or increased liability to CONTRACTOR, the OWNER shall pay to the CONTRACTOR all reasonable expenses, mutually agreed between OWNER and CONTRACTOR, arising from suspension of the WORK by an order in writing of the OWNER provided that such

suspensions of WORK is more than a cumulative period of ninety(90) days and provided that such suspension is not due to some fault on the part of the CONTRACTOR or a SUB-CONTRACTOR.

48.0 REPLACEMENT OF PARTS AND MATERIALS DEFECTIVE/DAMAGED/LOST DURING TRANSIT/ ERECTION AND COMMISSIONING.

48.1 If during the progress of the WORKS, the OWNER shall decide and inform in writing to the CONTRACTOR that the CONTRACTOR has manufactured any PLANT or part of the PLANT unsound or imperfect or has furnished 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 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.

48.2 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.

48.3 If the material/ equipment or any portion thereof is damaged or lost during transit and handling, storage, erection, COMMISSIONING at SITE, the replacements of such material / equipment shall be effected by the CONTRACTOR within a reasonable time to avoid unnecessary delay in the COMMISSIONING of the EQUIPMENT and without waiting for realisation of cost of damages from the insurance company, appointed by him for this purpose. This will not alter the schedule of COMMISSIONING & guarantee tests in any way.

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

49.2 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.

50.0 CONTRACTOR'S RESPONSIBILITIES

50.1 In consideration of payment by the OWNER, the CONTRACTOR shall regularly and diligently carry out and complete the WORKS in timely manner in accordance with the CONTRACT.

50.2 All WORK to be carried out by the CONTRACTOR shall be carried out with sound workmanship and materials, safety and in accordance with good engineering practice, applicable Legislation and codes.

The Work shall be carried out in accordance with the CONTRACT requirements, as per Clause 50.4.

Except as may otherwise be specifically provided in this CONTRACT, the CONTRACTOR shall be responsible to perform the WORKS and any other services/deliverables not specifically described in this CONTRACT if:

The provision of such additional services/deliverables is necessary in order for CONTRACTOR to satisfy the warranties and guarantees set forth in Clause 29 or to otherwise make the WORK comply with this Contract.

WORK undertaken and additional services/deliverables provided pursuant to this clause shall be deemed to have been included within the TOTAL CONTRACT PRICE and shall not give rise to any adjustment in TOTAL CONTRACT PRICE.

50.3 The CONTRACTOR shall set out the PLANT by reference to points, lines and levels of reference as defined in the approved SPECIFICATION.

50.4 The PLANT/WORKS as completed by the CONTRACTOR shall in every respect comply with the requirements defined in the Specification (Part II- Technical) or any other provision of the CONTRACT.

50.5 If 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 PROJECT MANAGER stating the reasons for his opinion and where appropriate submit his proposals for a variation in accordance with Clause 3 of SPECIAL CONDITIONS OF 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 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 PROJECT MANAGER on the progress of the WORKS, supporting his reports with appropriate Documentation(including mitigation plan for slippages) including any revisions to the approved programme.

50.8 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.

50.9 The CONTRACTOR shall avail the most beneficial notifications, abatements, exemptions etc., if any, as applicable for the supplies under the GST Laws as well as Custom Laws.

50.10 The CONTRACTOR shall comply with all the compliance requirements under GST law.

50.11 The CONTRACTOR shall raise invoice in the prescribed format with all the required information within the due date in terms of the provisions of GST Laws. Taxes will not be reimbursed if such invoices are raised after the due date.

50.12 The CONTRACTOR agrees to do all things that may be necessary to enable the OWNER to claim input tax credit in relation to any GST payable under this CONTRACT or in respect of any supply under this CONTRACT. This shall include (but not limited to):

- Issuing invoices/ debit notes/ revised invoices/ credit notes as per the prescribed format, containing all the information as is required for the OWNER to avail input tax credit basis such invoices/ debit notes/ revised invoices.
- Submission of periodic returns as per the GST laws within specified time lines with complete and correct details as may be prescribed
- Deposit of tax within the due dates as may be prescribed
- Issuance of debit note within the prescribed time limit to enable the OWNER take the credit.

50.13 The CONTRACTOR shall continuously maintain a high GST compliance rating score as per the GST law. The OWNER reserves the right to terminate this CONTRACT if the CONTRACTOR fails to achieve/ maintain an appropriate GST compliance rating score.

51.0 PROGRESS REPORTS AND PHOTOGRAPHS

51.1 The CONTRACTOR shall furnish each of one hard copy and one electronic copy of progress photographs of the work done in his shop/SITE. Photographs shall be taken when and where indicated by the PROJECT MANAGER. Photographs shall be approximately 8 inches by 10 inches in size, including a margin on one 10 inch side for binding. Adequate number of photographs shall be submitted indicating various stages of manufacture and erection. Each photograph shall contain the date, the name of the CONTRACTOR and the title of the view taken.

51.2 Required number of monthly progress reports, in prescribed proforma, shall be submitted by the CONTRACTOR to the PROJECT MANAGER for review. These shall detail the status of design, procurement of raw materials and bought outs, expediting status, 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 and construction work and programme of work for succeeding month and statement showing position of payment. The reports shall also include section on critical issues, action taken reports and mitigation plans etc.

52.0 SPARES

All the necessary Start-Up/ Commissioning spares and Mandatory spares shall be included in the scope of CONTRACT, which shall be as per the Part-II, Technical of the Technical document.

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, 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.

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.

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.

53.2.2 The CONTRACTOR shall keep on each SITE at least three copies of each and every Drawing, Specification and CONTRACT Document in excess of his own requirement and those copies shall be available at all times for use by the OWNER and PROJECT MANAGER and by any other person authorized by the OWNER who have a need to know the same for the PROJECT, who shall be provided an adequately sized SITE office or offices, for the safe-keeping and use of such documents, by the CONTRACTOR throughout the duration of the CONTRACT. Where one or more of CONTRACTOR'S yards/offices/offshore spreads are deployed in the WORKS, all requirements of the CONTRACT and CONTRACTOR'S obligation under the CONTRACT shall apply equally at each yard/office/offshore spread so deployed.

54.0 CORRESPONDENCE

54.1 All correspondence from the CONTRACTOR to the OWNER shall be as per the correspondence distribution schedule. All communications including technical-commercial clarification and/or comments shall be addressed to OWNER and shall always bear reference to CONTRACT.

54.1.1 Correspondence on technical and commercial matters shall be dealt with in separate letters and each copy of the letter shall be complete with all Annexure, if any.

54.2 Any notice to the CONTRACTOR under the terms of the CONTRACT shall be served by registered mail/Speed Post, fax , or courier.

54.3 Any notice to the OWNER shall be served from the CONTRACTOR's Principal office in the same manner.

54.4 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.

54.5 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, to the OWNER, all MATERIALS required for incorporation in the permanent WORKS as determined by the CONTRACTOR, within the scope of WORK, to be necessary to establish, commission and operate (so far as concerns mandatory spares) the PLANT/ Unit delivered on CIF basis at Indian port of CONTRACTOR's choice, custom clearance in India and transportation upto SITE in respect of imported materials and delivered at Site basis for all Indian MATERIALS and EQUIPMENT at the price specified in the Schedule of Rates.

55.1.2 **INVOICES**

CONTRACTOR's invoices shall be raised as per the approved billing schedule.

(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 post appointed date, 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 services, 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 PROJECT MANAGER, 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, for which purpose the OWNER shall, from time to time, grant to the CONTRACTOR or the CONTRACTOR's designate(s), such authority(ies) as may be reasonably required by the CONTRACTOR in this behalf.

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.

iii) 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, other local toll, terminal and/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.

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.

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 there under in respect of materials:

i) The CONTRACTOR shall in taking delivery, ensure compliance of any condition for delivery applicable to deliveries from the concerned authority or carrier, and shall be exclusively responsible to pay and bear any detention, demurrage or penalty or other charges payable by virtue of any delay or failure by the CONTRACTOR in lifting the materials or in observing any of the conditions aforesaid, and shall keep the OWNER indemnified from and against all consequences thereof

ii) The CONTRACTOR shall maintain a day-to-day account of all materials indicating the daily receipt(s), consumption(s) and balance of each material and category thereof. Such account shall be in the format, if any, prescribed by the PROJECT MANAGER and shall

be supported by all documents necessary to verify the correctness of the entries in the account. Such account shall be maintained at the CONTRACTOR MANAGER's office and SITE(s) and shall be open for inspection and verification (by verification of documents in support of the entry as also by feasible verification of the stock) at all times by the PROJECT MANAGER with authority at all times without obstruction to enter into or upon any go-down 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) All MATERIALS, including materials in respect of which licences / release orders/permits/ authorization have been accorded in the name of the OWNER shall, without prejudice to the responsibility/liability of the CONTRACTOR in respect thereof, vest in the OWNER

- upon shipment from the country of manufacture [FOB basis] with respect to the items to be procured or supplied from the source outside India and,

- ex-WORKS VENDOR shop with respect to the items to be procured in India.

and the CONTRACTOR shall be deemed to be acting on behalf of the OWNER, importer of records, and as an agent of the OWNER in respect of deliveries taken by the CONTRACTOR.

v) 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.

vi) The CONTRACTOR shall take out, at his own cost and keep in force at all times, during transit, handling, storage, and erection upto completion in all respect of the work, policy(ies) with Insurance Company(ies) approved by the OWNER for the full replacement value of the materials at site against the risks hereinafter specified. Such policies shall be in the joint names of the OWNER and the CONTRACTOR, with OWNER named as first beneficiary and with right in the OWNER (but without obligation to do so) to take out and pay the premia for any such policy(ies) and deduct the premia and any other costs and expense in this behalf from the monies for the time being due or in future becoming due to the CONTRACTOR.

a) Notwithstanding anything herein provided, the CONTRACTOR shall be and remain solely and exclusively liable to repair, restore or replace, as the case may be, the materials damaged or destroyed as a result of any act or omission, notwithstanding the existence or otherwise of any policy(ies) of insurance aforesaid, with the intent that any policy(ies) of insurance aforesaid taken out by the CONTRACTOR or by the OWNER, on default by the CONTRACTOR, shall not anywise absolve the CONTRACTOR from his full liability up to and until issue of the PRELIMINARY ACCEPTANCE as provided for herein in respect of the WORKS, the work(s) and all materials incorporated therein shall be and remain at the risks of the

CONTRACTOR in all respects, including (but not limited to) accident, lightning, earth-quake, fire, storm, flood, tempest, riot, civil commotion and/or war or otherwise with respect to the materials, but shall constitute merely an additional security and not a substitution of liability.

b) It shall be the exclusive responsibility of the CONTRACTOR to lodge and pursue any or all claims in respect of the insurance aforesaid.

c) The CONTRACTOR shall, as a condition to the certification of any Running Account Bill, satisfy the OWNER/ Project Manager 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.

d) Wherever total damages/loss of EQUIPMENT/MATERIAL, would occur, the CONTRACTOR will be entitled to payment of all payments received from the underwriters. However, following amounts shall be withheld:

1. The amount paid to the CONTRACTOR under the CONTRACT in respect of EQUIPMENT/MATERIAL damaged/lost (excluding the pro-rata advance(s) already paid to the CONTRACTOR.

2. Custom Duties and other taxes and duties which have already been paid by the OWNER.

In the event the claim money settled is less than the total of the amount in 1 & 2 above, then the entire claim money settled will be withheld by the OWNER and the balance shall be retained out of the subsequent payments due to the CONTRACTOR.

The aforesaid withheld amount shall be released to CONTRACTOR on fulfilment of corresponding conditions under terms of payment.

Subsequent payments, if any, due under the CONTRACT shall be regulated by the relevant terms of payment.

e) In case of damage to any equipment/material during any stage, the CONTRACTOR upon rectification of the damaged equipment to the satisfaction of the OWNER shall be paid to the extent of full claims settled by the underwriters.

f) For avoidance of doubt it is clarified that the insurance settlement amount shall not be used by OWNER as income or profit.

vii) Notwithstanding anything herein provided and notwithstanding the transference of all risks in respect of the materials to the CONTRACTOR, the ownership in respect of the material shall at all times be and remain in the OWNER.

viii) An inventory shall be made by the CONTRACTOR of all surplus construction materials and empties including but not limited to scrap, wastages and unserviceable material supplied and/or remaining in the hands of the CONTRACTOR upon completion of the CONTRACT for whatsoever reason, and the CONTRACTOR shall forthwith, upon being required to do

so, place the OWNER in undisputed possession of and transport the said material to the OWNER's stores or otherwise as reasonably directed by the Project Manager/Engineer Incharge.

ix) If the CONTRACTOR shall default in replacing at the job SITE, without any additional cost to the OWNER, any material lost, damaged, deteriorated, misused, wasted, short, stolen, misapplied or disposed of within the provisions hereof above, or shall fail to return to the OWNER any surplus material or empties within the provision hereof above, the CONTRACTOR shall be liable to pay to the OWNER the cost of such materials or empties delivered at OWNER's stockpile/godown.

55.3.0 **BILLS OF MATERIALS**

55.3.1 The CONTRACTOR shall within 45 days of EFFECTIVE DATE OF CONTRACT furnish to the OWNER a detailed Bill of Materials specifying the materials, which on preliminary determination made by the CONTRACTOR, will be required to be incorporated in the permanent WORKS in order to establish the WORKS/ Unit and to operate the PLANT/Unit (to the extent of the Mandatory spares), including construction materials.

55.3.2 Each item entered in the Bill of Materials shall be priced, so far as possible, in conformity with the details given in this behalf in the priced bid. The Bill of Materials and said price break–up therein and in the price bid 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.

55.3.3 The OWNER shall review or cause to be reviewed the prima facie adequacy, sufficiency, 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.

55.3.3.1 The priced Bill of Materials as approved by the OWNER shall constitute the Bill of Materials envisaged in the contract documents. However, no such approval shall, in any manner, absolve the CONTRACTOR of his full responsibility under the CONTRACT to sell and supply to the OWNER at and within the price of materials quoted in the Price Schedule, all materials required for the permanent incorporation in the WORKS and which are required to establish, commission and operate (to the extent of Mandatory spares) 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.

55.3.4 The Bill of Materials shall be subject to amendment in both items and prices in so far as necessary consequent upon any amendment in any relevant related technical particulars, and upon any amendment, the amended Bill of Materials as approved by the OWNER, shall thereafter constitute the Bill of Materials as envisaged in the CONTRACT documents, provided that unless the amendment results from a CHANGE ORDER and/or agreed variation, no such amendment shall anywise impose any liability on the OWNER to pay any amount, taxes or customs and other import duties in excess of the amount, taxes customs

and other import duties payable on the value of imported materials as indicated in the Price schedule but for such amendment.

55.4 **SUPPLY OF MATERIALS**

55.4.1 The CONTRACTOR shall supply the materials required to be supplied within the CONTRACTOR's scope of supply for incorporation in the permanent WORKS in accordance with and to meet the requirements in quality, quantity and other particulars of the descriptions, specifications, plans, drawings, designs and other documents applicable thereto, and the CONTRACTOR shall be deemed to have undertaken that all materials selected, procured and supplied by the CONTRACTOR within the scope of supply shall be of the best quality and workmanship and shall be capable of producing the designed desired results and to perform the designed and desired functions to meet the contractual requirements in all respects for the project.

55.4.2 The CONTRACTOR shall undertake and complete the supply of materials within the scope of supply to meet the scheduled progress and requirements of the WORK within the scope of work.

55.4.3 Within 30 (thirty) days from the EFFECTIVE DATE OF CONTRACT, the CONTRACTOR shall submit to the OWNER for approval in respect of each work or groups of work, a detailed Delivery Schedule in Graphical or other suitable form giving dates of starting and finishing the various supplies relating to the WORK, providing sufficient margin to cover for contingencies. The PROJECT MANAGER and the CONTRACTOR shall thereafter, within 14 (Fourteen) days, settle the Delivery Schedule which shall form part of the CONTRACT with attendant obligations upon the CONTRACTOR to make the various deliveries/supplies involved on or before the date(s) mentioned in respect thereof in the Delivery Schedule.

55.4.4 All materials shall be deemed to have been accepted only when the material is received at the project SITE and accepted by the PROJECT MANAGER. Such acceptance shall however, be subject to the terms and conditions hereof, including the right of rejection and/or replacement as elsewhere herein specified.

55.4.5 Deleted.

55.4.6 Any reference in the CONTRACT documents to the "approved Delivery Schedule" or to the "Delivery Schedule" shall mean the approved Delivery Schedule specified in Clause 55.4.3 above or the Delivery Schedule prepared and issued by the Project Manager/Engineer Incharge, whichever shall be in existence.

55.4.7 Within 7 (Seven) days of the occurrence of any act, event or omission which, in the opinion of the CONTRACTOR, is likely to lead to delay in the commencement or completion of delivery of any particular material or of all material and is such as would entitle the CONTRACTOR for an extension of the time specified in this behalf in the Delivery Schedule(s), the CONTRACTOR shall inform the Project Manager/Engineer Incharge in writing of the occurrence of the act, event or omission and date of commencement of such occurrence. Thereafter, if even upon the cessation of such act or event or the fulfilment of the omission, the CONTRACTOR is of opinion that an extension of time specified in the Delivery Schedule related to particular material(s) or in relation to all materials is necessary, the CONTRACTOR shall within 7 (Seven) days after the cessation or fulfilment as aforesaid make a written request to the Project Manager/Engineer Incharge for extension of the relative time specified in the Delivery Schedule and the Project Manager/Engineer Incharge shall at any time, prior to completion of the work, extend the relative time of completion in the Delivery Schedule for such period(s) as he considers necessary, if he is of reasonable opinion that such act/event/omission constitutes a ground for extension of time in terms of

the CONTRACT and that such act/event/omission has in fact resulted in insurmountable delay to the CONTRACTOR.

55.4.8 Notwithstanding the provisions of Clause 55.4.7 hereof, the OWNER may at any time after the completion of the work in all respects at the request of the CONTRACTOR made by way of appeal either against a decision of the Project Manager/Engineer Incharge taken under Clause 55.4.7 or against the Project Manager/Engineer Incharge refusal to take a decision under the said clause, if satisfied of the existence of any ground(s) justifying the delay/omission, extend the date of delivery of any materials for such period(s) as the OWNER may consider necessary.

55.4.9 Subject as elsewhere herein or in the CONTRACT documents, otherwise expressly provided, only the existence of force majeure circumstances as defined in Clause 55.4.10 hereof, shall afford the CONTRACTOR a ground for extension of time for delivery of materials, and specifically without prejudice to the generality of the foregoing:

i) Inclement or unforeseen weather, strike or lock-out (except as provided in Clause 55.4.10), shutdown, third party breach, delay in payment or commercial hardship shutdown or idleness or other impediment in progress or completion of the supply or work due to any reason whatsoever shall not afford the CONTRACTOR a ground for extension of time or relieve the CONTRACTOR of his/its full obligations under the CONTRACT.

ii) No delay whatsoever in the supply of any material by the CONTRACTOR or any of the CONTRACTOR's vendors, suppliers or SUB-CONTRACTORS shall anywise entitle the CONTRACTOR to any extension of time for completion or to any claim for additional costs, remuneration or damages or compensation notwithstanding that an increase in the time of performance of the CONTRACT is involved by virtue of the delay or failure and notwithstanding that any labour, machinery or equipment brought to or upon the job SITE by the CONTRACTOR or any SUB-CONTRACTOR is rendered idle by such delay.

55.4.10 "Force Majeure" shall mean an event beyond the control of the CONTRACTOR and not involving the CONTRACTOR's fault or negligence and not foreseeable as per Clause 35.0 of GCC.

55.4.11 No assurance, representation, promise or other statement by any personnel, Engineer or representative of the OWNER regarding the extension of time for the supply by the CONTRACTOR of any material within the CONTRACTOR's scope of supply shall be binding upon the OWNER or shall constitute an extension of time for the supply of any material(s) within the provision of Clause 55.4.7 or Clause 55.4.8 hereof, unless the same has been communicated by the PROJECT MANAGER to the CONTRACTOR in writing under Clause 55.4.7 or by the Managing Director under Clause 55.4.8 and the writing specifically states that it constitutes an extension of time within the provisions of Clause 55.4.7 or 55.4.8, as the case may be. Without prejudice to the foregoing, 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.

55.4.12 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.

55.4.13 **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 PROJECT MANAGER / OWNER.

ii) Wherever any item is specified by a brand name, manufacturer or vendor, the make mentioned shall be for establishing type, function and quality desired. Other makes will be considered, provided sufficient information is furnished to the OWNER/ PROJECT MANAGER, to assess the makes proposed by the CONTRACTOR as equivalent and acceptable and approved by PROJECT MANAGER.

iii) 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/ PROJECT MANAGER'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.

55.5.2 On arrival of the material at SITE the CONTRACTOR shall give written notice thereof to the Project Manager/Engineer Incharge 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.

55.5.3 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 Project Manager/Engineer Incharge 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 Project Manager/Engineer Incharge 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 Project Manager/Engineer Incharge 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 Project Manager/Engineer Incharge or Inspection Agency.

55.5.4 If on Inspection or proof, analysis or tests as aforesaid the Project Manager/Engineer Incharge 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 Project Manager/Engineer Incharge 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.

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

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**

55.6.1 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 DELETED

55.8 **PACKING AND FORWARDING**

(a) IMPORTED SUPPLIES (if any)

- The CONTRACTOR wherever applicable, shall, after proper painting, pack and crate all materials for shipment in a manner suitable for export to a tropical, humid climate in accordance with internationally accepted export practices and in such a manner so as to protect them from damage and deterioration in transit by road, rail and/or sea and/or air 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) to the materials due to improper packing.

- The Contractor shall notify the OWNER and PROJECT MANAGER of the date of each shipment from the port of embarkation as well as of the expected date of arrival of such shipment at the designated port of arrival only for the OWNER's/ PROJECT MANAGER'S information.

- The notification shall give complete shipping information concerning the weight, size and content of each package and such other information as the OWNER may require.

- The packing material used should be duly certified by a Phytosanitary Certificate issued as per international norms.
- Insurance Certificate (2 copies) or copy of MCE Policy
- Third Party Inspection Release Note or Inspection Certificate as per QAP approved by OWNER/ PROJECT MANAGER or waiver certificate issued by OWNER/ PROJECT MANAGER (2 copies).

(b) INDIGENOUS SUPPLIES

- The CONTRACTOR shall, wherever applicable, after proper painting, pack and crate all items in such a manner 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/ PROJECT MANAGER of the date of each shipment from the WORKS and expected date of arrival at the SITE for the information of OWNER/ PROJECT MANAGER.
- 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/ PROJECT MANAGER may require.
- The following documents shall be sent to the OWNER/ PROJECT MANAGER within 10 (ten) days from the date of shipment :
  - Invoice (2 copies)
  - Packing List (2 copies)
  - Test Certificate (4 copies)
  - Railway Receipt/Lorry Receipt (2 copies)
  - Insurance Certificate (2 copies) or copy of MCE Policy
  - Third Party Inspection Release Note or Inspection Certificate as per QAP approved by OWNER/ PROJECT MANAGER or waiver certificate issued by OWNER/ PROJECT MANAGER (2 copies).

55.9 **EQUIPMENT**

55.9.1 The CONTRACTOR shall be exclusively responsible to arrange for importation into India in its own name on drawback or re-export or other basis all equipment, if any, required to be imported into India for the purposes of the WORK and to pay and bear the customs, import and other duties and levies (if any) payable thereon or in respect thereof, and will be solely responsible for the timely and proper compliance of all applicable terms and conditions and formalities relative thereto.

55.9.2 The CONTRACTOR shall within 4 (four) months from the date of receipt of Acceptance of Bid, furnish to the PROJECT MANAGER a list of the said equipment which he proposes to import into India on a draw-back/re-export basis for the purposes of the work, together with complete details thereof. The OWNER may without obligation or responsibility furnishes to the Import Licensing Authorities in India its recommendations relative to import of such equipment which the OWNER considers necessary for the work. The OWNER may also without obligation or responsibility render such assistance as may be reasonably required by the CONTRACTOR from the OWNER to enable the CONTRACTOR to obtain the relative Import License(s)/Permit(s) for the importation of the said equipment on a draw-back/re-export basis.

55.10 **MISCELLANEOUS IMPORTS**

55.10.1 The CONTRACTOR shall be exclusively responsible at his own costs and initiative to arrange for importation into India, to import into India, to pay Custom duties and Port and other charges and levies, to clear from Customs and to transport to job SITE all consumables, spares for the CONTRACTOR's equipment and other materials and things whatsoever not covered under the OWNER's obligation provided that the OWNER may, without obligation or responsibility, render the CONTRACTOR such assistance by way of recommendation to the Import Control authorities in India or otherwise as may be reasonably required by the CONTRACTOR from the OWNER to enable the CONTRACTOR to obtain Import License(s)/Permit(s) for importation of such consumables, spares, material and other items as the OWNER considers necessary for importation by the CONTRACTOR for the purpose of the CONTRACT, taking into account local availability.

55.10.2 Any obligation undertaken or recommendation, facility or assistance provided by the OWNER to the CONTRACTOR for or in relation to the importation of any equipment or material whatsoever into India by or on behalf of the CONTRACTOR pursuant to the provisions hereof or otherwise shall be without any responsibility or liability whatsoever upon the OWNER and without right in the CONTRACTOR to raise any claim or demand or to seek extension of time on account of any delay or failure on the part of the OWNER or any delay or failure by the CONTRACTOR in obtaining Import License(s) and/or permits for importation thereof into India.

55.10.3 All materials and equipment Imported into India by or on behalf of the CONTRACTOR for and in connection with the WORK and any obligation undertaken or recommendation, facility or assistance provided by the OWNER relative thereto shall be on the clear understanding that the MATERIALS and EQUIPMENT shall be utilised only for and relative to the performance of the WORK covered by the CONTRACT.

55.10.4 All the EQUIPMENT and temporary WORKS and MATERIALS when brought to or erected on the job SITE, shall be exclusively intended for execution of WORKS and the CONTRACTOR shall not remove the same or any part thereof, except for the purpose of moving it from one part of the job SITE to another, without the prior consent in writing of the PROJECT MANAGER.

55.10.5 Upon completion of the WORKS, the CONTRACTOR shall within the scope of work remove from the job SITE all the equipment and temporary WORKS remaining thereon.

55.10.6 All EQUIPMENT, MATERIALS and temporary WORKS shall at all times be and remain at the risks of the CONTRACTOR in all respects. The OWNER shall not, at any time, be liable for the loss or destruction of or damage to any EQUIPMENT, temporary WORKS or MATERIALS for any reason whatsoever.

55.11 **UTILITIES AND CONSUMABLES ETC.**

55.11.1 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, easements and 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.

- Construction Water shall be provided at a single point to the Contractor at free of cost.

- Construction Power shall be provided on chargeable basis at a single point to the contractor and unit rate for the power shall be Rs.10 per unit.

Any cost related to distribution and taking it to different points/locations shall be borne by CONTRACTOR.

56.0 MEASUREMENTS, CERTIFYING INSPECTIONS AND PAYMENTS

56.1 Measurements:

56.1.1 Within 15 (fifteen) days from the date of certification of works completed / milestones achieved in respect of the WORK, 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 Project Manager/Engineer Incharge and the CONTRACTOR as herein provided.

56.1.2 If the CONTRACTOR fails to apply to the Project Manager/Engineer Incharge for Measurements within15 (fifteen) days from the date of certification of works completed / milestones achieved as specified in Clause 56.1.1, the Project Manager/Engineer Incharge 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**:

56.2.1 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.

56.2.2 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 Project Manager/Engineer Incharge, whose decision in this regard shall be final and binding upon the CONTRACTOR.

56.2.3 All measurements shall be taken jointly by the Project Manager/Engineer Incharge or person nominated by PM 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.

56.2.4 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 PROJECT MANAGER and the measurements so recorded and signed by the Project Manager/Engineer Incharge 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 / CONTRACTOR's MANAGER and PROJECT MANAGER 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 / CONTRACTOR's MANAGER and Project Manager/Engineer Incharge 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 in respect of any measurements recorded in the Measurement Book.

56.2.6 All objections noted in the Measurement Book in terms of Clause 56.2.5 shall be considered and decided within 15 days by the Project Manager/Engineer Incharge. The decision of the Project Manager/Engineer Incharge 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.

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 **FINAL BILL**

56.4.1 On the basis of the CONTRACT PRICE provided in the CONTRACT, the CONTRACTOR shall prepare a Final Bill in the prescribed form with reference to the total supplies covered by the scope of supplies and shall prepare a separate Final Bill with reference to the total services covered by the scope of services. Such Bill shall be prepared by applying the price of materials specified in Price Schedule in respect of supplies broken up with respect to the indigenous materials and with respect to imported materials (including PLANT, parts and components) in accordance with the break-up of the Price of Materials given the Price Schedule and the various formats there under, and by applying the price of services specified in the Price Schedule in respect of WORKS/services broken up with respect to the various heads of services/WORKS in accordance with the break-up of the Price of services given the Price Schedule and the various formats there under. Additions claimed to the CONTRACT PRICE or reductions there from resultant upon any CHANGE ORDER(S) shall be separately indicated in the Final Bill with reference to the relative CHANGE ORDERS(S).

56.4.2 The Final Bill shall, in addition to the payment entitlements arrived at according to the provisions of Clause 56.4.1 hereof separately state, include therein all claims of the CONTRACTOR if any with full particulars of the nature of such claim, grounds on which it is based and the amount claimed.

56.4.3 The Final Bill drawn in accordance with Clause 56.4.1 shall be submitted together with the PRELIMINARY ACCEPTANCE CERTIFICATE to the PROJECT MANAGER for certification, who shall certify the Final Bill, if drawn in accordance with Clause 56.4.1. After certification of the PROJECT MANAGER, 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.

56.4.4 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 56.4.1 hereof and associated provisions there under accompanied by the PRELIMINARY ACCEPTANCE CERTIFICATE in respect of the WORKS.

56.4.5 Payments of the amount(s) due on the Final Bill to the extent certified by the PROJECT MANAGER, shall be made within 84 (Eighty Four) days from the due date as specified in Clause 56.4.4 hereof, subject to the deductions provided in Clause 56.4.5.1.

56.4.5.1 All payments due to the CONTRACTOR on the Final Bill shall be subject to deduction of "on-account" payments and other amounts due from CONTRACTOR to the OWNER, tax deductions as provided for in Clause 56.7.2 and associated clauses there under, and any other deduction provided for herein or agreed to between the parties 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.

56.5.0 **PRICE SCHEDULE**

56.5.1 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.

56.5.2 Without prejudice to the generality of the provisions of Clause 56.5.1 hereof, the Price Schedule and CONTRACT 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 upon, using, converting fabricating, or erecting any item, equipment, system, material or component in or relative to the WORKS, civil work and construction activity 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, ware houses for storing EQUIPMENT and MATERIALS 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 GST and other taxes or terminal taxes payable in India with regard to materials supplied by the CONTRACTOR within the scope of supplies, all customs and import duties, GST, any applicable Cess and other direct and indirect taxes and duties, quay, wharfage, 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 entitlement to the CONTRACTOR for any exemption, remission, refund or reduction thereof.

(vi) The cost of all indemnities under the CONTRACT, and insurance premium 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), labour 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.

56.5.3 The prices stated in the Price Schedule and the CONTRACT PRICE(s) shall not be subject to escalation or increase for any reason whatsoever unless otherwise provided in the CONTRACT documents.

56.5.4 In view of GST regime, Bidder to quote the Prices after considering Input Tax Credit (ITC).

56.6.0 **ADVANCE**

56.6.1 Without prejudice to the provisions of Clause 56.4.4 hereof, the OWNER shall by way of assistance to the CONTRACTOR, make "advance" payments to the CONTRACTOR during the progress of the work and/or supply on the basis of Running Account Bills or otherwise as elsewhere more specially provided for in the CONTRACT documents.

56.6.2 The following provisions shall apply with respect to "advance" payments to the CONTRACTOR:

56.6.2.1 Advance(s) paid to the CONTRACTOR shall carry interest at the rates specified in the SPECIAL CONDITIONS OF CONTRACT, and shall be adjustable (without prejudice to the any other mode of recovery) from the Running Account Bills of the CONTRACTOR as provided in the SPECIAL CONDITIONS OF CONTRACT.

56.6.2.2 The advances paid to the CONTRACTOR shall be used for execution of this contract only and the CONTRACTOR shall satisfy the OWNER in this regard whenever required. If it is found that an 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).

56.6.2.3 The CONTRACTOR shall issue receipt voucher in the prescribed format, which shall include applicable GST, as provided under the GST Laws for advance payments made as per the CONTRACT.

56.6.3 Not withstanding anything elsewhere provided in the CONTRACT documents, all advances made by the OWNER to the CONTRACTOR shall forthwith become repayable to the OWNER in the event of the CONTRACT being terminated for any cause.

56.7.0 **MODE OF PAYMENT AND TAX DEDUCTIONS**

56.7.1 All payments made under or in terms of the CONTRACT, payable in Indian currency, shall be paid by crossed "Account payee" cheque sent to the office of the CONTRACTOR notified in this behalf by the CONTRACTOR by courier or though RTGS/ Electronic Fund Transfer mechanism (EFT) in the CONTRACTOR's bank account (RTGS shall mean Real Time Gross Settlement- a term used by Indian banking industry for electronically transferring money from one account to the other account). CONTRACTOR shall within 15 days of the EFFECTIVE DATE provide to OWNER its bank account details for the purpose of RTGS/EFT.. All cheques drawn shall be payable at the designated office of the OWNER's bankers and in no case will the OWNER be responsible if the cheque is mislaid, misappropriated or otherwise lost or stolen.

56.7.1.1 Subject to the other provisions hereof, if the execution of the WORKS or the supply of the materials shall necessitate the importation into India of MATERIALS, PLANT or EQUIPMENT within the CONTRACTOR's scope of supply, or if the WORKS or any part thereof are to be executed by labour from outside India or if any other circumstances exists as shall render this necessary or desirable, a portion of the payments to be made under the CONTRACT shall be made in the appropriate foreign currencies as requested in the CONTRACTOR'S bid and accepted by the OWNER.

56.7.2 The CONTRACTOR shall be primarily responsible for the payment of all Indian Income tax.

56.7.2.1 Deleted

56.7.2.2 The CONTRACTOR shall be exclusively liable to pay directly to the concerned Income Tax Authorities in India and to bear all Indian Taxes payable relative to employment of any personnel by the CONTRACTOR.

56.7.2.3 Payments to a CONTRACTOR resident in India shall be subject to deduction of taxes under Section 194 C of Income Tax and/or under other Section, law, rule or regulation for the time being in force providing for the deduction of tax at source.

56.7.3 If any TDS is deductible by the OWNER on the WORK undertaken by the CONTRACTOR, the OWNER shall be responsible for issuing the TDS Certificates within the timelines prescribed under GST laws.

56.8.0 **CLAIMS BY THE CONTRACTOR**

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

56.8.2 If required by the OWNER, the Project Manager/Engineer Incharge shall be authorised to require the CONTRACTOR to furnish, and the CONTRACTOR shall, upon the request of the Project Manager/Engineer Incharge /OWNER, furnish all invoices, vouchers and accounting records as may be deemed necessary by the Project Manager/Engineer Incharge /OWNER for the purpose of verifying any CONTRACTOR's claim.

56.9 **DISCHARGE OF OWNER'S LIABILITY**

56.9.1 The acceptance by the CONTRACTOR of any amount paid by the OWNER to 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 and accepted claims included in his Final Bill and the right to receive payment of the unadjusted balance of the Security Deposit in accordance with the provisions of Clause 56.10.3 on successful completion of the DEFECT LIABILITY PERIOD. But nothing herein stated shall affect the CONTRACTOR's undischarged liabilities and obligations under the CONTRACT.

56.9.2 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 notwithstanding any qualifying remarks, protest or condition imposed or purported to be imposed by the CONTRACTOR relative to the acceptance of such payment made as aforesaid with the intent that upon acceptance by the CONTRACTOR of any payment made as aforesaid, 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 security deposit in accordance with clause 56.10.3.0 hereof on successful completion of the DEFECT LIABILITY PERIOD. But nothing herein stated shall affect the CONTRACTOR's undischarged liabilities and obligations under the CONTRACT.

56.9.3 Notwithstanding anything provided in Clause 56.9.1 and/or Clause 56.9.2 of GCC, 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 of GCC and shall be and remain entitled to receive the unadjusted balance of the Security Deposit remaining in the hands of the OWNER in terms of Clause 56.10.3 of GCC and associated clauses thereunder.

56.10.0 **FINAL ACCEPTANCE CERTIFICATE AND RELEASE OF SECURITY**

56.10.1 Forthwith on the CONTRACTOR's application made after the expiry of DEFECT LIABILITY PERIOD provided and associated clauses thereunder and satisfaction of all liabilities of the CONTRACTOR in respect thereof, the PROJECT MANAGER 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.

56.10.2 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, Infringement of patents, copy right etc.

56.10.2.1 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.

56.10.3 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 security deposit shall be subject to the CONTRACTOR replacing such Bank Guarantee(s) with a Bank Guarantee from any of the Banks as per List attached as Annexure-1.28 in a format acceptable to the OWNER covering 10% (ten percent) of the value (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.

56.11 **CLAIMS OF OWNER**

56.11.1 The release/payment of any unadjusted balance of the Security Deposit (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 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 Security Deposit to the CONTRACTOR.

57.0 UNDERGROUND OBSTRUCTIONS

Underground obstructions, if any will be removed by Owner. The soil investigation report furnished in the technical part is to be considered for preparation of bid.

58.0 REGISTRATION OF THE CONTRACTOR WITH STATUTORY AUTHORITIES

58.1 Within 30 days of execution of the CONTRACT, the CONTRACTOR shall, insofar as necessary, register itself and the CONTRACT at their own cost with the Reserve Bank of India, Income Tax, GST and/or any other applicable statutory authorities as required under the rules and regulations governing in India. The TOTAL 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.

58.2 Immediately after notification of the acceptance of Bid, the foreign CONTRACTOR shall obtain permission for opening of their office(s) in India from the Reserve Bank of India, and shall obtain Income Tax clearance from Indian Income Tax authorities. Among other formalities, these will be required by the OWNER to release any payment due to the CONTRACTOR.

59.0 STATUTORY APPROVALS

59.1 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) 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 construction/COMMISSIONING 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.

59.2 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.

59.3 No extension of time shall be granted for meeting the requirement and/or obtaining APPROVAL of statutory authorities.

60.0 UTILISATION OF LOCAL RESOURCES

60.1 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.

60.2 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:

62.1 Any balance surplus MATERIALS including scrap shall belong to the CONTRACTOR upon completion of the WORKS.

62.2 For taking out balance 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 PROJECT MANAGER and OWNER in this regard.

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 PROJECT MANAGER shall resolve disputes, if any, in this regard, and his decision shall be final and binding on the CONTRACTOR.

63.2 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.

63.3 The CONTRACTOR shall do the necessary co-ordination and liaison work, with the Piling contractor (to be engaged by the OWNER, separately) for taking over the completed piling work front from the piling contractor.

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 PROJECT MANAGER for his APPROVAL. No EQUIPMENT shall be erected in the absence of an approved erection scheme for such EQUIPMENT.

The quoted prices 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 CONTRACTORS 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 PROJECT MANAGER before commencement of any electrical work or work pertaining to Electrical System.

65.2 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 DELETED

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

69.1 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.

69.2 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 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 OWNER shall have the right to instruct and direct CONTRACTOR, as to the results to be obtained under the CONTRACT, and shall be entitled to ascertain whether the WORK is carried out in accordance with the requirements of the CONTRACT, including the right to inspect the WORK at all stages of its performance. Such instructions direction and/or inspection by OWNER shall not relieve CONTRACTOR of his obligation, duties or liabilities under the CONTRACT.

70.2 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 CONTRACTOR obligations here under, unless otherwise specified in the CONTRACT.

71.0 PAYMENT TO THE SUB-CONTACTOR

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 good supplies in connection with the performance of the WORK.

71.2 If such satisfactory evidence is not supplied than the OWNER shall not be bound to make any further payment to CONTRACTOR for that part of work until it is supplies.

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 plan settle the dispute.

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.

OWNER shall approve the CVs of important personnel of CONTACTOR viz. project manager, eng. Manager, procurement manager and Construction Manager.

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 PROJECT MANAGER before start of WORK.

74.2 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 PROJECT MANAGER 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.

74.5 The CONTRACTOR shall enforce the provisions of ESI Act and Scheme framed 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 of CONTRACT . 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 PROJECT MANAGER periodically or at any date upon such request, as may be made by PROJECT MANAGER 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

75.1.0 Confidential Information

75.1.1 Non-disclosure

75.1.1.1 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:

i) 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 non-disclosure to the other Party.

75.1.2 Disclosure to Govt. Agency

75.1.2.1 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.

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.

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.

75.2.0 Training of Personnel

CONTRACTOR shall make necessary arrangements for the practical training of reasonable number of Technicians/Engineers of OWNER, if so desired by OWNER at its office or SUB-CONTRACTOR's WORKS of manufacture in the operation and maintenance of

EQUIPMENT without any extra cost such training shall be completed by CONTRACTOR before PRELIMANRY ACCEPTANCE. The expenses for travelling, lodging and boarding of the personnel of OWNER deputed for training shall be borne by OWNER.

75.3.0 **Recovery of Sums / Dues**

75.3.1 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.

75.3.2 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 Mutually Agreed Damages on demand.

75.3.3 For avoidance of doubt all the rights and remedies of OWNER and liabilities of the CONTRACTOR as set out in the CONTRACT shall be to the exclusion of any other rights, remedies or liabilities available at law.

75.4.0 **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.

75.5.0 **Cut-Off Dates**

No claims or correspondence on claims on this CONTRACT shall be entertained by either parties after expiry of the SECURITY CUM PERFORMANCE BANK GURANTEE, unless specified otherwise in CONTRACT.

75.6.0 **Paragraph Heading**

The paragraph heading in those conditions shall not affect the construction thereof.

75.7.0 **SITE Working and Safety Conditions**

CONTRACTOR shall follow the SITE working and safety conditions enclosed as per attached Part-II of Technical Documents.

75.8.0 **Miscellaneous**

75.8.1 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.

75.8.2 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 fees payable under CONTRACT by reason of its being unable to carry out WORK owing to inclement weather.

SECTION-3.0

SPECIAL CONDITIONS OF CONTRACT (SCC)

PART-I : COMMERCIAL

SECTION – 3.0

SPECIAL CONDITIONS OF CONTRACT

TABLE OF CONTENT

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 Percentage Rate 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 design, engineering, supply of equipment, procurement (including, without limitation, all transportation services in connection therewith), construction, erection, start up, PRE-COMMISSIONING, COMMISSIONING, sustain load test, testing including conducting of Performance Tests and other work and services upto 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 upto the PRELIMINARY ACCEPTANCE OF PLANT and having the performance as guaranteed under the CONTRACT by the CONTRACTOR, submission of As-built Drawings on a total, fixed price basis in accordance with this CONTRACT. 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, completion commissioning, conducting of PERFORMANCE AND GUARANTEE TESTS and remedying of DEFECTS during DEFECTS LIABILITY PERIOD.

(c) Transportation from vendor 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, civil and structural construction; mechanical, electrical and instruments erection and installation services; testing and commissioning, and PERFORMANCE AND GUARANTEE TESTS 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 (but not fuel, water and electricity for commissioning, testing and operating the PLANT which OWNER will provide to CONTRACTOR at no cost), chemicals, utilities, tools, supplies and other consumables and services; and

(h) Rectification of defects during DEFECTS 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, based on mutual agreement between OWNER and CONTRACTOR**,** CONTRACTOR shall include such item of EQUIPMENT in the design and perform such items of WORK, for such EQUIPMENT or WORK without any additional 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, CONTRACTOR may make use of the services of SUB-CONTRACTOR/ VENDOR (previously 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 required for performing the WORK and which are to be issued in the OWNER's name from the various statutory authorities.

1.1.6 The CONTRACTOR shall provide full technical assistance including follow-up to OWNER 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 SECURITY CUM PERFORMANCE BANK GUARANTEE as per the enclosed format in line with the provisions of GENERAL CONDITIONS OF THE CONTRACT.

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.

1.1.9 Deleted

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

1.2.3 **Design & Engineering**

1.2.3.1 CONTRACTOR shall provide all design and engineering services necessary for completion of the PLANT/WORK 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 (in terms of WORKS COST for PLANT), 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 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 FINAL PROPOSAL. CONTRACTOR shall review the basic design conditions, including soil data, and other conditions furnished by OWNER in NIT. If CONTRACTOR observes any inconsistency or insufficiency in these data, CONTRACTOR shall bring to the notice of OWNER the same, before its use.

1.2.4 **Review and Analysis**

CONTRACTOR shall review, analyse and optimise the steam system and power network of PLANT. CONTRACTOR shall allow PROJECT MANAGER to review WORK under CONTRACT including the optimisation of the steam and power network for PLANT. Subject to Clause 3 – CHANGE IN WORK/CHANGE ORDER CONTRACTOR shall incorporate in its design and engineering such additions and changes suggested by PROJECT MANAGER as long as these do not conflict with the responsibility of CONTRACTOR in fulfilling its guarantees under CONTRACT. CONTRACTOR shall not use any technical data, drawing, or document given by OWNER except for purpose of CONTRACT.

1.2.5 **Codes and Standards**

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 CONTRACT. However, it shall be CONTRACTOR's responsibility to follow all Indian Rules and Regulations as applicable.

CONTRACTOR 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**

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, The CONTRACTOR shall also furnish As-built Documents to OWNER within 2 months of the PRELIMANRY ACCEPTANCE.

1.2.7 **Owner's Review**

CONTRACTOR shall associate PROJECT MANAGER, (appointed by OWNER at OWNER's cost), with WORK as carried out by CONTRACTOR and SUB-CONTRACTOR / vendor. PROJECT MANAGER shall review all documents and give its comments to CONTRACTOR within 14 (fourteen) days from the date of receipt of the same. Review as aforesaid by OWNER and furnishing of comments by OWNER or the failure of OWNER 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 for, 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 of 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 MECHANICAL COMPLETION as given by CONTRACTOR. EQUIPMENT shall be procured from the vendor list agreed between CONTRACTOR and OWNER.

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 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 including FINAL PROPOSAL.

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 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/FINAL PROPOSAL 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 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 under Clause -1.2.6. These documents shall include but not limited to technical documents, final drawings, preservation instructions, operation and maintenance manuals, test certificates, spare parts catalogues, AS BUILT DOCUMENTS, 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. CONTRACTOR shall be responsible for any payment of penalty as imposed by the Statutory Agencies consequent to furnishing of the incorrect data/drawings.

1.2.8.2.8 All dimensions and weights shall be in metric system.

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 (of both) as may be applicable in the State of Uttar Pradesh (UP) 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.

1.2.8.2.11 EQUIPMENT supplied under CONTRACT shall conform to the standards as specified in Clause -1.2.5.1.

1.2.8.3 CONTRACTOR shall furnish unpriced copy of Purchase Orders for equipments and major items as per the list to be mutually agreed (Priced copy of Purchase Orders 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,

a) Lubrication schedule from VENDOR,

b) Mechanical specifications and equipment data sheets for review by OWNER for ALL EQUIPMENTS before manufacture is started,

c) Shop fabrication drawings from vendor,

d) Characteristic curves for pumps and compressors, etc. from vendor,

e) Certified drawings including civil scope drawing and loading data, pertinent bulletin, installation, operation and maintenance manuals and test certificates received from vendor,

f) Final revised vendor's drawings including one reproducible, as described in Technical Specifications, before PRILIMINARY ACCEPTANCE.

Any changes necessary during commissioning period can be incorporated in the as- built drawing and will be submitted within 2 months from the issuance of PRELIMANRY ACCEPTANCE CERTIFIACTE.

1.2.8.5 CONTRACTOR shall provide services of vendor's specialist for installation and commissioning of EQUIPMENT whenever necessary.

1.2.8.6 CONTRACTOR shall be responsible for the accuracy and completeness of PURCHASE ORDER. Any comments by PROJECT MANAGER shall not relieve CONTRACTOR of such responsibility.

1.2.8.7 Inspection, Expediting & Testing

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 according to PURCHASE ORDER. CONTRACTOR shall send copies of expediting and inspection reports regularly to OWNER. CONTRACTOR shall arrange Third Party Inspection and quality certification of EQUIPMENT, as described in FINAL PROPOSAL.

1.2.8.7.2 OWNER or its INSPECTOR shall have the right to inspect and/or to test EQUIPMENT to check its conformity to the specifications. 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. OWNER shall notify CONTRACTOR in writing the name of INSPECTOR retained for this purpose.

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 may reject it and CONTRACTOR shall either replace the rejected EQUIPMENT or make all alterations necessary to meet specification requirements without any additional cost to the OWNER.

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 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.

1.2.8.7.8 In order to enable INSPECTOR to obtain entry visa in time, CONTRACTOR shall notify OWNER 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 by E-mail/fax 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.

1.2.8.7.13 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.

1.2.8.7.14 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 living, lodging and airfare/rail fare incurred in connection with INSPECTOR shall be borne by OWNER.

In case of the EQUIPMENT, MATERIALS and /or WORKS fail to pass the inspection performed by OWNER or by INSPECTOR and re-inspection is to be carried out, then any cost be incurred by OWNER or by INSPECTOR for carrying out such re-inspection shall be borne and paid by CONTRACTOR, any delay due to failure of such re-inspection shall be to the account of CONTRACTOR and shall not become a reason for extension of time.

1.2.8.7.15 Nothing in Clause -1.2.8.7.2 to 1.2.8.7.14 shall in any way relieve CONTRACTOR from any guarantee/warranty or other obligations under this 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.

1.2.8.7.16 Arrangements for all inspections required by Statutory Authorities (local) and as specified in Technical Specifications/FINAL PROPOSAL shall be made by CONTRACTOR. 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 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 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 from CONTRACTOR. After free replacement of such rejected EQUIPMENT by CONTRACTOR, 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 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.

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 and Documents

1.2.8.9.1 Deleted.

1.2.8.9.2 Delivery schedule shall include time for submission of documents/drawings for review/approval, incorporation of comments, if any, and final review of drawings by PROJECT MANAGER. Within 14 (fourteen) DAYs after receipt by PROJECT MANAGER of any document requiring OWNER's review, PROJECT MANAGER shall either return one copy thereof to CONTRACTOR as it is, if PROJECT MANAGER has no comments or with its comments and reasons thereof.

1.2.8.9.3 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.

1.2.8.9.4 In case of delayed delivery beyond the stipulated delivery period, for reasons not attributable to OWNER, FORCE MAJEURE and suspension of WORK by OWNER, even though normal extension of GUARANTEED COMPLETION DATE time is allowed by OWNER, all extra costs on account of changes of statutory regulations/Acts or increase in price on any other account including any price variation, shall not apply to TOTAL 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 before PRELIMINARY ACCEPTANCE OF PLANT, CONTRACTOR shall be responsible for repair/replacement of EQUIPMENT.

1.2.8.10.3 Deleted

1.2.8.10.4 **Property in EQUIPMENT**

1.2.8.10.4.1 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.

1.2.8.10.4.2 **Regarding surplus Materials, the Clause 62 of GCC shall be applicable.**

1.2.8.10.4.3 The care and custody responsibility of CONTRACTOR for EQUIPMENT shall terminate upon PRELIMINARY ACCEPTANCE of PLANT.

1.2.8.10.5 **Assembly Marks and Name Plates**

1.2.8.10.5.1 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.

1.2.8.10.5.2 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.

1.2.8.10.5.3 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.

1.2.8.10.6 **Despatch/Shipping notice**

1.2.8.10.6.1 CONTRACTOR shall notify OWNER by fax/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.

1.2.8.10.7 **Heavy Lift Consignment (HLC) or Over Dimensional Consignments (ODC)**.

1.2.8.10.7.1 CONTRACTOR shall the follow the guidelines of Ministry of Road Transport and Highways (MORTH), India, for the shipping/transportation of the 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.

1.2.8.10.7.2 Deleted

1.2.8.10.7.3 CONTRACTOR shall make his own arrangements for movement of all consignments including ODC.

1.2.8.10.7.4 Deleted

1.2.8.10.7.5 CONTRACTOR confirms that it has surveyed the route for transportation of ODC 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 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 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.

1.2.8.10.8 **Marking**

1.2.8.10.8.1 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 then 5 cm. in size in English:

A. For Imported EQUIPMENT
A/c (Contractor)

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.

1.2.8.10.8.2 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).

1.2.8.10.8.3 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.

1.2.8.10.8.4 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.

1.2.8.10.9 **Packing List**

1.2.8.10.9.1 CONTRACTOR will include in each package an item-wise packing List, Invoice No. and associated drawings.

1.2.8.10.9.2 The packing list and any other documents shall be put in a closed polyethylene envelope and included in each package.

1.2.8.10.9.3 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".

1.2.8.10.10 Deleted

1.2.8.10.11 Deleted

1.2.8.10.11.1 OWNER requires ocean transportation by International repute carriers viz. Conference line vessels or by Indian flag Vessels.

1.2.8.10.11.2 Deleted

1.2.8.10.11.3 Deleted

1.2.8.10.11.4 Deleted

1.2.8.10.11.5 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 along with the applicable taxes, if any, shall be borne by CONTRACTOR.

1.2.8.10.12 Deleted

1.2.8.10.12.1 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. Copies shall also be sent to OWNER.

1.2.8.10.12.2 Insurance for transit risks and other risks shall be covered by CONTRACTOR.

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. 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 **Commissioning Spares and Consumable**

1.2.9.2.1 CONTRACTOR shall supply spares and consumable required for construction, PRE-COMMISSIONING, COMMISSIONING, start-up and testing of PLANT. The cost of spares and consumable shall be included in TOTALCONTRACT PRICE.

1.2.9.3 Special Maintenance Tools

1.2.9.3.1 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 TOTALCONTRACT PRICE.

1.2.9.4 Deleted

1.2.9.5 Deleted

1.2.9.6 **Chemicals**

CONTRACTOR shall supply all chemicals for first filling and make-up required up to PRELIMINARY ACCEPTANCE OF PLANT. The cost of these chemicals shall be included in the TOTAL CONTRACT PRICE.

1.2.9.7 **Lubricants**

1.2.9.7.1 CONTRACTOR shall supply lubricants in sufficient quantity for the first filling and make-up required up to PRELIMINARY ACCEPTANCE of PLANT. The cost of lubricants shall be included in the TOTALCONTRACT 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 **Mandatory Spares**

CONTRACTOR shall provide Mandatory Spares as per Section -9, Part-II of Technical Document. Notwithstanding anything contained in this CONTRACT, the charges for Mandatory Spares shall be included in CONTRACT PRICE.

1.2.9.9 **Construction Tools**

CONTRACTOR shall arrange at their own cost special construction aids, tools, tackles and fixture, required for construction of PLANT.

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 desired, shall have the right to place order for operational 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 of first class quality 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 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.

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

a) Any balance surplus MATERIALS including scrap shall belong to the CONTRACTOR upon completion of the WORKS.

b) For taking out balance 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 PROJECT MANAGER and OWNER in this regard.

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 incorporates all recent improvements in design and materials unless provided otherwise in CONTRACT. CONTRACTOR further warrants that EQUIPMENT supplied under this CONTRACT shall be of first quality 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 12 months for all EQUIPMENT from the date of PRELIMINARY ACCEPTANCE.

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, PROJECT MANAGER shall inform CONTRACTOR and CONTRACTOR shall immediately on receipt of such 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.

1.2.10.1.4 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 risks to transit to and from shall be borne by CONTRACTOR.

1.2.10.1.5 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 SECURITY CUM PERFORMANCE BANK GUARANTEE shall be suitably extended for the same. The value of the SECURITY CUM PERFORMANCE BANK GUARANTEE during the extended warranty period shall be 10 (Ten) percent of the cost of such repaired/replaced EQUIPMENT or its parts.

1.2.10.1.6 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.

1.2.10.1.7 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 taxes and duties etc. shall be borne by the CONTRACTOR. In case, the cost of such repair/replacement/WORK has been incurred by OWNER, CONTRACTOR shall reimburse the same immediately on demand by OWNER.

1.2.10.1.8 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.

1.2.10.2 **Spare Parts Warranty**

The Contractor shall warrant that all spare supplied will be new and in accordance with the Contract Documents and will be free from defects in design, material and workmanship and shall further guarantee asunder:

(i) For 2 years operational spares (both mandatory and recommended)

a) For any item of spares ordered or to be ordered by the OWNER for 2 years operational requirement of the plant which are manufactured as a continuous operation together with the corresponding main equipment/component, the Defect Liability Period will be twelve (12) months from the scheduled date of commercial operation of main equipment/plant under the Contract. 'Commercial Operation' shall mean the conditions of operation in which the complete equipment covered under the Contract is officially declared by the OWNER to be available for continuous operation at different loads upto and including rated capacity. Such declaration by the OWNER, however, shall not relieve or prejudice the Contractor any of his obligations under the Contract. In case of any failure in the original component/equipment due to faulty designs, materials and workmanship, the corresponding spare parts, if any, supplied will be replaced without any extra cost to the OWNER unless a joint examination and analysis by the OWNER and the Contractor of such spare parts prove that the defect found in the original part that failed, can safely be assumed not to be present in spare parts. Such replaced spare parts will have the same Defect Liability as applicable to the replacement made for the defective original part/component provided that such replacement for the original equipment and the spare replaced are again manufactured together. The discarded spare parts will become the property of the Contractor as soon as they have been replaced by the Contractor.

b) For the item of spares ordered or to be ordered by the OWNER for 2 years operational requirement of the plant, which with the written approval of the OWNER, are not manufactured as a continuous operation will be warranted for 7000 hrs of trouble free operation if used within a period of eighteen (18)months reckoned from the date of delivery at site. However, if such spare parts are put to use after eighteen (18) months of the delivery at Site then the guarantee of such spares will stand valid till the expiry of thirty six (36) months from the scheduled date of Commissioning of equipment/plant covered under the contract or 7000 hrs of trouble free operation after such spares are put in service, whichever is earlier.

c) For long term requirement : For item of spares that may be ordered by the OWNER to cover requirements beyond 2 years of Initial Operation of the plant, the warranty will be till the expiry of 7000 hrs of trouble free operation if used within a period of eighteen (18) months from the date of delivery at site. For item of spares that may be used after eighteen (18) months from the date of delivery at site, the warranty period will be 12 months from the date they are put to use or 7000 hrs of trouble free operation, whichever is earlier. In any case the defect liability of spares will expire at the end of forty eight (48)

months from the date of their receipt at site.

ii) The Defect Liability of spares covered in para (b) & above, that are not used within 18 months from the respective date of the delivery at Site will, however, be subject to condition that all such spares being stored/maintained/preserved in accordance with Contractor's standard recommended practice, if any, and the same has been furnished to the OWNER.

1.2.11 **Performance Guarantee of PLANT / EQUIPMENT**

1.2.11.1 CONTRACTOR guarantees that the performance of PLANT 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 PLANT and/or any of EQUIPMENT fails to be as guaranteed and set forth in CONTRACT, CONTRACTOR shall investigate the causes and provide without any additional 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 unlimited, in accordance with the provisions of CONTRACT.

1.2.11.3 Deleted.

1.2.12 **Government Clearances, Permits and Certificates**

1.2.12.1 CONTRACTOR shall procure at its expenses, all necessary APPLICABLE PERMITS, certificates and licenses required by virtue of all APPLICABLE LAWS, regulations, 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.

1.2.12.2 CONTRACTOR shall furnish necessary data/specifications/drawings etc. of EQUIPMENT likely to be imported to OWNER for obtaining import licence / necessary Government Clearances, for the same. CONTRACTOR shall also furnish necessary technical information, data, drawing, etc. as and when required to 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 EFFECTIVE DATE OF CONTRACT and provide to OWNER a PROJECT MASTER SCHEDULE indicating the important milestones of activities relating to WORK from EFFECTIVE DATE OF CONTRACT to the date of FINAL 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 PROJECT MANAGER on monthly basis.

1.2.13.2 CONTRACTOR shall clearly indicate any delay in WORK in the above schedules and shall inform PROJECT MANAGER the action taken to achieve the GUARANTEED COMPLETION DATE.

1.2.13.3 **Time Schedule Network / Bar Chart**

1.2.13.3.1 Within 30 (thirty) DAYS from EFFECTIVE DATE OF CONTRACT, CONTRACTOR shall submit to PROJECT MANAGER its time schedule regarding delivery of documentation, supply and manufacture of EQUIPMENT, time schedule for placement of purchase order and SUB-CONTRACT, etc.

1.2.13.3.2 The time schedule will be in the form of a network and a bar chart clearly indicating all main or key events regarding documentation, supply of raw materials, manufacturing, testing and delivery of equipment, civil works, erection, commissioning, testing etc.

1.2.13.3.3 The original issue and subsequent revisions of such time schedule shall be sent to OWNER in two copies (of which one shall be a reproducible/soft copy). The time schedule network/bar chart shall be updated at least every month during the period of CONTRACT.

1.2.13.4 **Progress of WORK**

1.2.13.4.1 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 25th of every Month.

1.2.13.4.2 The progress shall be expressed in percentages for all activities.

1.2.13.4.3 The first issue of the progress report shall be forwarded together with the time bar chart.

1.2.13.4.4 OWNER shall also review the physical/actual progress of WORK on the basis of CONTRACTOR's time schedule documentation.

1.2.13.4.5 Irrespective of such review, CONTRACTOR shall advise OWNER at the earliest possible date of any anticipated delay in the progress.

1.2.13.4.6 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.

1.2.13.4.7 Deleted.

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 endeavour 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. 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.

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. Foot print Area required for fabrication to be mentioned in BID by CONTRACTOR.

1.2.15 **Construction**

1.2.15.1 CONTRACTOR shall be responsible for all civil and structural work, foundations, insulating & painting works, erection, 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 PRELIMINARY ACCEPTANCE of PLANT on or before GUARANTEED COMPLETION DATE.

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 authorised 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 leading to MECHANICAL COMPLETION. Post MECHANICAL COMPLETION the CONTRACTOR shall consult the OWNER for the schedule of activities up to PRELIMINARY ACCEPTANCE and shall adhere to the completion schedule thus approved by the OWNER. In case PRELIMINARY ACCEPTANCE of the plant is delayed for reasons attributed to OWNER, the CONTRACTOR shall be compensated for the time and cost as mutually agreed with OWNER.

1.2.15.3 In case of delay in completion beyond the stipulated completion period as specified under Clause 1.2.15.2 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 **Civil Work Warranty**

CONTRACTOR shall certify that the all civil works, reinforced concrete, structures, permanent buildings and foundations has been designed in accordance with stipulations of relevant BIS Codes.

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 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.

1.2.16.3 In case of any safety related violations by the CONTRACTOR, appropriate penalties shall be levied as per the extant HSE policy of OWNER.

1.2.17 PRE-COMMISSIONING Services of PLANT

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. OWNER shall provide experienced/trained and suitable operating and maintenance personnel who will perform their tasks under the supervision and direction of CONTRACTOR.

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/SUB-CONTRACT.

1.2.18 **Mechanical Completion**

CONTRACTOR shall be responsible for completing the design, engineering, procurement, inspection and expediting, arranging for transportation of EQUIPMENT, construction and PRE-COMMISSIONING for making PLANT ready for acceptance of feed stock before the MECHANICAL COMPLETION.

1.2.19 **Commissioning Services of PLANT**

1.2.19.1 CONTRACTOR shall be responsible for COMMISSIONING after PRE-COMMISSIONING activities have been completed giving due regard to safety of EQUIPMENT according to sound international practice. OWNER shall provide experienced trained operating and maintenance personnel who shall work under the supervision and direction of CONTRACTOR. The COMMISSIONING activities shall include the following:

a) Introduction of raw materials, utilities, lining-up of various sections of PLANT leading to production of ammonia and urea.

b) Stabilising PLANT and stepping up production to full plant capacity.

c) Demonstrating and Conducting sustained load test and Guarantee Test as per PART-II, Technical.

1.2.19.2 CONTRACTOR shall provide engineers as required to commission PLANT. CONTRACTOR shall be responsible to provide supervision personnel for operation of PLANT until PRELIMINARY ACCEPTANCE and OWNER will operate the PLANT under the supervision and instructions of CONTRACTOR. During the sustained load test and the guarantee test, the range of operating conditions shall be within the limits of the design conditions and shall meet the requirements of safety and compliance with relevant Codes and Regulations.

1.2.20 **Performance Guarantee Test**

1.2.20.1 CONTRACTOR shall successfully complete PERFORMANCE TEST as early as possible after MECHANICAL COMPLETION.

1.2.20.2 CONTRACTOR shall, when PLANT is stabilized at full plant capacity to the satisfaction of OWNER, shall carry out PERFORMANCE TEST and prove Guarantees.

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 Uttar Pradesh (UP)in India. FINAL PROPOSAL shall be based on the codes, and regulations applicable on date of submission of Final Priced BID (Revised Price bid, if any).

In the event of change in any codes, laws or regulation applicable to PLANT 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 -3.0.

1..2.24 **Statutory Obligations**

1.2.24.1 CONTRACTOR shall comply with the requirements of all 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.

1.2.24.2 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).

1.2.24.3 The CONTRACTOR shall ensure that the SUB-CONTRACTOR shall comply with the Statutory Requirements, as applicable, for the execution of this CONTRACT.

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 EFFECTIVE DATE OF CONTRACT until PRELIMINARY ACCEPTANCE, as described under Clause -1.2.13. These schedules shall include the activities of CONTRACTOR, SUB-CONTRACTOR and vendor. CONTRACTOR shall monitor progress continuously and submit to PROJECT MANAGER 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 PROJECT MANAGER as may be required by any other Government Authority or any other agency such as Financing Institution etc.

1.2.26 Deleted

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 GUARANTEED COMPLETION DATE and any other activities leading to PRELIMINARY ACCEPTANCE by OWNER.

1.2.28 **Co-ordination**

1.2.28.1 CONTRACTOR shall render all necessary assistance to PROJECT MANAGER required for overall co-ordination of all activities connected with WORKS. For this purpose, CONTRACTOR and PROJECT MANAGER shall agree on a meeting as soon as practicable after EFFECTIVE DATE OF CONTRACT, 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 PROJECT MANAGER and furnish all technical information about various effluents/emission and discharge points from different sources indicating the quality and quantity of gaseous and liquid emission of pollutants from PLANT. CONTRACTOR shall also supply PROJECT MANAGER any additional information required on the above matter during the performance of process design and basic engineering design.

In the event, PROJECT MANAGER pursuant to its responsibilities of overall co-ordination 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 PROJECT MANAGER 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.

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.

1.2.30 CONTRACTOR's Representative and Key Personnel

1.2.30.1 CONTRACTOR shall with prior consent of PROJECT MANAGER appoint a CONTRACT MANAGER to manage the execution of WORK and he shall be CONTRACTOR's authorized Representative in India. 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 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

I. CONTRACTOR shall perform WORK in full compliance with its FINAL PROPOSAL and all other terms and conditions set forth herein and shall achieve the performance parameters as mentioned in the CONTRACT.

II. 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.

III. 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.

IV. The completed PLANT shall be free of DEFECTS and Deficiencies and shall be designed, constructed and engineered, in compliance with the Scope of Work.

V. PLANT shall be designed, engineered, constructed, tested, completed and delivered based on international standards ,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 GUARANTEED COMPLETION DATE.

VI. 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.

VII. 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 Additional Tests

1.2.32.1 Except for tests required as per the provision of CONTRACT, OWNER may at any time prior to FINAL ACCEPTANCE OF PLANT request re-testing or additional testing of any EQUIPMENT, incorporated or to be incorporated into PLANT, or WORK if OWNER believes the results of earlier tests are not accurate or do not establish the true condition of EQUIPMENT or WORK being tested.

1.2.32.2 If a portion of WORK or any EQUIPMENT, incorporated or to be incorporated into PLANT, fails any additional test or retest requested by OWNER pursuant to Clause-1.2.32.1, then CONTRACTOR shall correct or replace, or cause its SUB-CONTRACTOR/VENDOR to correct or replace, such item or portion so as to pass additional testing or re-testing and otherwise meet or conform to such requirements. No

changes to time schedule or increase in the CONTRACT PRICE shall be granted with respect to such additional testing. CONTRACTOR shall solely bear any cost (Including any tax costs) resulting thereof (including the cost of any required uncovering and recovering of WORK). Neither the failure by OWNER to discover Defects and Deficiencies, nor any payment to CONTRACTOR in respect thereof shall prejudice the rights of OWNER thereafter to require and obtain from CONTRACTOR the satisfactory performance of WORK hereunder. OWNER shall not be deemed to have accepted any WORK as a result of any additional testing.

1.2.32.3 Deleted

1.2.33 General

1.2.33.1 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.

1.2.33.2 CONTRACTOR shall arrange insurance pursuant to Clause 28.0 of GCC, at its own cost.

1.2.33.3 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 Basic Conditions for Design

OWNER has provided the design basis from the process licensor in the NIT.

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 achieve the technical quality, cost objective of WORK and 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.

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 PART-II, Technical Documents 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 PROJECT MANAGER under the CONTRACT. The PROJECT MANAGER 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 PROJECT MANAGER and the CONTRACT MANAGER.

2.3.3 OWNER shall depute its representatives to carry out above work at the office of CONTRACTOR. OWNER shall bear the cost of travel and stay of its personnel for such deputation. CONTRACTOR shall provide office accommodation, secretarial assistance, etc. in its office to OWNER's personnel. Number of OWNER's personnel to be deputed at CONTRACTOR's office on single location shall not exceed 10 (ten) at a time.

2.4 Government Clearances

All other approvals/clearances shall be obtained by CONTRACTOR. CONTRACTOR shall provide necessary services and assistance in obtaining Government clearances to be obtained in the name of OWNER. However, OWNER shall be responsible to obtain import licence and clearance for Concessional Duty / Deemed Export Benefits as per prevailing rules.

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 shall provide experienced operating and maintenance personnel according to its organisation, specifications, and standards during the PRE-COMMISSIONING and COMMISSIONING activities, who will work under the direction and control of CONTRACTOR. OWNER shall associate its personnel with the construction and erection of PLANT to familiarise the personnel with WORK, ascertain quality, and generally to prepare for proper operation and maintenance of PLANT.

2.7 Feed stock and Utilities

OWNER shall make available the feedstock and utilities subject to limit specified in CONTRACT and take over all products and effluents at BATTERY LIMIT as specified in CONTRACT.

2.8 Site Facilities

OWNER shall provide the following SITE facilities:

(i) Nominate its personnel for general co-ordination of site activities.

(ii) General security services. CONTRACTOR shall be responsible for safety and security of all EQUIPMENT and MATERIALS, its personnel and construction equipments.

(iii) Construction Water shall be provided without any additional cost to the CONTRACTOR at a single point at battery limit. Construction Power shall also be provided by OWNER but on chargeable basis at the prevailing rate.

(iv) OWNER shall not provide any accommodation and facilities for travelling to and from SITE to the place of residence to the personnel of CONTRACTOR, deputed at SITE for performing WORK under CONTRACT.

(v) OWNER shall not provide any accommodation and facilities for travelling to and from SITE to the place of residence to the personnel of SUB-CONTRACTOR and VENDOR.

(vi) Area for making shed/covered storage for storing EQUIPMENT

(vii) Area for CONTRACTOR's site office without any additional cost. Any construction for office etc. shall be to the CONTRACTOR's account.

3.0 CHANGE 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 or to the Scope of Work, and may cause the CONTRACT PRICE, the work schedule or the GUARANTEED COMPLETION DATE or any other CONTRACTOR's WARRANTEES to be adjusted.

3.2 In the event that CONTRACTOR is instructed by OWNER to perform any change order, whether it be additional work or a reduction in the scope of work, a 10% mark-up shall be allowed to cover the cost of overheads and profits of the CONTRACTOR on the TOTAL CONTRACT PRICE of the CHANGE ORDER for procurement of equipment, services including third party, including all taxes, duties and all other related costs. The cost of the change order should be supported by providing documentary evidence like vendor quotes.

3.3. On each request for a CHANGE IN WORK, CONTRACTOR shall promptly inform OWNER in writing whether this request will fall within the provision of CONTRACT. If this request does not fall under the provision of CONTRACT and CONTRACTOR has to incur additional expenses, then CONTRACTOR shall promptly submit a cost estimates, and terms of payment 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.

3.4 If in CONTRACTOR's opinion fulfillment of any of its obligations under CONTRACT would be jeopardised by a CHANGE IN WORK requested by OWNER, then CONTRACTOR shall explain in writing to OWNER the reasons for not accepting these changes within thirty (30) days of receipt of OWNER's written request.

3.5 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 :

a) Minor changes requested by OWNER and accepted by CONTRACTOR which do not involve any substantial additional cost or manhour effort, and have no effect on contractual completion period, and/or

b) Deleted.

c) Changes in CONTRACTOR's WORK required on account of CONTRACTOR not having included any item of EQUIPMENT or WORK which, in the opinion of OWNER/CONTRACTOR is necessary for the normal safe and continuous operation of PLANT.

d) Any change necessitated due to requirements of prevalent laws in India at the time of submission of Final priced Bid (Revised price bid, if any).

3.8 The Contractor shall note that the quantities of the different Items, as given in the "Schedule of Rates" are tentative based on tentative tender drawings and are subject to variation and they shall not be entitled to claim any higher rate or compensation on this account. Owner / Consultant reserves the right to change / modify the size and type of sections at any time. Owner / Consultant does not guarantee work under each item of the Schedule of Quantities. The total quantum of work may vary up to ± 25% on either side the Contract Price and nothing extra over the Unit Rate as referred in Schedule of Rates will be paid on this account. Quantum of individual item may vary to any extent.

However, in case of any increase in executed / work order value beyond awarded value, contractor shall prepare statement of such expected variation based on the drawings issued for construction or as per site condition and shall obtain prior issuance of formal amendment to Contract from the OWNER/CONSULTANT in this regard. In no case, the value of executed value should exceed the awarded value without prior written approval from OWNER/CONSULTANT.

4.0 ACCEPTANCE OF PLANTS AND FACILITIES

CONTRACTOR's liabilities for the Performance Guarantees given for the PLANT 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 PART-II, Technical Documents of NIT have been successfully carried out as per acceptance criteria specified below or alternatively, Mutually Agreed Damages as stipulated in Clause 31 of GCC have been paid by the CONTRACTOR and OWNER has issued PRELIMINARY ACCEPTANCE CERTIFICATE.

5.0 PLANT ACCEPTANCE CRITERIA

Subject to fulfilling PERFORMANCE AND GUARANTEE TESTS as per PART-II, Technical Documents of NIT and Clause 18.0 of SCC, OWNER shall be in readiness to accept the PLANTS. CONTRACTOR shall take all steps to fulfil the provisions of the CONTRACT for OWNER to issue PRELIMINARY ACCEPTANCE CERTIFICATE.

6.0 ISSUANCE OF PRELIMINARY ACCEPTANCE CERTIFICATE

Within 30 (thirty) DAYs from completing successfully PERFORMANCE & GUARANTEE TESTS by the CONTRACTOR, and CONTRACTOR fulfilling all the obligations under the provision of the CONTRACT, OWNER shall issue PRELIMINARY ACCEPTANCE

CERTIFICATE to CONTRACTOR. If OWNER does not issue the certificate, OWNER will provide written notice stating the reasons for refusing to issue the certificate within 60 days of request. On issue of this Certificate by OWNER, CONTRACTOR shall become entitled to receive all 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 CONTRACT. 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.

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 Percentage basis with single source responsibility.

9.2 The CONTRACT shall be in all respect being construed and governed in accordance with the Indian laws.

9.3 It is clearly understood that the total consideration for the CONTRACT has been broken up into various components only for the convenience of payment of advance under the CONTRACT and for the measurement of deviation or modification under the CONTRACT(s).

10.0 BID PRICES

10.1 CONTRACTOR shall quote price/rate basis as per format SCHEDULE OF RATES, for entire scope of work as per provisions of the bidding documents. The Total Price may also be called TOTAL CONTRACT PRICE.

10.2 The TOTAL CONTRACT PRICE shall remain firm and fixed and shall be valid during currency of the Contract and shall not be subject to variation/escalation on any account except as otherwise specifically provided in the CONTRACT.

10.3 The TOTAL CONTRACT PRICE shall be derived from SCHEDULE OF RATES comprising the total of the price of Equipments/Materials, Price of Services and prices for Civil & Structural Work, if any.

10.4 CONTRACTOR to note that the total price payable under the CONTRACT shall be restricted to TOTAL CONTRACT PRICE. The price evaluation shall be based on the criteria mentioned in ITB Section.

The above TOTAL CONTRACT PRICE shall be considering entire Contract as "Works Contract Service".

10.5 The quoted price shall be deemed to be inclusive of all taxes, statutory levies, cess, duties, TPI charges, packing & forwarding, municipal taxes, royalties, custom duty and customs related duties or any other charges etc., **excluding GST**, irrespective of whether same is categorically specifically indicated or not. Prices, taxes, duties including GST on any transaction between CONTRACTOR and their Sub-Contractor/supplier shall be included in the TOTAL CONTRACT PRICE quoted by the CONTRACTOR.

10.6 The price quoted shall be for the entire scope of work, whether specifically mentioned or not.

10.7 CONTRACTOR shall carry out entire scope of Work/ Supplies/Services as detailed in various sections of bidding documents within the quoted rate/price.

10.8 Price/Rate basis shall be deemed to be inclusive of the cost of any other supplies / work(s)/ services not specifically mentioned in the Bidding Document but are essentially required for the efficient, trouble free operation of the complete package, irrespective of whether the above unspecified supplies / work(s) / services are specifically mentioned in the Bidders bid or not.

10.9 The CONTRACTOR shall carefully examine the various clauses / sections of the Bidding Document inclusive of Scope of WORK, General Conditions of Contract, Special Conditions Of Contract, and Tender Specifications, Technical and Commercial amendments, if any etc. The CONTRACTOR shall include in his prices any sum he may consider necessary to cover the fulfilment of the various clauses contained therein. The items of work described and price stated shall be inclusive of everything necessary to complete the said item of work within the contemplation of the CONTRACT.

10.10 Spares for Start-up/Commissioning and Mandatory spares and any other Tools and Tackles as required are in CONTRACTORS scope and deemed to be included in their quoted TOTAL CONTRACT PRICE, irrespective of whether such spares / items are categorically mentioned or not in the CONTRACTORS bid. No claim on this issue shall be entertained at later date after award of work and at any stage during the faithful execution of the CONTRACT.

10.11 It shall be the sole responsibility of the CONTRACTOR to duly observe and faithfully perform and fulfil all obligations of all laws, rules, regulations, orders and formalities during the entire period / currency of the CONTRACT, applicable to Goods and Service Tax (GST), Custom duty etc, on the import, manufacture, sale and / or supply of any material(s)/ equipment to the OWNER and faithful performance of the Works Contract Service under the CONTRACT. The CONTRACTOR shall keep the OWNER and its Project Management Consultant (PMC) indemnified from and against any and all

claims, demands, prosecutions, actions, proceedings, penalties, damages, demurrages and / or other levies whatsoever made or levied by any Court, Tribunal or the Customs or other Authorities with respect to any alleged breach or infractions of any applicable laws, rules, regulations, orders or formalities concerning the same and from the consequence thereof.

In view of GST regime, CONTRACTOR shall quote the Prices Considering Input Tax credit (ITC).

10.12 The price of Works Contract Service shall be deemed to cover various factors including but not limiting to cost of materials / equipments / services, overheads, bidding cost, financing cost, profits, mobilization & demobilization cost etc, as applicable. Unless the scope expressly excludes certain provision from the CONTRACTOR's scope in the Bidding document / CONTRACT, no additional payment on any such head expressly not mentioned herein in the bidding document / contract shall be entertained at later date.

10.13 OWNER will issue forms/documents periodically (as may be required under GST regime) wherever applicable on all interstate sale of materials by the CONTRACTOR to enable the CONTRACTOR to comply with and avail benefits of GST.

11.0 CURRENCIES OF BID AND PAYMENT

11.1 BIDDER to quote prices in INR.

11.2 The PRICE quoted by the CONTRACTOR shall be gross of Indian Income Tax including withholding tax (if any), and the PRICE(S) shall be deemed to include Indian Income Tax including withholding tax (if any).

12.0 PRICES, TAXES AND DUTIES AND OTHER LEVIES

12.1 Except as specifically provided to the contrary in the SPECIAL CONDITIONS OF CONTRACT:

(i) The CONTRACTOR shall within the price of MATERIALS and scope of supply be responsible to pay on behalf of the OWNER any and all duties, taxes, levies and cesses including education cess etc lawfully payable on 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.

(iv) 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.

12.2 **Taxes, Duties and Levies in Foreign Countries**

The CONTRACTOR shall accept full and exclusive liability at his own cost for the payment of any and all taxes, duties, cesses and levies howsoever designated, as are payable to any government, local or statutory authority in any country as are now in force or as are hereafter imposed, increased or modified and as are payable by the CONTRACTOR, his agents, SUB-CONTRACTORS and Suppliers and its/their respective employees for or in relation to the performance of this CONTRACT. The CONTRACTOR shall be deemed to have been fully informed with respect to all such liabilities and shall further be deemed to have consideration and included the same in his bid and the PRICE shall not be varied in any way on this account.

12.3 **Tax Indemnity**

It will be the duty of the CONTRACTOR to duly observe and perform all laws, rules, regulations, orders and formalities applicable to GST, any applicable cess GST, Customs Duty and other taxes on the manufacture, sale, import and/or supply of any material to OWNER and/or applicable tax and levies 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.

12.4 All the applicable taxes, duties etc. on supply of materials, services and otherwise required for execution of CONTRACT on the price/rate basis as quoted in Section-5, Schedule of Rates (SOR) shall be included in the TOTAL CONTRACT PRICE except GST. GST amount paid by the Contractor shall be reimbursed by the Owner based on the GST invoice submitted by the Contractor (18% maximum).

12.5 The CONTRACTOR confirms that other than GST, it has included all taxes, duties, levies etc., as applicable at prevailing rates as on the date of submission of bids/revised price bid, if any, in its CONTRACT PRICE. 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.

12.6 Within the contractual period, any differential tax liability arising on account of statutory variation in India in percentage of taxes, duties shall be paid by OWNER to CONTRACTOR or vice versa and the same may be reflected therefore in CONTRACT PRICE on submission of documentary evidence. However, in case of delay in PRELIMINARY ACCEPTANCE OF PLANT due to reasons attributable to CONTRACTOR, any increase in percentage of taxes/duties over and above those specified and quoted by the Bidder in Section-5, Schedule of Rates (SOR) during the delayed period shall be to CONTRACTOR's account and shall not be reimbursed by OWNER.

12.7 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.

12.8 Deleted

12.9 Deleted

12.10 Deleted

12.11 Deleted

12.12 INCOME TAX

12.12.1 TOTAL 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 certificate to CONTRACTOR. It is 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.

12.12.2 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.

13.0 STATUTORY VARIATION IN TAXES AND DUTIES

13.1 If any new taxes or duties (including any increase in rate of any existing taxes or duties) are levied in India after the date of submission of bids/revised price bids (whichever is later) on any payments due to the CONTRACTOR under the CONTRACT other than tax on income, wealth or profits of the CONTRACTOR, the OWNER shall reimburse the CONTRACTOR the amount of such taxes or duties lawfully paid and borne by the CONTRACTOR against proof of payment. However, this is applicable within the GUARANTEED COMPLETION DATE only and shall not be reimbursed by OWNER during the delayed contractual project completion attributable to CONTRACTOR'S account.

13.2 If any existing taxes or duties are withdrawn or the rate is decreased after the date of submission of the bids / revised bids (whichever is later) on any payments due to the CONTRACTOR under the CONTRACT other than tax on income, wealth or profits of the CONTRACTOR, the OWNER shall receive the benefit of the reduced rate equivalent to the amount of such taxes or duties. This is applicable within the GUARANTEED COMPLETION DATE and also during the delayed contractual Project completion.

13.3 In case of delayed completion beyond the GUARANTEED COMPLETION DATE 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 increase in price on any other account including price variation clause, if any, 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.

14.0 TERMS OF PAYMENT

14.1 The payment to CONTRACTOR for the performance of the WORKS under the CONTRACT will be made by OWNER as per the guidelines & conditions specified herein in Annexure-1.10 of PART-I, Commercial i.e. PAYMENT TERMS.

15.0 Deleted

16.0 Deleted

17.0 LIABILITY FOR DEFECTS

17.1 If at any time before the PRELIMINARY ACCEPTANCE or during the DEFECTS LIABILITY PERIOD stated below, the Project Manager/ Engineer Incharge:

(a) Decides 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 reasonably predictable make good the DEFECTS 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 Project Manager/ Engineer Incharge, submit his proposals for making good any DEFECT to the Project Manager/ Engineer Incharge for his approval.

Subject to Clauses 17.4, 17.8 and 17.9 hereof, the DEFECTS LIABILITY PERIOD shall be a period of 12 months from the date of PRELIMINARY ACCEPTANCE.

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 (which is note covered under DEFECT LIABILITY) made good by the CONTRACTOR, the work done by the CONTRACTOR shall be the subject of CHANGE ORDER.

17.3 The sustained load test is to be carried out before the PERFORMANCE & GUARANTEE TEST. The performance guarantees are demonstrated only through the PERFORMANCE & GUARANTEE TEST carried out before the achievement of the PRELIMINARY ACCEPTANCE CERTIFICATE.

Bidder if available to 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 PROJECT MANAGER 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 DEFECTS 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 DEFECTS LIABILITY PERIOD).

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 hereof then the OWNER may, in addition to any other remedies or relief available to him under the CONTACT, 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 hereof 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, proceed to do the work in such a manner as the PROJECT MANAGER 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 hereof 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 PROJECT MANAGER and the CONTRACTOR may agree the amount to be paid by the CONTRACTOR, or in the absence of agreement the PROJECT MANAGER 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 hereof applies, the DEFECTS LIABILITY PERIOD, or if applicable the extended DEFECTS LIABILITY PERIOD, shall be extended by a period equal to the period during which it cannot be used. Similarly the DEFECTS LIABILITY PERIOD, or if applicable the extended DEFECTS 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.

17.9 If any part of the PLANT has a working life, which is specifically notified by the CONTRACTOR under this CONTRACT, to be less than 12 months, the DEFECTS LIABILITY PERIOD for such part shall be the working life so stated.

18.0 PERFORMANCE TESTS

18.1 Before the start of performance test, the CONTRACTOR is required to carry out the sustained load test as detailed elsewhere in the NIT. The specific guarantees under the CONTRACT in respect of the performance of the PLANT made by the CONTRACTOR which is verifiable by performances tests shall be governed by this Clause 18 hereof.

18.2 If the CONTRACT provides for the performance of the PLANT to be tested in sections or in parts, Sub-clause 18.3 to 18.7 hereof shall apply as if a reference to the PLANT were a reference to a section or a part.

18.3 The performance tests to be carried out on the PLANT shall those specified in PART-II, Technical Document of NIT, PERFORMANCE AND GUARANTEE TEST. If any unspecified test is subsequently proposed, the CONTRACTOR and the PROJECT MANAGER shall discuss whether such tests should be carried out. If they agree that the test should be carried out, the PROJECT MANAGER shall order the test as a CHANGE ORDER.

18.4 The performance test shall be carried out by the OWNER in the presence of CONTRACTOR as soon as is practicable using suitably trained and experienced employees and in accordance with the manuals provided by the CONTRACTOR and such other instruction as the CONTRACTOR may give in the course of carrying out such tests. If any instruction conflicts in any way with or significantly adds to the manuals, the CONTRACTOR shall issue it in the form of an amendment. The performance test shall be carried out as far as practicable under the conditions, if any, detailed in the specification forming part of the CONTRACT, which sets out the technical definition of the PLANT.

18.5 The CONTRACTOR shall give a notice to the PROJECT MANAGER his readiness to carry out the performance tests after completion of sustained load test, including a proposal for the time at which the tests would commence. The CONTRACTOR shall then confirm, at least seven DAYS before the commencement of the performance tests.

18.6 Every performance test shall be carried out to completion unless the PROJECT MANAGER or the CONTRACTOR shall order it to be stopped because its continuance would be unsafe or unacceptable to either Party.

18.7 The result of the performance tests shall be compiled and evaluated jointly by the OWNER or the PROJECT MANAGER and by the CONTRACTOR.

19.0 FINAL ACCEPTANCE CERTIFICATE

19.1 Subject to Sub-clause 17.8 and 19.2 hereof 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 or a Section in accordance with Clause 17 hereof (Liability for Defects), whichever is later, the PROJECT MANAGER shall issue a certificate (a 'FINAL ACCEPTANCE CERTIFICATE') to the CONTRACTOR stating that the PLANT or Section and any related work have finally been completed and the date of that completion.

19.2 If Sub-clause 17.4 hereof continues to apply to any part of the PLANT, the PROJECT MANAGER shall as soon as Sub-clause 19.1 hereof is otherwise satisfied, issue a FINAL ACCEPTANCE CERTIFICATE for the remainder of the PLANT or Section in which the repair or part is included, provided that such repair or part is then free from DEFECTS which the CONTRACTOR is bound to make under Clause 17 hereof. Such repair or part shall then be treated as if it were a separate Section and shall be the subject of separate FINAL ACCEPTANCE CERTIFICATE.

19.3 Deleted.

19.4 The FINAL ACCEPTANCE CERTIFICATE shall constitute conclusive evidence for all purposes and in any proceedings whatsoever between the OWNER and the CONTRACTOR that the CONTRACTOR has completed that part of the PLANT and made good all DEFECTS therein in all respects in accordance with his obligations under the CONTRACT.

Where there is more than one FINAL ACCEPTANCE CERTIFICATE the last to be issued shall be identified as being the last FINAL ACCEPTANCE CERTIFICATE.

No FINAL ACCEPTANCE CERTIFICATE shall be conclusive as stated above if it or any other FINAL ACCEPTANCE CERTIFICATE was issued in reliance upon any fraudulent act, misrepresentation or concealment.

EXHIBIT-1

EXPERIENCE CRITERIA

PART-I : COMMERCIAL

EXHIBIT-1

EXPERIENCE CRITERIA

EXHIBIT-1

SUBJECT: TENDER DOCUMENT FOR COMPOSITE MECHANICAL ERECTION WORKS FOR OFFSITE & UTILITIES AT GORAKHPUR, UTTAR PRADESH

EXPERIENCE CRITERIA

Bidder shall furnish their Experience details with reference to the work, which pre-qualify them in line with Experience Criteria mentioned under Clause 8.0 of "Instructions to Bidders".

(MARK √ FOR APPLICABILITY IN BOX)

1.0 EXPERIENCE AS CONTRACTOR

SL. NO.	DESCRIPTION	DETAILS
1.	Name of Project, Location (Executed by Bidder)	
2.	Description of work	
3.	Name of Owner, Postal Address, Phone / Fax No. / E-mail	
4.	Name of Consultant / Postal Address, Phone / Fax No. / E-mail.	
5.	Project Status • Date of Award • Scheduled Mechanical completion date. • Actual Mechanical completion date • Actual Project completion date (handover) • Delay in months (if any) • Reasons for delay (if any)	

6.	Scope of work executed by Bidder's organization	• Supply, Fabrication, Erection and Installation of Piping & Equipments / Machinery	☐	
7.	Completion Status	Specify - Completion Date • Whether completion certificate enclosed YES ☐ NO ☐	**Date**	
			Act.	**Sch.**
7.1	LD imposed/ Bonus claimed	YES/NO ; if yes, brief the reason:		
8.0	Document Furnished			
8.1	Copy of work order / Contract Agreement enclosed	YES ☐ NO ☐		
8.2	Documentary proof from the End User/OWNER regarding satisfactory performance indicating the period of completion.	YES ☐ NO ☐		

Note :

1. Bidder shall furnish the experience details as above of Projects which they consider suitable for their pre-qualification. OWNER / CONSULTANT reserve the right not to evaluate any other Project details.
2. Bidder to note that this exhibit form shall be filled as per the Proformas as stated, along with wherever applicable, copies of work order and completion certificates.
3. **Bidder to note that non-submission of relevant supporting documents may lead to rejection of their bid.** It is to be ensured that all relevant supporting documents shall be submitted alongwith the bid in the first instance itself. Pre-qualification may be completed based on the details so furnished without seeking any subsequent additional information.

For and on behalf of ....
Stamp & Signature : .....
Name : .....
Designation : .....
Date : .....

EXHIBIT-2

FINANCIAL CRITERIA

PART-I : COMMERCIAL

EXHIBIT-2

FINANCIAL CRITERIA

EXHIBIT-2

SUBJECT: TENDER DOCUMENT FOR COMPOSITE MECHANICAL ERECTION WORKS FOR OFFSITE & UTILITIES AT GORAKHPUR, UTTAR PRADESH

FINANCIAL CRITERIA

Bidder shall furnish details with reference to the work, which pre-qualify them in line with Financial Criteria mentioned under Clause 8.0 of "Instructions to Bidders".

1.0 DETAILS OF PROJECT REFERENCES AS PER CLAUSE 8.0 OF "INSTRUCTIONS TO BIDDERS"

SL. NO.	DESCRIPTION	PROJECT – 1, 2 etc. (Separate sheets for each Project)
1.	Project name and description	
2.	(a) Awarded contract value (INR) One completed Work with contract value not less than **INR 17.45 Crore** OR Two completed Works each works with contract value not less than **INR 10.90 Crore** OR Three completed Works each works with contract value not less than **INR 8.70 Crore**	
	(b) Final executed contract value (INR)	
3.	Name of Owner	
	(a) Name and address of Owner's contact person	
	(b) Telephone and Fax No. (c) Mobile No. (d) Email No.	
4.	(a) Date / month / year of award / commencement of Project	
	(b) Date / month / year of Scheduled Completion of the Project.	
	(c) Date / month / year of Actual Completion of the Project.	
5.	Document Furnished	YES/NO

SL. NO.	DESCRIPTION	PROJECT – 1, 2 etc. (Separate sheets for each Project)
5.1	Copy of work order / Contract Agreement enclosed	
5.2	Completion / Acceptance certificate identifying the successful commissioning of project.	

2.0 ANNUAL TURNOVER

SL. NO.	FINANCIAL YEAR	TURNOVER (IN INR)
1	FY: 2017-2018	
2	FY: 2016-2017	
3	FY: 2015-2016	

3.0 NET WORTH

Net worth as on the last day of the financial year ending 31st March 2018:	: …….

Whether copies of balance sheet and annual turnover statements for the above three financial years submitted	YES / NO

4.0 SOLVENCY CERTIFICATE

NAME & ADDRESS OF BANK	ISSUE DATE	AMOUNT (INR)

Note:

1. Bidder shall furnish the experience details as above of Projects which they consider suitable for their pre-qualification. OWNER / CONSULTANT reserve the right not to evaluate any other Project details.

2. Bidder to note that this exhibit form shall be filled as per the Proformas as stated, along with wherever applicable, copies of work order and completion certificates.

3. The bidder shall attach fresh solvency certificate issued by his banker. The solvency certificate shall not be more than six months old from the date of issue of NIT OR minimum credit ratings of "A" from ICRA/CRISIL etc OR equivalent reputed institutions, OR financing/credit limits from bank of value not less than **INR 8.70 Crore** valid as on date of issue of ITB.

4. **Bidder to note that non-submission of relevant supporting documents may lead to rejection of their bid.** It is to be ensured that all relevant supporting documents shall be submitted alongwith the bid in the first instance itself. Pre-qualification may be completed based on the details so furnished without seeking any subsequent additional information.

For and on behalf of : .....
Stamp & Signature : .....
Name : .....
Designation : .....
Date : .....

PART-I : COMMERCIAL

ANNEXURE-1.1

TENDER ACCEPTANCE LETTER

TENDER ACCEPTANCE LETTER
(To be given on Company Letter Head)

Date: _____

To,

Sub: Acceptance of Terms & Conditions of Tender.
NIT No: _____

Name of Tender/Work:-

_____

Dear Sir,

1. I / We have downloaded/obtained the tender document(s) for the above mentioned 'Tender/Work' from the web site(s) namely: _____ as per your advertisement, given in the above mentioned website(s).

2. I / We hereby certify that I/ we have read the entire terms and conditions of the tender documents (including all documents like annexure(s), schedules(s), etc.,), which form part of the contract agreement and I / we shall abide hereby by the terms / conditions/ clauses contained therein.

3. The corrigendum(s) issued from time to time by your department/ organization too has also been taken into consideration, while submitting this acceptance letter.

4. I / we hereby unconditionally accept the tender conditions of above mentioned tender document(s) corrigendum(s) in its totality / entirety.

5. In case any provisions of this tender are found violated, then your department/ organization shall without prejudice to any other right or remedy be at liberty to reject this tender/ bid including the forfeiture of the full said Earnest Money Deposit absolutely.

Yours Faithfully,

Signature of Bidder with Seal :
Name :
Date :
Email Address :
Contact Number :

PART-I : COMMERCIAL

ANNEXURE-1.2

COMMERCIAL QUESTIONNAIRE

SUBJECT: TENDER DOCUMENT FOR ……..

……..

Note:

1) The Bidder shall submit reply to each query.
2) The Bidder's reply/ confirmation as furnished in the Commercial Questionnaire (CQ) shall supersede the stipulation mentioned else where in the bid.

Sl. No.	OWNER'S/PDIL'S QUERY	BIDDER's REPLY / CONFIRMATION
1.	Please confirm that Master Index and copies of all technical and commercial amendments/addendums if any issued, duly signed and stamped on each page as a token of having received and read all parts of the bidding document and having accepted and considered the same in preparing their bid.	
2.	Please confirm that you have studied complete Bidding Document including Pre-Qualification Criteria, Technical and Commercial Part and your Bid is in accordance with the requirements of the Bidding Document.	
3.	Please confirm Bid Submission as per tender i.e. in Single Phase Two Bid System.	
4.	Please confirm that the Price Part does not include any terms and condition. In case any terms and condition is mentioned in the price part, the same shall be treated as null and void.	
5.	**Price confirmation copy**: Please confirm a Photocopy of the Schedule of Rates, to be submitted strictly as per **Section-5 of Part-II, Technical**, Rates being blanked out and in place indicating "**Quoted**" against each head**,** shall be submitted duly signed and stamped as confirmation to quoted rate failing which bid may be rejected.	
6.	Please confirm your compliance to total scope of work mentioned in the Bidding Document. CONTRACTOR's scope shall include supply of all materials and services required for completion of Work irrespective of whether such materials and services are mentioned in the Bidding Document or not.	
7.	Please confirm your acceptance for Time Schedule as mentioned in Instructions to Bidders.	
8.	Please confirm your acceptance for Payment Terms as per Bidding Documents.	
9.	Please confirm that your bid is valid for 120 days from the date of opening of Technical and Unpriced Commercial Bid.	

Sl. No.	OWNER'S/PDIL'S QUERY	BIDDER's REPLY / CONFIRMATION
10.	Please confirm EMD Validity as Bid Validity (120 Days) plus 90 Days.	
11.	Please confirm Damages for delay in completion as per Clause 31.0 of General Condition of Contract.	
12.	Please confirm Guarantee/Warranties as per Clause 29.0 of General Conditions of Contract (GCC).	
13.	Please confirm that your Bid is substantially responsive to the requirements of the Bidding Document and you have not stipulated any material deviation and submitted all details as specified in the Bidding Document.	
14.	Please confirm that adequate numbers of construction equipments, tools, tackles, etc. have been proposed which will be sufficient to complete the work as per the time schedule.	
15.	Please confirm that you have proposed adequate project / site organization with qualified supervisory personnel having sufficient experience.	
16.	Please confirm that all costs resulting from safe execution of Work, such as safety induction, use of protective clothing, safety glasses and helmet, safety precaution taken during monsoon, or any other safety measures to be undertaken by the CONTRACTOR for execution of Work are included in the Quoted Price.	
17.	Please confirm that all safety rules & regulations as mentioned in Bidding Document or notified at later date by OWNER during execution shall be adhered by CONTRACTOR.	
18.	The CONTRACTOR shall include safety rules & regulation and apply the same during the execution of the contract. Contractor shall also follow the safety guidelines of OWNER during the execution period of the contract.	
19.	Please confirm the following :- "The planning schedule, manpower deployment schedule, construction equipment deployment schedule etc. submitted by the bidder with his bid are indicative and shall not be basis for extra compensation in case actual needs are higher. Detailed planning schedule developed by CONTRACTOR after Contract award may be subject to fluctuations depending upon actual progress of the project and available Work front.	

Sl. No.	OWNER'S/PDIL'S QUERY	BIDDER's REPLY / CONFIRMATION
	Co-ordination and making available by CONTRACTOR of all staff, manpower, construction equipment, tools, cranes, etc. and materials as required for a timely completion of all Work as per OWNER's construction and priority schedule and in accordance with the available Work front are to be included in the pricing". Notwithstanding the above provision, the bidder shall submit these details in accordance with the volume of work, which may be reviewed and commented by us during pre award stage /post award stage.	
20.	Please confirm that the bidder has read the complete tender document and has understood the entire scope of work as given elsewhere in the tender document.	
21.	The safety measures as mentioned in Tender Document/GCC/SCC shall not be considered as limitative. The CONTRACTOR will be required to develop their stringent safety measures and submit the same to Engineer-in-Charge with the provision of a dedicated safety group closely monitoring the construction activities in all working shifts.	
22.	Please confirm the following that, a photocopy of the documents listed below has been enclosed in the bid:- 1. PAN Number 2. TIN Number 3. PF/ESI Number 4. GST Number 5. Labour Licence Registration Number 6. Latest Income Tax Clearance Certificate / ITR 7. Audited Balance Sheets	

For and on behalf of : ……

Stamp & Signature : ……

Name : ……

Designation : ……

Date : ……

PART-I : COMMERCIAL

ANNEXURE-1.3

NO DEVIATION CERTIFICATE

(Self Declaration on Bidder's Letter Head as per below performa)

DECLARATION

1. With reference to our Bid Proposal No. ……..…….. dated …….. for (Name of Tender/Works) ……
……..., we hereby confirm that we comply with all terms, conditions and specifications of the Bidding Documents read in conjunction with Amendments(s) / Clarification(s) / Addenda / Errata (if any) issued by the Owner prior to opening of Techno – Commercial Bids and the same has been taken into consideration while making our Techno – Commercial Bid & Price Bid and **we declare that we have not taken any deviation / exceptions in this regards.**

2. We further confirm that any deviation variation or additional conditions etc or any mention, contrary to the Bidding Documents and its Amendments(s) / Clarification(s) / Addenda / Errata (if any) as mentioned at 1.0 above found anywhere in our Techno – Commercial Bid and / or price Bid, implicit or explicit, shall stand unconditionally withdrawn, without any cost implication whatsoever to the Owner, failing which the Bid Security shall be forfeited.

For and on behalf of : ……..……

Stamp & Signature : …….

Name : …….

Designation : …….

Date : …….

PART-I : COMMERCIAL

ANNEXURE-1.4

DETAILS OF SIMILAR WORKS EXECUTED

SUBJECT: TENDER DOCUMENT FOR.....

.....

NAME OF THE PROJECT: BIDDER TO FILL

SL. NO.	FULL POSTAL ADDRESS OF CLIENT AND NAME OF OFFICER IN-CHARGE WITH PHONE/CELL NO AND E-MAIL	DESCRIPTION OF THE WORK	VALUE OF CONTRACT	DATE OF COMMENCEMENT OF WORK	SCHEDULED COMPLETION PERIOD	ACTUAL COMPLETION DATE	REMARKS

Note : 1) Description of work should be in detail.
2) Please also indicate the major problems if any, faced during construction of works.

STAMP & SIGNATURE OF BIDDER : _____

NAME OF BIDDER : _____

DATE : _____

PART-I : COMMERCIAL

ANNEXURE-1.5

CURRENT COMMITMENTS

SUBJECT: TENDER DOCUMENT FOR.....

……

SL. NO.	DESCRIPTION OF WORK	FULL POSTAL ADDRESS OF CLIENT & NAME OF OFFICER IN CHARGE	CONTRACT VALUE	DATE OF COMMENCEMENT OF WORK	SHEDULED COMPLETION PERIOD	% AGE COMP. AS ON DATE	EXPECTED DATE OF COMPLETION	REMARKS

STAMP & SIGNATURE OF BIDDER : _____

NAME OF BIDDER : _____

DATE : _____

PART-I : COMMERCIAL

ANNEXURE-1.6

DEPLOYMENT SCHEDULE FOR SUPERVISORY PERSONNEL

SUBJECT: TENDER DOCUMENT FOR.....

S NO.	DESCRIPTION	DEPLOYMENT SCHEDULE						TOTAL
		M1	M2	M3	…..	…..	…..	
1.	PROJECT MANAGER							
2.	RESIDENT MANAGER							
3.	PLANNING ENGINEER							
4.	ELECTRICAL ENGINEER							
5.	CIVIL & STRUCTURAL ENGINEER							
6.	ADMINISTRATION MANAGER							
7.	WAREHOUSE PERSONNEL							
8.	ADMIN/HR PERSONNEL							
9.	FINANCE PERSONNEL							
10.	SECURITY PERSONNEL							
11.	QA/QC PERSONNEL							
12.	SUPERVISORS							
13.	WELDERS							
14.	HIGHLY SKILLED							
15.	SKILLED							
16.	SEMI SKILLED							
17.	UNSKILLED							

NOTE : Bidder may add more personnel as per job assessment / experience

STAMP & SIGNATURE OF BIDDER : _____

NAME OF BIDDER : _____

DATE : _____

PART-I : COMMERCIAL

ANNEXURE-1.7

DEPLOYMENT SCHEDULE FOR CONSTRUCTION EQUIPMENT

SUBJECT: TENDER DOCUMENT FOR.....

.....

SL. NO.	DESCRIPTION	CAPACITY (Bidder to specify)	DEPLOYMENT SCHEDULE						TOTAL
			M1	M2	M3	…..	…..	…..	
1.	CRANES – 150 MT								
2.	CRANES – 75 MT								
3.	CRANES – 50 MT								
4.	CRANES – 35 MT								
5.	CRANES – 18/12/10/08 MT HYDRA								
6.	DIESEL GENERATORS								
7.	WELDING MACHINE								
8.	COMPRESSORS								
9.	TRACTORS								
10.	TRAILERS / TRUCKS								
11.	DUMPERS								
12.	OTHER TOOLS & TACKLES								
13.	SPECIAL TOOLS & TACKLES								
14.									

NOTE : Bidder may add more Equipments as per job assessment / experience.

STAMP & SIGNATURE OF BIDDER : _____

NAME OF BIDDER : _____

DATE : _____

PART-I : COMMERCIAL

ANNEXURE-1.8

DETAILS OF EQUIPMENT PROPOSED FOR TENDERED WORK

SUBJECT: TENDER DOCUMENT FOR.....

.....

DETAILS OF PROPOSED EQUIPMENTS, TOOLS & TACKLES

The bidder shall submit the details of construction equipments, Tools & tackles etc. in the following format, proposed to be deployed for this works.

Sl. No.	EQUIPMENTS LIST REQUIRED TO BE DEPLOYED				STATUS OF EQUIPMENT		SCHEDULE DEPLOYMENT DATE AT SITE	SCHEDULED COMPLETION DATE OF WORK	REMARKS
	Description of Equipment	Make	Year	Capacity	Own by Contractor	If on Hiring (Give Detail Address)			

Note : 1. In case of equipment are to be hired, bidder shall indicate the source of hiring and enclosed and enclose the consent the letter from such sources.
2. Bidder shall clearly indicate the expected data of availability of owned / hired equipment.

NOTE : Bidder may add Equipments as per job assessment / experience.

SIGNATURE OF BIDDER : ……
NAME OF BIDDER : ……..
COMPANY SEAL : ……

PART-I : COMMERCIAL

ANNEXURE-1.9

CONTENTS OF BID AND CHECK LIST

SUBJECT: TENDER DOCUMENT FOR ……...

……...

Bidder is requested to fill this check list and ensure that all details /documents have been furnished under relevant section as called for in the Bidding Document duly filled in, signed & stamped.

Please tick the box and ensure compliance:

SECTION-I : PRE-QUALIFICATION BID: (Refer Clause 8.0 of Instructions to Bidders)

S.NO.	DESCRIPTION	SUBMITTED
i)	Letter of submission	☐
ii)	Pre Qualification Criteria in favour of Experience Criteria as per **Exhibit-1** along with Copies of Work Orders, Certificates from End User/OWNER and completion certificates in support of prequalification requirement.	☐
iii)	Pre Qualification Criteria in favour of Financial criteria as per **Exhibit-2** along with copies of Work Orders, Completion/ Acceptance certificates and Annual audited Report for the last three financial years. Annual Reports shall be a verifiable statement of annual accounts certified by a Chartered Accountant or Public Accountant in the form of printed annual reports or similar document.	☐
iv)	**Solvency Certificate** as per Annexure-1.18. Date of Issue of this certificate should not more than six months old from the date of issue of NIT.	☐
v)	Format for **Financial Capability** of Bidder as per Annexure-1.21	☐

SECTION-II : TECHNICAL AND COMMERCIAL BID:

S.NO.	DESCRIPTION	SUBMITTED
i.	Photocopy of Earnest money Deposit (EMD)	☐
ii.	Power of Attorney of Bid Signatory from the Competent Authority as per Annexure-1.26	☐
iii.	Tender Acceptance Letter as per Annexure-1.1	☐
iv.	Commercial Questionnaire as per Annexure-1.2	☐
v.	No Deviation Certificate as per Annexure-1.3	☐
vi.	Details of Similar Works Executed as per Annexure-1.4	☐
vii.	Current Commitments of the Bidder as per Annexure-1.5	☐

S.NO.	DESCRIPTION	SUBMITTED
viii.	Deployment Schedule of Supervisory Personnel as per Annexure-1.6	☐
ix.	Deployment Schedule of Construction Equipment as per Annexure-1.7	☐
x.	Details of Equipment Proposed to be used for this work as per Annexure-1.8	☐
xi.	Contents of Bid and Check List as per Annexure-1.9	☐
xii.	A declaration shall be submitted as per Annexure-1.14 to the effect that Bidder have or had not been banned or blacklisted/del-listed by any PSU / Government Organizations.	☐
xiii.	Declaration by Bidder regarding Bidding Document as per Annexure-1.16	☐
xiv.	Photocopy of Integrity Pact as per Annexure-1.17	☐
xv.	EFT details as per Annexure-1.19	☐
xvi.	A declaration shall be submitted to the effect that Bidder submitting their Bid is not under liquidation, court receivership or similar proceedings as per Annexure-1.22	☐
xvii.	Declaration for Past Safety Record as per Annexure-1.23	☐
xviii.	Bidder to furnish PAN Number, TIN Number, PF/ESI Number, GST Number, Labor License Registration Number, Latest Income Tax Clearance Certificate / ITR etc. along with the bid.	☐
xix.	**Price confirmation copy** - A Photocopy of the Schedule of Rates, to be submitted strictly as per **Section-5 of Pa rt-II, Technical**, prices being blanked out and in place indicating "**Quoted**" against each head**,** shall be submitted duly signed and stamped.	☐
xx.	Master Index along with a copy of complete set of Bidding Documents of all technical and commercial amendments/addendums if any issued, duly signed and stamped on each page as a token of having received and read all parts of the bidding document and having accepted and considered the same in preparing their bid.	☐
xxi.	Any other information required in the Bidding Documents or considered relevant by the Bidder.	☐

For and on behalf of : …… ……
Stamp & Signature : ……
Name : ……
Designation : ……
Date : ……

PART-I : COMMERCIAL

ANNEXURE - 1.10

TERMS OF PAYMENT

0	02.01.2019	FOR TENDER	PKC	SK	RRK
REV.	**DATE**	**PURPOSE**	**PREPARED**	**REVIEWED**	**APPROVED**

TABLE OF CONTENTS

TERMS OF PAYMENT

1.0 FINANCIAL GUARANTEE FOR PERFORMANCE

The contractor shall provide financial guarantee within 15 days of award of work for due & faithful performance of the contract as per Clause no. 8 of General Conditions of Contract.

2.0 PAYMENT TERMS

Following terms of payment shall be applicable :

2.1. MOBILIZATION ADVANCE

Mobilization Advance not exceeding 10% of contract value shall be payable on submission of Bank Guarantee for the equivalent amount from a Nationalized / Scheduled Bank in the prescribed proforma, subject to acceptance of LOI and furnishing the Performance Bank Guarantee. **An interest @ 10% per annum shall, however, be charged on the above Mobilization Advance till it is recovered.** Recovery of this Advance shall be made @ 15% from each bill so that full Mobilization Advance including interest is recovered by the time 75% work is done. The interest shall be calculated on the advance up to the date of release of payment(s). Mobilization Advance shall be paid only on acceptance of LOI / Work Order and establishment of Site Office by Contractor. The payment of Mobilization Advance shall be released with certification by Consultant/Owner.

2.2. RUNNING ON ACCOUNT PAYMENT

Progress Payments shall be released to CONTRACTOR against monthly running account bills duly certified by Engineer-in-charge (EIC) after affecting the necessary deductions (like income tax) / recovery of mobilization advance including interest charges accrued thereon. The basis for payment against various items shall be below:

2.2.1 FOR EQUIPMENTS & PIPING WORKS [Section-5.2.1 of SOR]

A. Unloading of Equipment (Item No. 1.1.a)

i) 95% after unloading from Trailer, Truck etc. and placing at designated place, on proper supports as per instruction of Engineer Incharge.

ii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

B. Erection of New Equipments, Machineries & Skids etc. (Item No. 1.1.b)

i) 50% after placing the equipment on foundation or structure, preliminary leveling, alignment for half grouting, if required.

ii) 45% after final alignment/leveling and final grouting of equipment.
ii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

C. For Supply & Application of Grouting (Item No. 2.0)

i) 95% after Installation, Leveling, Alignment & Testing.
ii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

D. For Supply of Piping Items (Item No. 3.0)

i) 65% on receipt and acceptance of items at site.
ii) 30% after Erection / Installation.
iii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

E. For Fabrication and Erection of Piping (Item No. 4.a & 4.b)

i) 50% after Pre-fabrication of Piping as per Piping Layout, Isometric Drawing including necessary Tapings and Completion of NDT and acceptance by Engineering Incharge.
ii) 35% after Erection, Welding, Supporting, Alignment, NDT and acceptance by Engineering Incharge.
iii) 10% after Hydro-testing.
iv) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

F. For Erection of Pre-fabricated Piping (Item No. 5.a)

i) 85% after Erection, Welding, Supporting, Alignment, NDT and Acceptance by Engineering Incharge.
ii) 10% after Hydro-testing.
iii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

G. For Field Welding of Pre-fabricated Piping Joints (Item No. 5.b)

i) 85% after Alignment, Welding, including necessary Tapings, Completion of NDT and acceptance by Engineering Incharge.
ii) 10% after Hydro-testing.
iii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

H. For Testing of Heat Exchangers etc. (Item No. 6.0)

i) 95% after Completion of job as per instructions and acceptance by Engineering Incharge.
ii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

I. For Erection of Valves (Item No. 7.0)

i) 85% after Installation of Valves by Threading / Bolting / Welding and Completion of NDT and acceptance by Engineering Incharge.
ii) 10% after Hydro-testing.
iii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

J. Supply and Fabrication of Pipe Supports (Item No. 8.a)

i) 60% after Supply of Pipe Supports.
ii) 35% after Fabrication of Pipe Supports including Welding / Bolting and acceptance by Engineering Incharge.
iii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

K. Erection of Pipe Supports (Item No. 8.b & 8.c)

i) 95% after Erection of Pipe Supports as a part of Piping including Welding / Bolting and acceptance by Engineering Incharge.
ii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

L. Radiography (Item No. 9.0)

i) 95% after Completion of Radiography, Interpretation and Acceptance of complete Joint by Engineer Incharge.
ii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

M. Modification / Extra Works (if any) & Handling Charges for Modification & Erection (Item No. 10.0 & 11.0)

i) 85% after Completion of Modification Work and Acceptance by Engineer Incharge.
ii) 10% after Hydro-testing
iii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

N. Assistance during Pre-commissioning / Commissioning and Letter Stenciling (Item No. 12.0 & 13.0)

i) 95% after completion of job as per instruction and due certification by Engineer Incharge.
ii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

2.2.2 FOR SUPPLY & APPLICATION OF INSULATION FOR PIPING & EQUIPMENTS [Section-5.2.2 of SOR]

i) 60% after Supply of Insulation Material.
ii) 35% after Application of Insulation and acceptance by Engineering Incharge.
iii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

2.2.3 FOR PERMANENT CATHODIC PROTECTION FOR U/G PIPELINE NETWORK [Section-5.2.3 of SOR]

i) 60% after Supply of Material.
ii) 35% after Installation of PCP System and acceptance by Engineering Incharge.
iii) 05% on Commissioning / Completion of all works in all respects and acceptance thereof by Engineering Incharge.

2.3. The Running Account Bills shall be submitted on Monthly basis. However, kindly note that in addition of Running Account Bill, the contractor has to submit the Monthly Progress Report (Refer Annexure 1.24) duly approved by the Engineer-in-charge/ Resident Construction Manager at site. This report will acts as a mandatory document for submission of the bill. Failing in submission of the report, the invoice will not be processed further for payment.

2.4. RELEASE OF 1st R/A BILL

Payment will be released against 1st R/A bill only on submission of following documents by contractor to the indenting department.

i. Monthly Progress report approved by Engineer-in-charge/ Resident Construction Manager at site.
ii. Acceptance of LOI, Financial Guarantee for Performance and Signing of Contract Agreement.
iii. Labour License (as per statutory requirements)
iv. EPF Code Registration number with RPFC/ARPFC
v. Insurance Contractor All Risk (CAR) Policy
vi. Workmen compensation policy

2.5. SUBMISSION OF FINAL BILL

The final bill complete in all respect shall be submitted after certified completion of work. The bill should be accompanied with the following documents:

i. Job completion certificate.
ii. No claim certificate on HURL's prescribed proforma.
iii. Site clearance certificate.
iv. Performance guarantee duly amended to cover certified maintenance period.
v. Indemnity certificate towards labours payment and all other statutory payments.

No claim shall be entertained after receipt of final bill. Settlement of final bill shall be made within 1 (one) month period subject to furnishing of all required documents / clarification and extension of time, if any, by HURL's competent authority.

3.0 PRICE

The prices shall be firm during the entire contract period including all extensions granted on whatsoever ground may be.

4.0 INSTRUCTION FOR INVOICING & PAYMENT DOCUMENTATION

4.1. INVOICING

Invoicing shall be in compliance with the stipulations of the Work Order and the following instructions. Contractor is liable for all costs arising from noncompliance with

the instructions. As far as possible, description of Works in invoice shall match the description in Work Order. **Invoice for payment shall be addressed to Owner.**

The invoices shall be issued in the name of:

Hindustan Urvarak & Rasayan Limited,
Core-4, 9th Floor, Scope Minar,
Laxmi Nagar District Centre, Delhi-92

Kind Attention : Mr. Suhas Varadkar, Chief Manager
Tel no. : 011-22502267
Email : suhasvaradkar@hurl.net.in

The invoice shall contain the following information:

i. Work Order No.
ii. Item no., quantity and complete description
iii. Item-wise net price (unit and total) of the works where applicable.
iv. Net amount payable by deducting advance payment already invoiced, if any, and the guarantee retention amount, if any, from the total value of the Works being invoiced.

The signed invoices, original and copy shall be made on Contractor's letter head and shall be duly signed.

Invoices for progress payment(s) shall state the information under (i), (ii) and (iii).
Invoices for guarantee retention money shall state the information under (i) to (iv).

4.2. PROGRESS PAYMENT

1) Invoice for _____ in original and two (2) copies duly certified by Owner / Consultant.

2) Performance certificate in one (1) original plus two (2) copies from the beneficiary to the effect that progress achieved is equal to progress invoiced, duly certified by Owner/Consultant.

PART-I : COMMERCIAL

ANNEXURE - 1.11

PROFORMA OF BANK GUARANTEE FOR EARNEST MONEY DEPOSIT (EMD) / BID SECURITY

(To be stamped in accordance with Stamp Act,
if any, of the Country of the issuing Bank)

Bank Guarantee No. .....
Date.....

To:
[Owner's Name and Address]

Dear Sirs,

In accordance with Invitation for Bids under your Bid Document No. ..... M/s..... having its Registered/Head Office at..... (here-in-after called the 'Bidder') wish to participate in the said bid for ……..*[Name of Project]*…….....

As an irrevocable bank guarantee against Bid Security for an amount of .....(*).....valid for..... days from.....(**).....required to be submitted by the Bidder as a condition precedent for participation in the said bid which amount is liable to be forfeited on the happening of any contingencies mentioned in the Bidding Documents.

We, the .....*[Name & address of the Bank]*.....having our Head Office at.....(#).....guarantee and undertake to pay immediately on demand by.....*[Name of the Owner]* (hereinafter called the 'Owner')..... the amount of .....(*).....without any reservation, protest, demand and recourse. Any such demand made by the 'Owner' shall be conclusive and binding on us irrespective of any dispute or difference raised by the Bidder.

This Guarantee shall be irrevocable and shall remain valid upto .....(@)..... If any further extension of this guarantee is required, the same shall be extended to such required period (not exceeding one year) on receiving instructions from M/s ..... *[Bidder's Name]*..... on whose behalf this guarantee is issued. In witness where of the Bank, through its authorised officer, has set its hand and stamp on this.....day of.....20.....at.....

.....
(Signature)
. .....
(Name)
. .....
(Designation with Bank Stamp)
Attorney as per
Power of Attorney No.....
Date.....

NOTE :

1. (*) The amount shall be as specified in Letter Inviting Bid.
   (**) This shall be the date of opening of Technical and Commercial bids.
   (#) Complete mailing address of the Head Office of the Bank to be given.
   (@) This date shall be three (3) months beyond bid valid.

2. The Stamp Paper of appropriate value shall be purchased in the name of Bidder / Bank issuing the guarantee.

PART-I : COMMERCIAL

ANNEXURE - 1.12

PROFORMA OF SECURITY CUM PERFORMANCE BANK GUARANTEE / SECURITY DEPOSIT

(To be submitted on non judicial stamp paper of appropriate value)

PROFORMA OF BANK GUARANTEE FOR CONTRACT PERFORMANCE

(This guarantee should be executed on non-judicial stamp paper of appropriate value)

Bank Guarantee No…….
Date……..

To,
[Owner's Name & Address]

Dear Sirs,

In Consideration of **Hindustan Urvarak & Rasayan Limited, having its Registered Office at Coal Bhawan, 7th Floor, Plot No. AF- III, Action Are a-1A, Newtown, Kolkata-700156**, (hereinafter referred to as the 'Owner' which expression shall unless repugnant to the context or meaning thereof include its successors, administrators and assigns) having awarded to M/s. _____ with its registered / Head Office at _____ (hereinafter referred to as the 'Contractor' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns), a Contract by issue of Owner's Letter of Intent No. _____ dated _____ and the same having been unequivocally accepted by the Contractor, resulting in a contract _____(*scope of contract*) _____ and the Contractor having agreed to provide a Contract Performance Guarantee for the faithful performance of the entire Contract equivalent to Rs. _____ (%) _____ per cent) of the said value of the Contract to the Owner.

We _____ (*name and address*)_____ having its Head Office at _____ (hereinafter referred to as the `Bank' which expression shall, unless repugnant to the context or meaning thereof, include it successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Owner, on demand any and all monies payable by the Contractor to the extent of _____ as aforesaid at anytime upto _____ (days/month/year) without any demur, reservation, context, recourse or protest and/or without any reference to the Contractor. Any such demand made by the Owner on the Bank shall be conclusive and binding notwithstanding any difference between the Owner and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. The Bank undertakes not to revoke this guarantee during its currency without previous consent of the Owner and further agrees that the guarantee herein contained shall continue to be enforceable till the Owner discharge this guarantee.

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 extend the time for performance of the Contract by the Contractor. The Owner shall have the fullest liberty, without affecting this guarantee, to

postpone 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 forbear to enforce any 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. The bank shall not be released to its obligations under these presents by any exercise by the Owner of its liberty with reference to the matters aforesaid or any of them or by reason of any other act of omission or commission on the part of the Owner or any other indulgences shown by the Owner or by any other matter or thing whatsoever which under law would, but for this provision have the effect of relieving the Bank.

The Bank also agrees that the Owner at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee the Owner may have in relation on to the Contractor's liabilities.

Notwithstanding anything contained hereinabove our liability under this guarantee is restricted to Rs. _____ and it shall remain in force upto and including _____ and shall be extended from time to time for such period (not exceeding one year), as may be desired by M/s_____{Contractor's Name}_____ on whose behalf this guarantee has been given.

IN WITNESS, the Principal and surety have executed this performance bond and have affixed their seals on the date set forth.

Dated this……day of…….20…….at…….

WITNESS:

……..
(Signature)

……..
(Name)

……..
(Official Address)

(Signature)……..

(Name)……

……
(Designation with
Bank Stamp)

Attorney as Power
of Attorney No…….
Dated……..

PART-I : COMMERCIAL

ANNEXURE - 1.13

BANK GUARANTEE FOR ADVANCE / PROGRESS PAYMENT

(To be submitted on non judicial stamp paper of appropriate value)

PROFORMA OF BANK GUARANTEE FOR ADVANCE PAYMENT

(To be stamped in accordance with Stamp Act)

In Consideration of **Hindustan Urvarak & Rasayan Limited, having its Registered Office at Coal Bhawan, 7th Floor, Plot No. AF- III, Action Are a-1A, Newtown, Kolkata-700156**, (hereinafter referred to as the `Owner' which expression shall unless repugnant to the context or meaning thereof include its successors, administrators and assigns) having awarded to M/s. _____ (hereinafter referred to as the `Contractor' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns), a Contract by issue of Owner's Letter of Intent No. _____ dated _____ and the same having been unequivocally accepted by the Contractor, resulting in a Contract _____ *(scope of contract*)_____ and the Owner having agreed to make an advance payment to the Contractor for performance of the above Contract amounting Rs. _____ (Rupees _____ only) as an advance against Bank Guarantee to be furnished by the Contractor.

We _____ *(name of the bank)* _____ having its Head Office at _____ (hereinafter referred to as the `Bank', which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Owner, immediately on demand any or, all monies payable by the Contractor to the extent of _____ as aforesaid at any time upto _____ @ _____ without any demur, reservation, context, recourse or protest and/or without any reference to the Contractor. Any such demand made by the Owner on the Bank shall be conclusive and binding notwithstanding any difference between the Owner and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. We agree that the Guarantee herein contained shall be irrevocable and shall continue to be enforceable till the Owner discharges this guarantee.

The guarantee herein contained is not revocable by notice during the currency and will remain in full force until (a) payment has been made to the owner by the Bank of the aggregated amount payable herein under or (b) the said advance has been fully adjusted and extinguished, as hereafter set forth, whichever is earlier.

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 Contract by the Contractor. The Owner shall have the fullest liberty without affecting this guarantee, to postpone 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 forbear to enforce any covenants, contained or implied with Contract between the Owner and the Contractor or any other course or remedy or security available to the Owner. The bank shall not be released of its obligations under these presents by any exercise by the Owner of its liberty with reference to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Owner or any other indulgence shown by the Owner or by any

other matter or thing whatsoever which under law would but for this provision have the effect of relieving the Bank.

The Bank also agrees that the Owner at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Owner may have in relation to the Contractor's liabilities.

Notwithstanding anything contained herein above our liability under this guarantee is limited to _____ and it shall remain in force upto and including _____ @ _____ and shall be extended from time to time for such period (not exceeding one year), as may be desired by M/s. _____ on whose behalf this guarantee has been given.

Dated this _____ day of _____ 200___ at _____

PART-I : COMMERCIAL

ANNEXURE - 1.14

PROFORMA FOR BLACKLISTED

(Self Declaration on Bidder's Letter Head as per below proforma)

DECLARATION

To ,

…….
…….
…….

NIT NO. : ……

SUBJECT : TENDER DOCUMENT FOR ……
……..

Sir ,

We hereby declare that M/s …… is neither put on Holiday or Black-listed by any Government / PSU / Private firm or Financial Institution.

Signature

Name :
Designation :
Seal of the Bidder:

PART-I : COMMERCIAL

ATTACHMENT - 1.15

FORMAT OF CONTRACT AGREEMENT

FORMAT OF CONTRACT AGREEMENT

(To be executed on non-judicial stamp paper of appropriate value)

THIS CONTRACT AGREEMENT is made the_____day of_____, 20____.

BETWEEN

(1) *[Name of Owner]*, a corporation incorporated under the laws of India and having its principal place of business at *[address of Owner*] (hereinafter called "the Owner"), and (2) [name of Contractor], a corporation incorporated under the laws of India and having its principal place of business at [address of Contractor] (hereinafter called "the Contractor")

WHEREAS the Owner desires to engage the Contractor to *……..[scope of work]…….* and the Contractor have agreed to such engagement upon and subject to the terms and conditions hereinafter appearing.

NOW IT IS HEREBY AGREED as follows:

ARTICLE 1. CONTRACT DOCUMENTS

1.1 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 and its Appendices
b) Letter of Intent (LOI)
c) Special Conditions of Contract and amended/clarification, if any
d) General Conditions of Contract and amended/clarification, if any.
e) Part-II, Technical, of the NIT documents and amended/clarification, if any.
f) Technical Specifications and Drawings and amended/clarification, if any.
g) The Bid and Schedule of Prices including Supplementary Price, if any.
h) Integrity Pact (IP) signed between the Owner and the Bidder/Contractor.
i) Instruction to Bidders.

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

1.2 **PRIORITY OF DOCUMENTS**

In the event of any ambiguity or conflict between the CONTRACT DOCUMENTS listed in clause 1.1 above, the order of precedence shall be the order in which the CONTRACT DOCUMENTS are listed in Clause 1.1 above.

1.3 **Definitions**

Capitalized words and phrases used herein shall have the same meanings as are ascribed to them in the General Conditions of Contract.

ARTICLE 2. CONTRACT PRICE AND PAYMENT TERMS

2.1 **Contract Price**

The Owner hereby agrees to pay to the Contractor the Contract Price in consideration of the performance by the Contractor of its obligations hereunder. The Contract Price shall be the

and [amount in words], [amount in figures], or such other sums as may be determined in accordance with the terms and conditions of the Contract.

2.2 **Payment Terms**

Payment shall be made by the Owner to the Contractor as per the provisions of Bidding Documents.

ARTICLE 3. EFFECTIVE DATE FOR DETERMINING TIME FOR COMPLETION

The Completion period of the Project shall be determined from the date of Letter of Award.

ARTICLE 4. NON-ASSIGNABILITY

The Contract and benefits and obligations thereof shall be strictly personal to the CONTRACTOR and shall not on any account be assignable or transferable by the CONTRACTOR.

ARTICLE 5. 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 hereunder. It is expressly understood and agreed that the Owner is an Independent legal entity with power and authority to enter into contracts solely on its own behalf under the applicable laws of India and the general principles of Contract Law. The Contractor expressly agrees, acknowledges and understands that the Owner is not an Agent, Representative or Delegate of the Govt. 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, the Contractor expressly waives, releases and foregoes any and all actions or claims, including cross claims, impleader claims or counter claims against the Government of India arising out of this Contract and covenants not to sue the Government of India as to any manner, claim, cause of action or thing whatsoever arising of or under this Contract.

ARTICLE 6. APPENDICES

The Appendices listed in the attached list of Appendices shall be deemed to form an integral part of this Contract Agreement. Reference in the Contract to any Appendix shall mean the Appendices attached hereto, and the Contract shall be read and construed accordingly.

ARTICLE 7. NO LIABILITY ON DIRECTOR AND EMPLOYEE

No Director, employee, consultant or agent of the OWNER or other person representing the OWNER or acting on behalf of the OWNER in or pursuant to the Contract or in the discharge of any obligation to the OWNER under the Contract or otherwise in relation to the Contract shall have any personal liability to the CONTRACTOR or any Sub-Contractor, agent, representative, director or employee of the CONTRACTOR or to any other person acting for or on behalf of the CONTRACTOR and the CONTRACTOR on its own behalf and on behalf of its Sub Contractors, directors, employees, agents and representatives hereby waives and disclaims any and all right of action which it or they may have whether under tort or Contract or otherwise against the OWNER or any director, employee, agent, consultant or representative of the OWNER for act of omission or commission done or omitted to be done.

ARTICLE 8. WAIVER

No failure or delay by the OWNER in enforcing any right or remedy of the OWNER in terms of the CONTRACT or any obligation or liability of the CONTRACTOR in terms thereof, shall be deemed to be a waiver of such right, remedy, obligation or liability, as the case may be, by the OWNER and notwithstanding such failure or delay, the OWNER shall be entitled at any time to enforce such right, remedy, obligation or liability, as the case may be.

ARTICLE 9. LANGUAGE OF CONTRACT AND COMMUNICATION

The language of the Contract shall be English and all communications, drawings, design, data, information, codes specifications and other document whatsoever supporting the bid or otherwise exchanged under the Contract shall be in English. In the event that any technical documentation is in any language other than English, the document should be translated and presented to the OWNER/Project Manager in English and English document/translated document shall be regarded as the only authentic document.

IN WITNESS WHEREOF the Owner and the Contractor have caused this Agreement to be duly executed by their duly authorized representatives the day and year first above written.

Signed by for and on behalf of the Owner

_____

[*Signature*]

_____

[*Title*]

in the presence of _____

Signed by for and on behalf of the Contractor

_____

[Signature]

_____

[Title]

in the presence of _____

CONTRACT AGREEMENT

dated the_____ day of_____, 20_____

BETWEEN

_____

["the Owner"]

and

_____

["the Contractor"]

PART-I : COMMERCIAL

ANNEXURE - 1.16

DECLARATION BY BIDDER REGARDING BIDDING DOCUMENT

(Declaration on Bidder's Letter Head as per below performa)

SUBJECT: TENDER DOCUMENT FOR .....

.....

We _____ (Name of the Bidder) hereby represent that we have gone through and understood the Bidding Documents, **NIT NO: ..... DATED** _____ (including but not limited to) the Commercial & Technical Requirements/ Specifications in **Part-I : Commercial and Part-II : Technical** of the Bidding documents and amendments, if any, and that our Bid has been prepared accordingly in compliance with the requirements stipulated in the said documents.

We are submitting a copy of complete set of Bidding Documents, **Part-I : Commercial and P art-II : Technical and Amendments**, if any, as part of our Bid duly signed and stamped on each page in token of our acceptance. Further we undertake that in the event of award of work to us, all the parts shall be considered for constitution of Contract Agreement.

For and on behalf of : ……

Stamp & Signature : ……

Name : ……

Designation : ……

Date : ……

PART-I : COMMERCIAL

ANNEXURE - 1.17

FORMAT FOR INTEGRITY PACT

INTEGRITY PACT

This pre-bid pre-contract Agreement (hereinafter called the Integrity Pact) is made on ____ day of the month of _____ 2018, between **M/s Hindustan Urvarak & Rasayan Ltd.,** registered under Companies Act, 2013, having its registered office at **having its Register ed Office at Hindustan Urvarak & Rasayan Limited, having its Registered Office at Coal Bhawan, 7th Floor, Plot No. AF-III, Action Area-1A, Newtown, Kolkata-700156**, (hereinafter referred to as [HURL], which expression shall mean and include, unless the context otherwise requires, its successors and assigns) of the First Part and M/s _____ a Company, firm incorporated under _____ Laws to which it is subject to (hereinafter called the "Bidder/Seller", which expression shall mean and include, unless the context otherwise requires, its successors, heirs / legal representatives / administrator in office and assigns) of the Second Part.

Whereas

HURL has issued NIT_____ dated_____ inviting bids from Parties for undertaking-the Project /Work of_____ at its unit located at_____ (hereinafter referred to as the Project /Work). The BIDDER is a private Company/Public Company/Government Undertaking / Partnership / registered export agency, constituted in accordance with the relevant law in the matter and HURL is joint venture company incorporated by Indian Oil Corporation Ltd. (IOCL), National Thermal Power Corporation Ltd. (NTPC), Coal India Ltd. (CIL), The Fertilizer Corporation of India Ltd. (FCIL) and Hindustan Fertiliser Corporation Ltd. (HFCL).

The Bidder is willing to offer/ has offered to carry out the Project/ Work and understands that this Integrity Pact has to be executed between the parties before HURL can consider the offer.

NOW, THEREFORE,

To avoid all forms of corruption by following a system that is fair, transparent and free from any influence/prejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to :-

Enabling HURL to undertake the Project/Work at a competitive price in conformity with the defined specifications by avoiding the high costs and the distort nary impact of corruption on public procurement, and

Enabling BIDDER to abstain from bribing or indulging in any corrupt practices in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and HURL will commit to prevent corruption, in any form, by its officials by following transparent procedures.

In respect of the Project/Work an Independent Monitor shall be appointed by HURL to verify facts and to take necessary action, legal or otherwise as may be deemed appropriate including criminal proceedings, against the persons and /or Organizations indulging in the corrupt practice.

NOW, THEREFORE IN CONSIDERATION OF T HE MUTUAL COVENANTS CONTAINED HEREIN, THE PARTIES AGREE AS UNDER:

1.0 COMMITMENTS OF HURL:

1.1 HURL undertakes that no official of HURL, connected directly or indirectly with the Project/Work, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the BIDDER, either for themselves or for any other person, organization or third party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the contract.

1.2 HURL will, during the pre-contract stage, treat all BIDDERs alike, and will provide to all BIDDERs the same information and will not provide any such information to any particular BIDDER which could afford an advantage to that particular Bidder in comparison to other BIDDERs.

1.3 HURL will report to the Independent Monitor of any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach. HURL will also report to appropriate Government Office wherever necessary".

2.0 PRECEDING MISCONDUCT:

2.1 In case any preceding misconduct on the part of any official(s) is reported by the BIDDER to the Independent Monitor with full and verifiable facts and the same is prima facie found to be correct by the Independent Monitor, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by HURL or the Independent Monitor and such a person shall be debarred from further dealings related to contract process. In such a case while an enquiry is being conducted by HURL the proceedings under the contract would not be stalled.

3.0 COMMITMENTS OF BIDDER:

3.1 The BIDDER commits itself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its bid or during any pre-contract or post-contract stage in order to secure the contract or in furtherance to secure it and in particular commit itself to the following:

3.2 The BIDDER will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the HURL, connected directly or indirectly with the bidding process, or to any person, organization or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the contract.

3.3 The BIDDER further undertakes that it has not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of HURL or otherwise in procuring the Contract or forbearing to do or
having done any act in relation to the obtaining or execution of the contract or any other contract with HURL for showing or forbearing to show favour or disfavour to any person in relation to the contract or any other contract with HURL.

3.4 BIDDER shall disclose the name(s) and address(es) of foreign principals, associates, agents and distributors, advisors, representatives and sub-contractors.

3.5 BIDDER shall disclose the payments to be made by them to agents/ brokers or any other intermediary, in connection with this bid/ contract.

3.6 The BIDDER further confirms and declares to HURL that he has not engaged any individual or firm or company, whether Indian or foreign, to intercede, facilitate or in any way to recommend to HURL or any or its functionaries, whether officially or unofficially to the award of the contract to the BIDDER, nor has any amount been paid, promised or intended to be paid to any such individual, firm or Company in respect of any such intercession, facilitation or recommendation.

3.7 The BIDDER, either while presenting the bid or during pre-contract negotiations or before signing the contract, shall disclose complete details of any payments made, is committed to or intends to make to any officials of HURL or their family members, agents, brokers or any other intermediaries in connection with the contract and the details of services agreed upon for such payments.

3.8 The BIDDER will not collude with other parties, interested in the contract, to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.

3.9 The BIDDER will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.

3.10 The BIDDER shall not use improperly, for purposes of completion or personal gain, or pass on to others, any information provided by HURL as part of the business relationship, such as plans, technical proposals and business details including information contained in any electronic data carrier. The BIDDER also undertakes to exercise due and adequate care to ensure that no information is divulged to others.

3.11 The BIDDER commits to refrain from giving any complaint in connection with the Project, directly or through any other manner, without supporting it with full and verifiable facts.

3.12 The BIDDER shall not instigate or cause to instigate any third party to commit any of the actions aforestated.

3.13 If the BIDDER or any employee of the BIDDER or any person acting on behalf of the BIDDER, either directly or indirectly, is a relative of any of the employees of HURL, or, if any relative of an employee of HURL has financial interest/stake in the BIDDER, the same shall be disclosed by the BIDDER at the time of filing the tender.

The term `relative' for this purpose would be as defined in Companies Act, 2013 or any modifications thereof.

3.14 The BIDDER shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any employee of HURL.

4.0 PREVIOUS TRANSGRESSION

4.1 The BIDDER declares that no previous transgression occurred in the last three years immediately before signing of this Integrity Pact with HURL, in respect of any corrupt practices

envisaged hereunder, and/or with any Public Sector Enterprises/ Government department that could justify BIDDERs exclusion from the tender process.

4.2 The BIDDER agrees that if it makes incorrect statement on this subject, BIDDER can be disqualified from the tender process of the contract, and if already awarded, the Contract can be terminated for such reason.

5.0 EARNEST MONEY / SECURITY DEPOSIT:

5.1 While submitting commercial bid, the BIDDER shall deposit an amount _____ as Earnest Money/Security Deposit, with HURL through any of the following instruments:

(i) Bank draft or pay order in favour of

(ii) A confirmed guarantee by an Indian Nationalized Bank, promising payment of the guaranteed sum to the Buyer on demand within three working days without any demur whatsoever and without seeking any reasons whatsoever. The demand for payment by the Buyer shall be treated as conclusive proof of payment

(iii) Any other mode or through any other instrument

5.2 The amount and validity of the earnest money / Security Deposit shall be as mentioned in the NIT.

5.3 In case of the successful BIDDER a clause would also be incorporated in the Article pertaining to Performance Bond in the purchase contract that the provisions of Sanctions for Violation shall be applicable for forfeiture of Performance Bond in case of the decision by the BUYER to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.

5.4 No interest shall be payable by the HURL to the BIDDER on Earnest Money/ Security Deposit for the period of its currency.

6.0 SANCTIONS FOR VIOLATIONS

6.1 Any breach of the aforesaid provisions by the BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER) shall entitle HURL to take all or any one of the following actions, wherever required:-

i. To immediately call off the pre contract negotiations without assigning any reason or giving any compensation to the BIDDER. However, the proceedings with the other BIDDER(s) would continue.

ii. The Earnest Money Deposit (in pre-contract stage) and /or Security Deposit/Performance Bond (after the contract is signed) shall stand forfeited either fully or partially, as decided by HURL, without assigning any reason thereof.

iii. To immediately cancel the contract, if already signed, without giving any compensation to the BIDDER.

iv. To recover all sums already paid by HURL, together with interest thereon at 2% higher than the prevailing Lending Rate of State Bank of India or at 2% higher than LIBOR as may be applicable based on whether the bidder is an Indian party or a foreign party. If any outstanding payment is due to the BIDDER from HURL in connection with any other contract for any other Project/Work/ Supply, such outstanding payment could also be utilized to recover the aforesaid sum and interest.

v. To encash the advance bank guarantee and performance bond/ warranty bond, if furnished by the BIDDER, in order to recover the payments, already made by HURL, along with interest.

vi. To terminate all or any other Contracts with the BIDDER. The BIDDER shall be liable to pay compensation for any loss or damage to HURL resulting from such termination and RCF shall be entitled to deduct the amount so payable from the money(s) due to the BIDDER.

vii. To debar/blacklist the BIDDER from participating in future bidding processes of HURL for a minimum period of five years, which may be further extended at the discretion of HURL.

viii. To recover all sums paid, in violation of this Pact by BIDDER to any middleman or agent or broker, with a view to securing the contract.

ix. In case where irrevocable Letters of Credit have been opened in respect of any contract signed by HURL with the BIDDER, the same shall not be operated.

x. Forfeiture of Performance Bond in case of a decision by HURL to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.

6.2 HURL will be entitled to take all or any of the actions mentioned at para 6.1 (i) to (x) of this Pact also on the Commission by the BIDDER or any one employed by it or acting on its behalf (Whether with or without the knowledge of the BIDDER) of an offence as defined in Chapter IX of the Indian Penal code, 1860 or Prevention of Corruption Act, 1988 or any other statute enacted for prevention of corruption.

6.3 The decision of HURL to the effect that a breach of the provisions of this Pact has been committed by the BIDDER shall be final and conclusive on the BIDDER. However, the Bidder can approach the Independent Monitor appointed for the purposes of this Pact.

7.0 INDEPENDENT MONITOR:

7.1 HURL has appointed following persons as Independent Monitor for this Pact:

(i) Name :. …….
Address:
Email:
Mobile:

(ii) Name :. …….
Address:
Email:
Mobile:

7.2 The task of the Monitor shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this Pact.

7.3 The Monitor shall not be subject to instructions by the representatives of the parties and perform his functions neutrally and independently.

7.4 Both the parties accept that the Monitor has the right to access all the documents relating to the project/ procurement, including minutes of meetings.

7.5 As soon as the Monitor notices, or has reason to believe a violation of this Pact, he will so inform the Authority designated by HURL.

7.6 Notwithstanding any Confidentiality Agreement/ clause agreed between HURL and Bidder, the BIDDER accepts that the Monitor has the right to access, without restriction, to all Project documentation of HURL including that provided by the BIDDER. The BIDDER will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to this project documentation. The same is applicable to Subcontractors. The Monitor shall be under contractual obligation to treat the information and documents of the BIDDER/ Subcontractor (s) with confidentiality.

7.7 HURL will provide to the Monitor sufficient information about all meetings among the parties related to the supply provided such meetings could have an impact on the contractual relations between the parties. The parties will offer to the Monitor the option to participate in such meetings.

7.8 The Monitor will submit a written report to the designated Authority of HURL within 8 to 10 weeks from the date of reference or intimation to him by HURL/ BIDDER and should the occasion arise, submit proposals for correcting problematic situations.

8.0 FACILITATION OF INVESTIGATION

In case of any allegation of violation of any provisions of these terms or payment of commission, HURL shall be entitled to examine all the project documents of the BIDDER and the BIDDER shall provide necessary information and documents in English and shall extend all possible help for the purpose of such examination.

9.0 LAW AND PLACE OF JURISDICTION

This Pact is subject to Indian Law. The place of performance and jurisdiction is the registered office of HURL.

10.0 OTHER LEGAL ACTIONS

The Actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the extant law in force relating to any civil or criminal proceedings.

11.0 VALIDITY

11.1 The validity of this Integrity Pact shall be from date the NIT is issued and extend upto two years from the date of last payment under the contract. In case BIDDER is not awarded Contract/Purchase Order, this Integrity Pact shall expire after twelve months from the date of issue of the NIT.

11.2 Should one or several provisions of this Pact turn out to be invalid, the remainder of this Pact shall remain valid. In this case, the parties will strive to come to an agreement to their original intentions.

12.0 The parties hereby sign this Integrity Pact, through their authorized representative, for having accepted the conditions contained hereinabove.

HURL	**BIDDER**
( )	*( )*
Date:	*Date:*
Place:	*Place:*
Witness	Witness
1. _____	1. _____
2. _____	2. _____

PART-I : COMMERCIAL

ANNEXURE - 1.18

PROFORMA FOR SOLVENCY CERTIFICATE

PROFORMA FOR SOLVENCY CERTIFICATE

(on Bank's Letter Head)

REF NO: …… DATE: …….....

To Whomsoever Concerned

This is to certify that to the best of our knowledge and information, M/s_____ (Bidders name with complete address), a customer of our Bank, is respectable, and is capable of executing orders to the extent of Rs. _____ (Rupees_____). M/s _____ have been our customer since _____ to date and has been granted the following limits, at present, against various facilities granted by the Bank:

…… ……..
…… ……...

This certificate is issued without any guarantee, risk or responsibility on behalf of the Bank or any of its officials.

This certificate is issued at the specific request of the customer.

Yours faithfully,

(Bank Official's signature & stamp)

PART-I : COMMERCIAL

ANNEXURE - 1.19

FORMAT FOR EFT DETAILS

FORMAT FOR EFT DETAILS

I / WE hereby agree to receive the payment against our bills raised to M/s Hindustan Urvarak & Rasayan Ltd. directly in our bank account as per details given below through Electronic Fund Transfer Mechanism. Necessary details are given as below:

1	Name, Branch and address of Payee's bank	:	_____
2	Title of the account	:	_____
3	Account number	:	_____
4	Nature of the Account	:	_____
5	Branch MICR code number	:	_____
	[Enclose photocopy of cancelled cheque]	:	_____
6	Permanent Account Number	:	_____
	[PAN] of the Payee	:	_____
7	IFSC Code	:	_____

STAMP & SIGNATURE OF BIDDER : _____

NAME OF BIDDER : _____

DATE : _____

PART-I : COMMERCIAL

ATTACHMENT - 1.20

GENERAL GUIDELEINS FOR GOODS & SERVICE TAX (GST)

GENERAL GUIDELINES FOR GOODS & SERVICE TAX (GST)

1.0 GST (Goods & Service Tax)

1.1 Bidders are required to submit copy of the GST Registration Certificate while submitting the bids wherever **GST** is applicable.

1.2 Quoted prices should be inclusive of all taxes and duties, except **GST**. Please note that the responsibility of payment of **GST (CGST & SGST or IGST or UTGST)** lies with the Contractor/Supplier/Service Provider of Goods / Services only. Contractor/Supplier/Service Provider of Goods / Services (Service Provider) providing taxable service shall issue an Invoice/Bill, as the case may be as per prevailing rules/ regulation of GST. Further, returns and details required to be filled under GST laws & rules should be timely filed by Contractor/Supplier/Service Provider of Goods / Services (Service Provider) with requisite details.

1.3 Payments to Contractor/Supplier/Service Provider for claiming **GST** amount will be made provided the above formalities are fulfilled. Further, OWNER may seek copies of challan and certificate from Chartered Accountant for deposit of **GST** collected from Owner.

1.4 In case CBEC (Central Board of Excise and Customs)/ any equivalent government agency brings to the notice of OWNER that the Contractor/Supplier/Service Provider of Goods / Services has not remitted the amount towards **GST** collected from OWNER to the government exchequer, then, that Contractor/Supplier/Service Provider of Goods / Services shall be put under Holiday list of OWNER for period of six months.

1.5 In case of statutory variation in **GST,** other than due to change in turnover, payable on the contract value during contract period, the Contractor/Supplier/Service Provider of Goods / Services 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.

1.6 In case contract completion is delayed for the reasons not attributable to OWNER, then any increase in the rate of **GST beyond** the contractual delivery period shall be to Contractor/Supplier/Service Provider's account whereas any decrease in the rate **GST** shall be passed on to the Owner.

1.7 In case contract completion is delayed for the reasons attributable to OWNER then any increase in the rate of **GST beyond** the contractual delivery period shall be to OWNER's account whereas any decrease in the rate **GST** shall also be passed on to the Owner.

1.8 Claim for payment of Statutory variation of **GST**, should be raised within two [02] months from the date of issue of 'Government Notification' for payment of differential (in %) **GST**, 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.

1.9 Where OWNER has the obligation to discharge **GST** liability under reverse charge mechanism and OWNER has paid or is /liable to pay **GST** to the Government on which interest or penalties becomes payable as per GST laws for any reason which is not attributable to OWNER or ITC with respect to such payments is not available to OWNER for any reason

which is not attributable to OWNER, then OWNER shall be entitled to deduct/ setoff / recover such amounts against any amounts paid or payable by OWNER to Contractor / Supplier.

1.10 Contractor shall ensure timely submission of invoice(s) as per rules/ regulations of **GST** with all required supporting document(s) within a period specified in Contracts/ LOA to enable OWNER to avail input tax credit. Further, returns and details required to be filled under **GST** laws & rules should be timely filed by supplier with requisite details.

If input tax credit with respect to **GST** is not available to OWNER for any reason attributable to Contractor/Supplier/Service Provider which is not attributable to OWNER, then OWNER shall not be obligated or liable to pay or reimburse **GST** charged in the invoice(s) and shall be entitled to / deduct/ setoff /recover the such **GST** thereupon together with all penalties and interest if any, against any amounts paid or payable by OWNER to Supplier of Goods / Services.

2.0 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 (OWNER in this case) by way of commensurate reduction in prices. The Contractor/Supplier/Service Provider of Goods / Services may note the above and quote their prices accordingly.

PART-I : COMMERCIAL

ANNEXURE - 1.21

FORMAT FOR FINANCIAL CAPABILITY OF BIDDER

(On Chartered Accountant's Letter Head)

FORMAT FOR CHARTERED ACCOUNTANT CERTIFICATE FOR FINANCIAL CAPABILITY OF THE BIDDER

We have verified the Annual Accounts and other relevant records of M/s…… (Name of the bidder) and certify the following

A. ANNUAL TURNOVER OF LAST 3 YEARS:

Year	Amount (INR)
Year 1: 2017-18	
Year 2: 2016-17	
Year 3: 2015-16	

B. FINANCIAL DATA FOR LAST AUDITED FINANCIAL YEAR :

Description	FY Closing as on 31.03.2018
	Amount (INR)
Current Assets	
Current Liabilities	
Working Capital (Current Assets-Current liabilities)	
Net Worth (Paid up share capital and Free Reserves & Surplus)	

Name of Audit Firm:
Chartered Accountant
Date:

[Signature of Chartered Accountant]
Name:
Designation:
Seal:
Membership no.:

Instructions:

1. The financial year would be the same as one normally followed by the bidder for its Annual Report.
2. 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.
3. For the purpose of this Tender document, (i) Annual Turnover shall be "Sale value/ Operating Income" (ii) Working Capital shall be "Current Assets less Current liabilities" and (iii) Net Worth shall be "Paid up share capital and Free Reserves & Surplus"
4. **This certificate is to be submitted on the letter head of Chartered Accountant.**

PART-I : COMMERCIAL

ANNEXURE - 1.22

FORMAT FOR BIDDER NOT UNDER LIQUIDATION, COURT RECEIVERSHIP OR SIMILAR PROCEEDINGS

(Self Declaration on Bidder's Letter Head as per below performa)

DECLARATION

To ,

……
……
……

NIT NO. : ……

SUBJECT : TENDER DOCUMENT FOR ……..
……

Sir ,

We hereby declare that M/s …….. is not under liquidation, court receivership or similar proceedings as on date.

Signature

Name :
Designation :

Seal of the Bidder.

PART-I : COMMERCIAL

ANNEXURE - 1.23

FORMAT FOR PAST SAFETY RECORD

(Self Declaration on Bidder's Letter Head as per below performa)

DECLARATION

To,

……
……
……

NIT NO. : ……

SUBJECT : TENDER DOCUMENT FOR ……
……...

Sir ,

We hereby declare that, we have taken up all safety measures during the past 5 years while executing the works awarded to me.

No deviation and casualty has been found during execution of the contract.

The above information is true and correct to the best of my knowledge and belief.

Signature

Name :

Designation :

Company Name :

Seal of the Bidder :

PART-I : COMMERCIAL

ANNEXURE - 1.24

FORMAT FOR PAST DAILY / WEEKLY / MONTHLY PROGRESS REPORT

CLIENT	**HINDUSTAN URAVARAK RASAYAN LIMITED (HURL)**
CONSULTANT	**PROJECTS & DEVELOPMENT INDIA LIMITED (PDIL)**
CONTRACTOR	
PROJECT DETAILS	
PROJECT LOCATION	
LOI Ref. NO.	
PROJECT ZERO DATE	
SCHEDULE COMPLETION DATE	

PROJECT STATUS AS OF ----------

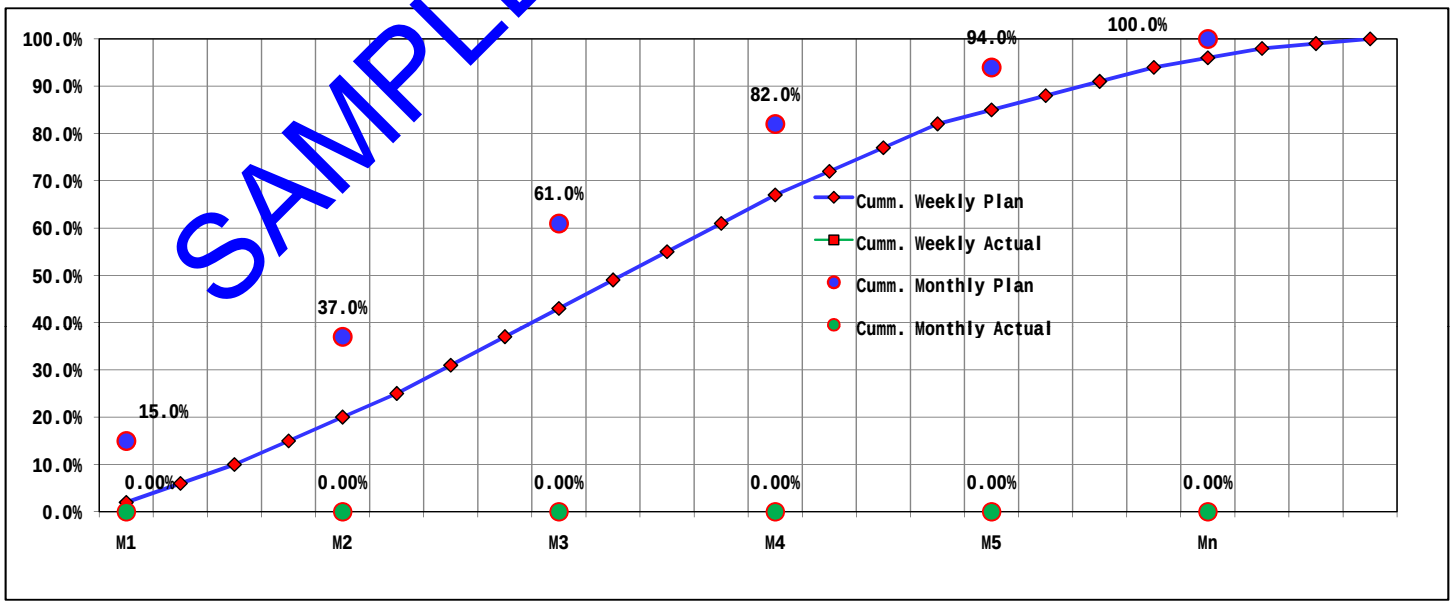
ANNEXURE NO.	DESCRIPTION
ANNEXURE-1	OVERALL PROGRESS SUMMARY
ANNEXURE-2	ENGINEERING STATUS
ANNEXURE-3	PROCUREMENT STATUS
ANNEXURE-4	CONSTRUCTION PROGRESS STATUS

ANNEXURE-1

CLIENT	HINDUSTAN URAVARAK RASAYAN LIMITED (HURL)	STATUS AS OF:	
CONSULTANT	PROJECTS & DEVELOPMENT INDIA LIMITED (PDIL)		
CONTRACTOR			
PROJECT DETAILS:			
LOI Ref.			
PROJECT ZERO DATE			
SCHEDULE COMPLETION DATE			

DETAILED OVERALL PROGRESS REPORT

Sr No	Descrption		WTG	M_1				M_2				M_3				M_4				M_5				M_n			
				W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20	Wn1	Wn2	Wn3	Wn
1	Engineering	Plan	10%																								
		Actual																									
2	Procurement	Plan	50%																								
		Actual																									
3	Construction	Plan	30%																								
		Actual																									
4	Commissioning (As per System / Stream wise)	Plan	10%																								
		Actual																									
5	TOTAL PROJECT PROGRESS %	Weekly Plan	100%	2.0%	4.0%	4.0%	5.0%	5.0%	5.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	5.0%	5.0%	5.0%	3.0%	3.0%	3.0%	3.0%	2.0%	2.0%	1.0%	1.0%
		Weekly Actual																									
		Cumm. Weekly Plan	100%	2.0%	6.0%	10.0%	15.0%	20.0%	25.0%	31.0%	37.0%	43.0%	49.0%	55.0%	61.0%	67.0%	72.0%	77.0%	82.0%	85.0%	88.0%	91.0%	94.0%	96.0%	98.0%	99.0%	100.0%
		Cumm. Weekly Actual																									
		Cumm. Monthly Plan	100%	15.0%				37.0%				61.0%				82.0%				94.0%				100.0%			
		Cumm. Monthly Actual		0.00%				0.00%				0.00%				0.00%				0.00%				0.00%			



CLIENT HINDUSTAN URAVARAK RASAYAN LIMITED (HURL)

CONSULTANT PROJECTS & DEVELOPMENT INDIA LIMITED (PDIL)

CONTRACTOR

PROJECT DETAILS:

LOI Ref.

PROJECT ZERO DATE

SCHEDULE COMPLETION DATE

STATUS AS OF:

ANNEXURE NO. 2

ENGINEERING PROGRESS REPORT FOR .....

						1ST SUBMISSION				2ND SUBMISSION				3RD SUBMISSION				
ACTIVITY HEAD	S. no.	Descrption	Documents No	WTG [1]	Progress %	Schedule Date	Actual Date	Approval / Comments date	Approval Code	Schedule Date	Actual Date	Approval / Comments date	Approval Code	Schedule Date	Actual Date	Approval / Comments date	Approval Code	Remarks
ENGINEERING	1	Document 1		5.00%														
	2	Document 2		5.00%														
	3	Document 3		5.00%														
	4	Document 4		5.00%														
	5	Document 5		5.00%														
	6	Document 6		5.00%														
	7	Document 7		5.00%														
	8	Document 8		5.00%														
	9	Document 9		5.00%														
	10	Document 10		5.00%														
	11	Document 11		5.00%														
	12	Document 12		5.00%														
	13	Document 13		5.00%														
	14	Document 14		5.00%														
	15	Document 15		5.00%														
	16	Document 16		5.00%														
	17	Document 17		5.00%														
	18	Document 18		5.00%														
	19	Document 19		5.00%														
	20	Document 20		5.00%														
ENGINEERING PROGRESS %				100.00%	0.00%													

(1) Weightages to be assigned as per volume of work

CLIENT HINDUSTAN URAVARAK RASAYAN LIMITED (HURL)

CONSULTANT PROJECTS & DEVELOPMENT INDIA LIMITED (PDIL)

CONTRACTOR

PROJECT DETAILS:

LOI Ref.

PROJECT ZERO DATE

SCHEDULE COMPLETION DATE

STATUS AS OF:

ANNEXURE NO. 3

PROCUREMENT PROGRESS REPORT FOR .....

ACTIVITY HEAD	S. no.	DESCRPTION	ITEM NO / ENQUIRY NO	DELIVERY SCHEDULE	LOI NO. & Date	VENDOR NAME	MFG. LOCATION	WTG (2)	ACTUAL PROGRESS %	ORDERING 10%		INSPECTION 50%		DISPATCHED 80%		RECEIPT AT SITE 100%		REMARKS
										SCH	ACTUAL	SCH	ACTUAL	SCH	ACTUAL	SCH	ACTUAL	
PROCUREMENT	1	Item1																
PROCUREMENT	2	Item2																
PROCUREMENT	3	Item3																
PROCUREMENT	4	Item4																
PROCUREMENT	5	Item5																
PROCUREMENT	6	Item6																
PROCUREMENT	7	Item7																
PROCUREMENT	8	Item8																
PROCUREMENT	9	Item9																
PROCUREMENT	10	Item10																
PROCUREMENT	11	Item11																
PROCUREMENT	12	Item12																
PROCUREMENT	13	Item13																
PROCUREMENT	14	Item14																
PROCUREMENT	15	Item15																
PROCUREMENT	16	Item16																
PROCUREMENT	17	Item17																
PROCUREMENT	18	Item18																
PROCUREMENT	19	Item19																
PROCUREMENT	20	Item20																
PROCUREMENT PROGRESS %								100%										

(2) Weightages to be assigned as per Cost of Items

CLIENT — HINDUSTAN URAVARAK RASAYAN LIMITED (HURL)
CONSULTANT — PROJECTS & DEVELOPMENT INDIA LIMITED (PDIL)
CONTRACTOR
PROJECT DETAILS:
LOI Ref.
PROJECT ZERO DATE
SCHEDULE COMPLETION DATE

ANNEXURE NO. 4

PROGRESS DATE:
REPORT DATE:

SITE WEATHER :
HOLIDAY INFORMATION:

MANPOWER DEPLOYED
SKILLED :
UNSKILLED :
STAFF :
TOTAL MANOPOWER :

CONSTRUCTION DAILY PROGRESS REPORT FOR ..... AS OF DD-MM-YYYY.....

S. NO.	ACTIVITY	SOR. SR. NO.	DESCRPTION AS PER SOR	UNIT	SOR CUMM. QTY [A]	RATE	VALUE	WTG (3) [W%]	NAME OF SUB-CONTRACTOR (IF ANY)	Front Available	Progress Quantity				Balance qty.	Monthly Plan	Monthly Cumulative Achieved	Backlog	% Progress = [B] / [A] x [W%]	Remarks
											Upto Prev. day	Today plan	Today Executed	Cumulative [B]						
A	CIVIL WORK																			
B	MECHANICAL ERECTION WORK																			
C	ELECTRICAL WORK																			
D	INSTRUMENTATION WORK																			
E	ANY OTHER WORK																			
	TOTAL CONSTRUCTION PROGRESS							100.0%											0.0%	

(3) Weightages to be assigned as per Cost & Effort

PART-I : COMMERCIAL

ANNEXURE - 1.25

LIST OF APPROVED BANKS

FOR

SUBMISSION OF BANK GUARANTEE

SCHEDULED COMMERCIAL BANKS

A. SBI AND ASSOCIATES

1. State Bank of India
2. State Bank of Bikaner & Jaipur
3. State Bank of Hyderabad
4. State Bank of Mysore
5. State Bank of Patiala
6. State Bank of Travancore

B. NATIONALISED BANKS

1. Allahabad Bank
2. Andhra Bank
3. Bank of India
4. Bank of Maharashtra
5. Canara Bank
6. Central Bank of India
7. Corporation Bank
8. Dena Bank
9. Indian Bank
10. Indian Overseas Bank
11. Oriental Bank of Commerce
12. Punjab National Bank
13. Punjab & Sind Bank
14. Syndicate Bank
15. Union Bank of India
16. United Bank of India
17. UCO Bank
18. Vijaya Bank
19. Bank of Baroda
20. Bhartiya Mahila Bank

C. SCHEDULED PRIVATE BANKS (INDIAN BANKS)

1. Catholic Syrian Bank
2. City Union Bank
3. Dhanlaxmi Bank Ltd.
4. Federal Bank Ltd
5. Jammu & Kashmir Bank Ltd
6. Karnataka Bank Ltd
7. Karur Vysya Bank Ltd
8. Lakshmi Vilas Bank Ltd
9. Nainital Bank Ltd
10. Kotak Mahindra Bank
11. Ratnakar Bank Ltd
12. South Indian Bank Ltd
13. Tamilnad Mercantile Bank Ltd
14. ING Vysya Bank Ltd
15. Axis Bank Ltd.
16. IndusInd Bank Ltd
17. ICICI Bank
18. HDFC Bank Ltd.
19. DCB Bank Ltd
20. Yes Bank Ltd

D. SCHEDULED PRIVATE BANKS (FOREIGN BANKS)

1. Abu Dhabi Commercial Bank Ltd
2. Bank of America NA
3. Bank of Bahrain & Kuwait B.S.C.
4. Mashreq Bank p.s.c.
5. Bank of Nova Scotia
6. Crédit Agricole Corporate and Investment Bank
7. BNP Paribas
8. Barclays Bank
9. Citi Bank N.A.
10. Deutsche Bank A.G.
11. The HongKong Shangai Banking Corporation Ltd
12. HSBC Bank Oman S.A.O.G.
13. Societe Generale
14. Sonali Bank Ltd.
15. Standard Chartered Bank
16. J.P. Morgan Chase Bank, National Association
17. State Bank of Mauritus Ltd.
18. DBS Bank Ltd.
19. Bank of Ceylon
20. Bank Internasional Indonesia
21. A B Bank
22. Shinhan Bank.
23. CTBC Bank Co. Ltd.
24. Mizuho Bank Ltd
25. Krung Thai Bank Public Company Ltd.
26. Antwerp Diamond Bank N.V.
27. The Bank of Tokyo-Mitsubishi UFJ Limited.
28. Austalia & Newzealand Banking Group Limited
29. Sumitomo Mitsui Banking Corporation
30. American Express Banking Corporation
31. Common Wealth Bank of Australia
32. Credit Suisse A.G.
33. First Rand Bank Ltd.
34. Industrial & Commercial Bank of China Ltd.
35. JSC VTB Bank
36. National Australia Bank
37. Rabobank International
38. Sberbank
39. UBS AG
40. United Overseas Bank Ltd.
41. Westpac Banking Corporation
42. Woori Bank
43. The Royal Bank of Scotland N.V.
44. Doha Bank Qsc

E. OTHER PUBLIC SECTOR BANKS

1. IDBI Bank Ltd

PART-I : COMMERCIAL

ANNEXURE - 1.26

FORMAT FOR POWER OF ATTORNEY

POWER OF ATTORNEY
(to be submitted on the Non-Judicial stamp paper)

Tender er No.:
Description of work:
Name of Bidder:_____

"The undersigned _____ (Name of LEGAL PERSON, i.e. CEO/MD/ CHAIRMAN /C&MD/Company Secretary/Partners/Proprietor) is lawfully authorized to issue this POA* on behalf of the company M/s _____ (Name of bidder) whose registered address is _____ _____ and does hereby appoint Mr./Ms _____ (name of authorized person signing the bid document) _____ (Designation) of M/s _____ (Name of bidder) whose signature appears below to be the true and lawful attorney/(s) and authorize him/her to sign the bid, 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.

(*)

1. In case of a Limited Company, if the POA is issued by other than CEO/MD/ CHAIRMAN /C&MD/Company Secretary, then the POA must be accompanied by a "Board Resolution" of the bidder's company authorizing the "Legal Person" to issue POA.
2. For a Partnership Firm, the POA must be signed by all Partners and a copy of Partnership Deed of the Company must be enclosed with bid.
3. For a Proprietorship firm, if the bid is signed by any person other than the Proprietor, then legal person shall be the Proprietor of the firm.

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:

PART-II
TECHNICAL

PROJECT: - GORAKHPUR FERTILISER COMPLEX

TENDER DOCUMENT

FOR
COMPOSITE MECHANICAL ERECTION WORKS

AT

HURL, GORAKHPUR (OSBL)

ENQUIRY NO.(PNPM/EM250/E/601)

(PART-II, TECHNICAL)

ISSUED BY:

PROJECTS & DEVELOPMENT INDIA LTD. NOIDA

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

SECTION-1.0

PROJECT SYNOPSIS AND TECHNICAL SCOPE OF SUPPLY OF PIPING ITEMS

PART-II

SECTION -01

SYNOPSIS

COMPOSITE MECHANICAL ERECTION WORKS

AT

HURL GORAKHPUR (OSBL)

1.0 GENERAL DESCRIPTION & BRIEF SCOPE OF WORK

Scope of work of the Contractor shall include Procurement, Supply, Fabrication, Erection Inspection as applicable, Insurance, Transportation of all equipment / Piping materials to work site, Storage, construction and erection of all civil and structural as required, Piping fabrication & Erection ,Equipment erection & alignment, electrical and instrumentation works if any, assembly and Installation, obtaining all necessary statutory approvals, Testing, Mechanical Completion, Pre-Commissioning, Commissioning for the entire Unit.

For this purpose Projects & Development India Limited (PDIL) – NOIDA has been engaged as a Consultant for carrying out the detailed engineering services for the proposed project.

2.0 SITE INFORMATION

Government of India has formed a joint venture company of M/s NTPC Ltd., M/s Coal India Limited (CIL),M/s Indian Oil Corporation & FCIL by name M/s Hindustan Urvarak & Rasayan Ltd. (HURL) hereinafter also referred to as "OWNER", for setting up a brown field Ammonia Urea Fertilizer Complex along with its associated offsite & utility facilities at existing fertilizer complex of FCIL, Gorakhpur, in the State of Uttar Pradesh.

The Gorakhpur Fertilizer Factory is located at a site about 12 Km north from Gorakhpur town in eastern part of Uttar Pradesh. It has excellent connectivity by road, rail & by Air. The nearest railway station is situated at a distance of about 6 Km from plant site & Gorakhpur Airport is situated at a distance of about 16 Km from plant site and has flights to and from Delhi via Lucknow and from Kolkata via Patna.

In this Composite erection enquiry the following Philosophy has been considered Contractors:-

1. Supply of Piping material & it's fitting, Valve**,** GASKET, STUDS & NUTS FOR ALL SIZES as per Technical specification to complete the work related to this projects.
2. Fabrication and erection of **Product piping** (aboveground /Under ground piping) works
3. Fabrication and erection of Cooling water **piping** (aboveground /under ground piping) works.
4. Supply & Installation of Cathodic Protection for all UG Piping related to OSBL.
5. Supply & Application of wrapping coating.
6. Unloading and transportation of items (Equipments & Piping).
7. Supply & Erection of EOT Crane for Air receivers SKID & Dryers.
8. **Erection of new equipments (i.e.** Erection of Instrument/Plant Air generation skid, Erection of Inert Gas Generation Skid, Erection of Dryers, Air receivers.
9. Supply & Installation of Steel structure work related to Crossover of pipe lines (including supply & installation of Grating as per STD.)
10. Erection of on line Instrumentation items if any.
11. Supply & Application of Painting of Piping & Equipments.

12. Supply & Application of Insulation of Piping & Equipments.
13. Pre-commissioning and commissioning activities.

It is an essential requirement that Bidder must visit to M/S HURL, Gorakhpur plant site for assessment and quantum of work involved and facilities available at site at their own cost without any commercial implications to Owner before submitting the techno-commercial bid. Plot plan of HURL, Gorakhpur site is attached indicating tentative storage areas locations.

Bidder shall quote for the entire works as per the SOR (Schedule of rates) enclose in this tender documents.

Bidder's Scope of work shall cover procurement of items/materials whatsoever required along with consumables including transportation to site, safe storage at site, erection, inspection, testing, painting, commissioning, guarantees etc. as per the technical specifications and other reference documents / standards & codes referred/enclosed along with this Tender Document.

For other documents, refer individual attachments related to Technical specifications and scope of works for Equipments and A/G Piping erection works U/G Piping erection works, Painting works & Schedule of Rates.

Successful Bidder shall submit **Procedure, Job Method Statement (JMS) and job Safety Analysis (JSA)** for approval before starting the work and incorporate all comments/modifications suggested by Owner/PMC.

Bidder shall depute experienced scheduling engineer to prepare, monitor and update the day to day program and progress of works in the form of Bar chart using software such as primavera/MS Project etc. as well as to prepare the progress review MOM. The same shall be submitted for review and circulation.

3.0 TIME SCHEDULE:

For Construction, Supply, Erection/Installation and Pre-Commissioning/Commissioning

- Mechanical Completion : **12 Months** from the Effective Date of Contract
- Commissioning : **14 Months** from the Effective Date of Contract

Note:- The quantities mentioned in the SOR (Section-5 of Part-II, Technical) are tentative. Contractor to take confirmation for firm quantity from Owner/Consultant before placement of order against the supply items.

PART-II

SECTION-01

TECHNICAL SCOPE

OF

SUPPLY OF PIPING ITEMS

FOR

COMPOSITE MECHANICAL ERECTION WORKS

AT

OSBL HURL, GORAKHPUR

LIST OF ATTACHMENTS

Sl. No.	Document / Drawing No.	Description	No. of Sheets
1	PNMP-TS-6100	Technical scope for Pipes	6
2	PNMP-TS-6300	Technical scope for Fittings	5
3	PNMP-TS-6400	Technical scope for Flanges	5
4	PNMP-TS-6610	Technical scope for Stud & Nuts	5
5	PNMP-TS-6620	Technical scope for Gaskets	4
6	PNMP-TS-6700	Technical scope for Valves	5
7	PNMP-TS-6100F	Technical scope for FRP Piping items	5
8	PNMP-ITP-01	Inspection & Test Plan- CS, LTCS & SS Welded Pipes	1
9	PNMP-ITP-02	Inspection & Test Plan- CS, LTCS, AS & SS Seamless Pipes	1
10	PNMP-ITP-03	Inspection & Test Plan- Fittings	2
11	PNMP-ITP-04	Inspection & Test Plan- Forged Flanges	1
12	PNMP-ITP-05	Inspection & Test Plan- Studs & Nuts	1
13	PNMP-ITP-06	Inspection & Test Plan- Gaskets	1
14	PNMP-ITP-07	Inspection & Test Plan- Valves	2
15	BAV201, BAV210, BAV501, BAV510, BAV520	Data Sheets- Ball Valves	5
16	BUV203, BUV204, BUV510	Data Sheets- Butterfly Valves	3
17	CHV201, CHV201S, CHV210, CHV210S, CHV501, CHV510	Data Sheets- Check Valves	6
18	GAV201, GAV201S, GAV210, GAV210S, GAV212, GAV501, GAV510	Data Sheets- Gate Valves	7
19	GLV201, GLV201S, GLV210, GLV210S, GLV501, GLV510	Data Sheets- Globe Valves	6
20	PLV201, PLV202, PLV501, PLV510	Data Sheets- Plug Valves	5
21	HURL-PNMP-PDS-600	Other Standards / Datasheets	-

Note:

1. Supply of items shall be done as per Bill of Quantity, codes, standards & attached specifications of this document.
2. Quality Assurance plan (QAP) / Inspection Test Plan (ITP) shall be approved by Owner/ Inspection Agency/Authority.
3. Specification/documents for job completion if required shall be submitted by bidder for review by owner before implementation.

TECHNICAL SCOPE

FOR

SUPPLY OF PIPES

1.0 GENERAL

1.1 Scope: This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, fabrication, inspection, testing, painting, packing and dispatch etc. This specification shall be read in conjunction with relevant codes and enquiry documents. As a general rule the most stringent requirement shall govern and Owner's option shall be binding.

1.2 The pipes shall be supplied in random length of 4 to 7 mtrs.

1.3 Total length allowance shall be -0/+1 random length.

1.4 All the standards referred shall be of latest edition.

1.5 In case of conflict between different specifications and technical condition of supply, the vendor shall contact Owner for any clarifications/confirmation; otherwise it shall be assumed that all clauses are clear to the vendors.

1.6 The quantities mentioned are tentative, may vary $\pm$ 25% and will be decided at the time of placement of order. The quantity of individual item may vary more than 100%.

2.0 GENERAL INSTRUCTIONS FOR BIDDING PURPOSE ONLY

2.1 Each sheet of technical condition of supply and specification sheets shall be duly signed and stamped by competent authority and shall be enclosed alongwith offer without which the offer shall be considered incomplete.

2.2 The price shall be quoted on the zerox copy of the same sheet of the bill of material attached with the enquiry specification and any deviation from the required specification shall be marked therein. Prices typed on other format shall not be considered for evaluation and rejected without any reference.

2.3 Any deviations from the clause stipulated, in the codes and other enquiry documents shall be clearly mentioned in a separate "Deviation List" with proper ref.no. In the absence of any such indications, it shall be assumed that the offer complies with all the requirements in totality and such assumptions shall be strictly binding on the supplier.

3.0 MATERIAL

3.1 All materials, whatsoever, required to complete the supply shall be procured by the supplier and all such materials shall be covered with due identifiable material test certificates.

3.2 For pipes having NPS $\geq$2" and nominal wall thickness, t >3.0 mm, the ends shall be beveled as per ASME B16.25 with weld contour as described below:

Material	Wall thickness, " t "	Weld contour
Carbon steel (except Low temp Carbon steel)	3< t < 22mm	Figure 2(a)
	t > 22mm	Figure 3(a)
Alloy Steel, Stainless steel & Low Temp Carbon steel	3< t < 10mm	Figure 4
	10< t < 25mm	Figure 5(a)
	t > 25mm	Figure 6(a)

3.3 Seamless and ERW Pipes shall not have any circumferential seam joint in a random length. However, in case of EFW pipes, in one random length one welded circumferential seam of same quality as longitudinal weld is permitted which shall be at least 2 meters from either end. The longitudinal seams of two portions shall be staggered by at least 90 degree apart.

3.4 EFW pipes of size less than 36"NB shall not hav e more than one longitudi nal seam joint and of size >=36"NB shall not have more than two longitudinal seam joints.

3.5 All stabilised grades (type 321, 321H, 347 and 347H) of stainless steel pipes shall be in a stabilized heat treated condition. Stabilizing heat treatment shall be carried out subsequent to the normal solution annealing. Soaking time & holding temperature for stabilizing heat treatment shall be 900 deg C & 4 hrs respectively.

3.6 Carbon content for carbon steel pipes shall be maximum 0.25%.

3.7 "SAW" (Submerged Arc Welded) pipe shall also be acceptable against ERW (Electric Resistance Welding) Pipe for sizes 16"NB and above for carbon steel pipes.

3.8 Pipes shall not be supplied with any type of coating & wrapping (C & W) materials, wherever applicable. Activity of coating & wrapping (C & W) shall be done at site. Only bare pipes shall be supplied by bidder.

3.9 Pipes supplied as per IS-1239 Part-1 for sizes upto 6", shall be ERW, Black & Grade Heavy with plain ends for size upto 1 ½" and bevel ends for size 2" to 6".

3.10 Pipes supplied as per IS-3589 for sizes 8" & above, shall be ERW, Grade Fe410, with beveled ends.

3.11 In case of SAW pipe to IS-3589, for sizes 26"NB & above, in one random length one welded circumferential seam of same quality as longitudinal weld is permitted which shall be at least 1.5 meters from either end. The longitudinal seams of two portions shall be staggered by at least 90 degree apart.

3.12 Galvanized pipes shall be coated with zinc by hot dip galvanizing method in accordance with ASTM A153.

3.13 Galvanizing shall be done before pipe ends are threaded (screwed).

3.14 Seamless pipes are acceptable in place of welded pipes.

3.15 Furnace butt-welded, furnace lap-welded and spiral welded pipes are not permitted.

4.0 TESTING

4.1 In case of seamless & welded pipes, parent material including weld and heat effected zone for low temperature service shall be impact tested (on charpy v notch) at the lowest design temperature in accordance with requirements of code/ specification.

4.2 Hydrostatic test shall be carried out on each random length of pipe as per ASTM A530 for pipes to ASTM specification and as per API 5L for pipes to API 5L specification.

4.3 Hydrostatic test for IS pipes shall be carried out on each random length of pipe as per test pressure conditions provided in IS-1239 & IS-3589 specification. Maximum hydrotest pressure for IS-1239 & IS-3589 pipes shall be limited to 5 MPa, wherever applicable.

4.4 Transverse tension test shall be carried out on pipes of nominal size 8" and above and thickness of Sch.120 and above as per supplementary requirements of respective standards.

4.5 Check analysis shall be carried out as per ASTM A530. For pipes as per ASTM A312 and pipe size $\geq$ 8" and thickness $\geq$ Sch120, Check analysis shall also be carried out as per supplementary requirement S1 of ASTM A312.

4.6 For seamless pipes, each length of pipe with following specifications shall be ultrasonically tested as per ASTM E213 or ASTM A388.

(a) Size upto 4 inches and Sch $\geq$ 120

(b) Size $\geq$ 5 inches and thk. $\geq$ 12 mm

Any defects producing signal greater than the appropriate reference groove shall be unacceptable. The allowable defect shall be longitudinal flat bottom groove on the outside or inside surface of the pipes and length not greater than 25 mm, width not greater than 1.6 mm and depth not greater than the smaller of 1 mm or 5% of the wall thickness.

4.7 Intergranular Corrosion (IGC) Test shall be done for austenitic stainless steel pipes as per the followings:

As per ASTM A262 Practice B, Corrosion rate upto 60 mils/year shall be acceptable.

OR

As per ASTM A262 Practice E, with acceptance criteria of "no cracks as observe from 250X micrograph".

4.8 All stainless steel pipes shall be supplied in solution annealed condition.

4.9 Positive Material Identification (PMI) shall be done for Alloy steel & Stainless steel pipes.

5.0 INSPECTION

5.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the Owner to carryout inspection.

5.2 The inspecting authority shall be provided free access at all possible times to those parts of supplier's work engaged in production and testing of materials ordered.

5.3 The inspecting authority shall have the right to select random samples for check test and reject materials, if samples furnished as above and tested as per the specifications fail to meet the requirement specified.

5.4 All the items shall be inspected and tested in the presence of one or more representatives of the purchaser during various stages of manufacturing. Material shall be considered acceptable for despatch only after final certificate of acceptance is issued by the Inspector.

5.5 Testing performed in the presence of the purchaser's representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.

5.6 Quality Assurance plan (QAP) / Inspection Test Plan (ITP) shall be submitted by bidder for approval by Third Party Inspection Agency (TPIA).

5.7 Scope of Inspection by TPIA :

Review of MTC (all batches).

Visual check for surfaces, external appearance (10% random witness).

Dimensional check – Outside diameter, weight, wall thickness, out of ovality, straightness, bevel angle (10% random witness).

Various physical test i.e. tensile strength, yield strength, percentage elongation, flattening test, bend test (inspection frequency as per respective specification).

Hydrostatic test (min. 10% random witness).

Packing: 10% random witness before dispatch.

Documentation (MTC, Inspection Release Note): 100% Review / Approval

6.0 DOCUMENTATION

6.1 The following documents (Technical), as a minimum, are required to be submitted by the supplier along with bid, after placement of order for approval purposes and final documentation before despatch of consignment.

Sl. No.	Description of document	Along with bid	After placement of order	
			For approval/ information	Final documents before despatch
1.	Catalogue & technical literature/ preliminary drawings of items quoted, if applicable.	Yes	x	x
2.	Deviation if any, from the technical spec., giving justification for the same.	Yes	x	x
3.	Drawings & documents	x	Yes (A)	Yes
4.	All types of testing & inspection certificates.	x	x	Yes
5.	Quality Assurance Plan (QAP)	x	Yes (A)	Yes

NOTES:

(A) for Approval (I) for information

QAP shall be mutually finalized with Inspection Authority specified in the order.
Number of sets shall be as stipulated elsewhere in the bid document. Final documentations shall be supplied in hard copies (4 Nos.) as well as soft copies in CD formats. Applicable software is MS Office, Word, Excel and Acrobat.

6.2 The pipe shall be supplied with 4 copies of the mill test certificates indicating the following and duly signed by the inspecting authority alongwith supply of materials.

a) Purchase order no.

b) Material specification and grade

c) Size and sch.no./thickness

d) Quantity

e) Heat and Lot No.

f) Results of Chemical analysis

g) Mechanical test results (as per applicable clause)

h) Hydrostatic test results

i) Non-destructive test results (as per applicable clause)

6.3 Pipes under IBR shall be supplied with 8 copies of IBR certificate in form IIIA duly signed by inspecting authority along with supply.

7.0 MARKING

7.1 Marking on pipe shall be as per the relevant standard. The minimum requirements of marking information shall be ASTM or API designation, size and Sch.No./thickness on each meter of standard pipe length in addition to the requirement of relevant code.

7.2 For all pipes of size 2" and above, marking shall be done by paint stenciling using a weather resistant paint against rust and moderate handling.

7.3 For pipe equal to size 1 ½ inch or less, marking shall be done on pipe or by die stamping on a metal tag fixed to the pipe by compression method.

7.4 In addition each length of pipe shall be given a 20 mm wide color code strip for the entire length, according to color coding of pipe material as per this specification.

7.5 Part no. appearing against each item of bill of material shall be marked on both ends of each random length of pipe by paint stenciling and should be able to withstand sea transport, handling and storage.

8.0 PRESERVATION AND PACKING

8.1 Pipes up to size 4" shall be packed separately by sizes and material grades and clearly tagged for identification. However pipes above 4" can be shipped in crates or shipped loose.

8.2 All ends shall be capped or plugged. One coat of approved anti rust paint shall be applied on the surface of the pipe except S.S.pipes.

8.3 Pipes shall be adequately protected from both inside and outside to avoid mechanical damage during transit and storage. For transportation overseas, protection and packing shall be adequate to prevent damage from sea atmosphere.

9.0 GUARANTEE

9.1 All items shall be guaranteed against poor workmanship and defective material as per the clauses mentioned in the commercial terms and conditions of "ITB".

SL.NO.	MATERIAL	PIPING STANDARD	COLOUR
1.	C.S.	API 5L GR.B	Yellow
2.	C.S.	A-106 GR.B, ASTM-A672	Blue
3.	L.T.C.S.	A-333 GR.1, A-671 GR.CC-60	Red
4.	½ Mo	A-335 GR.P-1	Green
5.	1 ¼ Cr. ½ Mo	A-335 GR.P-11	Lilac
6.	2 ¼ Cr. 1 Mo	A-335 GR.P-22	Brown
7.	S.S.304	A-312 GR.TP-304, A-358 GR.TP304	White
8.	S.S.304L	A-312 GR.TP-304L	Slate
9.	S.S.321	A-312 GR.TP-321	Aluminum
10.	S.S.347	A-312 TP-347H	Grey
11.	S.S.316	A-312 GR.TP-316	Black
12.	S.S.316L	A-312 GR.TP-316L, A-358 GR.TP316L	Red

TECHNICAL SCOPE

FOR

SUPPLY OF FITTINGS

1.0 GENERAL

1.1 **Scope**: This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, inspection, testing, painting, packing and dispatch etc. This specification shall be read in conjunction with relevant codes and enquiry documents. As a general rule the most stringent requirement shall govern and Owner's option shall be binding.

1.2 Unless otherwise specified , the ends of fittings shall be to the following standards:

Socket Weld (SW) / Threaded (Thd) ends as per ASME B 16.11.
Butt Weld (BW) ends as per ASME B16.25 for sizes 2" & above.
Threading as per ASME B1.20.1 (NPT, Taper threads).

1.3 All the standards referred shall be of latest edition.

1.4 In case of conflict between different specifications and technical condition of supply, the vendor shall contact Owner for any clarifications/confirmation; otherwise it shall be assumed that all clauses are clear to the vendors.

1.5 The quantities mentioned are tentative, may vary $\pm$ 25% and will be decided at the time of placement of order. The quantity of individual item may vary more than 100%.

2.0 GENERAL INSTRUCTIONS FOR BIDDING PURPOSE ONLY

2.1 Each sheet of technical condition of supply and specification sheets shall be duly signed and stamped by competent authority and shall be enclosed along with offer without which the offer shall be considered incomplete and rejected without any reference.

2.2 The price shall be quoted on the zerox copy of the same sheet of the bill of material attached with the enquiry specification and any deviation from the required specification shall be marked therein. Prices typed on other format shall not be considered for evaluation and rejected without any reference.

2.3 Any deviations from the clause stipulated in the code and other enquiry documents shall be clearly mentioned in a separate "Deviation List" with proper ref. no. In the absence of any such indications, it shall be assumed that the offer complies with all the requirements in totality and such assumptions shall be strictly binding on the supplier.

3.0 MATERIALS

3.1 All materials, whatsoever, required to complete the supply, shall be procured by the supplier and all such materials shall be covered with due identifiable material test certificates.

3.2 For forgings to ASTM-A-105, carbon content shall be equal to or less than 0.25%.

3.3 Bevel ends of BW Fittings shall be beveled as per ASME B16.25 with weld contour as described below:

Material	Wall thickness, " t "	Weld contour
Carbon steel (except Low temp Carbon steel)	3< t < 22mm	Figure 2(a)
	t > 22mm	Figure 3(a)
Alloy Steel, Stainless steel & Low Temp Carbon steel	3< t < 10mm	Figure 4
	10< t < 25mm	Figure 5(a)
	t > 25mm	Figure 6(a)

3.4 Length of each Nipple shall be 100 mm.

3.5 Nippolets as per MSS SP-97 or TB-RAC 5035 shall be acceptable.

3.6 For reducing BW fittings (tee & reducer) having different wall thicknesses at each end, the greater one shall be employed and the ends shall be matched to suit respective thickness.

3.7 All welded fittings shall have maximum negative tolerance equivalent to pipe selected.

3.8 All welded fittings shall be double welded for size 16" and above. Inside weld projection shall not exceed 1.6mm, and the welds shall be ground smooth at least 25mm from the ends.

3.9 For fittings made out of welded pipe, the pipe itself shall be of double welded type, manufactured with the addition of filler material and made employing automatic welding only.

3.10 Threaded fittings shall have threaded ends with NPT taper threads as per ASME B1.20.1.

3.11 Seamless stub ends shall not have any welds on the body.

3.12 Galvanized CS fittings shall be hot dip galvanized, as per ASTM A153.

3.13 Seamless fittings are acceptable in place of welded fittings.

4.0 TESTING

4.1 Austenitic stainless steel fittings shall undergo Intergranular corrosion (IGC) test as per ASTM A262 Practice B, Corrosion rate upto 48 mils/year shall be acceptable. Two sets of samples shall be drawn from each heat treatment lot, one set corresponding to highest carbon content and other set corresponding to highest wall thickness of the fittings.

4.2 All CS welded fittings shall be normalized.

4.3 Bevel ends of all BW fittings shall undergo 100% Magnetic particle (MP) / Dye Penetrant (DP) test.

4.4 All welded fittings shall be 100% radiographed on all welds.

4.5 Alloy steel & stainless steel fittings shall undergo positive material identification (PMI).

4.6 All stainless steel fittings shall be supplied in solution annealed condition.

4.7 Each fitting of thickness and sizes as mentioned below shall be ultrasonically tested as per ASTM-E-213 or ASTM-A-388.

Size Range	Sch./Thk.
Up to 4"	≥ Sch 120
≥ 5"	≥ 12 mm

Any defects producing signal greater than the appropriate reference groove shall be unacceptable. The allowable defect shall be longitudinal flat bottom groove on the outside or inside surface of the fittings and of length not greater than 25 mm, a width not greater than 1.6 mm and depth not greater than the smaller of 1 mm or 5% of the wall thickness.

4.8 In case of pipe fittings (both seamless and welded) for low temperature service, the parent material including weld and heat affected zone shall be impact tested on charpy V-Notch in accordance with requirements of Code/ Specification.

4.9 All stabilised grades (type 321, 321H, 347 and 347H) of stainless steel pipes shall be in a stabilized heat treated condition. Stabilizing heat treatment shall be carried out subsequent

to the normal solution annealing. Soaking time & holding temperature for stabilizing heat treatment shall be 900 deg C & 4 hrs respectively.

5.0 INSPECTION

5.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the owner or owner's representative to carryout inspection of materials.

5.2 The inspecting authority shall be provided free access at all possible times to those parts of supplier's work engaged in production and testing of materials ordered.

5.3 The inspecting authority shall have the right to select random samples for check test and reject materials, if samples furnished as above and tested as per the specifications fail to meet the requirement specified.

5.4 All fittings shall be inspected during various stages of manufacturing. Fittings shall be considered acceptable for dispatch only after final certificate of acceptance is issued by the inspector.

5.5 Testing performed in the presence of the Purchaser's representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.

5.6 Quality Assurance plan (QAP) / Inspection Test Plan (ITP) shall be submitted by bidder for approval by Third Party Inspection Agency (TPIA).

5.7 Scope of Inspection by TPIA :

Review of Procedures (Manufacturing / HT / NDT / DT / PQR /WPQ): 100%

Review of MTC (all batches), test coupons and Supplier's Inspection Report: 100%.

NDT Reports: RT 100% Report Review & other NDT Reports 10% random witness.

Visual check for dimensional, surfaces, external appearance, cleaning & finishing: 10% Random witness.

Final Inspection for dimension, marking, color coding: Random witness (10% min.)

Packing: 10% Random witness before dispatch.

Documentation (MTC, Inspection Release Note): 100% Review / Approval

6.0 DOCUMENTATION

6.1 The following documents (Technical), as a minimum, are required to be submitted by the supplier along with bid, after placement of order for approval purposes and final documentation before dispatch of consignment.

Sl. No.	Description of document	Along with bid	After placement of order	
			For approval/ information	Final documents before despatch
1.	Catalogue & technical literature/ preliminary drawings of items quoted, if applicable.	Yes	x	x
2.	Deviation if any, from the technical spec., giving justification for the same.	Yes	x	x
3.	Drawings & documents	x	Yes (A)	Yes
4.	All types of testing & inspection certificates.	x	x	Yes
5.	Quality Assurance Plan (QAP)	x	Yes (A)	Yes

NOTES:

(A) for Approval (I) for information

QAP shall be mutually finalized with Inspection Authority specified in the order.
Number of sets shall be as stipulated elsewhere in the bid document. Final documentations shall be supplied in hard copies (4 Nos.) as well as soft copies in CD formats. Applicable software is MS Office, Word, Excel and Acrobat.

6.2 The items shall be supplied with 4 copies of the mill test certificates indicating the following and duly signed by the inspecting authority alongwith supply of materials.

a) Purchase order no.
b) Material specification and grade
c) Size and Sch. No. /Thickness
d) Quantity
e) Heat and lot no.
f) Results of Chemical analysis
g) Mechanical test results (as per applicable clause)
h) Non-destructive test results (as per applicable clause)

6.3 Pipe Fittings under IBR shall be supplied with 8 copies of IBR certificate in form IIIC duly signed by inspecting authority along with supply.

7.0 MARKING

7.1 Marking shall be done as per relevant std. on each fitting or on a metal tag attached to the fitting using low stress die stamping method.

7.2 Surface preparation of external surface of carbon steel fittings shall be done before marking is applied.

7.3 Minimum marking information shall include Purchase Order No. item code, material specification, size & thickness/schedule/rating.

8.0 PRESERVATION AND PACKING

8.1 Fittings shall be packed separately by the sizes and material grades and clearly tagged for identification.

8.2 CS Fittings shall be adequately protected from both inside and outside with rust preventives. In case of stainless steel fittings, rust preventive coating is not required.

8.3 Bevel End Protectors of plastic caps, securely tightened with belts or wires, shall be used for protection of bevel ends to avoid mechanical damage during transit and storage.

8.4 The packing case shall be clearly marked with purchase order number and shall include complete packing list of all the items contained in the case.

9.0 GUARANTEE

9.1 All items shall be guaranteed against poor workmanship and defective material as per commercial terms and conditions.

TECHNICAL SCOPE

FOR

SUPPLY OF FLANGES

1.0 GENERAL

1.1 Scope: This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, inspection, testing, painting, packing and despatch etc. This specification shall be read in conjunction with code and enquiry documents. As a general rule the most stringent requirement shall govern and Owner's option shall be binding.

1.2 Unless otherwise specified , the ends of flanges shall be to the following standards:

Socket Weld (SW) / Threaded (Thd) ends as per ASME B 16.11.
Butt Weld (BW) ends as per ASME B16.25 for sizes 2" & above.
Threading as per ASME B1.20.1 (NPT, Taper threads).

1.3 All the standards referred shall be of latest edition.

1.4 In case of conflict between different specifications and technical condition of supply, the vendor shall contact Owner for any clarifications/confirmation; otherwise it shall be assumed that all clauses are clear to the vendors.

1.5 The quantities mentioned are tentative and may vary +_ 25% and shall be decided at the time of placement of order. The quantity of individual item may vary more than 100%.

2.0 GENERAL INSTRUCTIONS FOR BIDDING PURPOSE ONLY

2.1 Each sheet of technical condition of supply and specification sheets shall be duly signed and stamped by competant authority and shall be enclosed alongwith offer without which the offer shall be considered incomplete and rejected without any reference.

2.2 The price shall be quoted on the zerox copy of the same sheet of the bill of material attached with the enquiry specification and any deviation from the required specification shall be marked therein. Prices typed on other format shall not be considered for evaluation and rejected without any reference.

2.3 Any deviations from the clause stipulated in the code and other enquiry documents shall be clearly mentioned in a separate "Deviation List" with proper ref. no. In the absence of any such indications, it shall be assumed that the offer complies with all the requirements in totality and such assumptions shall be strictly binding on the supplier.

3.0 MATERIALS

3.1 All materials, whatsoever, required to complete the supply, shall be procured by the supplier and all such materials shall be covered with due identifiable material test certificates.

3.2 Bevel ends of weld neck flanges shall be beveled as per ASME B16.5/ASME B16.47.

3.3 For forgings to ASTM A105, carbon content shall be equal to or less than 0.25%.

3.4 Flanges manufactured by closed die forging method shall be preferred.

3.5 Flanges shall be supplied in finished, machined and drilled condition. Raised face shall have concentric serrations/smooth finish as applicable.

3.6 Welding ends of welding neck flanges shall be prepared to suit outside pipe diameter and wall thickness according to ANSI B 36.10.

3.7 Flanges shall be coated with zinc by hot dip galvanizing process as per ASTM A153, wherever Galvanized (Galv.) flanges are required.

3.8 For bore of socket weld flanges upto 1 ½" NB & upto 600#, the pipe thickness shall be Sch 80 for carbon steel, alloy steel & low temperature carbon steel material and Sch 40S for stainless steel material.

3.9 Long weld neck flange shall have 38 mm bore for 1 1 / 2" NB and 24 mm bore for 1 " NB, unless otherwise specified in bill of materials.

4.0 TESTING

4.1 One tension test shall be carried out for each heat in each heat treatment charge.

4.2 For flanges fabricated from plates, one bend test shall be carried out for each heat in each heat treatment charge.

4.3 Impact test for low temp service shall be carried out at the lowest design temperature and shall meet the requirements of the applicable material specifications.

4.4 Austenitic stainless steel flanges shall undergo Intergranular corrosion (IGC) test as per ASTM A262 Practice B, Corrosion rate upto 48 mils/year shall be acceptable. Two sets of samples shall be drawn from each heat treatment lot, one set corresponding to highest carbon content and other set corresponding to highest rating / thickness of the flanges.

4.5 All stainless steel flanges shall be supplied in solution annealed condition.

4.6 Bevel ends of weld neck flanges shall undergo 100% Magnetic particle (MP) / Dye Penetrant (DP) test.

4.7 All stabilised grades (type 321, 321H, 347 and 347H) of stainless steel pipes shall be in a stabilized heat treated condition. Stabilizing heat treatment shall be carried out subsequent to the normal solution annealing. Soaking time & holding temperature for stabilizing heat treatment shall be 900 deg C & 4 hrs respectively.

5.0 INSPECTION

5.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the owner to carryout inspection.

5.2 The inspecting authority shall be provided free access at all possible times to those parts of supplier's work engaged in production and testing of materials ordered.

5.3 The inspecting authority shall have the right to select random samples for check test and reject materials, if samples furnished as above and tested as per the specifications fail to meet the requirement specified.

5.4 All items shall be inspected during various stages of manufacturing. Items shall be considered acceptable for despatch only after final certificate of acceptance is issued by the inspector.

5.5 Testing performed in the presence of the Purchaser's representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.

5.6 Quality Assurance plan (QAP) / Inspection Test Plan (ITP) shall be submitted by bidder for approval by Third Party Inspection Agency (TPIA).

5.7 Scope of Inspection by TPIA :

Review of Procedures (Manufacturing / HT / NDT / DT / PQR /WPQ): 100%

Review of MTC (all batches), test coupons and Supplier's Inspection Report: 100%.

NDT Reports: RT 100% Report Review & other NDT Reports 10% /random witness.

Visual check for surfaces, external appearance, cleaning & finishing: 10% Random witness.

Final Inspection (dimension, marking, color coding, positive material identification PMI applicable for Alloy & SS material): Random witness (10% min.)

Packing: 10% Random witness before dispatch.

Documentation (MTC, Inspection Release Note): 100% Review / Approval

6.0 DOCUMENTATION

6.1 The following documents (Technical), as a minimum, are required to be submitted by the supplier along with bid, after placement of order for approval purposes and final documentation before dispatch of consignment.

Sl. No.	Description of document	Along with bid	After placement of order	
			For approval/ information	Final documents before despatch
1.	Catalogue & technical literature/ preliminary drawings of item supplied.	Yes	x	x
2.	Deviation if any, from the technical spec., giving justification for the same.	Yes	x	x
3.	Drawings & documents	x	Yes (A)	Yes
4.	All types of testing & inspection certificates.	x	x	Yes
5.	Quality Assurance Plan (QAP)	x	Yes (A)	Yes

NOTES:

(A) for Approval (I) for information

QAP shall be mutually finalized with Inspection Authority specified in the order.
Number of sets shall be as stipulated elsewhere in the bid document. Final documentations shall be supplied in hard copies (4 Nos.) as well as soft copies in CD formats. Applicable software is MS Office, Word, Excel and Acrobat.

6.2 The flanges shall be supplied with 4 copies of the mill test certificates indicating the following and duly signed by the inspecting authority alongwith supply of materials.

a) Purchase order no.

b) Material specification and grade

c) Size and Sch. No. /Thickness

d) Quantity

e) Heat and lot no.

f) Results of Chemical analysis

g) Mechanical test results (as per applicable clause)

h) Non-destructive test results (as per applicable clause)

i) Results of impact test where applicable.

6.3 Flanges under IBR shall be supplied with 8 copies of IBR certificate in form IIIC duly signed by inspecting authority along with supply.

7.0 MARKING

7.1 Flanges manufactured according to ANSI B16.5, ASME B16.47, API 605, MSS SP44 shall be marked as per code and MSS SP-25. Schedule number of butt welding ends also shall be marked.

7.2 In addition, information about heat number and heat treatment shall be indicated. Flanges manufactured to other standard shall be marked as per relevant code. If standard is silent on marking, material spec., size and pressure rating shall be marked by punching.

8.0 PRESERVATION AND PACKING

8.1 After inspection and before despatch, flanges shall be thoroughly dried and cleaned. All flanges except S.S. flanges shall be coated with hard film type of rust preventive to protect against rusting during transit and storage.

8.2 Exposed faces of flanges shall be protected over their entire surface with a suitable close fitting protector duly attached at not less than four points. The type of protector and method of attachment shall be approved by the purchaser. B.W ends shall be protected with end protectors.

8.3 Flanges shall be secured together with wire of suitable strength passing through the bolt holes in such a manner that the flanges are paired and no flange face remains exposed.

8.4 Flanges shall be adequately protected to avoid damage during transit and storage. For transportation overseas packing shall be suitable to prevent damage from sea atmosphere.

8.5 The packing case shall be clearly marked with purchase order number and shall include complete packing list of all the items contained in the case.

8.6 Flanges shall be packed separately by the sizes and grades and clearly tagged for identification.

9.0 GUARANTEE

9.1 All items shall be guaranteed against poor workmanship and defective material as per the clauses mentioned in the commercial terms and conditions.

TECHNICAL SCOPE

FOR

SUPPLY OF STUD & NUTS

1.0 GENERAL

1.1 **Scope**: This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, inspection, testing, painting, packing and despatch etc. This specification shall be read in conjunction with code and enquiry documents. As a general rule the most stringent requirement shall govern and Owner's option shall be binding.

1.2 All the standards referred shall be of latest edition.

1.3 In case of conflict between different specifications and technical condition of supply, the vendor shall contact Owner for any clarifications/confirmation; otherwise it shall be assumed that all clauses are clear to the vendors.

1.4 The quantities mentioned are tentative and may vary $\pm$ 25% and shall be decided at the time of placement of order. The quantity of individual item may vary more than 100%.

2.0 GENERAL INSTRUCTIONS FOR BIDDING PURPOSE ONLY

2.1 Each sheet of technical condition of supply and specification sheets shall be duly signed and stamped by competant authority and shall be enclosed alongwith offer without which the offer shall be considered incomplete and rejected without any reference.

2.2 The price shall be quoted on the zerox copy of the same sheet of the bill of material attached with the enquiry specification and any deviation from the required specification shall be marked therein. Prices typed on other format shall not be considered for evaluation and rejected without any reference.

2.3 Any deviations from the clause stipulated in the code and other enquiry documents shall be clearly mentioned in a separate "Deviation List" with proper ref. no. In the absence of any such indications, it shall be assumed that the offer complies with all the requirements in totality and such assumptions shall be strictly binding on the supplier.

3.0 MATERIALS

3.1 All materials, whatsoever, required to complete the supply, shall be procured by the supplier and all such materials shall be covered with due identifiable material test certificates.

3.2 Nuts as per A194 Gr.7 shall also be acceptable over and above tender requirement of A194 Gr. 4.

3.3 Each Stud shall be threaded full length and provided with two heavy hex nuts.

3.4 Galvanized studs & nuts shall be as per ASTM A307 & ASTM A563 respectively.

3.5 The ends of stud bolts shall be finished with a chamfer of 45 ^{o} to a depth slightly exceeding the depth of threads. The ends shall be perpendicular to the stud bolt axis and their surface shall be sufficiently smooth to facilitate marking.

3.6 Stud bolts shall be free from harmful defects and shall have a good finish. Threads shall be clearly formed and free from burrs, scale, chatter marks or other imperfections.

3.7 The nuts shall have a chamfer of 30 ^{o} on the upper and lower faces. Both faces shall be machined or have a surface equal to that produced by machining.

4.0 INSPECTION & TESTING

4.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the owner to carryout inspection.

4.2 The inspecting authority shall be provided free access at all possible times to those parts of supplier's work engaged in production and testing of materials ordered.

4.3 The inspecting authority shall have the right to select random samples for check test and reject materials, if samples furnished as above and tested as per the specifications fail to meet the requirement specified.

4.4 All items shall be inspected during various stages of manufacturing. Items shall be considered acceptable for despatch only after final certificate of acceptance is issued by the inspector.

4.5 Testing performed in the presence of the Purchaser's representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.

4.6 Scope of Inspection by TPIA :

Review of MTC (all batches).

Visual check of surfaces: 10% Random witness.

Dimensional check: 10% Random witness.

Various physical test as per code requirements (min. 01 random per heat / lot / size sample witness).

Packing: 10% Random witness before dispatch.

Documentation (MTC, Inspection Release Note): 100% Review / Approval

5.0 DOCUMENTATION

5.1 The following documents (Technical), as a minimum, are required to be submitted by the supplier along with bid, after placement of order for approval purposes and final documentation before despatch of consignment.

Sl. No.	Description of document	Along with bid	After placement of order	
			For approval/ information	Final documents before despatch of consignment
1.	Catalogue & technical literature/ preliminary drawings of item supplied.	Yes	x	x
2.	Deviation if any, from the technical spec., giving justification for the same.	Yes	x	x
3.	Drawings & documents	x	Yes (A)	Yes
4.	All types of testing & inspection certificates.	x	x	Yes
5.	Quality Assurance Plan (QAP)	x	Yes (A)	Yes

NOTES:

(A) for Approval (I) for information

QAP shall be mutually finalized with Inspection Authority specified in the order.
Number of sets shall be as stipulated elsewhere in the bid document. Final documentations shall be supplied in hard copies (4 Nos.) as well as soft copies in CD formats. Applicable software is MS Office, Word, Excel and Acrobat.

5.2 The items shall be supplied with 4 copies of the mill test certificates indicating the following and duly signed by the inspecting authority alongwith supply of materials.

a) Purchase order no.

b) Material specification and grade

c) Size and Sch. No. /Thickness

d) Quantity

e) Heat and lot no.

f) Results of Chemical analysis

g) Mechanical test results (as per applicable clause)

h) Non-destructive test results (as per applicable clause)

i) Results of impact test where applicable.

6.0 MARKING

6.1 Identification mark shall be clearly stamped at the end of stud and on one of the faces of the nut as per the respective Std.

6.2 The studs and nuts shall be marked with size, length, material specification etc. as per relevant Std.

7.0 PRESERVATION AND PACKING

7.1 The packing case shall be clearly marked with purchase order number and shall include complete packing list of all the items contained in the case.

7.2 Studs and nuts after inspection shall be applied with rust preventive coating.

7.3 Each stud shall have the nuts fixed to it and each sizes of studs put in separate polythene bags.

7.4 These bags shall be suitably packed in wooden packing cases in such a way that these are not damaged during transit and storage.

8.0 GUARANTEE

8.1 All items shall be guaranteed against poor workmanship and defective material as per the clauses mentioned in the commercial terms and conditions.

TECHNICAL SCOPE

FOR

SUPPLY OF GASKETS

1.0 GENERAL

1.1 **Scope**: This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, inspection, testing, painting, packing and despatch etc. This specification shall be read in conjunction with code and enquiry documents. As a general rule the most stringent requirement shall govern and Owner's option shall be binding.

1.2 All the standards referred shall be of latest edition.

1.3 In case of conflict between different specifications and technical condition of supply, the vendor shall contact Owner for any clarifications/confirmation; otherwise it shall be assumed that all clauses are clear to the vendors.

1.4 The quantities mentioned are tentative and may vary $\pm$ 25% and shall be decided at the time of placement of order. The quantity of individual item may vary more than 100%.

2.0 GENERAL INSTRUCTIONS FOR BIDDING PURPOSE ONLY

2.1 Each sheet of technical condition of supply and specification sheets shall be duly signed and stamped by competant authority and shall be enclosed alongwith offer without which the offer shall be considered incomplete and rejected without any reference.

2.2 The price shall be quoted on the zerox copy of the same sheet of the bill of material attached with the enquiry specification and any deviation from the required specification shall be marked therein. Prices typed on other format shall not be considered for evaluation and rejected without any reference.

2.3 Any deviations from the clause stipulated in the code and other enquiry documents shall be clearly mentioned in a separate "Deviation List" with proper ref. no. In the absence of any such indications, it shall be assumed that the offer complies with all the requirements in totality and such assumptions shall be strictly binding on the supplier.

3.0 MATERIALS

3.1 All materials, whatsoever, required to complete the supply, shall be procured by the supplier and all such materials shall be covered with due identifiable material test certificates.

4.0 INSPECTION & TESTING

4.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the owner to carryout inspection.

4.2 The inspecting authority shall be provided free access at all possible times to those parts of supplier's work engaged in production and testing of materials ordered.

4.3 The inspecting authority shall have the right to select random samples for check test and reject materials, if samples furnished as above and tested as per the specifications fail to meet the requirement specified.

4.4 All items shall be inspected during various stages of manufacturing. Items shall be considered acceptable for despatch only after final certificate of acceptance is issued by the inspector.

4.5 Testing performed in the presence of the Purchaser's representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.

4.6 Scope of Inspection by TPIA :

Review of MTC (all batches).

Visual check of surfaces (10% random witness).

Dimensional check (10% random witness).

Various physical test as per manufacturing standard requirements (01 random sample witness).

Packing: 10% Random witness before dispatch.

Documentation (MTC, Inspection Release Note): 100% Review / Approval

5.0 DOCUMENTATION

5.1 The following documents (Technical), as a minimum, are required to be submitted by the supplier along with bid, after placement of order for approval purposes and final documentation before despatch of consignment.

Sl. No.	Description of document	Along with bid	After placement of order	
			For approval/ information	Final documents before despatch of consignment
1.	Catalogue & technical literature/ preliminary drawings of item supplied.	Yes	x	x
2.	Deviation if any, from the technical spec., giving justification for the same.	Yes	x	x
3.	Drawings & documents	x	Yes (A)	Yes
4.	All types of testing & inspection certificates.	x	x	Yes
5.	Quality Assurance Plan (QAP)	x	Yes (A)	Yes

NOTES:

(A) for Approval (I) for information

QAP shall be mutually finalized with Inspection Authority specified in the order.
Number of sets shall be as stipulated elsewhere in the bid document. Final documentations shall be supplied in hard copies (4 Nos.) as well as soft copies in CD formats. Applicable software is MS Office, Word, Excel and Acrobat.

5.2 The items shall be supplied with 4 copies of the mill test certificates indicating the following and duly signed by the inspecting authority alongwith supply of materials.

a) Purchase order no.

b) Material specification and grade

c) Size and Sch. No. /Thickness

d) Quantity

e) Heat and lot no.

f) Results of Chemical analysis

g) Mechanical test results (as per applicable clause)

h) Non-destructive test results (as per applicable clause)

6.0 **MARKING**

6.1 All the items shall be marked as per relevant std. on a metal tag attached to the items using low stress die stamping method.

6.2 Each gasket shall be marked with size, rating, material specification and dimensional std. etc. as per relevant standard.

7.0 **PRESERVATION AND PACKING**

7.1 Gaskets shall be packed separately by the sizes and grades in polythene bags or sheets and clearly tagged for identification with purchase order no.

8.0 **GUARANTEE**

8.1 All items shall be guaranteed against poor workmanship and defective material as per the clauses mentioned in the commercial terms and conditions.

TECHNICAL SCOPE

FOR

SUPPLY OF VALVES

1.0 GENERAL

1.1 **Scope**: This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, inspection, testing, painting, packing and despatch etc. This specification shall be read in conjunction with code and enquiry documents. As a general rule the most stringent requirement shall govern and Owner's option shall be binding.

1.2 All the standards referred shall be of latest edition.

1.3 In case of conflict between different specifications and technical condition of supply, the vendor shall contact owner for any clarifications/confirmation; otherwise it shall be assumed that all clauses are clear to the vendors.

1.4 The quantities mentioned are tentative and may vary $\pm$ 25% and shall be decided at the time of placement of order. The quantity of individual item may vary more than 100%.

2.0 GENERAL INSTRUCTIONS FOR BIDDING PURPOSE ONLY

2.1 Each sheet of technical condition of supply and specification sheets shall be duly signed and stamped by competant authority and shall be enclosed alongwith offer without which the offer shall be considered incomplete and rejected without any reference.

2.2 The price shall be quoted on the zerox copy of the same sheet of the bill of material attached with the enquiry specification and any deviation from the required specification shall be marked therein. Prices typed on other format shall not be considered for evaluation and rejected without any reference.

2.3 Any deviations from the clause stipulated in the code and other enquiry documents shall be clearly mentioned in a separate "Deviation List" with proper ref. no. In the absence of any such indications, it shall be assumed that the offer complies with all the requirements in totality and such assumptions shall be strictly binding on the supplier.

3.0 MATERIALS

3.1 All materials, whatsoever, required to complete the supply, shall be procured by the supplier and all such materials shall be covered with due identifiable material test certificates.

3.2 Forging equivalent of body material + Stellited for seat ring of body and seat of disc is acceptable against material A182 Gr. F6a + Stellited specified in licensor datasheets.

3.3 For valve sizes up to NPS 1½", lift/plug check valves are also acceptable in addition to licensor specification of swing check valves.

3.4 Stem shall be machined from a forged rolled bar or forged. Casting is not permitted. However, integral stem of cast stainless steel Ball Valves/Plug valves is acceptable.

3.5 Minimum thickness of stelliting / hardfacing by deposition, wherever required, shall be 1.6 mm.

3.6 PN equivalent rating for Class150# butterfly valves shall be minimum PN20.

3.7 Forging are acceptable in place of casting but not vice-versa.

4.0 TESTING

4.1 All valves castings shall be of radiographic quality, the castings of following valves shall be subjected to radiography to the following extent:

Material	Pressure rating (lbs.)	Extent of radiography (min. 1 valve)

C.S./LT C.S./A.S./S.S. -- do – -- do --	150 lbs ≥ 26” 300 lbs ≥ 18” ≥ 600 lbs - all sizes	100 % valves -- do -- -- do --

4.2 Butt welded ends of all valves of all ratings shall be 100% radiographed.

4.3 All valves with stellite/hard facing shall be subjected to 100% D.P. test of stellite facing and 10% of supplied valves shall be hardness tested for the stellite/hard facing.

4.4 Austenitic stainless steel valves shall undergo Intergranular corrosion test as per ASTM A262 Practice B. Corrosion rate upto 48 mils/year shall be acceptable. Two sets of samples shall be drawn from each heat treatment lot, one set corresponding to highest carbon content and other set corresponding to highest rating.

5.0 INSPECTION

5.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the owner to carryout inspection.

5.2 Scope of inspection by TPIA :

Review of MTC (all batches).

Calibration check of testing instruments.

Visual check of castings / surfaces (10% random witness).

Dimensional check (10% random witness).

Non destructive test as per code requirements (10% random witness).

Hydrostatic testing, pneumatic testing, tightness testing of shutter/seat, leak checks on packing/gaskets of valves (per tag no. & per size), to be witnessed by TPIA as per table below:

Pressure rating (lbs.)	Quantity, Q (Nos.)
≤ 800 and 1500 for NPS ≤1 1/2”	Q=√N
≤ 600 for NPS ≤14”	Q=√N
≤ 600 for NPS ≥16”	100%
≥ 900 for all the NPS	100%

N= Number of pieces relating to each item of order

Q= Number of pieces to be witnessed by TPIA, rounded off to nearest higher whole number (subject to min. 10% quantity).

Packing: 10% random witness before dispatch.

Documentation (MTC, Inspection Release Note): 100% review / approval

5.3 The inspecting authority shall be provided free access at all possible times to those parts of supplier’s work engaged in production and testing of materials ordered.

5.4 The inspecting authority shall have the right to select random samples for check test and reject materials, if samples furnished as above and tested as per the specifications fail to meet the requirement specified.

5.5 All items shall be inspected during various stages of manufacturing. Items shall be considered acceptable for despatch only after final certificate of acceptance is issued by the inspector.

The various stages of inspection of valves include inspection of valve casting, forging, spindle and trim materials received from sub-supplier by co-relating test certificates and check analysis wherever required. Parts assembled in valves such as bonnet, wedge, seats, gland packing etc. shall be inspected for workmanship and long life.

After the assembly of valves, the hydrotest with water or air test for body & seat shall be carried out for each valve as per specified standard and test pressures.

Finally all valves are to be cleaned, dried and painted only after final acceptance certificate is issued by inspector.

5.6 Testing performed in the presence of the Purchaser's representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.

5.7 Valves meant for steam service shall be tested in accordance with requirements of IBR and certified in Form-IIIC by authorized inspection agency for the steam conditions as per data sheets.

5.8 Quality Assurance plan (QAP) / Inspection Test Plan (ITP) shall be submitted by bidder for approval by Third Party Inspection Agency (TPIA).

6.0 DOCUMENTATION

6.1 The following documents (Technical), as a minimum, are required to be submitted by the supplier along with bid, after placement of order for approval purposes and final documentation before despatch of consignment.

Sl. No.	Description of document	Along with bid	After placement of order	
			For approval/ information	Final documents before despatch
1.	Catalogue & technical literature/ preliminary drawings of quoted items.	Yes	x	x
2.	Deviation if any, from the technical spec., giving justification for the same.	Yes	x	x
3.	Drawings & documents	x	Yes (A)	Yes
4.	All types of testing & inspection certificates.	x	x	Yes
5.	Quality Assurance Plan (QAP)	x	Yes (A)	Yes

NOTES:

(A) for Approval (I) for information

QAP shall be mutually finalised with Inspection Authority specified in the order.
Number of sets shall be as stipulated elsewhere in the bid document. Final documentations shall be supplied in hard copies (4 Nos.) as well as soft copies in CD formats. Applicable software is MS Office, Word, Excel and Acrobat.

6.2 The manufacturer shall furnish six copies of sectional assembly drawings within 3 weeks of receipt of L.o.i. incorporating manufacturing, testing stds., valve dimensions, part list including material specification, Tag. no., purchase Order no. etc. for purchaser's approval before starting manufacturing. The valve shall be manufactured as per delivery schedule on the basis of drawings approved by the purchaser within 4 weeks.

6.3 The manufacturer shall submit the following drawings and documents in 8 copies each alongwith the supply of material. In addition 4 copies shall be sent to pdil.

i) Material test certificates for body and trim materials. (in this, supplier must indicate clearly chemical composition and physical properties).

ii) Hydraulic test certificate.

iii) Manufacturer's guarantee certificate.

iv) Approved sectional drawings of the valves showing complete dimensions with part number and description for easy identification along with the material of construction etc.

v) I.B.R certificate in Form IIIC duly signed by the inspecting authorities for valves meant for steam service.

vi) Inspection and test certificates for Non I.B.R items signed by inspecting authority.

6.4 Manufacturer is required to keep proper records of all the certificates such as foundries/forged shop certificates and the check analysis carried out for raw materials.

7.0 MARKING

7.1 Marking shall be according to ANSI B16.34 or API 6D, Sec.7. For valves with butt-welding ends, Schedule number is also to be marked. In addition tag no. shall be marked on all the valves.

7.2 Marking of size, valve tag no. / Code no. shall be done using low stress die stamping method on a corrosion resistant metal tag which shall be securely attached to the valve body.

8.0 PRESERVATION AND PACKING

8.1 All valves when offered for inspection or when prepared for dispatch to the site shall be free of sand, rust, scale, swarf or any other harmful matter.

8.2 Flanged and B.W. ends of all valves shall be protected by means of metal/wooden plates or caps securely fastened to the valve. A joint composed of plastic, rubber and other non-absorbent material shall be placed between the flanges and the plates. Plastic caps are acceptable for small bore valves.

8.3 Threaded or exposed machined parts shall be uniformly coated with suitable rust preventive.

8.4 Un-machined exterior surface shall be painted with one coat of black or grey finish. However stainless steel valves shall not be painted.

8.5 Valves shall be painted only after inspection is complete in all respects.

8.6 Valves shall be packed for dispatch in such a way as to minimize the possibility of damage during transit. All valves shall be suitably boxed before dispatch.

8.7 Valves shall be dispatched with packing installed. Handwheels of valves of size 4" and smaller shall be attached to them. In larger sizes, hand wheels shall be removed and wired to the valves.

8.8 The packing case shall be marked with purchase order no. and shall include complete packing list of all the items contained in the case.

9.0 GUARANTEE

9.1 All valves shall be guaranteed against poor workmanship and defective material as per the clauses mentioned in the commercial terms and conditions.

TECHNICAL SCOPE

FOR

SUPPLY OF FRP PIPING ITEMS

1.0 **GENERAL**

1.1 Scope: This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, fabrication, inspection, testing, painting, packing and dispatch etc. This specification shall be read in conjunction with relevant codes and enquiry documents. As a general rule the most stringent requirement shall govern and Owner's option shall be binding.

1.2 All the standards referred shall be of latest edition.

1.3 In case of conflict between different specifications and technical condition of supply, the vendor shall contact Owner for any clarifications/confirmation; otherwise it shall be assumed that all clauses are clear to the vendors.

1.4 The quantities mentioned are tentative, may vary ± 25% and will be decided at the time of placement of order. The quantity of individual item may vary more than 100%.

2.0 PIPES

2.1 All pipes and their dimensions, tolerances, chemical composition, physical properties, heat treatment, hydrotest and other testing and marking shall conform to the codes and standards specified in the purchase order.

2.2 Guaranteed of chemical and mechanical resistance according design condition (temperature and pressure) for fibre, resin and joint.

2.3 Supply of all engineer data and documents required for pipe laminate by hand layup and filament winding.

2.4 Pipe shall be supplied in single or double random length of 6 and 12 meters respectively.

2.5 Trimming length for site adjustment purpose (150 mm) shall be provided in three directions to erection.

2.6 Mechanical characteristics (minimum and maximum) for stress calculation according to BS 7159 or NBN EN ISO 14692 standards will be provided.

2.7 The Vendor shall provide QCP, Internal tests Reports and certificates for tests. For any supplementary tests, reports shall also be furnished.

2.8 Inspection and testing in accordance with the applicable codes shall be supplied for all mandatory tests.

2.9 Supply of all engineering data and documents required for fabrication, packing, shipping, storage and installation.

3.0 **FLANGES**

3.1 All flanges and their dimensions, tolerances , chemical composition, physical properties, heat treatment, hydrotest and other testing and marking shall conform to the codes and standards specified in the purchase order.

3.2 Guaranteed of chemical and mechanical resistance according design condition (temperature and pressure).

3.3 All items shall be protected from Rust, Corrosion and Mechanical damage during transportation, shipment and storage.

3.4 The flange faces shall be properly protected to prevent damage to the flange face during shipping.

4.0 **FITTINGS**

4.1 Fittings and their dimensions, tolerances, chemical composition, physical properties, heat treatment, hydrotest and other testing and marking shall conform to the codes and standards specified in the purchase order.

4.2 Material shall be the same as piping (according the piping class specification).

4.3 Guaranteed of chemical and mechanical resistance according design condition (temperature and pressure).

4.4 Supply of engineering data and documents required for fittings laminate type.

4.5 Seaworthy packing and conditioning for transport and storage. Fittings will be separate by material, length, diameter and thickness.

5.0 FRP JOINING MATERIAL

5.1 The Vendor must complete the quantities required for FRP Joining material and erection Kit container. This material must be new and suitable to cover period of project. Handling and Erection Procedure shall be provided by supplier.

6.0 SPECIFICATION FOR FRP MATERIAL

6.1 Anticorrosion Barrier: Polymer veil: Min thickness 2.5 mm, only used for chemical resistance. Mechanical resistance to be sustained by FRP.

6.2 Pipe Wall Thickness: 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 vendors' 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.

6.3 The Vendor shall substantiate its selection for the thicknesses of each item, by issuing a calculation sheet in which are defined the thicknesses of plastic liner and laminate structure, nature and arrangement of textile glass layers, winding angle etc.

6.4 Loads and Supports: In addition to pressure and thermal loading, the piping systems will be designed to resist the effects of loads imposed by the weight of the pipe, fittings, valves and actuators, insulation, fluid in the lines, and any other external loads including earthquake, wind etc.

6.5 The piping will be supported such that the stresses created by the imposed loads do not exceed the allowable stresses prescribed by ASME B31 .3, as applicable. For design purposes, all lines will be assumed to be water filled for hydrostatic test.

6.6 All FRP fittings shall be dimensioned according to DIN & Equivalent standards. Any deviations by vendor shall be listed and completed by all technical clarifications. The Thickness should equal or greater to pipes.

7.0 INSPECTION

7.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the Owner to carryout inspection.

7.2 The inspecting authority shall be provided free access at all possible times to those parts of supplier’s work engaged in production and testing of materials ordered.

7.3 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.

7.4 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.

7.5 Quality Assurance plan (QAP) / Inspection Test Plan (ITP) shall be submitted by bidder for approval by Third Party Inspection Agency (TPIA).

7.6 Scope of Inspection by TPIA :

Review of MTC (all batches).

Visual check for surfaces, external appearance (10% random witness).

Dimensional check – Outside diameter, weight, wall thickness, out of ovality, straightness (10% random witness).

Various physical test i.e. tensile strength, yield strength, percentage elongation, flattening test, bend test, as applicable (inspection frequency as per respective specification).

Hydrostatic test (min. 10% random witness).

Packing: 10% random witness before dispatch.

Documentation (MTC, Inspection Release Note): 100% Review / Approval

8.0 DOCUMENTATION

8.1 The following documents (Technical), as a minimum, are required to be submitted by the supplier along with bid, after placement of order for approval purposes and final documentation before despatch of consignment.

Sl. No.	Description of document	Along with bid	After placement of order	
			For approval/ information	Final documents before despatch
1.	Catalogue & technical literature/ preliminary drawings of items quoted, if applicable.	Yes	x	x
2.	Deviation if any, from the technical spec., giving justification for the same.	Yes	x	x
3.	Drawings & documents	x	Yes (A)	Yes
4.	All types of testing & inspection certificates.	x	x	Yes
5.	Quality Assurance Plan (QAP)	x	Yes (A)	Yes

NOTES:

(A) for Approval (I) for information

QAP shall be mutually finalized with Inspection Authority specified in the order.

Number of sets shall be as stipulated elsewhere in the bid document. Final documentations shall be supplied in hard copies (4 Nos.) as well as soft copies in CD formats. Applicable software is MS Office, Word, Excel and Acrobat.

8.2 The pipe shall be supplied with 4 copies of the test certificates indicating the following and duly signed by the inspecting authority alongwith supply of materials.

a) Purchase order no.

b) Material specification and grade

c) Size and sch.no./thickness

d) Quantity

e) Heat and Lot No.

f) Results of Chemical analysis

g) Mechanical test results (as per applicable clause)

h) Hydrostatic test results

i) Non-destructive test results (as per applicable clause)

9.0 MARKING AND DISPATCH

9.1 The Vendor shall be responsible to provide pipe and fittings with sufficient interior strutting or cross bracing to prevent deflection under their own weight.

9.2 The Vendor shall be responsible to ensure that, throughout their fabrication; all piping elements are marked and can be easily identified.

9.3 The marking shall remain legible under normal handling and installation practices.

9.4 All items shall be dry, clean and free from moisture, dirt and loose foreign materials of any kind.

9.5 All items shall be protected from any damage during transportation, shipment and storage.

9.6 Each size of fittings and flanges, shall be supplied in separate packaging marked with the, Material specification, Size and Rating.

10.0 GUARANTEE

10.1 All items shall be guaranteed against poor workmanship and defective material as per the clauses mentioned in the commercial terms and conditions of “ITB”.

पी डी आई एल PDIL	INSPECTION & TEST PLAN CS, LTCS & SS WELDED PIPES	PNMP-ITP-01 DOCUMENT NO SHEET 1 of 1

1.0 SCOPE:

This Inspection & Test Plan covers the minimum requirements of CS, LTCS & SS Welded Pipes, as per Purchase Order / Purchase Requisition / codes & standards specified /approved documents.

2.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
1.0	Raw Material Identification/Chemical composition	a) Raw Material Identification Report b) Mill Test Certificates	P.O. Specification / Applicable codes & standard	R	R
2.0	Welding(WPS/PQR/WPQ)				
2.1	Qualification of Welding Procedure	ASME SEC.IX Approved WPS/PQR	ASME SEC.IX	R	R
2.2	Qualification of Welding Personnel	ASME SEC.IX	ASME SEC.IX	R	R
3.0	Manufacturing (Rolling, machining etc.)	Supplier's Manufacturing Procedure	Applicable Material STD	H	R
4.0	Heat Treatment (as applicable)	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R/R
5.0	Selection of Test Coupons	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
6.0	Destructive Testing: Tensile, bend, hardness, transverse tension, Impact test (as applicable) etc.	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	10% RW
7.0	Non Destructive Testing (as applicable)				
7.1	Ultrasonic Testing	ASME SEC V / ASTM E213	ASME SEC VIII DIV.1/ P.O.	H	10% RW
7.2	Radiography Testing	ASME SEC V / ASTM E94	ASME SEC VIII DIV.1/ P.O.	H	RT Film Review
8.0	Hydro Testing	ASTM A530/A999/API 5L	ASTM A530/A999/API 5L	H	10% RW
9.0	Visual examination (Workmanship, Finish, and Appearance)	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
10.0	Overall Dimensional check (Outside diameter, Bevel Ends, thickness, mass & tolerances, Surface Condition)	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
11.0	Random Length	P.O.	P.O.	H	10% RW
12.0	Positive Material Identification (For AS & SS pipes)	ASTM E1476/ PMI procedure	Applicable Material STD	H	10% RW
13.0	Product Marking & Packing/End protection	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
14.0	Documentation & Certification	Applicable STD/ P.O.	Applicable STD/ P.O.	H	R

Abbreviation: DT- Destructive Testing, H- Hold (Do not proceed without approval), HT- Heat treatment, R-Review, R/R- Report Review, ITP-Inspection and Test Plan, P- Performed, PO- Purchase Order, PQR- Procedure Qualification Record, PR-Purchase Requisition, RW- Random Witness, TC-Test Certificate, TPI or TPIA- Third Party Inspection Agency, W-Witness / Inspection

पी डी आई एल PDIL	INSPECTION & TEST PLAN CS, LTCS, AS & SS SEAMLESS PIPES	PNMP-ITP-02 DOCUMENT NO SHEET 1 of 1

1.0 SCOPE:

This Inspection & Test Plan covers the minimum requirements of CS, LTCS , AS & SS Seamless Pipes, as per Purchase Order / Purchase Requisition / codes & standards specified /approved documents.

2.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
1.0	Raw Material Identification/Chemical composition	a) Raw Material Identification Report b) Mill Test Certificates	P.O. Specification / Applicable codes & standard	R	R
2.0	Forming	Supplier's Manufacturing Procedure	Applicable Material STD	H	R
3.0	Heat Treatment (as applicable)	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R/R
4.0	Selection of Test Coupons	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
5.0	Destructive Testing: Tensile, bend, hardness, transverse tension, Impact test (as applicable) etc.	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	10% RW
6.0	Non Destructive Testing (as applicable)				
6.1	Ultrasonic Testing	ASME SEC V / ASTM E213	ASME SEC VIII DIV.1/ P.O.	H	10% RW
6.2	Radiography Testing	ASME SEC V / ASTM E94	ASME SEC VIII DIV.1/ P.O.	H	RT Film Review
7.0	Hydro Testing	ASTM A530/A999/API 5L	ASTM A530/A999/API 5L	H	10% RW
8.0	Visual examination (Workmanship, Finish, and Appearance)	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
9.0	Overall Dimensional check (Outside diameter, Bevel Ends, thickness, mass & tolerances, Surface Condition)	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
10.0	Random Length	P.O.	P.O.	H	10% RW
11.0	Positive Material Identification (For AS & SS pipes)	ASTM E1476/ PMI procedure	Applicable Material STD	H	10% RW
12.0	Product Marking & Packing/End protection	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
13.0	Documentation & Certification	Applicable STD/ P.O.	Applicable STD/ P.O.	H	R

Abbreviation: DT- Destructive Testing, H- Hold (Do not proceed without approval), HT- Heat treatment, R-Review, R/R- Report Review, ITP-Inspection and Test Plan, P- Performed, PO- Purchase Order, PQR- Procedure Qualification Record, PR-Purchase Requisition, RW- Random Witness, TC-Test Certificate, TPI or TPIA- Third Party Inspection Agency, W-Witness / Inspection

1.0 SCOPE:

This Inspection & Test Plan covers the minimum requirements of Forged, Seamless & Welded Fittings, as per Purchase Order / Purchase Requisition / codes & standards specified /approved documents.

2.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
1.0	Raw Material Identification	a) Raw Material Identification Report b) Mill Test Certificates	P.O. Specification / Applicable codes & standard	H	R/R
2.0	Welding(WPS/PQR/WPQ)				
2.1	Qualification of Welding Procedure	ASME SEC.IX Approved WPS/PQR	ASME SEC.IX	H	R
2.2	Qualification of Welding Personnel	ASME SEC.IX	ASME SEC.IX	H	R
3.0	Manufacturing (Forming, machining etc.)	Supplier's Manufacturing Procedure	Applicable Material STD	H	R
4.0	Heat Treatment(Wherever Applicable)	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R/R
5.0	Selection of Test Coupons	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
6.0	Chemical Composition	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R
7.0	Destructive Testing: Tensile strength, Yield strength, Elongation, Hardness Test, Impact test (as applicable) etc.	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	10% RW
8.0	Non Destructive Testing				
8.1	100% Radiography test on welding	ASTM E94	ASME SEC VIII Div.1, Para. UW-51	H	RT Film Review
8.2	Ultrasonic testing(as applicable)	ASME SEC V / ASTM E213	ASME SEC VIII Div.1/P.O.	H	10% RW
8.3	Dye Penetration (DP) / Magnetic Particle (MP)Test of Bevel Ends	ASTM E 165 for DP Test / ASTM E 709 for MP Test	ASME Sec. VIII	H	10% RW
8.4	Positive Material Identification (PMI) for AS/SS materials	ASTM E1476 / P.O.	ASME Sec. VIII Div.1	H	10% RW
8.5	Intergranular corrosion (IGC) test for SS materials	ASTM A262 Practice B	P.O.	H	10% RW
9.0	Visual examination (Workmanship, Finish, and Appearance)	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
10.0	Overall Dimensional check	ASME B16.25/B16.11/B16.9/P.O.	ASME B16.25/B16.11/B16.9/P.O.	H	10% RW
11.0	Galvanizing (as applicable)	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
12.0	Surface Preparation & Painting (If Applicable)	P.O.	P.O.	H	10% RW

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
13.0	Marking & Packing/End Protection/ Dispatch	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
14.0	Certification	Applicable STD/ P.O.	Applicable STD/ P.O.	H	R

Abbreviation: DT- Destructive Testing, H- Hold (Do not proceed without approval), HT- Heat treatment, R-Review, R/R- Report Review, ITP-Inspection and Test Plan, P- Performed, PO- Purchase Order, PQR- Procedure Qualification Record, PR-Purchase Requisition, RW- Random Witness, TC-Test Certificate, TPI or TPIA- Third Party Inspection Agency, W-Witness / Inspection

पी डी आई एल PDIL	INSPECTION & TEST PLAN FORGED FLANGES	PNMP-ITP-04 DOCUMENT NO SHEET 1 of 1

1.0 SCOPE:

This Inspection & Test Plan covers the minimum requirements of Forged Flanges, as per Purchase Order / Purchase Requisition / codes & standards specified /approved documents.

2.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
1.0	Raw Material Identification	a) Raw Material Identification Report b) Mill Test Certificates	P.O. Specification / Applicable codes & standard	H	R/R
2.0	Manufacturing (Forging, machining etc.)	Supplier's Manufacturing Procedure	Applicable Material STD	H	R
3.0	Selection of Test Coupons	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
4.0	Chemical Composition	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R/R
5.0	Heat Treatment, as applicable	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R/R
6.0	Destructive Testing				
6.1	Tensile Test	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
6.2	Hardness Test	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
6.3	Impact Test, as applicable	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
7.0	Non Destructive Testing				
7.1	Dye Penetration Test/ Magnetic Particle Test	ASTM E 165 for DP Test/ ASTM E 709 for MP Test	ASME Sec. VIII	H	W
8.0	Final Inspection				
8.1	Visual Examination	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
8.2	Flange Facing Finish	ASME B46.1	ASME B46.1 / P.O.	H	10% RW
8.3	Overall Dimensional check	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
9.0	Marking	MSS-SP25 / P.O.	MSS-SP25 / P.O.	H	10% RW
10.0	Certification	AS PER P.O.	AS PER P.O.	H	R

Abbreviation: DT- Destructive Testing, H- Hold (Do not proceed without approval), HT- Heat treatment, R-Review, R/R- Report Review, ITP-Inspection and Test Plan, P- Performed, PO- Purchase Order, PQR- Procedure Qualification Record, PR-Purchase Requisition, RW- Random Witness, TC-Test Certificate, TPI or TPIA- Third Party Inspection Agency, W-Witness / Inspection

पी डी आई एल PDIL	INSPECTION & TEST PLAN STUDS & NUTS	PNMP-ITP-05 DOCUMENT NO SHEET 1 of 1

1.0 SCOPE:

This Inspection & Test Plan covers the minimum requirements of Studs & Nuts, as per Purchase Order / Purchase Requisition / codes & standards specified /approved documents.

2.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
1.0	Raw Material Identification (Chemical Composition)	a) Raw Material Identification Report b) Mill Test Certificates	ASTM A193/ A194	H	R/R
2.0	Heat Treatment	ASTM A193/ A194	ASTM A193/ A194	H	R/R
3.0	Selection of Test Coupons	ASTM A193/ A194	ASTM A193/ A194	H	W
4.0	Chemical Composition	ASTM A193/ A194	ASTM A193/ A194	H	R
5.0	Mechanical Testing (Tensile strength, Yield strength, Elongation, Hardness Test, Proof Load test for nuts, etc.)	ASTM A193/ A194	ASTM A193/ A194	H	W
6.0	Machining of Studs & Nuts	ASTM A193/ A194	ASTM A193/ A194	H	R
7.0	Final Inspection				
7.1	Visual Examination	ASTM A193/ A194 & P.O	ASTM A193/ A194 & P.O	H	10% RW
7.2	Surface Finish	ASTM A193/ A194	ASTM A193/ A194	H	10% RW
7.3	Overall Dimensional check	ASTM A193/ A194	ASTM A193/ A194	H	10% RW
8.0	Marking	ASTM A193/ A194 & P.O	ASTM A193/ A194 & P.O	H	10% RW
9.0	Certification	ASTM A193/ A194 & P.O	ASTM A193/ A194 & P.O	H	R

Abbreviation: DT- Destructive Testing, H- Hold (Do not proceed without approval), HT- Heat treatment, R-Review, R/R- Report Review, ITP-Inspection and Test Plan, P- Performed, PO- Purchase Order, PQR- Procedure Qualification Record, PR-Purchase Requisition, RW- Random Witness, TC-Test Certificate, TPI or TPIA- Third Party Inspection Agency, W-Witness / Inspection

पी डी आई एल PDIL	INSPECTION & TEST PLAN GASKETS	PNMP-ITP-06 DOCUMENT NO SHEET 1 of 1

1.0 SCOPE:

This Inspection & Test Plan covers the minimum requirements of Gaskets, as per Purchase Order / Purchase Requisition / codes & standards specified /approved documents.

2.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
1.0	Raw Material Identification (Chemical & Physical)	a) Raw Material Identification Report b) Mill Test Certificates	ASME B16.20 / P.O.	H	R/R
2.0	Compression Test	ASME B16.20	ASME B16.20	H	W
3.0	Hardness test	ASME B16.20	ASME B16.20	H	10% RW
4.0	Final Inspection				
4.1	Visual Examination	ASME B16.20 / P.O.	ASME B16.20 / P.O.	H	10% RW
4.2	Surface Finish	ASME B16.20	ASME B16.20 / P.O.	H	10% RW
4.3	Overall Dimensional check	ASME B16.20	ASME B16.20 / P.O.	H	10% RW
5.0	Marking	ASME B16.20 / P.O.	ASME B16.20 / P.O.	H	10% RW
6.0	Certification	ASME B16.20 / P.O.	ASME B16.20 / P.O.	H	R

Abbreviation: DT- Destructive Testing, H- Hold (Do not proceed without approval), HT- Heat treatment, R-Review, R/R- Report Review, ITP-Inspection and Test Plan, P- Performed, PO- Purchase Order, PQR- Procedure Qualification Record, PR-Purchase Requisition, RW- Random Witness, TC-Test Certificate, TPI or TPIA- Third Party Inspection Agency, W-Witness / Inspection

1.0 SCOPE:

This Inspection & Test Plan covers the minimum requirements of Valves, as per Purchase Order / Purchase Requisition / codes & standards specified /approved documents.

2.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
1.0	Raw Material Identification (Forging /Casting)	Raw Material Identification Report	P.O. Specification / Applicable codes & standard	H	R/R
1.1	Heat Treatment Forging /Casting	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R
1.2	Dimensions of Forging/Casting	Supplier's Drawing	Supplier's Drawing	H	R
1.3	Surface Finish of Forging/Casting	MSS-SP-55	MSS-SP-55	H	R
1.4	Chemical Properties of Forging/Casting	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R
1.5	Physical Properties of Forging/Casting	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R
1.6	Dye Penetrant Test of stellite facing	ASTM E 165 for DP Test	ASME SEC VIII	H	10%RW
1.7	Hardness Test of stellite facing	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10%RW
1.8	Radiography of Castings	P.O./ASTM E94	ASME SEC VIII	H	RT Film Review
2.0	Chemical & Physical Properties of Valve Body parts	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R
3.0	Intergranular corrosion test (IGC) (For Austenitic SS Valves only)	ASTM A262 Practice B	P.O.	H	R
4.0	Hydraulic and Pneumatic Test				
4.1	Shell Test	Applicable STD/ P.O.	Applicable STD/ P.O.	H	W (As per P.O.)
4.2	Seat Test	Applicable STD/ P.O.	Applicable STD/ P.O.	H	W (As per P.O.)
4.3	Pneumatic Test	Applicable STD/ P.O.	Applicable STD/ P.O.	H	W (As per P.O.)
5.0	Fire safe test (as applicable)	API 607/ API 6FA	API 607/ API 6FA	H	10%RW
6.0	Performance Test for Hand wheel/Lever /Gear Operator.	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10%RW
7.0	Positive Material Identification (PMI) for AS/SS Valves	ASTM E1476 / P.O.	ASME Sec. VIII Div.1	H	10%RW
8.0	Final Inspection of finished valves (Visual & Dimensional)	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10%RW

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
9.0	Surface preparation & Painting	P.O.	P.O.	W	R
10.0	Marking	Applicable API STD./ MSS-SP25 & P.O.	Applicable API STD./ MSS-SP25 & P.O.	H	10% RW
11.0	Certification	Applicable STD/ P.O.	Applicable STD/ P.O.	H	R

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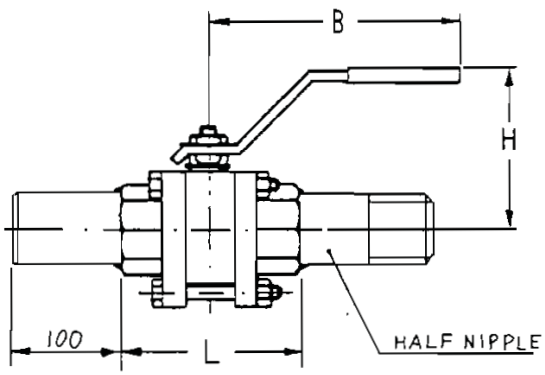
VALVE DATA SHEETS

PDIL

BALL VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	BAV 201
PRESSURE RATING CLASS	800
FACE	SW b)
CONSTRUCTION	
BODY	THREE PIECES TYPE FULL BORE FLOATING BALL
EXTENDED STEM	NO
WRENCH OPERATED	YES
GEAR OPERATED	NO
FIRE SAFE	YES
NOMINAL SIZE	1/2" - 1 1/2"
MATERIALS	
BODY	A 105
BALL	AISI 316
BODY SEAT RING	PTFE
STEM PACKING	PTFE GRAPHITE
STEM	13 Cr.
DESIGN CONDITIONS	
PRESSURE RATING	API 602

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

2 IF OTHERWISE STATED THE VALVES SHALL BE FULL BORE

MANDATORY STANDARDS:

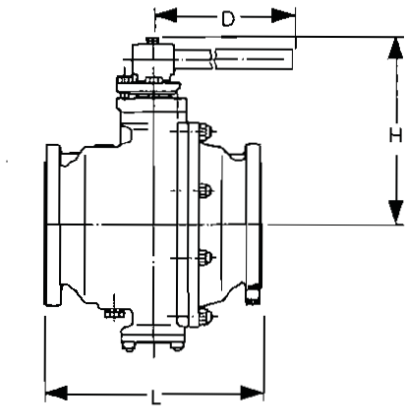
API 598, API 602, API 607, API 608, ANSI B16.11, ANSI B16.34

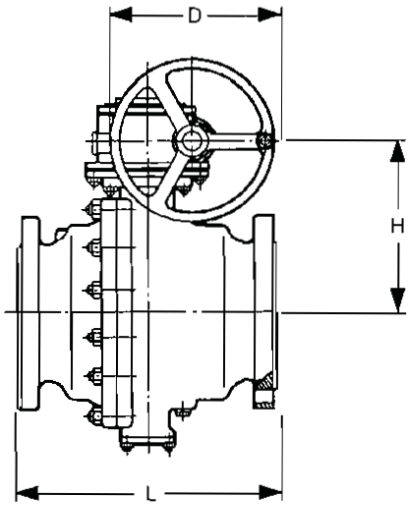
NOTES:

a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD
b) VALVE PROVIDED WITH EXTENTED ENDS, 100mm LONG SCH 80/HALF NIPPLE

PDIL

BALL VALVE





DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	**BAV 210**	
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" - 24"	
FIRE SAFE	YES	
NOMINAL SIZE	2" - 24"	
MATERIALS		
BODY	A 216 Gr. WCB	
BALL	AISI 316 OR C.S. CHROMEPLATED	
BODY SEAT RING	PTFE	
STEM PACKING	PTFE GRAPHITE	
STEM	13 Cr.	
DESIGN CONDITIONS		
PRESSURE RATING	ANSI B16.34	
FLUID	Kg/cm2g	°C

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

2. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

MANDATORY STANDARDS:

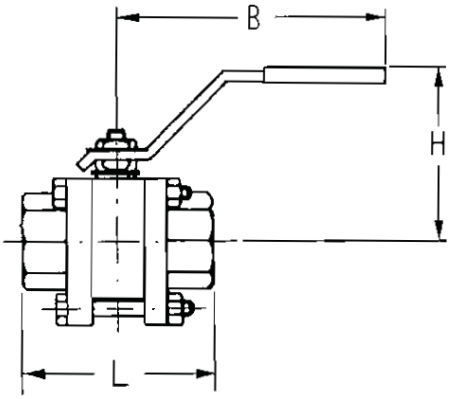
API 598, API 607, API 608, ANSI B16.10, ANSI B16.34, ANSI B16.5

NOTES:

a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD

PDIL

BALL VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	BAV 501
PRESSURE RATING CLASS	800
FACE	THREADED (NPT)
CONSTRUCTION	
BODY	THREE PIECES TYPE FULL BORE FLOATING BALL
EXTENDED STEM	NO
WRENCH OPERATED	YES
GEAR OPERATED	NO
FIRE SAFE	YES
NOMINAL SIZE	1/2" - 1 1/2"
MATERIALS	
BODY	AISI 316
BALL	AISI 316
BODY SEAT RING	PTFE
STEM PACKING	PTFE GRAPHITE
STEM	AISI 316
DESIGN CONDITIONS	
PRESSURE RATING	API 602

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

2. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

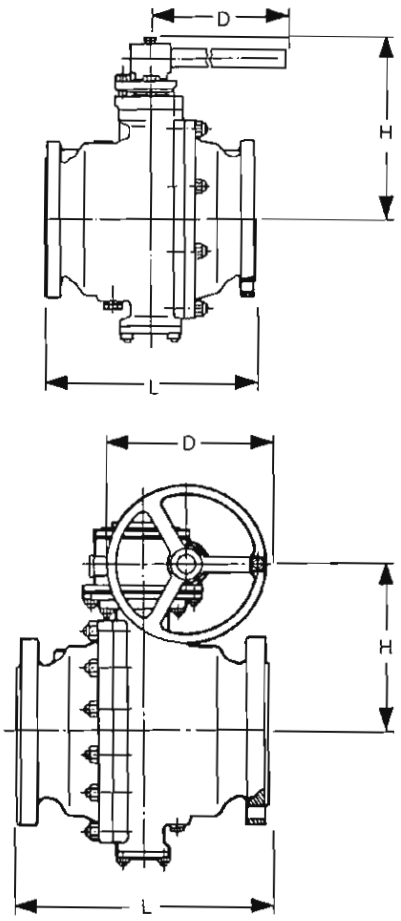
MANDATORY STANDARDS:

API 598, API 602, API 607, API 608, ANSI B16.11, ANSI B16.34

NOTES:

a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD
b) BOTH ENDS FEMALE SCREWED

BALL VALVE



DESIGN (ILLUSTRATIVE ONLY)

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
DESIGN 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:

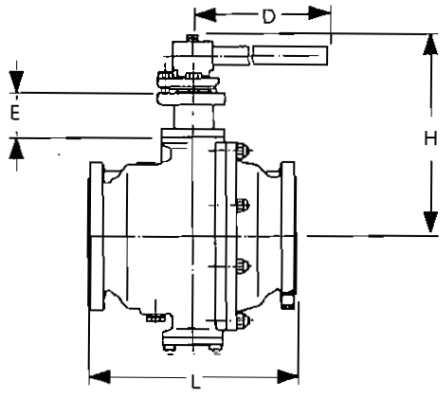
API 598, API 607, API 608, ANSI B16.10, ANSI B16.34, ANSI B16.5

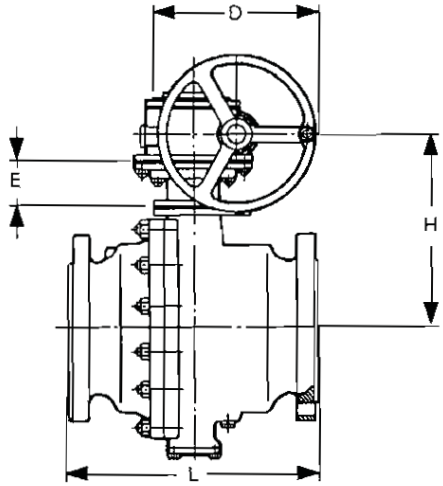
NOTES:

a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD

PDIL

BALL VALVE





DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	BAV 520
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
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"
MATERIALS	
BODY	A 351 Gr. CF 8M
BALL	A 351 Gr. CF 8M CHROMEPLATED
BODY SEAT RING	AISI 316 STELLITED
STEM PACKING	PTFE GRAPHITE
STEM	AISI 316
DESIGN 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:

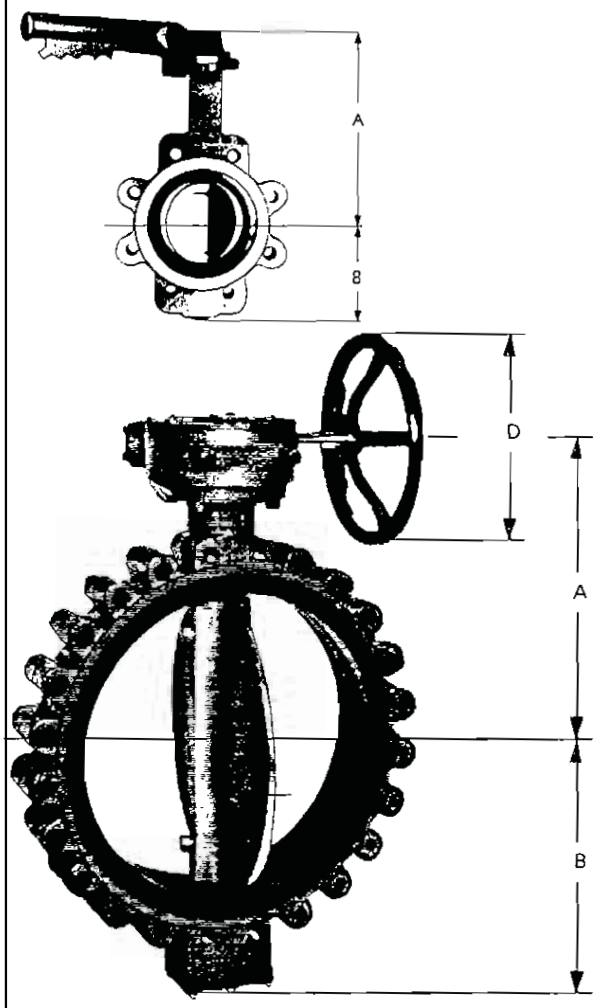
API 598, API 607, API 608, ANSI B16.10, ANSI B16.34, ANSI B16.5

NOTES:

a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD
b) STEM EXTENSION E = 150mm

PDIL

BUTTERFLY VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	BUV 203
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
BODY	CAST
	LUG TYPE WITH
	THREADED HOLES
	RUBBER LINED
GEAR OPERATED	YES > = 8"
NOMINAL SIZE	2" - 24"
MATERIALS	
BODY	A 216 Gr. WCB
BODY LINING	ETHYLENE-PROPYLENE
DISC	A 216 Gr. WCB
SHAFT	A 276 Gr. 316
SHAFT PACKING	PTFE
DESIGN CONDITIONS	
PRESSURE RATING	API 609

GENERAL

1. RUBBER LINING: THE WETTED SURFACES OF VALVE BODY 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:

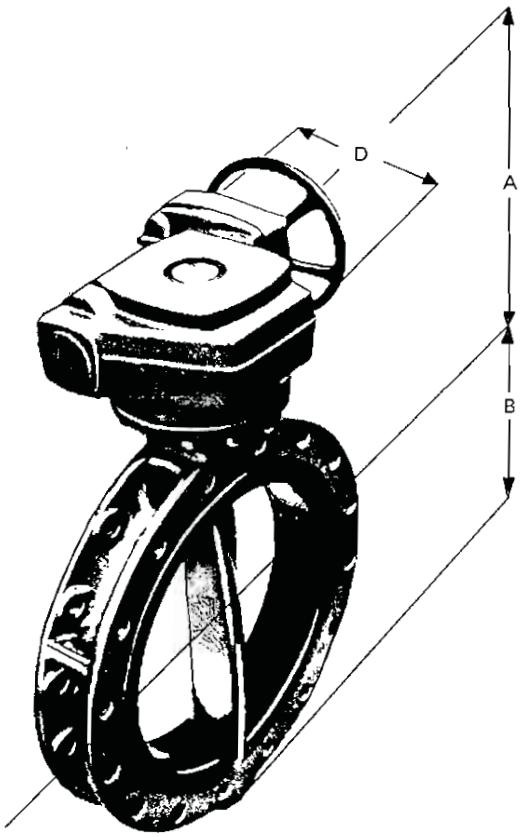
API 609, ANSI B16.5

NOTES:

a) THE VALVE SHALL BE DESIGNED FOR CLOSURE IN DEAD-END-PIPING

PDIL

BUTTERFLY VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	BUV 204
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
BODY	FLANGED SHORT BODY
	FULL-DRILLED
	BOLTHOLES IN FLANGES
	RUBBER LINED
GEAR OPERATED	YES
NOMINAL SIZE	26" - 64"
MATERIALS	
BODY	A 216 Gr. WCB
BODY LINING	ETHYLENE-PROPYLENE
DISC	A 216 Gr. WCB
SHAFT	A 276 Gr. 316
SHAFT PACKING	PTFE
DESIGN CONDITIONS	
PRESSURE RATING	ASME B16.47

GENERAL

1. RUBBER LINING: THE WETTED SURFACES OF VALVE BODY 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:

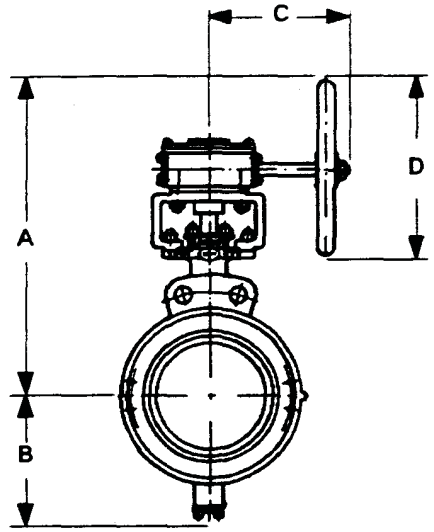
AWWA C 504, ASME B16.47

NOTES:

a) THE VALVE SHALL BE DESIGNED FOR CLOSURE IN DEAD-END-PIPING
b) FLANGES ACC. TO ASME B16.47 SERIES B

PDIL

BUTTERFLY VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	**BUV 510**
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
BODY	WAFER TYPE
	CATEGORY "B"
GEAR OPERATED	> = 8"
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	PTFE
DESIGN CONDITIONS	
PRESSURE RATING	ANSI B16.34

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED
2. FASE-TO-FASE DIMENSIONS SHALL BE PER API 609

MANDATORY STANDARDS:

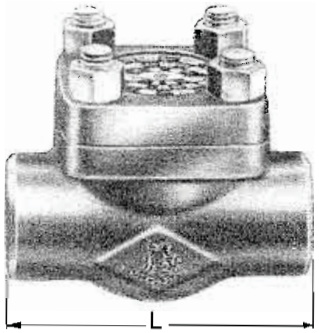
API 609, ANSI B16.34, ANSI B16.47, ANSI B16.5

NOTES:

a) MANUFACTURER MAY RECOMMEND ALTERNATIVE SEAT MATERIAL AND SEAT RATING SUBJECT TO PURCHASER APPROVAL
b) FLANGES > 24" ACC. TO ASME B16.47 SERIES B

PDIL

CHECK VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	CHV 201S
PRESSURE RATING CLASS	800
FACE	SW
CONSTRUCTION	
BODY	FORGED
BONNET TO BODY CONNECTION	BOLTED
SEAT RING	RENEWABLE
TYPE OF DISC	BALL
NOMINAL SIZE	1/2" - 1 1/2"
MATERIALS	
BODY	A 105
BODY SEAT RING	A 182 Gr. F6a STELLITED
DISC	**13 Cr Stellited.**
DESIGN CONDITIONS	
PRESSURE RATING	API 602

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED
2. IF NOT OTHERWISE STATED THE VALVE SHALL BE FULL BORE

MANDATORY STANDARDS:

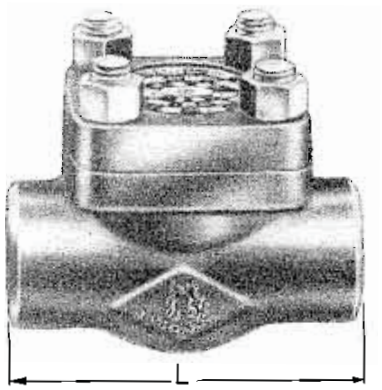
API 598, API 602, ANSI B16.11, ANSI B16.34

NOTES:

a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602
b) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION

PDIL

CHECK VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	CHV 201
PRESSURE RATING CLASS	800
FACE	SW
CONSTRUCTION	
BODY	FORGED
BONNET TO BODY CONNECTION	BOLTED
SEAT RING	RENEWABLE
TYPE OF DISC	BALL
NOMINAL SIZE	1/2" - 1 1/2"
MATERIALS	
BODY	A 105
BODY SEAT RING	A 182 Gr. F6a STELLITED
DISC	A 182 Gr. F6a
DESIGN CONDITIONS	
PRESSURE RATING	API 602

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED
2. IF NOT OTHERWISE STATED THE VALVE SHALL BE FULL BORE

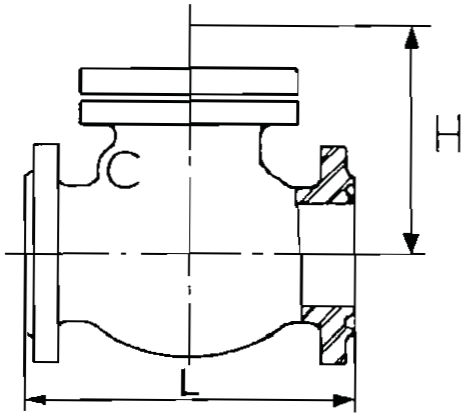
MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B 16.34

NOTES:

a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602

CHECK VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	**CHV 210**
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
SEAT RING	RENEWABLE
TYPE OF DISC	SWING TYPE
ACCESSORIES	NO
BY-PASS	NO
NOMINAL SIZE	2" - 24"
MATERIALS	
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

GENERAL

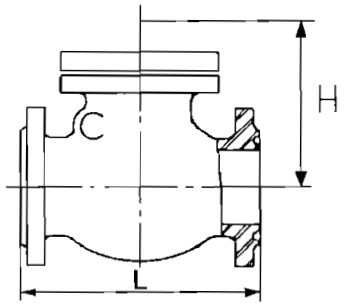
1. COPPER AND COPPER ALLOYS NOT PERMITTED

MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

PDIL

CHECK VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	CHV 210S	
PRESSURE RATING CLASS	150	
FACE	RF	
CONSTRUCTION		
BODY	CAST	
BONNET TO BODY CONNECTION	BOLTED	
SEAT RING	RENEWABLE	
TYPE OF DISC	SWING TYPE	
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 CONDITIONS		
PRESSURE RATING	ANSI B16.34	
FLUID	Kg/cm2g	°C

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

MANDATORY STANDARDS:

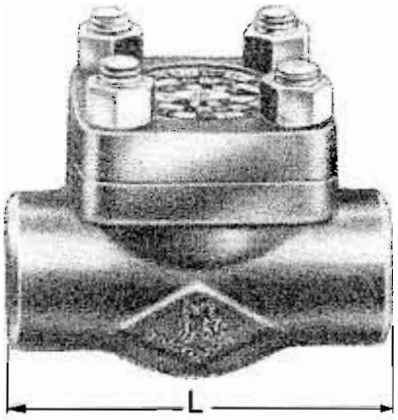
API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

NOTES:

a) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION

PDIL

CHECK VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	**CHV 501**
PRESSURE RATING CLASS	800
FACE	SW
CONSTRUCTION	
BODY	FORGED
BONNET TO BODY CONNECTION	BOLTED
SEAT RING	RENEWABLE
TYPE OF DISC	BALL
NOMINAL SIZE	1/2" - 1 1/2"
MATERIALS	
BODY	A 182 Gr. F304
BODY SEAT RING	AISI 304
DISC	AISI 304
DESIGN CONDITIONS	
PRESSURE RATING	API 602

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED
2. IF NOT OTHERWISE STATED THE VALVE SHALL BE FULL BORE

MANDATORY STANDARDS:

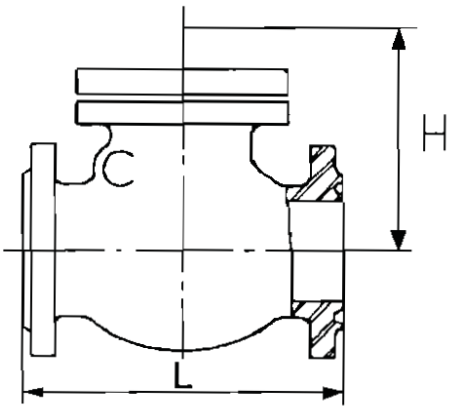
API 598, API 602, ANSI B16.11, ANSI B 16.34

NOTES:

a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602

PDIL

CHECK VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	CHV 510
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
SEAT RING	INTEGRAL
TYPE OF DISC	SWING TYPE
ACCESSORIES	NO
BY-PASS	NO
NOMINAL SIZE	2" - 24"
MATERIALS	
BODY	A 351 Gr. CF8
BODY SEAT RING	A 182 Gr. F304 OR INTERGRAL
DISC	AISI 304
HINGE PIN	A 276 Gr. 304
DESIGN CONDITIONS	
PRESSURE RATING	ANSI B16.34

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

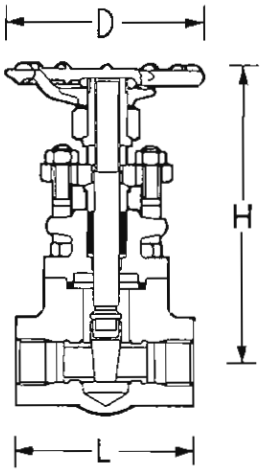
MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

NOTES:

PDIL

GATE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GAV 201
PRESSURE RATING CLASS	800
FACE	SW
CONSTRUCTION	
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"
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	8
DESIGN CONDITIONS	
PRESSURE RATING	API 602

GATE SYMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS	WEDGE	SINGLE	SOLID WEB
WSF			FLEX. SOLID WEB
WDF		DOUBLE	SLIP ON OR SPLIT
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:

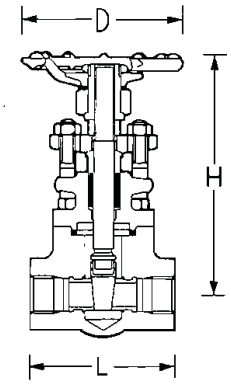
API 598, API 602, ANSI B16.11, ANSI B16.34

NOTES:

a) LENGTH TO BE VERIFIED BY MANUFACTURER

PDIL

GATE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GAV 201S
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
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	GRAPHITE
TRIM NUMBER	8
DESIGN CONDITIONS	
PRESSURE RATING	API 602

GATE SYMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS	WEDGE	SINGLE	SOLID WEB
WSF			FLEX. SOLID WEB
WDF		DOUBLE	SLIP ON OR SPLIT
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

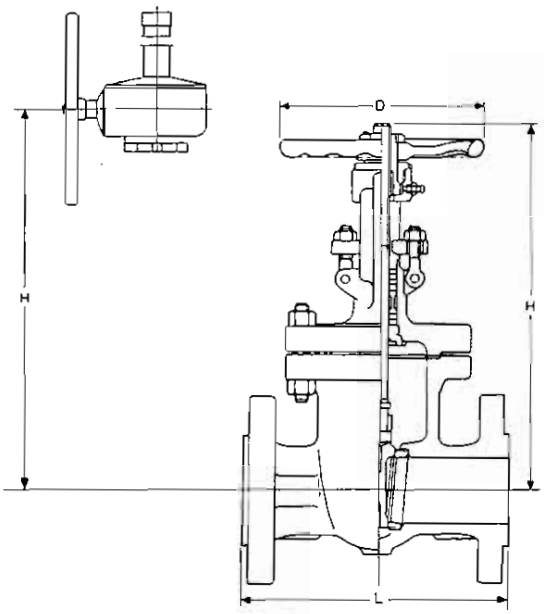
MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B16.34

NOTES:

a) LENGTH TO BE VERIFIED BY MANUFACTURER
b) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION

GATE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GAV 210
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
HANDWHEEL	NON-RISING
STEM	RISING
STEM AND YOKE TYPE	OS & Y
GATE TYPE	WSF OR WDF
GEAR OPERATED	YES > = 14"
BY-PASS VALVE	NO
NOMINAL SIZE	2" - 48"
MATERIALS	
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 CONDITIONS	
PRESSURE RATING	ANSI B16.34

GATE SYMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS	WEDGE	SINGLE	SOLID WEB
WSF			FLEX. SOLID WEB
WDF		DOUBLE	SLIP ON OR SPLIT
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
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:

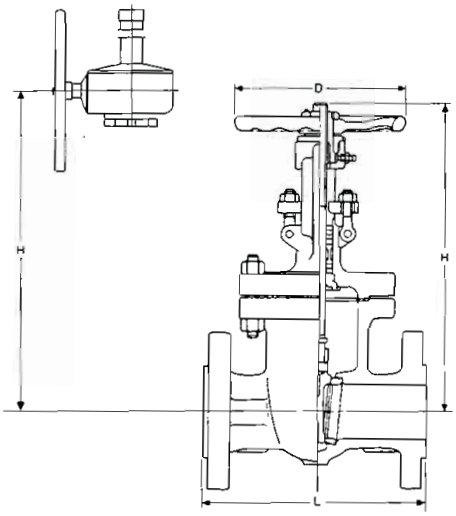
API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45, ASME B16.47

NOTES:

a) FLANGES > 24" ACC. TO ASME B16.47 SERIES B

PDIL

GATE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GAV 210S
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
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
BODY SEAT RING	A 105 STELLITED
GATE	A 216 Gr. WCB 13 Cr. FACED
STEM	13 Cr.
STEM PACKING	GRAPHITE
TRIM NUMBER	8
DESIGN CONDITIONS	
PRESSURE RATING	ANSI B16.34

GATE SYMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS	WEDGE	SINGLE	SOLID WEB
WSF			FLEX. SOLID WEB
WDF		DOUBLE	SLIP ON OR SPLIT
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
4. VALVES > = 10" AND > = 600" RATING SHALL HAVE BOSSES FOR BY-PASS CONNECTION ACC. TO API 600 AND MSS-SP 45, LOCATION E-F

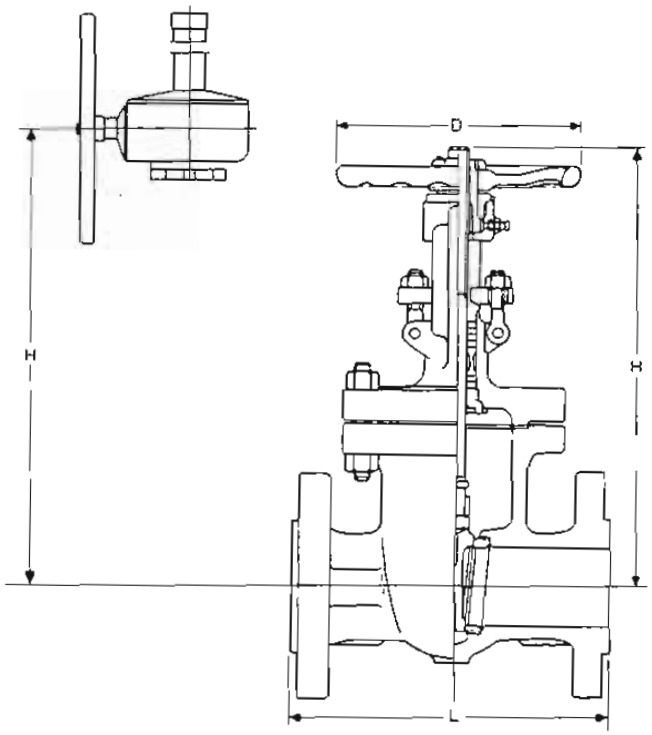
MANDATORY STANDARDS:

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

GATE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GAV 212
PRESSURE RATING CLASS	600
FACE	RF
CONSTRUCTION	
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"
MATERIALS	
BODY	A 216 Gr. WCB
BODY SEAT RING	A 105 STELLITED
GATE	A 216 Gr. WCB
STEM	13 Cr.
STEM PACKING	IMPREGNATED BRAIDED ASBESTOS
TRIM NUMBER	8

GATE SYMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS	WEDGE	SINGLE	SOLID WEB
WSF			FLEX. SOLID WEB
WDF		DOUBLE	SLIP ON OR SPLIT
PDF	PARALLEL		FLEXIBLE

DESIGN CONDITIONS		
PRESSURE RATING	ANSI B16.34	
FLUID	Kg/cm2g	°C
HYDROGEN	50	150
PROCESS CONDENSATE	47	350
NAPHTHA	46	270
SYNTHESIS GAS	90	100
PROCESS AIR	38	425

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:

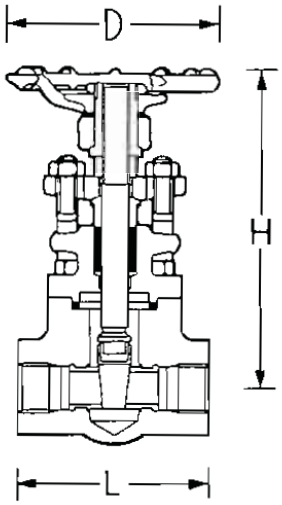
API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

NOTES:

a) WSF IS ACCEPYABLE FOR SIZES < = 6" ONLY

PDIL

GATE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GAV 501
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
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
TRIM NUMBER	2
DESIGN CONDITIONS	
PRESSURE RATING	API 602

GATE SYMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS	WEDGE	SINGLE	SOLID WEB
WSF			FLEX. SOLID WEB
WDF		DOUBLE	SLIP ON OR SPLIT
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

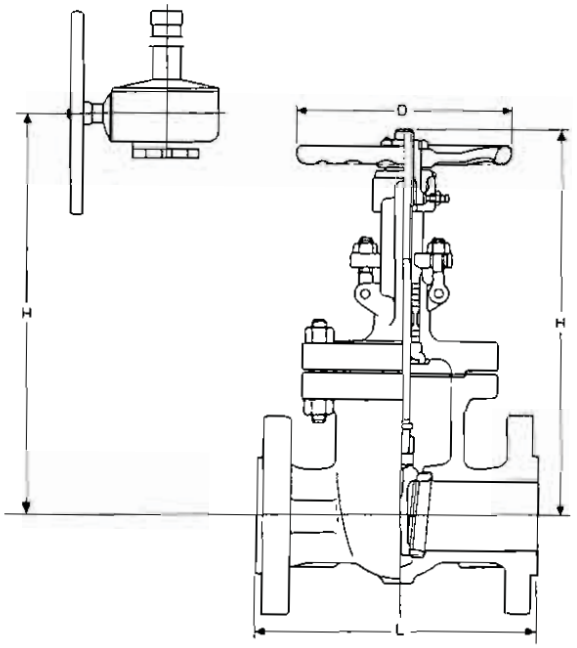
MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B16.34

NOTES:

a) LENGTH TO BE VERIFIED BY MANUFACTURER

GATE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GAV 510
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
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"
MATERIALS	
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 CONDITIONS	
PRESSURE RATING	ANSI B16.34

GATE YMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS	WEDGE	SINGLE	SOLID WEB
WSF			FLEX. SOLID WEB
WDF		DOUBLE	SLIP ON OR SPLIT
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
4. VALVES > = 10" AND > = 600" RATING SHALL HAVE BOSSES FOR BY-PASS CONNECTION ACC. TO API 600 AND MSS-SP 45, LOCATION E-F

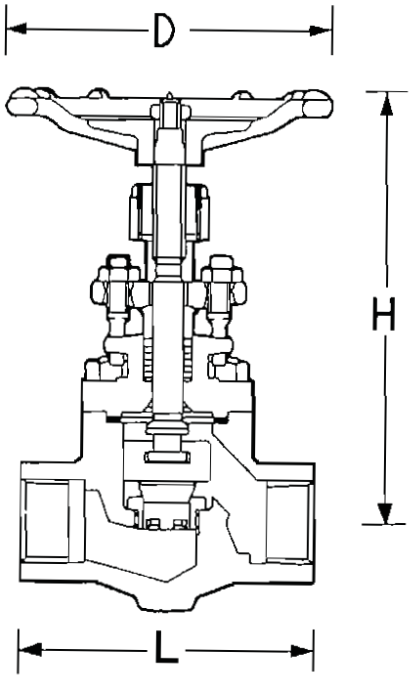
MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

NOTES:

PDIL

GLOBE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GLV 201
PRESSURE RATING CLASS	800
FACE	SW
CONSTRUCTION	
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"
MATERIALS	
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

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:

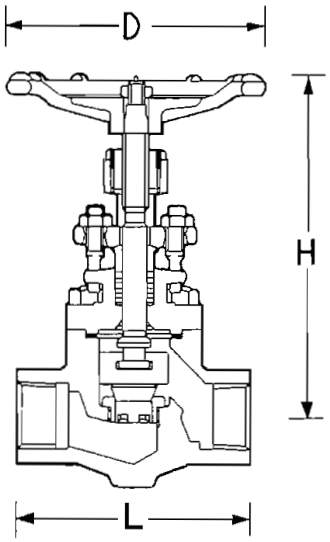
API 598, API 602, ANSI B16.11, ANSI B16.34

NOTES:

a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602
b) LENGTH TO BE VERIFIED BY MANUFACTURER

PDIL

GLOBE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GLV 201S
PRESSURE RATING CLASS	800
FACE	SW
CONSTRUCTION	
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"
MATERIALS	
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 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

MANDATORY STANDARDS:

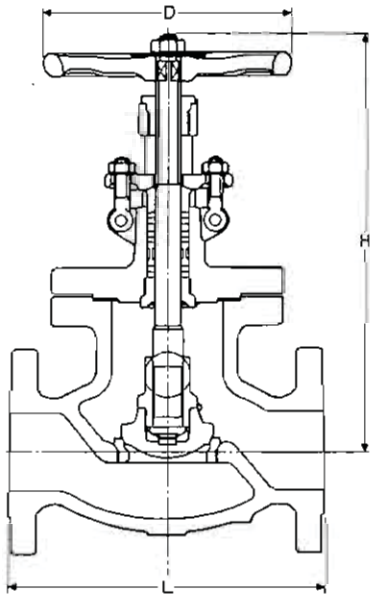
API 598, API 602, ANSI B16.11, ANSI B16.34

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

PDIL

GLOBE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GLV 210
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" - 12"
MATERIALS	
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 CONDITIONS	
PRESSURE RATING	ANSI B16.34

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

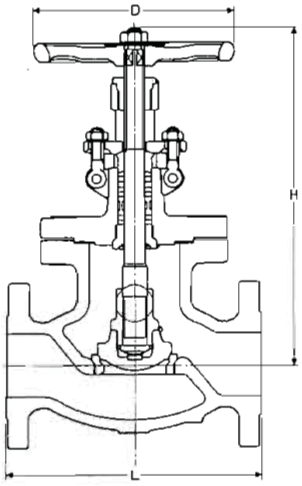
MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

NOTES:

PDIL

GLOBE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GLV 210S
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" - 12"
MATERIALS	
BODY	A 216 Gr. WCB
BODY SEAT RING	A 105 STELLITED
DISC	A 216 Gr. WCB 13 Cr. FACING
STEM	13 Cr.
STEM PACKING	GRAPHITE
TRIM NUMBER	
DESIGN CONDITIONS	
PRESSURE RATING	ANSI B16.34

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:

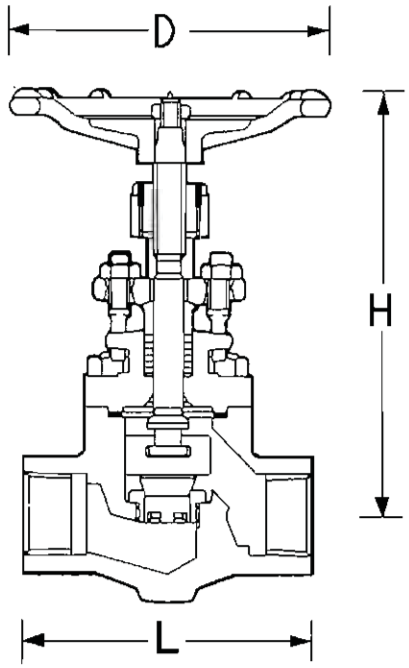
API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

NOTES:

a) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION

PDIL

GLOBE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GLV 501
PRESSURE RATING CLASS	800
FACE	SW
CONSTRUCTION	
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"
MATERIALS	
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 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

MANDATORY STANDARDS:

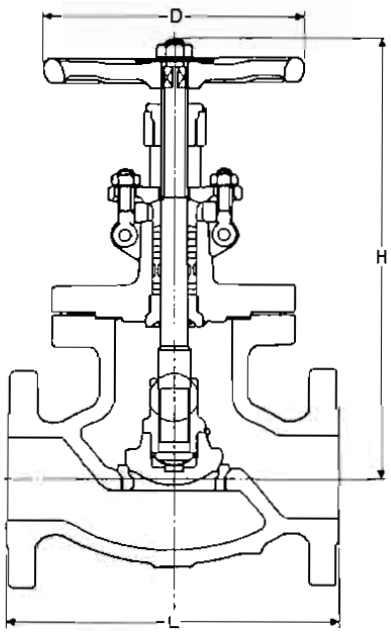
API 598, API 602, ANSI B16.11, ANSI B16.34

NOTES:

a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602
b) LENGTH TO BE VERIFIED BY MANUFACTURER

PDIL

GLOBE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GLV 510
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 351 Gr. CF8
BODY SEAT RING	A 182 Gr. F304
DISC	AISI 304
STEM	A 276 Gr. 304
STEM PACKING	GRAFOIL
TRIM NUMBER	
DESIGN CONDITIONS	
PRESSURE RATING	ANSI B16.34

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

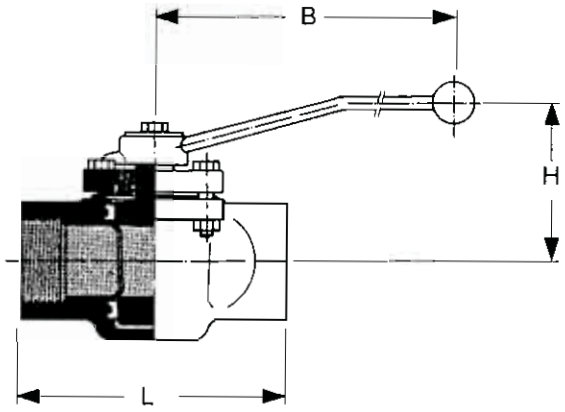
MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

NOTES:

PDIL

PLUG VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	PLV 201
PRESSURE RATING CLASS	600
FACE	TREADED (NPT)
CONSTRUCTION	
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 CONDITIONS	
PRESSURE RATING	ANSI B16.34

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

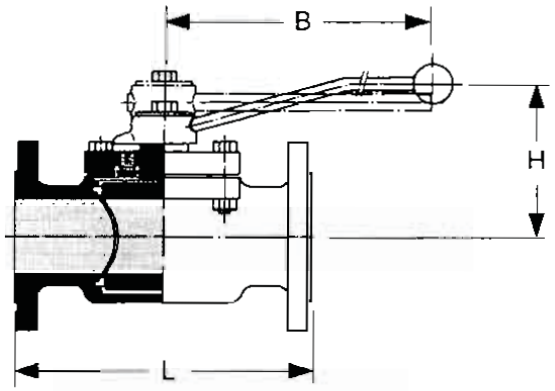
MANDATORY STANDARDS:

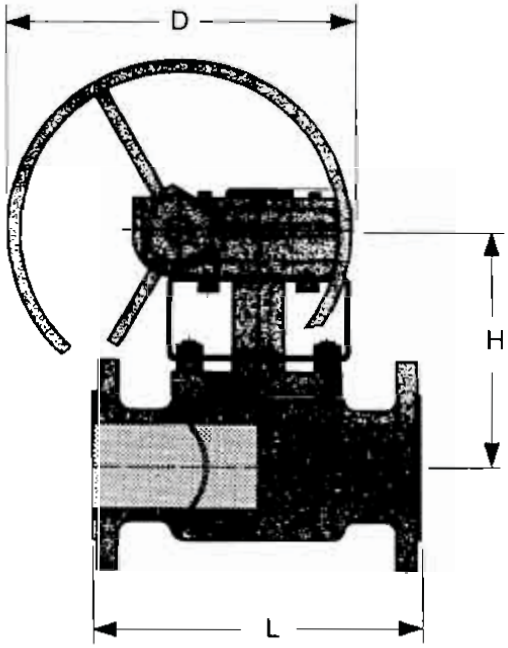
API 598, API 6D, ANSI B16.11, ANSI B16.34

NOTES:

a) EQUIVALENT CAST MATERIAL IS ACCEPTABLE

PLUG VALVE





DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	PLV 202
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
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"
MATERIALS	
BODY	A 216 Gr. WCB
PLUG	A 105 CHROMEPLATED 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:

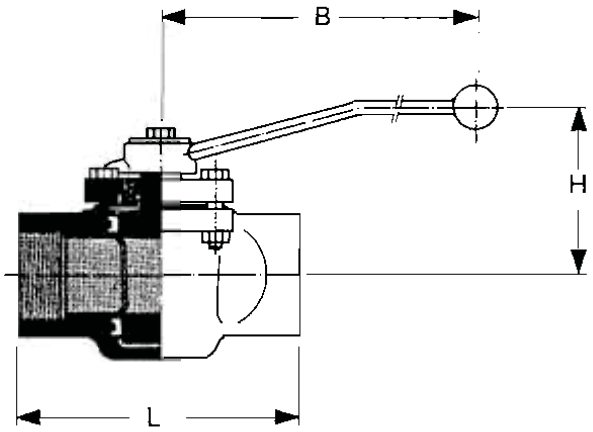
API 598, API 599, ANSI B16.10, ANSI B16.5

NOTES:

a) EQUIVALENT CAST MATERIAL IS ACCEPTABLE

PDIL

PLUG VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	**PLV 501**
PRESSURE RATING CLASS	600
FACE	TREADED (NPT)
CONSTRUCTION	
BODY	FULL BORE NON-LUBRICATED
PLUG	TAPER PLUG
WRENCH OPERATED	YES
GEAR OPERATED	NO
FIRE SAFE	NO
NOMINAL SIZE	1/2" - 1"
MATERIALS	
BODY	AISI 316
PLUG	AISI 316
BODY SEAT RING	REINFORCED PTFE
STEM PACKING	PTFE
DESIGN CONDITIONS	
PRESSURE RATING	ANSI B16.34

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

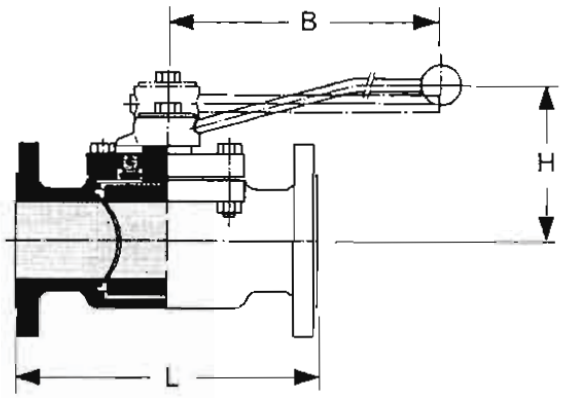
MANDATORY STANDARDS:

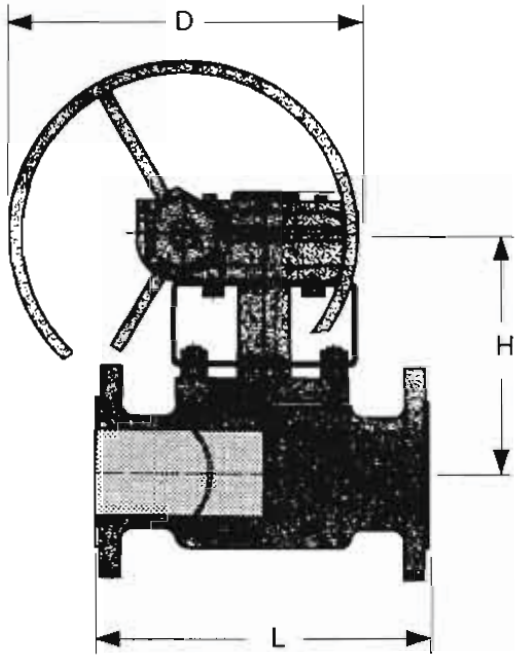
API 598, API 6D, ANSI B16.11, ANSI B16.34

NOTES:

PDIL

PLUG VALVE





DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	PLV 510
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
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"
MATERIALS	
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

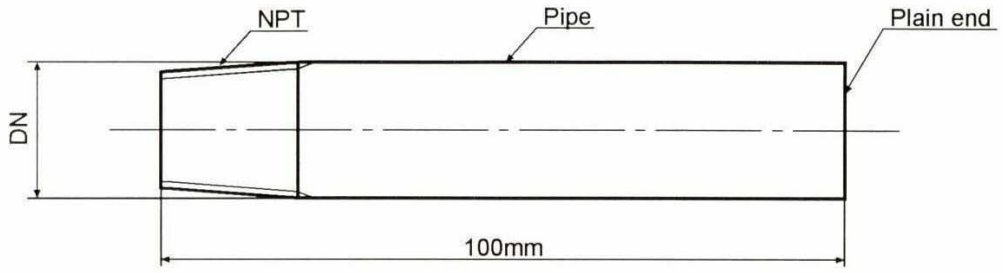
NOTES:

a) EQUIVALENT CAST MATERIAL IS ACCEPTABLE

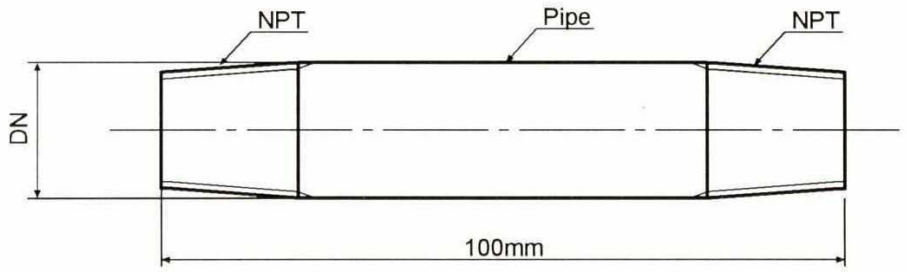
OTHER STANDARDS/DATASHEETS

NIPPLES

1) Half nipple (1/2-nipple)



2) Nipple

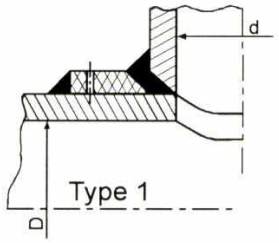


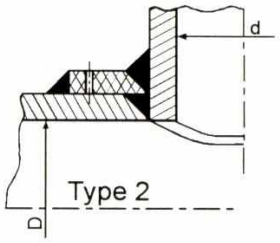
DN = 1/2", 3/4", 1" or 11/2"
Schedule and material of pipe acc. to
piping class specification

Threading acc. to ANSI B 1.20.1-1983

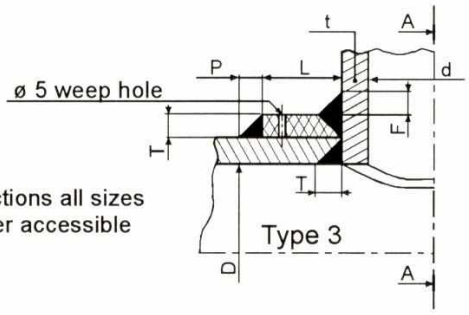
REINFORCING RINGS

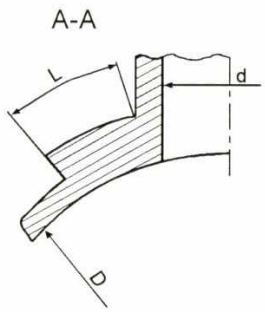
Branch connections-sizes under 24"
inside of header inaccessible





Branch connections all sizes
inside of header accessible





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.

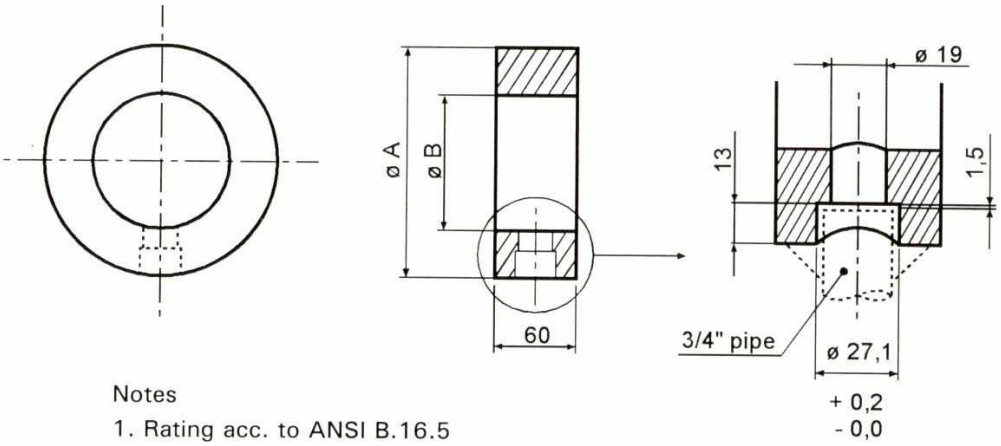
F - Fillet weld leg dimension equal to t.

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

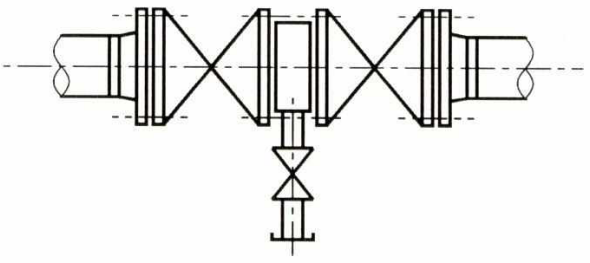
DRIP RING



Notes

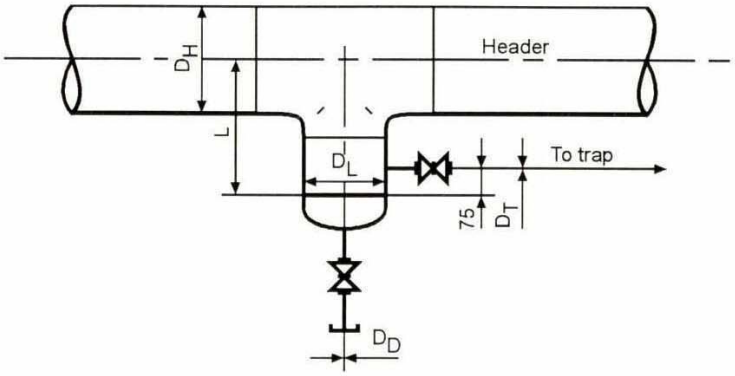
1. Rating acc. to ANSI B.16.5
2. Material in accordance with piping class
3. Faces to be machined parallel and finish to be in accordance with ANSI B.16.5
4. Nom. dia., rating and material to be engraved on edge in letters min. 5mm high e.g. 3"-CL. 600-A 182 Gr. F1

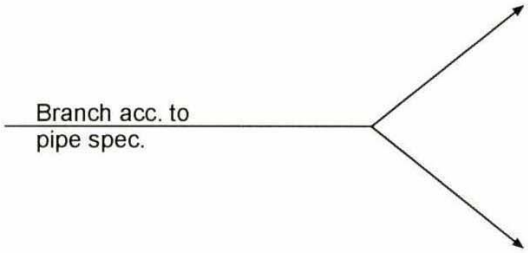
DN Inch.	Class 150 RF		Class 300 RF		Class 600 RF	
	A mm	B mm	A mm	B mm	A mm	B mm
2"	100	52	107	52	107	52
3"	132	78	145	78	145	78
4"	170	102	177	102	190	102
6"	220	154	247	154	263	154
8"	276	206	304	205	317	198
10"	336	260	358	254	396	247
12"	406	311	418	303	453	295
14"	447	343	480	334	487	317
16"	510	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

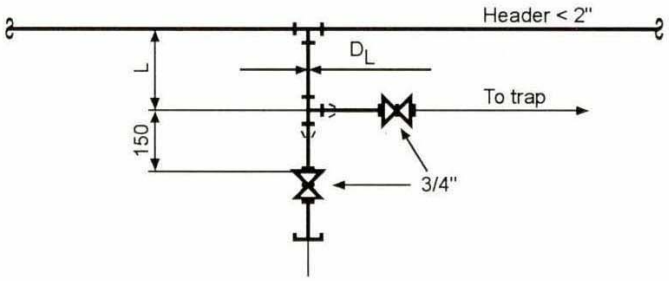


Only where no alternative installation is possible, driprings shall be used.

DRIP LEG ON STEAM HEADERS



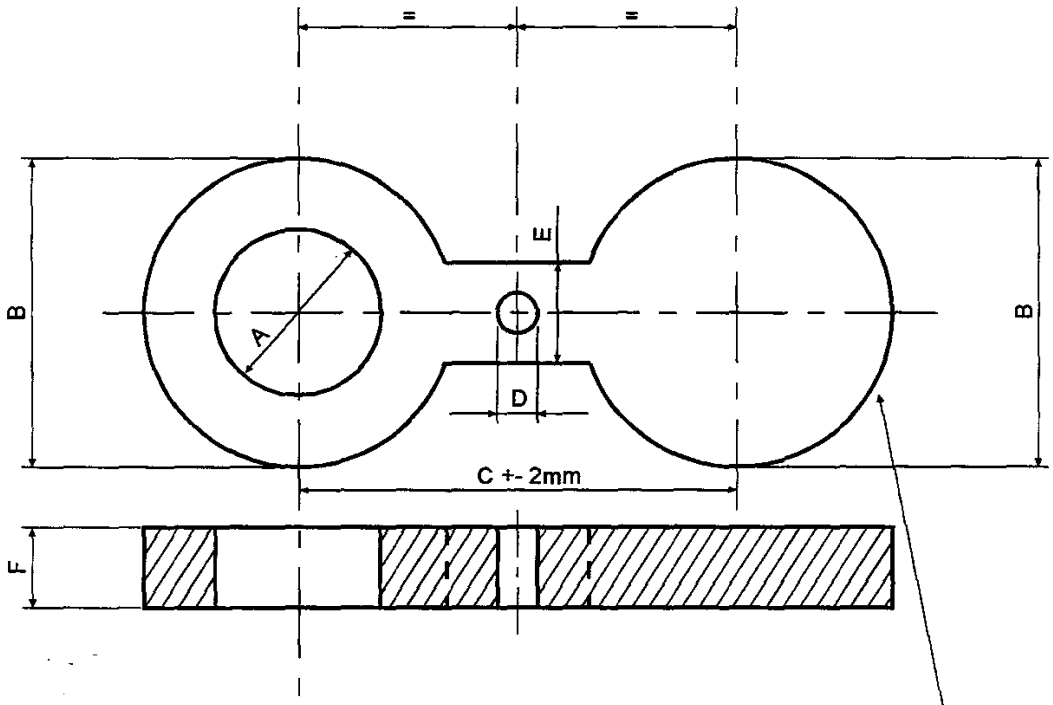




*) D_L = Header size

D_H	= < 2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
D_L	*)	3"	4"	6"	6"	8"	8"	10"	12"	12"	12"	12"
L	250	300	300	350	350	400	400	450	500	525	550	600
D_D	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"
D_T	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	1"	1"	1"	1"	1"	1"

SPECTACLE PLATE CLASS 150 RF

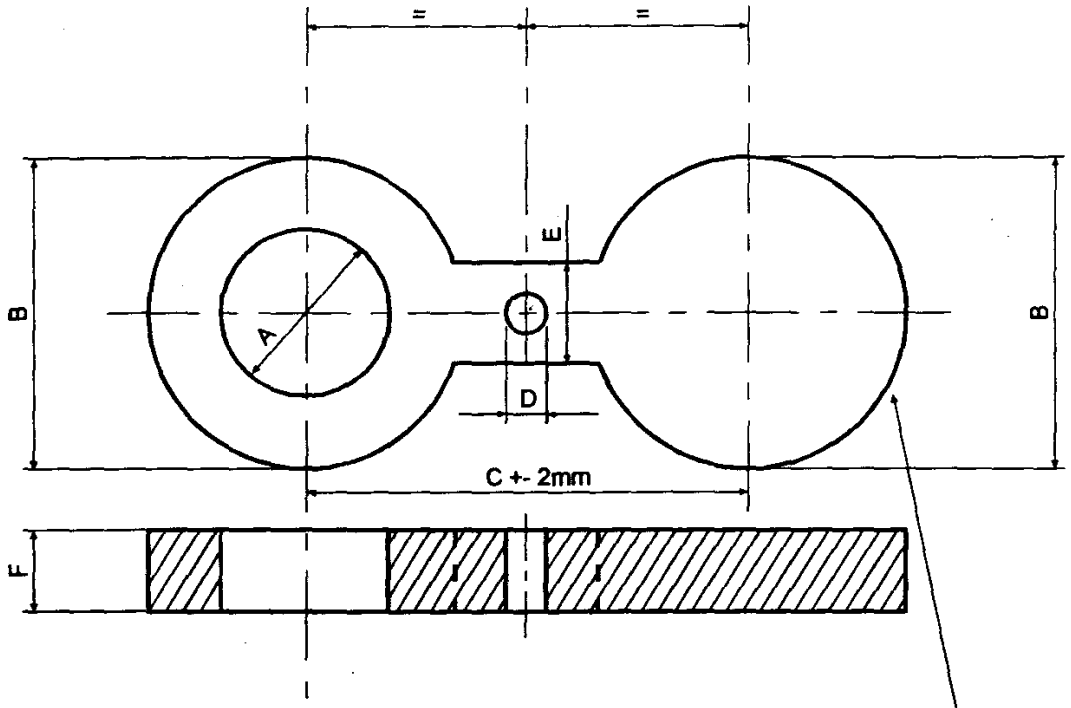


Spectacle plate suitable for flanges acc. to ANSI B16.5. Material as for flanges acc. to piping class.

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	A	B	C	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

SPECTACLE PLATE CLASS 300 RF

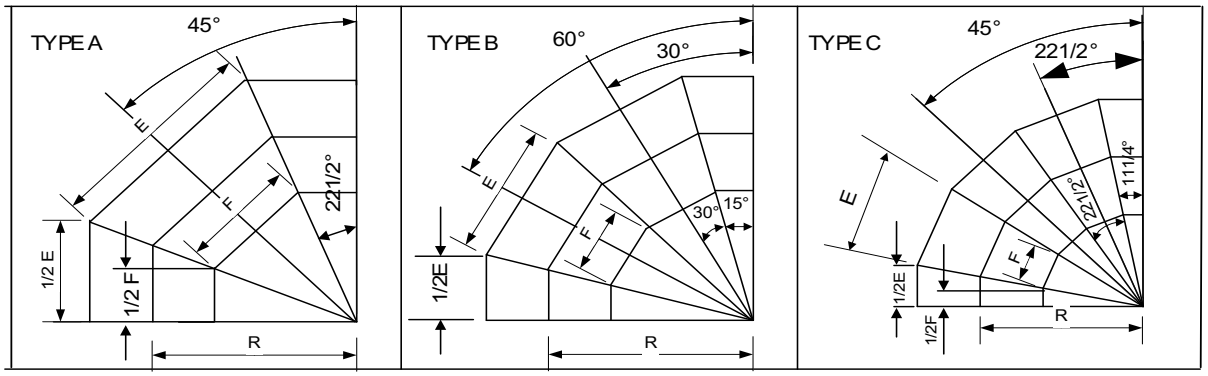


Spectacle plate suitable for flanges acc. to ANSI B16.5. Material as for flanges acc. to piping class.

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	B	C	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

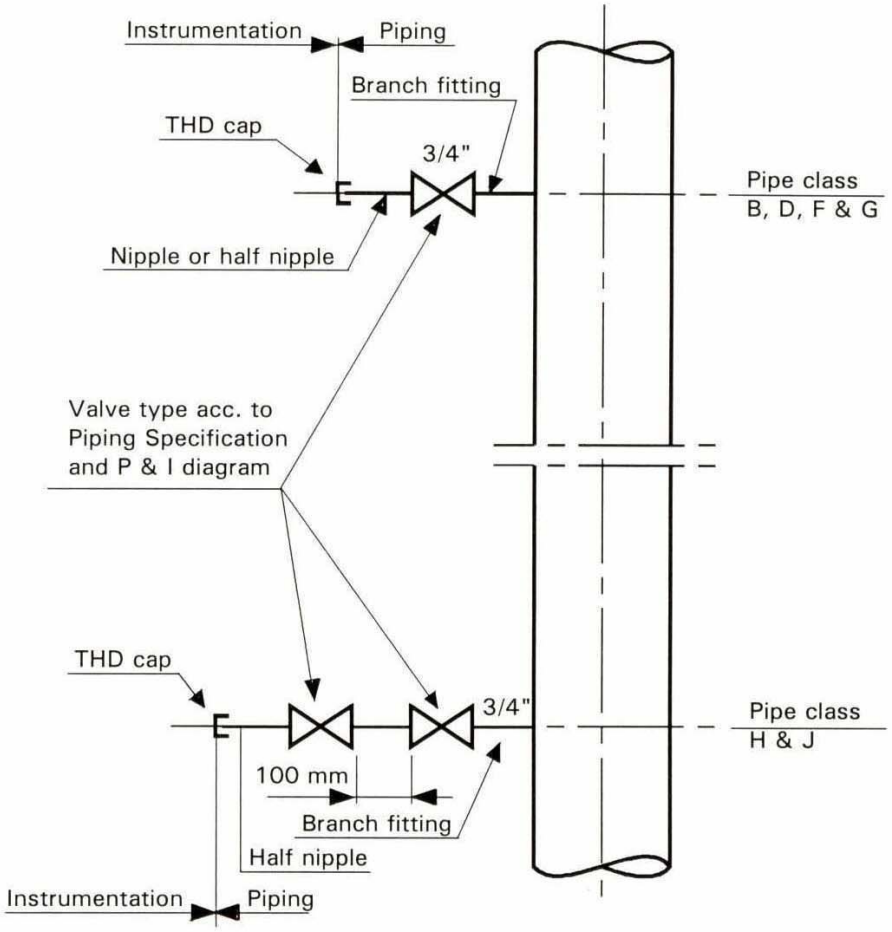


NOM SIZE INCH	OUTSIDE DIAM D mm	R =1.5D mm	30° 60°	45°	90°	$22^1/_2°$	DIMENSION					
							TYPE A		TYPE B		TYPE C	
							E mm	F mm	E mm	F mm	E mm	F mm
2	60.3	76	B	A	A	C	88	38	57	24	42	18
3	88.9	114	B	A	A	C	131	58	85	37	63	28
4	114.3	152	B	A	A	C	173	79	112	51	83	38
6	168.3	229	B	A	A	C	259	120	168	78	125	58
8	219.1	305	B	A	B	C	343	162	222	105	165	78
10	273.1	381	B	A	B	C	429	203	277	131	206	97
12	323.9	457	B	A	B	C	513	244	332	158	246	117
14	355.6	533	B	C	B	C			381	190	283	141
16	406.4	610	B	C	B	C			436	218	323	162
18	457	686	B	C	B	C			490	245	364	182
20	508	762	B	C	B	C			544	272	404	202
22	559	838	B	C	B	C			599	300	445	222
24	610	914	B	C	B	C			654	327	485	243
26	660	991	B	C	C	C			707	354	525	263
28	711	1,067	B	C	C	C			762	381	566	283
30	762	1,143	B	C	C	C			817	408	606	303
32	813	1,219	B	C	C	C			871	436	647	323
34	864	1,295	B	C	C	C			926	463	687	344
36	914	1,372	B	C	C	C			980	490	727	364
38	965	1,448	B	C	C	C			1,034	517	768	384
40	1,016	1,524	B	C	C	C			1,089	544	808	404
42	1,067	1,600	B	C	C	C			1,144	572	849	424
44	1,118	1,677	B	C	C	C			1,198	599	890	445
46	1,168	1,752	B	C	C	C			1,252	626	929	465
48	1,219	1,829	B	C	C	C			1,307	653	970	485
52	1,321	1,982	B	C	C	C			1,416	708	1,051	526
56	1,422	2,134	B	C	C	C			1,524	762	1,131	566
60	1,524	2,286	B	C	C	C			1,633	817	1,213	606
64	1,626	2,439	B	C	C	C			1,743	871	1,294	647
68	1,727	2,591	B	C	C	C			1,851	925	1,374	687
72	1,829	2,743	B	C	C	C			1,960	980	1,455	728
76	1,931	2,897	B	C	C	C			-	-	1536	768

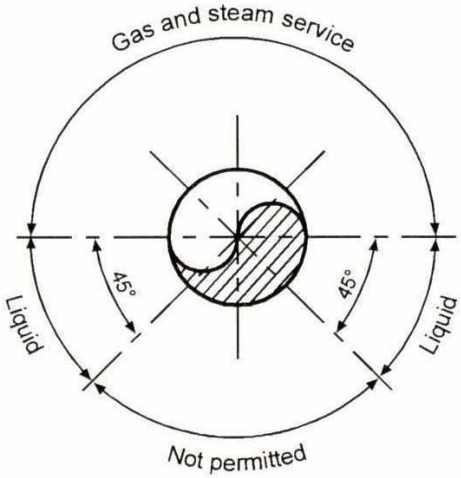
P1	27.12.2017		FOR REVIEW/COMMENT	NAZ	NS	GL/HOD
P	21.10.2017		FOR REVIEW/COMMENT	NAZ	NS	DM
REV	REV DATE	EFFDATE	PURPOSE	PREPD	REVWD	APPD

BRANCH FOR ANALYSIS - AND PRESSURE CONNECTIONS ON PIPING

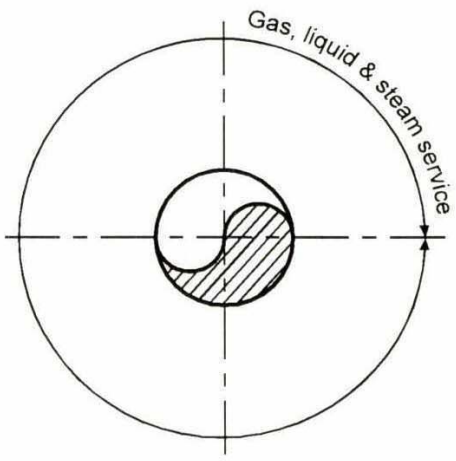
(FOR ANALYSIS CONNECTIONS WITH PROBE SEE SPECIAL DRAWINGS)



Location of branch in horizontal line

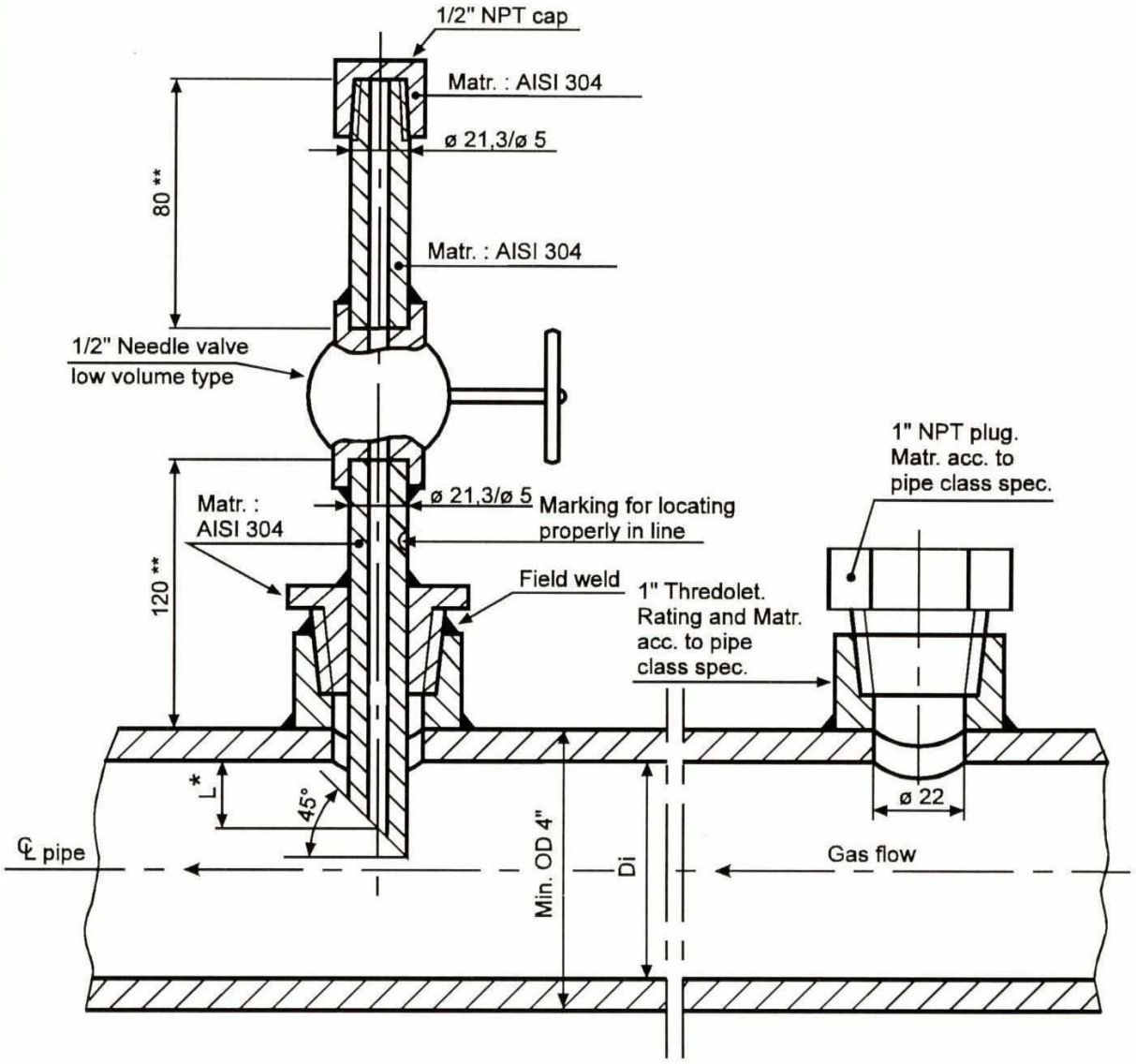


Location of branch in vertical line



All branch fittings and valves to be specified acc. to pipe class.

ANALYSIS CONNECTION WITH PROBE ON PIPE
FOR RATINGS < = CLASS 900



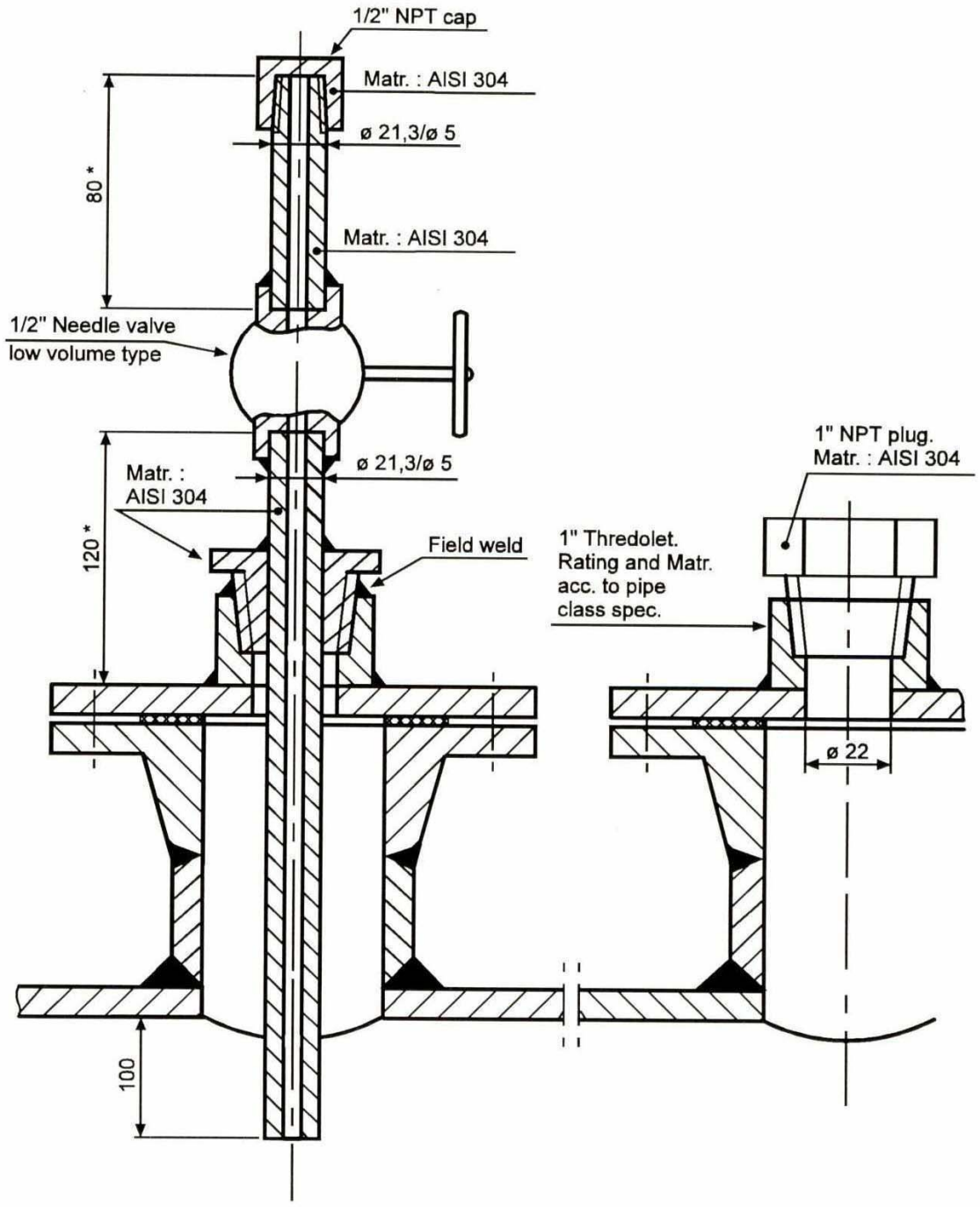
Final execution
Instrumentation supply

During pressure test and cleaning
Piping supply

* For Di > 6", L = 1/3 Di +- 1/6 Di
For Di < = 6", L = 1/2 Di +- 1/6 Di

** Shortest possible

ANALYSIS CONNECTION WITH PROBE ON EQUIPMENT FOR RATINGS < = CLASS 900



Final execution
Instrumentation supply

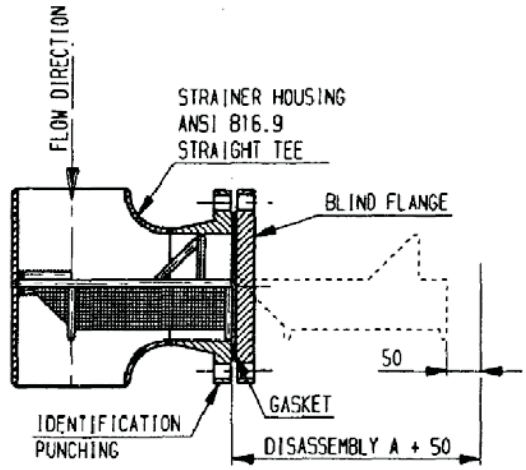
During pressure test and cleaning
Piping supply

* Shortest possible

STRAINER DATA SHEETS

PDIL

T -TYPE STRAINER



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	TTS 210	
PRESSURE RATING CLASS	150	
FACE	RF	
CONSTRUCTION		
BODY	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	
NOMINAL SIZE	2" - 24"	
MATERIALS		
BODY	A 216 Gr. WCB	
STRAINER	AISI 304	
DESIGN CONDITIONS		
PRESSURE RATING	ASME B16.34	
FLUID	Kg/cm2g	°C

GENERAL

1. STRAINER MUST BE REMOVABLE
2. COPPER AND COPPER ALLOYS NOT PERMITTED

MANDATORY STANDARDS:

ASME B16.34, ASME B16.5, MSS-SP 45

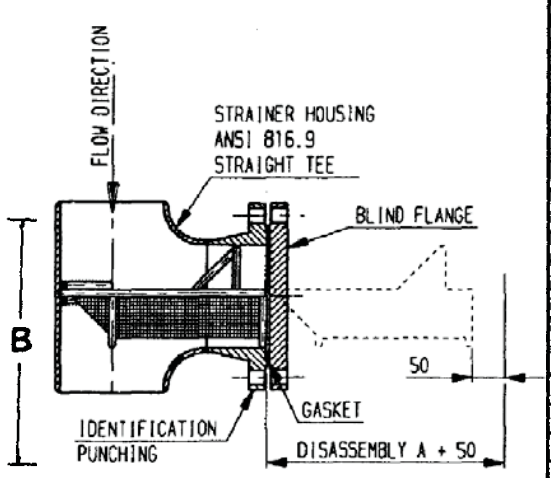
NOTES:

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

PDIL

T-TYPE STRAINER



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	TTS 510	
PRESSURE RATING CLASS	150	
FACE	RF	
CONSTRUCTION		
BODY	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	
NOMINAL SIZE	2" - 24"	
MATERIALS		
BODY	A 351 Gr. CF8	
STRAINER	AISI 304	
DESIGN CONDITIONS		
PRESSURE RATING	ASME B16.34	
FLUID	Kg/cm2g	°C

GENERAL

1. STRAINER MUST BE REMOVABLE
2. COPPER AND COPPER ALLOYS NOT PERMITTED

MANDATORY STANDARDS:

ASME B16.34, ASME B16.5, MSS-SP 45

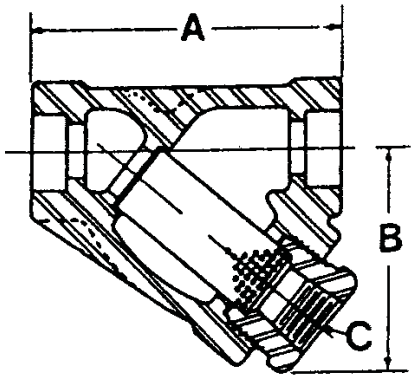
NOTES:

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

PDIL

Y-TYPE STRAINER



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	YTS 201	
PRESSURE RATING CLASS	600	
FACE	SW	
CONSTRUCTION		
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"	
MATERIALS		
BODY	A 105	
STRAINER	AISI 304	
DESIGN CONDITIONS		
PRESSURE RATING	ASME B16.34	
FLUID	Kg/cm2g	°C

GENERAL

1. STRAINER MUST BE REMOVABLE
2. COPPER AND COPPER ALLOYS NOT PERMITTED

MANDATORY STANDARDS:

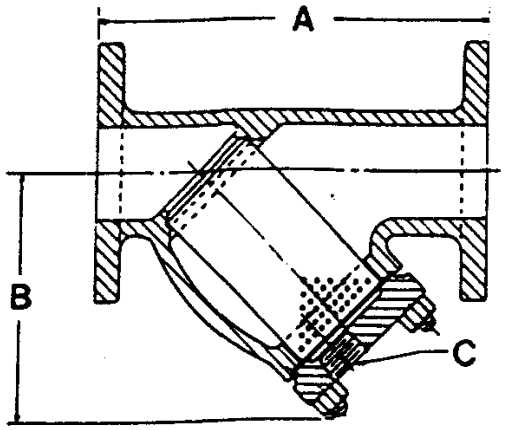
ASME B16.11, ASME B16.34

NOTES:

1. STRAINER SIZE - BLOW OFF CONNECTION
   1/2" - 3/4" 1/4" NPT PLUG
   1" - 1 1/2" 3/4" NPT PLUG

PDIL

Y-TYPE STRAINER



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	YTS 210	
PRESSURE RATING CLASS	150	
FACE	RF	
CONSTRUCTION		
BODY	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	
NOMINAL SIZE	2" - 24"	
MATERIALS		
BODY	A 216 Gr. WCB	
STRAINER	AISI 304	
DESIGN CONDITIONS		
PRESSURE RATING	ASME B16.34	
FLUID	Kg/cm2g	°C

GENERAL

1. STRAINER MUST BE REMOVABLE
2. COPPER AND COPPER ALLOYS NOT PERMITTED

MANDATORY STANDARDS:

ASME B16.34, ASME B16.5, MSS-SP 45

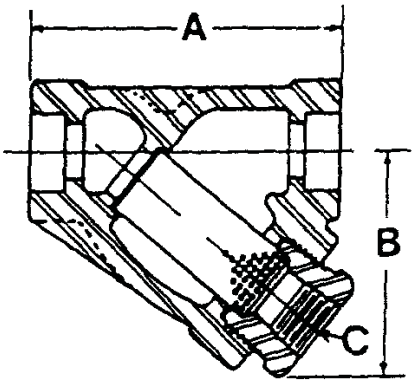
NOTES:

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

PDIL

Y-TYPE STRAINER



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	YTS 501	
PRESSURE RATING CLASS	600	
FACE	SW	
CONSTRUCTION		
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"	
MATERIALS		
BODY	A 182 Gr. F304	
STRAINER	AISI 304	
DESIGN CONDITIONS		
PRESSURE RATING	ASME B16.34	
FLUID	Kg/cm2g	°C

GENERAL

1. STRAINER MUST BE REMOVABLE
2. COPPER AND COPPER ALLOYS NOT PERMITTED

MANDATORY STANDARDS:

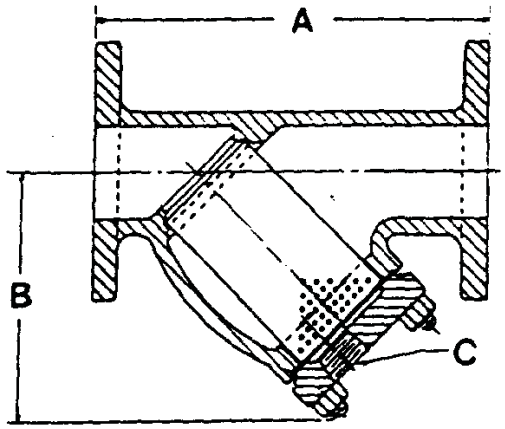
ASME B16.11, ASME B16.34

NOTES:

1. STRAINER SIZE - BLOW OFF CONNECTION
   1/2" - 3/4" — 1/4" NPT PLUG
   1" - 1 1/2" — 3/4" NPT PLUG

PDIL

Y-TYPE STRAINER



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	YTS 510	
PRESSURE RATING CLASS	150	
FACE	RF	
CONSTRUCTION		
BODY	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	
NOMINAL SIZE	2" - 24"	
MATERIALS		
BODY	A 351 Gr. CF8	
STRAINER	AISI 304	
DESIGN CONDITIONS		
PRESSURE RATING	ASME B16.34	
FLUID	Kg/cm2g	°C

GENERAL

1. STRAINER MUST BE REMOVABLE
2. COPPER AND COPPER ALLOYS NOT PERMITTED

MANDATORY STANDARDS:

ASME B16.34, ASME B16.5, MSS-SP 45

NOTES:

1. STRAINER SIZE - BLOW OFF CONNECTION

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

SECTION-2.0

SCOPE OF WORK AND TECHNICAL SPECIFICATIONS FOR PIPING & ERECTION WORKS

PART-II

SECTION-02

SCOPE OF WORK

&

TECHNICAL SPECIFICATION

OF

PIPING AND EQUIPMENTS ERECTION WORKS

FOR

COMPOSITE MECHANICAL ERECTION WORKS AT HURL GORAKHPUR

(OSBL)

REV	REV ATE	PURPOSE	PREPD	REVWD	APPD
0	28.12.18	FOR ENQUIRY	DILIP	DILIP	GC
P	08.12.18	DRAFT ENQUIRY	DILIP	DILIP	GC

CONTENTS

DESCRIPTION

Scope of works & Technical Specification for Erection of equipments / machineries/SKID, Supply, Fabrication & Erection of Piping items works.

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1.0 SCOPE OF WORK

The scope of work covers Supply of Piping materials, Valves, Flange, GASKET, STUDS & NUTS FOR ALL SIZES as per Technical specification to complete the work related to this projects erection of Equipments/machineries/SKID, fabrication & erection piping and structural's, works of HURL.

Any item/activity which is not listed here but is required for completion of job as per enquiry's scope of work, Technical Specifications and drawings shall be under Contractor's scope without any cost implication to Owner

In this Composite erection enquiry the following Philosophy has been considered Contractors:-

1. Supply of Piping material & it's fitting, Valve, GASKET, STUDS & NUTS FOR ALL SIZES as per Technical specification to complete the work related to this projects.
2. Fabrication and erection of Product piping (aboveground /Under ground piping) works
3. Fabrication and erection of Cooling water piping (aboveground /under ground piping) works.
4. Supply & Installation of Cathodic Protection.
5. Supply & Application of wrapping coating.
6. Unloading and transportation of items (Equipments & Piping).
7. Erection of new equipments (i.e. Erection of Instrument/Plant Air generation skid, Erection of Inert Gas Generation Skid, Erection of Dryers, Air receivers and Supply & Erection of EOT Crane for SKID & Dryers.
8. Supply & Installation of Steel structure work related to Crossover of pipe lines (including supply & installation of Grating as per STD.)
9. Erection of Instrumentation items if any.
10. Supply & Application of Painting of Piping & Equipments.
11. Supply & Application of Insulation of Piping & Equipments.

Pre-commissioning and commissioning activities

The scope of work shall include, but not limited to, the following:-

1.1 Unloading and transportation of equipments / materials/skid from the storage yard or directly from trailer / truck will be the responsibility of the contractor. Suitable lift machinery/equipments should be available with the contractor for lifting and erection purpose. The dedicated team should be identified with proper credentials at the work place.

1.2 Receipt of all other materials including equipments & its accessories, SKID, piping, structural and instrumentation material, storage yard and unpacking these from packages / boxes, checking and reporting the defects/damages and shortages, if any by the Contractor in writing to the Owner/Consultant. The lifting and transportation of materials shall be done by the Contractor to their site stores/yard, storage and protecting them as per relevant specification and instruction of Owner/Consultant's representative. Saddle/skirts, foundation bolts, equipment internals, davits, prefabricated structural, etc. may come in loose supply from equipments vendors. If required, Contractor shall open the boxes, remove stiffeners, bracing and any other means of protection used for transportation without any additional cost to Owner/Consultant. No separate payment shall be made for transportation of these items.

In the event of non-reporting by Contractor, of the defects/ damages and shortages of the items issued by Owner/Consultant within a prescribed time from the date of issue, the Contractor shall be responsible for any eventual consequence resulting there from and shall repair/ replace the defective/damaged items at his own risk and cost.

After opening the packing boxes Contractor shall record the items available in individual case. In case spares / tools etc. are issued to the Contractor along with equipment / accessories by virtue of having been packed in the same case, Contractor shall return to Owner's store immediately, the items which are not required by them.

If materials to be supplied by the Contractor for erection use (piping material, package items, instrument's, steel etc.), contractor shall make necessary arrangement for their storage by constructing temporary storage/sheds. Necessary arrangements for unloading and packing, lifting, shifting and transportation inside the plant shall be done by the Contractor.

1.3 Before start of any erection activities the following shall be checked by Contractor:

a. Thorough initial surveying of the SITE shall be done with regard to the proper laying/ routing of the equipment/pipe lines/SKID work. It is responsibility of contractor to generate the fabrication & erection front depending on availability of Drawings, material and site condition to co-up the progress of the work. Any delays due to this reason are solely attributable to the contractor.

b. Checking of foundations/structures including anchor bolts for their correct dimension, levels, co-ordinates etc., with reference to bench marks, well before the actual erection is planned. Discrepancies, if any, are reported to Owner for his decision so that any rectification, if required, can be carried out earlier than planned erection date. Anchor bolt's sleeves shall be free of water and debris.

c. Chipping (up to 100 mm) & removal of old grouting materials, wherever required and cleaning the top of foundation, inside the pocket for equipments, machinery, structural and pipe supports, etc. In case where epoxy grouting is required, the pockets are to be cleaned first with water and then with dry air. Compressor required for this purpose shall be arranged by the Contractor. For supports coming directly on floor, the Contractor shall be required to chip the floor and then make necessary pipe support pedestals (of concrete) as per drawing/ specification and instruction of Owner/Consultant.

d. Prior to installation of Equipments, Machineries, package items, piping & structural etc., the Contractor shall ensure the following:

i) Foundation bolts are clean.

ii) Nuts fit properly over the entire threaded length.

iii) Foundation bolts are coated properly with GREASE MIXED WITH GRAPHITE POWDER and wrapped with polythene (Threaded part only).

iv) To ensure the correctness of existing holes/slots in structure and to rectify existing holes/slots or to make new ones, if required.

e. Necessary grouting space shall be maintained by Contractor by putting packing plates (to be supplied by Contractor) as per requirement. If more than one packing plate is used to build up the required thickness, the packing plates must be tack-welded to each-other. The packing plate may be retained in their place by grouting or by tack welding (using MS/TOR steel rods) to each other. Number of packing plates should be kept as minimum as possible. Packing plates shall be free from burrs and high spots. Providing & fixing of packing plates is the part of erection & alignment of equipments without extra cost to Owner.

g. Certain equipment's platform, valve's operating platform and their gratings, indicated or not indicated in the drawings, may have to be fabricated and installed (including grouting wherever required) at site as per site requirement or as per instructions of Owner/Consultant.

h. Structural steel fabrication and erection as per requirement of site. Detailed structural drawing preparation shall be included in the rates of fabrication Refer Schedule of Rates.

i. To deliver pre-fabricated piping, supports and structural to painting yard/shop and pick up and bring back the same to erection site after shot blasting and primer paint application.

j. Carrying out Dye-penetrate examination, Radiography and other Non-destructive tests etc. where ever required as per Instruction of Engineering In charge/Owner.

k. In addition to piping designed and engineered by Consultant, Contractor shall be required to fabricate and/or erect pipelines designed, engineered and/or supplied by package vendors etc. as per instruction of Owner/Consultant.

1.4.0 SUPPLY FABRICATION & ERECTION OF PIPING (AG)

Pipes and pipe fittings in random length/No, flanges and valves etc. shall be supplied by Contractor's. As per PNMP-TS-6100 & SOR & MTO

1.4.1 a) All piping shall be assorted and marked for identification to avoid mix up of different materials, as per colour code provided by Owner / Consultant.

b) Prefabrication of piping as per convenient spools from pipes supplied in random commercial lengths (in some cases pipes may be supplied in painted condition). Contractor shall mark spools on isometrics and layout drawings in consultation with Owner/Consultant.

1.4.2 **PRE-FABRICATED PIPING**

Pre-fabricated (painted or unpainted) pipes & spools pertaining to Pump Vendor's or by package item supplier etc. shall be supplied by Owner as free issue material for their erection as per drawing and instruction of Owner if applicable.

1.4.3 Erection of fabricated and prefabricated piping including those of all on-line items such as but not limited to valves, control valves, flow nozzles, in line filters, basket strainers, Y-strainers, safety / relief valves, orifice flanges, etc. by welding, bolting or screwed joints as per drawing, specification, standards, codes and instructions of Owner/Consultant. Orifice plates, control valves, piping spools may have to be removed and re-installed after hydro-test, cleaning & blowing of pipe lines.

1.4.4 Erection of piping after cleaning from inside and joining by bolting, welding or screwing etc. at site as per drawings, specifications/standards/codes and instruction of Owner/Consultant.

The fabrication and installation of internal spacers, SS wrapper plates and swage jacket, if required, shall be done by Contractor within his quoted rates for pipes and nothing extra is payable on this account.

1.4.7 Carry out dye penetrate examination, radiography, and submission of films.

1.4.8 **For radiography use of Close Proximity Camera with Selenium Source is preferred.**

1.4.9 Modification of certain existing erected piping as per site requirement by "Dismantling and Reinstallation as per instruction of Owner/Consultant.

1.4.9 All activities listed below shall be covered under the scope of this CONTRACT. These activities shall be covered in the unit rates for pre-fabrication, fabrication and erection of piping, nothing extra shall be paid on this account unless indicated otherwise specifically :-

i) Cleaning, edge preparation, welding, Non-Destructive Tests (radiography shall be paid separately as per SOR), wherever required as per specifications/standards and codes including supply of manpower machinery, consumables, and necessary arrangements for execution of all works. Wire brush with SS bristles only shall be used for the purpose cleaning the welding joints of CS/SS piping.

ii) Pressure setting of Safety valve shall be set at respective pressure for mounting on equipment and or piping after hydro-testing flushing and cleaning of system. Checking of all rupture discs, breather valves, flame arrestors etc., shall be done prior to their installation.

iii) The Contractor shall be required to make stub-in connection for branches from main line for piping as well as instrument tapings. Stub-in connections shall include fabrication, installation and welding of reinforcement pads wherever required as per drawings, documents and standards. The fabrication and welding of these items shall also be in the scope of Contractor. However the pads and rings materials shall be

made from pipes/plates as per drawing, document, Standard, specifications and instruction of Owner/Consultant.

iv) Cutting & chipping of floors and making holes in walls, if required to facilitate pipe laying and supporting and/or fixing of sleeves. After lying of piping the cut-out holes shall be filled and finished as per instructions of Owner without any extra cost to Owner.

v) Threading the ends of C.S., GI etc piping shall be done up to 1-1/2" size, if required. Seal welding of screwed joints of C.S., GI etc. piping shall be done wherever required as per instruction of Owner/Consultant.

viii) All the flanged valves, except control valves shall be hydro-tested, at Contractor's shop prior to their erection. The defective valves shall be rectified by lapping, etc. The valves shall be suitably dried after hydro-testing.

ix) Normally for plant piping of sizes 2" and above, isometrics, shall be supplied to the Contractor by Consultant. Normally for below 2" piping isometrics are not made. In case referred to above, when isometrics are not available, piping work shall be executed as per latest revision of piping layout drawing. However, if Contractor requires isometric drawings, he may prepare the same from layout drawing and the same shall be approved at SITE by Owner/Consultant prior to execution.

xi) DELETED.

xii) Some equipment/machinery nozzles may be without flanges and require welding with pipes directly. In such cases piping may be tested by taking equipment/ machinery in the loop. But if this is not possible, the piping shall be tested by welding an end blind plate prior to final welding with equipment/ machinery; final weld testing shall be done by 100% radiography. The thickness of such blind has to be calculated by the Contractor & got approved by Owner for fixing.

xiii) Lapping if necessary shall be done on the machined seats of the mating surfaces of flanges prior to putting metallic ring gaskets.

xiv) The Contractor will be required to take up pre-fabrication of piping even prior to receipt and erection of equipment/machinery. There may be some deviations in equipment/machinery dimensions or levels and co-ordinates. This should be taken care of while prefabricating the piping spools & field joints accordingly for site adjustment. In shop fabrication as far as possible, margins for field adjustment in three planes shall be kept. Nothing extra shall be paid for cutting/welding etc. for such adjustments i.e. change in piping spool length due to site condition or change of level/coordinates will not be considered for modification and contractor shall complete the job without any extra cost to owner.

It will be responsibility of the Contractor to verify the Isometrics by physical measurements & required field joints prior to prefabrication of piping spool pieces. Contractor shall promptly inform any discrepancy in drawings to Owner/Consultant.

Though the payment shall be made as per actual measurements, nothing extra shall be payable for cutting, welding / or extra joints needed because of site adjustment.

xv) The supply and application of anti-seize lubricating compounds such as **MOLYKOTE, NEVER SIEZE, and GREASE** etc. for the protection of threads of valve stems, studs, bolts and nuts etc.

xvi) All permanent gaskets shall be fixed in the piping system just after all testing; blowing or pickling etc. operations are over, and just before leak testing / seal testing of the piping system. The temporary gaskets for testing shall be arranged by the Contractor without any extra cost to OWNER.

xvii) During bad weather, the Contractor shall make suitable and adequate arrangement by way of providing protection against rain and wind for carrying out welding and other fabrication and erection jobs smoothly at SITE, necessary rain protection hoods shall be prepared for each welder to enable him carry out the job under owner/consultant instructions.

xviii) DELETED

xix) All instruments pressure taping, temperature taping, thermowell taping and installation of welded thermowells (except instrument) shall be in the scope of the Contractor. Installation data sheets for carrying out the above jobs shall be provided at Site. Threaded/Screwed joints, if and wherever required shall be seal-welded as per the instructions of Owner/Consultant.

xx) In case of dissimilar thicknesses at any weld joint, the internal surface of thicker member shall be beveled for proper matching of I.D. The beveling slope shall not exceed 1:4. In such cases, for dissimilar thicknesses, no extra payment will be made.

xxi) Piping having threaded nozzles and threaded flanges may require chasing of flange/nozzle threads on a lathe at site to avoid interference, if any.

xxii) DELETED

xxii) Removal and re-erection of all on-line instruments during testing and / or calibration or functional testing, if so required, at SITE. Calibration and functional testing is excluded from the scope of this contract.

xiv) Carrying out hydraulic/pneumatic testing of the erected piping in loops after stress relieving if required, which shall be done only after the joints have been tested and found acceptable. Any temporary piping, temporary spool pieces, required drain and vent for hydro test and temporary supports required for carrying out hydro testing shall be supplied and erected by the Contractor within his quoted rates, nothing extra is payable on this account. Contractor is required to carry out the test, required hydrostatic drain and vent, tightening of bolts, and replacement of gaskets shall also be done without any extra cost to Owner. Equipment flanges shall be considered as part of piping system for this purpose. Making suitable arrangement for fixing of target plates shall be part of the scope of Contractor.

xxv) After hydro testing, pipe lines of sizes 2" and above shall be cleaned by air blowing and card board blasting or steam blowing, for efficient and proper cleaning of line as per instruction of Owner/Consultant. If compressor is required for these activities, the same shall be arranged by the Contractor without any extra cost to the Owner/Consultant. During this activity, the piping shall be adequately supported. Temporary piping spool shall be fabricated by the Contractor from the materials taken from the Owner and erected as per site requirement. Fabrication and fixing/removal of all spool pieces, blinds etc. required for carrying out hydro-testing/blowing shall be Contractor's sole responsibility without any extra cost to Owner. Nothing extra shall be payable on this account. For card board blasting, all materials shall be arranged by Contractor without any extra cost to Owner. Making suitable arrangement for fixing of target plates shall be part of the scope of Contractor.

xxvi) Carrying out the final "loop testing" of the entire process piping work including the erected equipment and machinery system with either air or Nitrogen at available pressure for establishing a leak proof system to the satisfaction of Owner/Consultant. It shall be noted by Contractor that after hydro-testing till completion of loop testing, no additional payment shall be made for removal/fixing and re-fixing of permanent gaskets, fasteners, valves, on-line instruments, filters, traps, etc.

1.5 SUPPLY, FABRICATION & ERECTION OF SUPPORTS

Supports falling under the scope of this enquiry shall consist of:-

a. Resting supports
b. Guide supports
c. Anchor supports
d. Axial stopper support

e. Spring supports (if any)

All structural steels required for fabrication of above supports shall consist of angles, channels, beams, plates, flats etc. including bolts, nuts and washers to be in the Contractor's scope of supply.

1.5.1 Supply and fabrication of supports as per drawings, sketches, specifications, standards and instructions of Owner/Consultant. All materials required for supports shall be in the Contractor scope except pipes for Truniun (Dummy supports).

Supply and fabrication of piping support shoes/clamps shall be done by Contractor as per support bill of materials outside the premises.

1.5.2 Erection of all supports supplied and fabricated by Contractor as well as supplied by Vendors of various packages, equipments and machinery. Contractor may be required to fabricate and install additional supports, if required, up to the time of and including pre-commissioning and trial runs of machinery. **Erection of supports shall include making of support pedestals (of concrete for all types) including grouting etc.**

1.6.0 ERECTION OF EQUIPMENTS, VARIOUS SKID & MACHINERIES ETC.

1.6.1 Erection of equipments / Various SKID and Machinery etc. leveling, alignment, finishing, grouting including supply of shims, packing plates, taper wedges etc. as required at site.

a) Checking of the level and alignment for skewness/runout of machineries

1.6.2 The following activities shall also be covered under the scope of this contract. These activities shall be covered in the unit rate of erection of equipments as the case may be and nothing extra shall be paid on this account unless indicated otherwise specifically:

a. First maintenance of Equipments & Machinery.

b. Flushing of lube oil and Seal oil piping

c. Supply and application of anti-seize lubricating compounds such as **MOLYKOT/ NEVERSIEZE** etc. for bolts and nuts of equipment.

1.7 For machineries, erection ,leveling, alignment, dowelling, drilling tapping in base plate, installation of sight glass/gauges/safety valves directly mounted on machinery supplied by vendors, coupling and decoupling from machineries for no load testing/repair by vendors, etc. and grouting (including supply of all grouting materials) shall be in the scope of contractor. Nothing extra shall be paid on this account.

1.8 First maintenance of equipment before pre-commissioning or as and when desired by Owner/Consultant.

1.9 Carrying out radiography, other non-destructive tests at site as defined in this tender.

1.11 Dismantling and reassembly of structures removed to facilitate erection of some equipment. The job may involve opening of bolts/cutting of structural member by gas and fitting back by bolting/welding.

1.12 Fabrication and erection of additional equipment supports, structures etc. shall be taken up by the Contractor and the payment shall be made Schedule of Rates

1.13 To carry out non-destructive testing. Radiography shall be paid as per unit rates stated in S.O.R. However, all other non-destructive test, as per standards, codes and specification, shall be deemed to be included in the unit rates for fabrication and/or erection as the case may be and nothing extra shall be paid.

2.0 OBLIGATION OF OWNER/CONSULTANT

2.1 To provide a plot of land to enable the Contractor to build his office, stores, fabrication shop, urinal and latrine etc., at his own cost. **For Office / Store etc. only Pre-Engineered Porte Cabins to be considered and shall be arranged by the contractor at his own cost.**

2.2 To issue hot and cold safety work permits to Contractor as and when required.

2.3 To facilitate issuance of gate-pass and night/special passes to workmen of Contractor for their entry to work SITE through security gate.

2.4 To facilitate issuance of gate-pass to the Contractor for entry of his materials and equipment including tools and tackles etc. for entry to work SITE through security gate.

2.5 To function as a medium of co-ordination between various Contractors for facilitating smooth progress of work.

2.6 Provide all clarifications in technical matters for expediting the job.

2.7 To lay down the system for issue of materials from Owner / Consultant's stores/ storage yard.

2.8 To provide information regarding availability of fronts and materials to be issued by Owner so as to enable the Contractor to plan and organize the execution of work under his scope as per the overall project schedule.

2.9 To provide the following items as free issue to Contractor:

i) To provide piping layout drawings, piping isometric drawings, line list schedule, etc., technical specification of the equipment which will be fabricated and erected at site.

Foundation bolts and anchor bolts (only which are received with equipments) for equipment. However, anchor/foundation bolts wherever required for structural steel work shall be arranged and supplied by the Contractor.

ELECTRICITY

One point free of cost construction power shall be provided by owner. Any further distribution will be the responsibility of the Construction Contractor.

CONSTRUCTION WATER

Construction water, at single point, free of cost shall be shall be provided by owner. Any further distribution will be the responsibility of the Construction Contractor

3.0 OBLIGATIONS AND RESPONSIBILITIES OF CONTRACTOR

The Contractor's obligations and responsibilities shall include but not limited to the following:

3.1 Deteted

3.2 All permanent gaskets, fasteners, such as bolts/nuts/washers etc. for all size of piping and nuts, bolts, washers etc. required for **structural** works, shall be arranged and supplied by Contractor.

3.3 ***Paved floor*** and covered shed area shall be made available for piping pre-fabrication and *work shop* without any extra cost to Owner. The pre-fabrication of piping shall not be allowed on loose earth. The Contractor must strictly adhere and built the same during the mobilization stage.

3.4 To deploy skilled, semiskilled and unskilled personnel in requisite numbers and as per scheduled programme so as to complete the WORK as per overall project schedule.

3.5 To deploy suitably qualified supervisors and engineers in requisite numbers to assure execution of good quality job as per best engineering practices and to the full satisfaction of Owner/Consultant.

3.6 To prepare detailed planning and execution schedule considering the availability of fronts and materials. This shall be reviewed by Owner and Contractor shall be required to keep updating the same (as per the instructions of Owner/Consultant) to take care of any changes in the availability of fronts and materials and to complete all jobs as per the overall project schedule. Owner shall in no way be held responsible for such changes because such changes are deemed quite a common feature in any project of this size.

"To achieve the targeted progress, as required by Owner/Consultant, the number of construction equipments, tools tackles and manpower shall be augmented by contractor without any additional cost to Owner/ Consultant. These numbers shall be based on the actual output achieved in the previous fortnight".

3.7 To check for quantity compliance between bill of materials and drawings for piping, structures etc. and intimate Owner sufficiently well in advance regarding discrepancies if any.

3.8 Compressed air generation to arrange & provide at site.

3.9 To arrange and supply all equipments/machineries, lifting, handling and shifting devices, tools and tackles which are required for the execution of jobs in sufficient quantities, as per the best engineering practices and within the targeted completion Schedule. It must be clearly under stood that Owner/ Consultant shall not be responsible for arranging or supplying any tools and tackles. Contractor shall also arrange motorised hydro-testing pump in sufficient nos. for hydro testing of pipes.

LIST OF MAJOR TOOLS AND TACKLES REQUIRED ARE AS LISTED BELOW:

a) Cranes of suitable capacity.

b) Hydra of suitable capacity.

c) Suitable Trailer with Prime Mover

d) Motor generator welding sets in sufficient numbers

e) TIG welding sets complete with all accessories

f) DG welding machines

g) Rectifier welding sets

h) Gas cutting set

i) Drilling and grinding machines

j) Air Compressor

k) Portable D.G. Set

l) Theodolites/Dumpy level /Master level/Sprit level

m) Pipe beveling machine

n) Pipe bending machines

o) Sufficient pipe fabrication stand for piping spool fabrication

p) Non Sparking Tools (Spanners / Hammering Wrenches of different sizes).

q) Manual Torque Wrench preferably ratcheting type

r) Wooden sleepers and scaffolding (metallic only) materials.

s) D-shackles, slings, lifting and spreader beams and any other special tools and tackles and facilities required to complete all jobs as per NIT to the engineering practices.

t) Viewer for interpretation of radiography.

u) Rolling M/c/Bending Machine

v) Radiography camera, Radiography source **(For radiography use of Close Proximity Camera with Selenium Source is preferred),** washing & developing facilities for radiographs. To carry-out the radiography activities the Contractor shall fulfill the criteria as follows: -

1. The Contractor's NDT Engineers / Specialists must be fully qualified by the competent authority i.e. at least ASNT / ISNT Level II in UT, MPT, DPT, RT for carrying out statutory NDT inspection as per Rule 19 of SMPV (U) Rules 1981. The copy of certificates must be submitted to Owner for verification.

2. The Contractor must have adequate qualified and experienced manpower to undertake the NDT jobs and should be capable to carry out the jobs on round the clock basis, if required.

3. The Contractor shall have adequate number of NDT equipments and all equipments must be calibrated and in good condition.

X) Central and portable electric ovens for electrode's baking & heating.

3.10 To arrange and supply all consumables (required for executing the job covered under the scope of Contractor such as but not limited to the following in adequate quantity of required quality and in time to meet the completion schedule :-

Electrodes, filler wires, industrial gases such as oxygen, acetylene, argon, water soluble paper, fuel oils, cotton waste, markine cloth, toil stones; emery papers; grinding wheel; cutting wheel; thread petroleum compounds, Teflon sealing tapes, raw dust, sponge, cardboard pickling and Passivation chemicals, Asbestos cloth and target plates etc.

3.11 To provide proper storage and security arrangements for Contractor's tools, tackles, equipments, materials etc. as well as materials issued by Owner to Contractor. Owner shall not be responsible for any loss or damage to items in the custody of Contractor at site for any reason whatsoever.

3.12 Completion of all repairs arising out of defective work done by Contractor. Owner may at his discretion require the Contractor to rectify certain defects in materials caused due to bad workmanship of supplier and/or during transportation. For such work of course, the payment modalities shall be settled by mutual agreement as per the items already available in this tender before starting such rectification jobs.

3.13 To maintain all the records for manpower, materials and execution of job as required by law as well as Owner/Consultant.

3.14 To get his work approved from statutory agencies such as but not limited to Boiler Inspector, Factory Inspector, and Inspector of Explosives etc., if required.

3.15 To make arrangements for services such as transport, medical lighting, canteen etc. for working round the clock.

3.16 In addition to safety regulations listed elsewhere in the NIT, Owner /Consultant may issue certain safety directive which shall have to be followed meticulously without any reservation.

For executing Hot Job the party should possess the following –

a. Suitable provision for Water Curtain
b. DCP Cylinder.
c. Asbestos Clothes
d. Plant Air Connectivity system to the booths

3.17 To undertake scope of work listed in this enquiry; to follow TECHNICAL CONDITIONS OF CONTRCT listed in Para No. 4.0 and to honor all other obligations listed specifically in other section or subsection of the enquiry.

3.18 Reconciliation of materials issued to Contractor as directed by Owner/Consultant.

3.19 Hand over of the completed works to Owner as per procedure laid down by Owner/Consultant.

3.20 To submit documentation forming part of request for issue of completion certificate.

3.21 Clear the site after cleaning the areas where the Contractor executed the job, stored the materials and built his office / fabrication shop etc.

3.22 For working within booths the contractor should have suitable metallic planks / gratings etc which will serve as the working platform for the executing team. **Use of Bamboo or any wooden structure is strictly prohibited**.

As the work requires working at height and within booths contractor should be equipped with scaffolding pipes of different sizes and in good condition. Scaffolding pipes will be subject to inspection prior to being cleared for erection.

3.23 Equipments / facilities for material transportation / erection/ piping alignment works like Chain Pulley Blocks of different capacities. Hydraulic / Screw Jacks of different capacities, Tripod, Platform Trolleys, Slings (Metallic/non metallic), Rope (of suitable length).Master Spirit Level.

3.24 Provide the Pre- Commissioning & Commissioning Gang: Non Sparking Tools (Spanners /Hammering Wrench of different size) + Manual Torque Wrench ratcheting type in addition to the normal tools for box up etc.

Note: - Contractor has to erect Welding Booths covered on all sides with CGI Sheets so that there is no splash over of welding / grinding sparks outside the booths at the contractor's risk and cost. Only new CGI Sheets will be allowed to be used.

4.0 TECHNICAL CONDITIONS OF CONTRACT

4.1 WELDER'S QUALIFICATION

Welders proposed to be deployed at SITE shall be tested for welding procedure qualification and welder performance qualification in the presence of Owner/Consultant or his representative or any statutory authority whenever required strictly as per standards, codes and specifications.

4.2 ELECTRODES AND FILLER WIRES

Electrodes and filler wires to be used at site in this job shall be procured from the approved vendors only. Electrodes and filter wires shall be **D&H, Advani Orlikon or ESAB, Mailam and Bohler group make only**

Selection of electrodes and filler wires shall be as per standards, codes and specifications. Tests required, if any, to satisfy the technical suitability of these electrodes/filler wires shall be arranged by Contractor at his own cost. All electrodes and filler wires shall be supplied by Contractor within their quoted rates. All welding of materials shall be as per Engineering/Technical Standard and shall be of radiographic quality. Electrodes shall be baked as per manufacturer's catalogue at suitable temperature for the requisite time before these are to be used. The ovens (mother as well as field) are to be arranged by the Contractor.

4.3 ROOT RUN USING TIG

All piping's root run for Carbon Steel weld joints shall be done using TIG welding. Welding of socket joints for all CS and C.S. piping > 600 # rating shall be done by TIG welding only.

Further to this if butt weld joints are required to be done by ***TIG welding***; only **Argon gas** shall be used both for shielding and purging wherever required.

4.4 FIRST MAINTENANCE

A. PIPING

i) After hydro-testing, all blanks, temporary spool pieces etc. shall be removed, replaced by permanent gaskets and fixtures, as required.

ii) Cleaning/blowing of piping as per specifications and instructions of Owner/Consultant.

iii) All piping, dismantled for hydro test, cleaning and blowing etc shall be re-erected in position as per drawings and instructions of Owner/Consultant.

iv) Seal / leak testing of piping shall be done as per instructions of Owner / Consultant.

v) Gland packing of valves (where defective) to be replaced. Required packing materials shall be supplied by Contractors.

vi) Removal, inspection and reinstallation of first spool pieces of suction piping of machinery before start up. Removal, cleaning and reinstallation of temporary strainers during pre- commissioning (as many times as required).

viii) Removal of pre-set pins of spring hangers (after hydro-testing) and hot setting of springs.

ix) Contractor shall provide their services without any extra cost during start-up of plant or attending leakages.

x) Temporary piping for pre-commissioning and commissioning shall be in the scope of Contractor.

xi) Tapping for instrumentation shall be in the scope of Contractor.

B. EQUIPMENTS & MACHINERY/skid

After erection and grouting (but before commissioning) the equipment shall be flushed and/or, cleaned by the Contractor. All temporary arrangements including piping, equipment etc. shall be supplied by the Contractor without any extra cost to Owner. Dismantling and re-erection of piping, manholes, internals (including re-fixing if found displaced or loose) shall be done to the satisfaction of the Owner/Consultant's representative and shall be capable to withstand maximum working pressure.

Oil flushing of machineries Oil circuits shall be carried out by the contractor if flushing is done with water, the equipment shall be dried by through compressed air, inspected by Consultant's representative and then boxed up. All the above jobs shall be done as per the instructions and to the full satisfaction of the Consultant/Owner's representative.

4.5 GROUTING

Grouting of pipe supports, structures and machineries etc. shall be carried out in general as per approved site work instruction except the following:

A) SELECTION AND TYPE OF GROUT

i) For piping support, ordinary grout mix as mentioned below may be used:

1:1:2 cement grout to which anti-shrinkage compound is added, such as CONBEX MONOLITHEX OR FERROGROUTE ETC. Pockets of rotary equipments base frame to be filled by lean concrete without extra cost to owner.

ii) During actual grouting three cubes for testing are to be taken for each batch prepared and to be tested and must meet the strength required as mentioned.

Contractor shall check and ensure that cement containing calcium chloride is not used for grouting and all grouting shall be suitably cured so as to achieve full strength. After the grout has been cured fully, anchor bolts shall be checked for adhesion with the grout by tightening of nuts.

Instructions for grouting received from equipment vendor shall override specification in this enquiry.

4.6 CONDITIONS OF ISSUE AND RECONCILIATION OF MATERIALS:-

4.6.1 CONDITIONS FOR ISSUE OF MATERIALS

Whenever any material is issued by Owner following conditions for issue of material in addition to other conditions specified in the contract shall be applicable:

1.1 Necessary indents shall be raised by the Contractor as per procedure laid down by the Engineer-in-Charge from time to time, when the materials are required for incorporation in permanent works

1.2 Materials shall be issued only for permanent works and not for temporary works, enabling works etc. unless specifically approved by the Engineer—in-Charge.

1.3 The Contractor shall bear all other cost including lifting, carting from issue points to work site/Contractor's store, custody and handling etc. and return of surplus/serviceable scrap materials to Owner's storage points to be designated by the Engineer-in-Charge. No separate payment for such expenditure shall be made.

1.4 No material shall be allowed to be taken outside the plant without a gate pass.

1.5 The Contractor shall be responsible for proper storage, preservation and watch & ward of the materials.

4.6.2 RETURN OF UNUSED MATERIAL/ SCRAP

2.1 All unused/scrap materials shall be the property of the Owner and shall be returned in good and acceptable condition category wise by the Contractor at his own cost to Owner’s Store(s).

2.2 No credit shall be given to the Contractor for return of scrap. The Contractor should quote the rates accordingly. Contractor shall make his own arrangements for weighing

the cut offs to be returned to Owner's Stores.

2.3 In case the Contractor fails to return unused materials/ accountable scrap, then recovery for such quantity of materials, not returned by the Contractor shall be affected at following penal rates from the Contractor's bills or from any other dues of the Contractor to the Owner:

S No	Material		Penal Rates
1	a.	Penal Rate for non-return of accountable scrap	Issue Rate + 25% OR Landed Rate + 25% (in case issue rate are not indicated in the contract)
	b.	Penal rate for return of serviceable materials in excess of permitted % allowances.	
	c.	Penal rate for issuance of unplanned OFC jointing kits	
2	a.	Penal rates for non-return of Unused material and or penal rate for generating scrap in excess of permitted % allowances	Twice the Issue Rates OR Twice the landed Rates(in case issue rate are not indicated in the contract)
	b.	Penal rate for using excess amount of materials like cement than permitted % allowances	

NOTE: 1) Landed Rate shall he arrived from the latest Purchase Order of respective material received at site by Owner/ Consultant.

2) In case more stringent penal rates have been indicated elsewhere in the Contract (based on Project requirement), the same shall supersede the above rates.

4.6.4 REINFORCEMENT BARS ISTRUCTURAL STEEL/PLATES

4.6.4.1 The scrap allowance for the reinforcement bars/structural steel including steel plate issued by the Owner shall be total 3% (2.5% accountable and 05% unaccountable) of the actual consumption as incorporated in the works.

4.6.4.2 All serviceable reinforcement bars/structural steel/steel plates shall be issued is available length/shapes/sizes and no claims for extra payment on account of issue of non-standard lengths/shapes/sizes and bending etc. shall be entertained Reinforcement bars and structural steel shall be issued on weighment basis as per normal warehousing practice. In exceptional circumstances, the reinforcement bars/structural steel, if issued on linear measurement, the IS coefficients for unit weight shall be considered For the purpose of billing and accounting, only linear measurements shall be taken and weight shall be calculated as per IS coefficients in three decimals. The difference in unit weight as per IS and actual as issued, if any, shall be to Contractor's account and Contractor is deemed to have considered the same at the time of bidding.

4.6.4.3 Reinforcement bars/structural steel/steel plates shall be issued only for those items where Owner's supply has been specifically mentioned in Schedule of Rates/ Scope of Supply The storage of these items shall be done in such a way so as to avoid rusting/ damage to any kind to the materials.

4.6.4.4 All reinforcement bars/structural steel (except M.S. Plates) in length of 2 meters and above shall be considered as serviceable materials provided the material is in good and acceptable condition. Reinforcement bars/structural steel section (except MS Plates) in lengths less than 2M shall be treated as scrap.

4.6.4.5 The contractor shall strive to avoid generation of cut pieces of length 2m and above, as far as practicable, by effectively planning & executing the construction works.

4.6.4.6 For the purpose of accounting of the plates, all plates measuring not less than 1 Sq.m in area and having any dimensions not less than 200mm when returned to Owner's store, shall be considered as serviceable material. All other pieces shall be treated as wastage/scraps The Contractor shall prepare a plate cutting diagram in such a way that the minimum scrap is generated, also the cut plates should be used at proper places to reduce the scrap.

4.6.4.7 The serviceable cut pieces as mentioned in 4.4 & 4.5 above shall be considered as unused material for reconciliation purpose. Material appropriation shall be done and wherever applicable, the recovery at penal.

4.6.5.0 PIPING MATERIALS

4.6.5.1 All serviceable pipes shall be issued in available lengths/shapes and no claims for extra payments on account of issue of non-standard length & shape shall be entertained. Pipes shall be issued on linear measurement basis All valves, flanges, fittings etc. shall be issued on number(s) basis, Contractor shall store the materials in such a way so as to avoid mixing of different types of material and shall maintain complete identification and traceability at all times.

4.6.5.2 The scrap allowance for pipes issued by the Owner shall be 3% (2.5% accountable + 0.5% unaccountable) of the actual consumption as incorporated in the works.

4.6.5.3 All pipes in length of 2 meters and above shall be considered as serviceable material provided the material is in good and acceptable condition and has clear identification and traceability (Manufacturer’s name, heat number/batch number and test certificates).Pipes in lengths less than 2M shall be treated as scrap. The contractor shall strive to avoid generation of out pieces of length 2m and above as far as practicable, by effectively planning & executing the construction works.

4.6.5.4 All unused/scrap pipes, valves, flanges, forged fittings like elbows, reducers tees shall be returned by the Contractor category wise duly cleaned, greased and spec. marked at his own cost to Owner's stores.

4.6.5.5 Material appropriation shall be done and wherever applicable, the recovery at penal rates as per clause 4.6.2.3 above shall be affected from the contractor.

4.6.6.0 EQUIPMENTS

Various equipment/materials intended for the installation shall be received by Owner in unpacked, skid mounted, crated, packed or loose condition and shall be stored in the warehouses and open yards. In general, materials shall be issued to the Contractor in 'as received' condition, It shall be the Contractor's responsibility to draw, load and transport all materials from Owner's designated places of issue to the point of installation and return all packing materials like steel frames, wooden boxes/scrap etc.to Owner's stores.
All materials supplied by the Owner shall be duly protected by the Contractor at his own cost with appropriate preservative like primer, lacquer coating, grease etc. as required.

4.6.7.0 LINE PIPES

7.1 All bare/ coated line pipes as per Line Pipe specifications shall be issued on linear measurement basis. The serviceable line pipes shall be issued in available lengths and shapes and no claim for extra payment on account of issue of non-standard length and shape shall be entertained. Contractor shall store and maintain the line pipes in proper manner to avoid mixing of different classes of pipes. Contractor shall maintain complete identification and traceability at all times. All out pieces when returned to Owner's storage points after beveling shall be considered as serviceable material provided:

a) Corrosion Protection Coating is intact.

b) Pipe pieces have pipe specifications, manufacturer's logo/name and heat number duly authenticated with hard stamp of the authorized inspector as per approved procedures

All out pieces of pipes measuring less than 2 M shall be treated as wastage/scrap.

The contractor shall strive to avoid generation of cut pieces of length 2m and above, as far as practicable, by effectively planning & executing the construction works.

7.2 For the purpose of accounting of bare/ coated line pipes, following allowances shall be Permitted:
a) Unaccountable wastage
Up to 100 Km 0.1%, 101 to 500 Km 0.07%, Beyond 500 Km 005%

c) Scrap (All cut pieces of pipes measuring 0.25% less than 2 Meter).

c) Serviceable materials (All out pieces of pipe 05% measuring 2 Meter and above).

The percentage allowance shall be accounted on the basis of pipe book chain age for main pipeline.

7.3 Material appropriation shall be done and wherever applicable, the recovery at penal rates as per above shall be affected from the contractor.

4.7 NON DESTRUCTIVE TESTING

Radiography of weld joints, DP testing (DPT materials is only of ITW Signode/ Ferrochem/Checkmate), shall be carried out by Contractor as per codes/standards/ specifications wherever required. **Close Proximity Radiography (CPR) to be used** by using suitable source of suitable strength depending upon thickness shall be used up to 30 mm thick pipes. For more than 30 mm thickness of pipe, DPT at root run will be done, filup up to 30mm shall be tested with radiography and final welding shall be tested with ultrasonic testing. Ultrasonic testing charges are covered in unit rates of piping. The joints to be radio graphed shall be selected by Owner/ Consultant. Radiography of repaired joints shall be at Contractor cost.

The decision of Owner/ Consultant regarding interpretation of radiographs shall be final. For higher thicknesses where **CPR** is not possible, ultrasonic testing shall be carried out. Testing being a specialized job, it is mandatory that Contractor must get this job done through approved agencies listed elsewhere in this enquiry. Where less than 100% examinations reveal, unacceptable defects in a weld or welds, two further welds per defective weld in batch, represented by this welder shall be tested. If the tests of these further welds reveal no unacceptable defects, the defects in the first weld or welds shall be repaired and re-tested. However, if the further welds in the batch reveal unacceptable defects, all the remaining welds in the batch shall be inspected, without any extra cost for the increase in number of radiographs on this account.

100% D.P. Testing of root weld shall be done.

Radiography of weld joints shall be as per specification for all piping.

Note: - For radiography use of Close Proximity Camera with Selenium Source is preferred.

4.8 HYDROTESTING

Hydraulic/Pneumatic testing including repair, rectification and retesting of the complete piping system, by making suitable loops in consultation with Consultant's representative, shall be done by the Contractor. The decision to include any equipment in a loop or not shall be taken by IOCL's representative. All the necessary materials and arrangements required (such as but not limited to blanks, temporary supports, temporary spools in place on on-line instruments, pressure gauges, pumps suitable for required hydro test pressure, including connected piping and accessories for pumps temporary fasteners etc.) shall be in the scope of Contractor. The pressure gauges shall be used after due calibration and

certification by the Consultant's representative (a valid calibration test certificate shall be made available at all time of test by the Contractor).

During testing all on-line instruments may have to be removed or blanked as required by Owner/Consultant. If removed, necessary spool pieces are to be fabricated and installed by Contractor without any extra cost to owner. The above instruments shall be installed back in the line only after cleaning and blowing of the line is over. Additional vents and drains, if required for pressure testing, shall be installed by Contractor without any extra cost to owner. All the above activities form part of hydro-testing/ pneumatic testing, as the case may be. After hydro/pneumatic testing is completed to the satisfaction of the Owner / Consultant's representative, the piping shall be cleaned and blown with steam/air as per relevant technical specification. All on-line instruments shall be removed, (except if permitted by the Owner / Consultant's representative) and installed back after cleaning of the pipe line. Whenever the on-line instruments are to be removed, supply, installation and removal of spool pieces shall be arranged by the Contractor, without any extra cost to the Owner/Consultant.

4.9 CARD BOARD BLASTING

The pipe lines which are required to be cleaned by air/card board blasting shall be done as per standards, specifications and instruction of Consultant in order to ensure that the lines are cleaned properly. For this purpose, the following points are kept in view:

i) Lines to be card board blasted shall be properly supported.

ii) One end of the line shall be blanked with two or three "standard card boards of 1/16" thickness & target plate" using flanges and bolting system.

iii) Other end of the line shall be connected to the pneumatic pressure system.

iv) Air pressure shall then be increased till the card board bursts at around 3-4 Kg/cm^2 pressure, thereby expelling out even the tiniest dust, rust and weld slag particles from inside of the pipelines.

v) Target plates are to be used here to check if the line is fully cleared.

vi) Supply of target plates and card-board shall be in the scope of Contractor

4.9. a STEAM BLOWING

For lines which require steam blowing the following are to be kept in view while carrying out job as per standards, specifications and instructions of Consultant.

i) Lines to be steam blown shall be properly supported.
ii) Temporary lines are required to be laid for proper venting of steam. Such vents shall be properly supported.
iii) Then open end of vent line shall be provided with suitable arrangement for fixing oftarget plates.
iv) The total loop shall be allowed to get heated up with suitable pressure steam for a certain interval after which steam should be vented and line allowed cooling. This alternative heating, cooling and venting shall enable proper cleaning of pipe line.

v) After some cycles, target plates shall be installed to gauge the status of cleaning. Steam blowing shall continue till satisfactory results are obtained.

4.10 MEASUREMENTS

4.10.1 FOR STRUCTURALS

A) For payment, weights indicated on approved vendor drawings shall be taken. Where weights are not indicated on vendor drawings, net weight indicated on packing lists shall be taken or as per IS hand book (SP-06). However, if weights are neither indicated on vendor drawings nor on packing list, weights shall be calculated from approved vendor drawings. For calculation of weights the following guidelines shall be followed:

i) Weld metal weight shall not be considered.

ii) No deduction or addition shall be made for opening and for nozzles less than 300 mm diameter.

iii) For 300 mm and above openings, nozzles and skews the actual weights shall be added or subtracted.

iv) Weights of structures and plates shall be taken as per IS hand book (SP-06).

v) For structural / heat exchangers base plates, if the weights are not available in the drawings the same shall be taken as per relevant ISI hand book / code (SP-06).

4.10.2 FOR PIPING

i) To make payment for Erection of piping, the length of piping shall be measured along the centre line of piping including all fittings but excluding valves and spectacle blinds (which are being paid separately). Length of piping shall be calculated from isometrics. However, if no isometric exists for a line, actual measurements shall be taken at site.

ii) On-line instruments such as Control valves, Rota meters, Orifice plates and Steam traps, in-line Filters and Strainers, Expansion bellows, Bellmouth, Vortex breaker, Spectacle blind, Relief/Safety valves etc. shall be treated as Valves. For Relief/Safety valves, the size at smaller end shall be considered.

iii) Measurement for branch connection shall be taken from the root of Stub-in or Weldolets joint, However separate payment shall be made for RF Pad as per SOR.

iv) Reducers shall be paid along with piping of larger diameter, except in the case of funnels, where they shall be paid along with drain pipe to which they are connected.

v) Weight of supports shall be calculated from support sketches, drawings or standards and specifications using ISI hand book.

vi) Weight of structural steel platforms shall be taken as indicated on drawings. If not indicated on drawings, the same may be calculated using ISI hand book.

vii) Payment for radiography shall be made based on as per SOR specification weld radiographed.

viii) The payment shall be made for the weld joints found acceptable and no payment shall be made for defective weld joints. Payment for overlapping of films is not permissible, though overlapping is required.

4.10.3 FOR EQUIPMENTS/MACHINERIES

For payment weights indicated on approved vendor drawings shall be taken. Where weights are not indicated on vendor drawings, net weight indicated on packing lists shall be taken. However, if weights are neither indicated on vendor drawings nor on packing list, weights shall be calculated from approved vendor drawings.

For structural/heat exchangers base plates, if the weights are not available in the drawings the same shall be taken as per relevant ISI hand book/code (SP-06).

4.11 TRIAL RUN, TESTING AND COMMISSIONING

All machines shall be put on trial for 72 hours continuously as per instruction of Owner/ Consultant. The Contractor shall provide his competent personnel during trial run. Final inspection of bearings etc. to be carried out after trial run shall be part of trial run and testing. Up to this activity, the services of Contractor are covered within the unit rates of erection.

During commissioning i.e. after trial run and testing is over, Owner/ Consultant may require the services of Contractor's skilled/unskilled personnel up to a period of one year from the date of issue of completion certificate. These persons shall be paid as per the man-hour rates. The requirement of number and type of people shall be indicated to Contractor at least 15 days in advance. This one year period shall not be counted as part of Contractor period.

4.12 STANDARDS, CODES & SPECIFICATIONS

The latest revision of the following standards codes and specification shall form part of this enquiry:

4.13 INDIAN & INTERNATIONAL CODES (FOR REFERANCE)

a) ANSI: B 31.3

b) ASME SECTION VIII & IX (Latest revision)

c) IS-800 CODE OF PRACTICE FOR STRUCTURAL STEEL IN GENERAL BUILDING CONSTRUCTION (Latest revision)

d) IS-554 - DIMENSIONS FOR PIPE THREADS FOR PRESSURE JOINTS

4.14 GENERAL INSTRUCTIONS FOR STORAGE OF PIPING

4.14.1 Following shall apply for the storage of equipments to be supplied to the Contractor, unless superseded by other orders.

4.14.2 **STORAGE METHODS**

a) Open-air storage

b) Open-air storage, area fenced

c) Roofed, open-air storage, area fenced

d) Storage in building or rooms provided with lock and key

e) Storage in unheated rooms

4.14.3 **STORAGE OF PIPE**

a) PIPES (carbon steel), Suitable storage: open-air storage. Measures to be taken:

The material is to be stored separately by nominal size and wall thickness and appropriately colour-coded. The pipes are to be placed on wooden supports in a manner as to prevent them from shifting. Good accessibility is to be provided for transportation facilities and lifting gear. The end of special pipes (e.g. high pressure pipes) is to be protection against damage.

b) Piping Elements Such As Fittings, valves etc

Suitable indoors storage, Secured 4.15.2 (a)

Special Measures:

The piping materials are to be stored on solid, well accessible and marked shelves, and also care should be taken not to damage the facing when placing the items into or withdrawing them from the stores. Protective covers are to remain on the valves, etc. until commencement of erection without any extra cost to owner.

c) STORAGE OF PACKING MATERIAL:

Suitable storage: open-air storage area

Measures to be taken: To be prevented from coming in contact with the soil, and shall be covered with tarpaulins.

4.14.4 **STORAGE OF EQUIPMENTS**

Sealing faces area to be protected against damage and corrosion. The equipment is to be protected from incoming contact with the soil by providing wooden supports. The openings are to be covered to prevent rain, snow, sand etc. from entering.

4.14.5 **SPECIAL INSTRUCTIONS**

a) The equipments are to be stored in such a manner that the markings are clearly legible and visible.

b) Attention is to be paid during storage to any special symbol marked on the packing or equipment (according to the shipping instructions).

c) Any protections provided on the machinery shall not be removed during storage.

4.15 **GENERAL INSTRUCTIONS TO CONTRACTOR**

4.15.1 All weld joint designs shall be deployed as per technical specifications. For alternative weld joint design, prior approval of OWNER/CONSULTANT is required.

4.15.2 Maximum tolerance on line and level of steel work shall be ± 3 mm on any part of the structure. The structure shall not be out of plumb more than 3.5 mm on each 10 m section height and not more than 7 mm per 30M section height. This shall apply unless indicated otherwise on drawings.

4.15.3 The use of existing foundation, structures and supports as a point of anchorage for lifting, pulling and locking purpose is prohibited and shall be allowed only when Owner/Consultant permits in writing.

4.15.4 At SITE, Consultant's representative shall have access at all times to all jobs being executed by the Contractor. The Contractor is bound by CONTRACT to provide him with all facilities, access to the jobs etc., in order to enable him to conduct inspection, checking, testing etc. as per his requirements. Regarding interpretation of drawings and technical documents, methodology in which jobs are to be executed, modifications necessary to complete a job or jobs etc. and in all other SITE matters the decision of Owner/Consultant representative shall be treated as final.

4.15.5 Prior to connecting, of the two equipments, or an equipment/ machinery with piping, tack welding of joints shall be done and got approved from Owner/Consultant prior to actual welding and completion of the job.

4.15.6 The Contractor shall arrange for daily cleaning of his SITE area of execution, including trenches, pits and drains, without fail. If he fails to do so, Owner/Consultant shall arrange to carry out this job through any other agency and cost for this shall be deducted from the running bills of Contractor.

4.15.7 The following safety factor shall apply to all lifting equipments:

Hoisting line	- 3.5
Guy wires	- 3.0
Slings	- 5.0
Shackles	- 5.0
Safety factor	- Breaking strength/load

4.15.8 Load test of all lifting tackles of Contractor shall be conducted by Contractor at SITE in the presence of Owner/ Consultant before such tackles are used at SITE.

4.15.9 Anchor bolts for sliding saddles shall be kept in the middle of slotted holes. The nuts for sliding saddles are loosened approximately by 3 mm and then counter nuts are tightened.

4.15.10 during the bad weather condition, the Contractor shall make suitable and adequate arrangement by way of providing protection against rain and wind for carrying out welding and other fabrication and erection jobs smoothly at site.

4.15.11 Lapping shall be done on the mechanical seats of the mating flange surfaces prior to putting metallic ring gaskets wherever required.

4.15.12 During alignment of moving machineries, wherever cutting, grinding, minor welding, lapping etc. would be required to complete alignment operations, the same shall be provided and arranged by Contractor without any additional cost. Weights of the machinery in the bill of quantities and schedule of rates are indicative only.

4.15.13 However, erection of piping etc. is to be undertaken using mobile cranes of Contractor. Availability of mobile cranes from Owner/ Consultant shall not be considered at all in CONTRACTOR'S offer.

4.15.14 Irrespective of the piping class, all welds in CS/SS Pipes of lube oil and seal oil circuit shall be made using TIG welding with Argon gas backing.

4.15.15 Quality control procedures and instructions for various supervisions in writing shall be prepared by the Contractor before opening their site. It shall be duty of quality control engineer to see that supervisors are following the same in Toto.

4.15.16 some of the equipments may come with blanks welded on the nozzles provided for protection/hydro test. Cutting of such blanks and edge preparation of such nozzles as per direction of Owner/ Consultant of such equipments and nothing extra shall be paid for this activity.

4.15.17 Contractor shall ensure that during the above ground welding job, asbestos cloth shall be used to cover instruments; cables etc., so as to avoid damage to these as well assure safe working conditions at lower levels.

4.15.18 The Contractor shall make necessary arrangements for transportation to site and safe storage (storage room duly approved by BARC/DOSE) of radiographic source at site without any cost to Owner. However necessary space shall be provided by Owner.

4.15.19 Equipment and structural shall be preserved after erection till Commissioning of plants as per instructions of Owner /Consultant. Any damage and/or cost of rectification because on non-compliance of above shall be to Contractor's account.

Even after handing over of the work to Owner/ Consultant if some defects, dirt and foreign materials are found inside the equipment, wrong fitting of any sort etc.; which could not be detected during the time of execution, were noticed; Contractor must make good the above mentioned defects; clean the inside of the equipment properly, arrange for proper fitting etc. at his own risk and cost, without any additional cost to Owner/ Consultant.

4.15.20 Machineries shall be stored with adequate care. Direct mounted instruments shall be removed from machine before transportation during storage and erection (to be properly tagged and marked for identification) and shall be mounted just before pre-commissioning. Flanged connections of all machines to be kept blanked or plugged to prevent entry of foreign materials.

4.15.21 SUMMARY OF APPROXIMATE SURFACE AREA FOR PAINTING WORKS

PIPING WORK

SL. NO.	PLANT	UNIT	APPROX. QTY.	REMARKS
1.				
A	Temp. Range UP TO 90°C	M^2	800.00	
B	Temp. Range 91°C TO 200 °C	M^2	1200.00	
C	Temp. Range 201°C TO 400 °C	M^2	520.00	
D	Temp. Range above 400°C	M^2	100.00	
	Total	M^2	2620	
3.				

Above quantities of surface area required for painting works are approximate.

C: Bidder shall calculate surface area required for painting/Touch-up works on following items based on attached documents / Drawings while quoting the bid. Unit rate should be inclusive of Painting works.

I. EQUIPMENTS AND PIPING

II. MACHINERY

III. STRUTURAL ITEMS

5.0 STATUTORY APPROVALS

The Contractor shall be fully responsible for obtaining Statutory Approvals (Like IBR etc). for drawings and documents needed for carrying out dismantling /erection and Hydro testing of equipment & piping coming under different local authority .All documents needed for the same shall be supplied to Contractor by Owner/Consultant. Statutory fee shall be paid by the Owner on production of documentary evidence.

SCOPE OF WORK & TECHNICAL CONDITIONS

OF

UNDER GROUND PIPING WORKS

FOR

COMPOSITE MECHANICAL ERECTION WORKS

AT

HURL GORAKHPUR

(OSBL)

REV	REV ATE	PURPOSE	PREPD	REVWD	APPD
0	28.12.18	ENQUIRY FOR ISSUANCE	DILIP	DILIP	GC
P	30.11.18	DRAFT ENQUIRY FOR REVIEW	DILIP	DILIP	GC

1.0 GENERAL

1.1 This Construction specification covers excavation in all kind of strata, lifting backfilling, stacking & disposal, within specified limit & as directed by Engineer-in-Charge .

1.2 This also covers dewatering, shoring, strutting & timbering, safety of workman/ pedestrians, equipment or adjoining structures.

1.3 This specification shall be applied to field construction of various chambers, pits, trenches etc. which becomes the part of work during the alignment of U/G piping or as specified in drawing or as directed by Engineer-In–charge.

1.4 This specification shall not apply to the followings

a) Work, not covered under above Scope of work.

b) Temporary installation.

c) Specific job requirement, where job requirements are in contradiction to this specification.

1.5 Reference documents

The work shall be compliances with all applicable governmental, local laws & regulations, codes & standards, specifications & drawings or as directed by Owner/Consultant.

1.6 Earthwork excavation for U/G Piping

Excavation work shall be carried out in all kind of strata for excavation work.

2.0 SCOPE OF WORK

2.1 The scope of work to be performed by the Contractor shall include but not limited to the following: -

a) Transportation of materials issued by Owner such as pipes, valves, fittings, etc., from Owner's stores to Contractor's shop/site.

b) Piping fabrication, shot blasting, supply and application of primer/painting as per specification enclosed in NIT, supply and application of wrapping/ coating as per spec enclosed in NIT, laying of U/G piping, inter-connection with the existing system/unit, excavation, backfilling, sand filling compaction, hydro test of piping & other works related to UG piping to complete the system in all respect is in scope of contractor.

2.2 Fabrication of fittings such as miter bends, reducers etc. from pipes:

I. Contractor shall be required to fabricate miter bends and reducers etc. out from free issue pipes as per engineering standards/specification attached with this tender document. Miter bends shall be 3 Miters for 90^0 and 2 Miters for 45^0.

II. Fabrication of Tees is not envisaged. All tapings shall be taken by stub-in connection (with or without reinforcement pads), and these shall be considered part of the piping work and no extra compensation shall be made for making stub-in connections.

3.0 PRE FABRICATION OF SPOOLS

3.1 Pipes shall be pre-fabricated in convenient spools in accordance with ANSI-B-31.3 category 'D' Service.(Services related to U/G Piping).Site fabrication shall meet all the requirements of ANSI B 31.3 and ASME Section IX. Prior to start of pre-fabrication, Contractor shall check and ensure that actual site requirements match with the drawings. Discrepancies observed, if any must be brought to the notice of the Owner/Consultant for their appropriate decision before execution of work. While doing spool pre-fabrication, extra lengths shall be kept to facilitate site adjustments.

The prefabricated piping spool shall be Hydrotested prior to wrapping coating and lowering in trenches.

3.2 The following dimensional tolerances shall govern pre-fabrication and erection work:

a. Plus/minus max. 3 mm on all dimensions from:

i) Face to face

ii) Centre to face

iii) Ref. line to attachment.

b. Out of roundness: Not to exceed + 3 mm and – 1.5 mm (In diameter)

c. Circumference: 0.5% of nominal outside circumference.

d. ± maximum 3mm lateral translation of branches, flanges or connections for normal services

e. Straightness shall not deviate 3.2 mm from a 3m Straight edge.

f. Flanges bolt holes to be symmetrically out of centre line.

Flanges rotation shall not exceed 1.5 mm measured on the bolt circle.

g. Flange faces misalignment: Max. (1:250) measured across any diameter from normal service (flange connections total 1:125).

4.0 EARTHWORK EXCAVATION FOR TRENCHES FOR PIPELINES

4.1 Trenching work shall be carried out in all cases of soil.

4.2 For Underground piping, earth excavation work shall also be referred the Document ES 6018 – Engineering Standards for Underground Piping.

4.3 In case of pressure piping, the trench shall be excavated generally as to provide a cover of 600 mm or dia. of pipe whichever is more. In case of gravity sewers / pipes, the trench shall be excavated to confirm to invert levels as per drawings. However in certain cases the pipes may run shallower levels or at deeper levels depending upon drawing, site condition, etc. This

4.4 Work shall be deemed to cover all work connected with trenching, whether trenches with single pipeline or pipelines in common trenches including road cutting.

4.4 The width of the trench shall be sufficient to give free working space on each side of the pipe. The free working space shall be as per work instruction. Generally it shall not be less than 150 mm on either side or 1/3 dia. of pipe, whichever is greater.

4.5 When pipeline are running parallel whether the trenching shall be individual or common shall be decided by Engineer-in-charge and the Contractor shall follow accordingly.

4.6 Excavated materials shall not be deposited within 1.5m from the top edge of the excavation, or within a distance equal to the depth of excavation whichever is greater.

4.7 The Contractor shall maintain excavated pit in a dry and trim condition.

4.8 In case of road cutting, all material i.e. metal, soling stone etc., shall be taken out carefully and kept separately for reuse and road work shall be redone up to the original level with the excavated road materials, after laying and testing of the pipeline, within 10 days from the date of starting this work. The Contractor shall construct a bye pass road when the road cutting work is been carried out. All this work shall be covered under laying of pipe works.

4.9 The trench shall follow the gradient of pipeline as specified in the drawing. The Contractor shall keep the trench in good condition until the pipe is laid and tested and it shall be the sole responsibility of the Contractor to prevent caving or settling down either before or after the pipe is laid.

In case pipe is lowered in caved trench and backfilled before being inspected by the Engineer-in-charge, the Contractor shall re-excavate the trench for inspection and backfill the same under his own responsibility.

5.0 Wrapping and coating

Coating and wrapping shall be as per Technical specification attached with this tender doc using the following specifications:

5.1 Surface cleaning and preparation shall consist of cleaning and degreasing by Grit / Shot blasting and or power scraping, using most suitable method or a combination therefore, both followed by carefully removal of the dust according to the specification ISO 8501-1: 1988 SA 2.5.

5.2 One coat of primer shall be applied immediately after surface preparation as per specification.

5.3 Application of wrapping on underground piping shall be carried out as per PDIL Standard (Attached herewith) Test certificate of materials used for this work shall be submitted to Owner's for verification and acceptance prior to be used.

5.4 Coating and wrapping job shall only be done by experienced personal for this job, by which speed of wrapping and application of enamel can be controlled so as to achieve uniform thickness of coating and wrapping.

5.5 To check the quality of coating and wrapping shall be done by high voltage spark tester equipped with a positive signaling device to indicate any faults, holes, breaks or conductive particles in coating thickness, as per specifications.

5.6 Coating and wrapping for the field joints to be under taken inside the trenches shall be executed using the same specification and workmanship as indicated above. After coating and wrapping operation is over the total surfaces coated in the trench shall be checked for defects using high voltage spark tester as indicated above.

6.0 PIPE LAYING AND WELDING IN TRENCHES

6.1 Pipes shall be laid in trenches after:

- Pipes have been coated and wrapped in the shop and/or at site.
- Coating and wrapping has been tested using high frequency high voltage spark tester (using 12000-16000 voltage)

6.2 Pipe laying shall be undertaken as per specifications, Using of suitable capacity cranes only, taking sufficient care while handling (use of suitable belt type slings is essential) Coated pipe to ensure zero damages during handling.

6.3 Excavation shall be carried out strictly as per specification. Moreover excavation shall be carried out only by suitable excavators with ripper arrangement and not manually unless it is not possible to excavate with excavators.

Vol. of surplus excavated materials = vol. of piping + vol. of sand filled.

Vol. of sand filled = the min base width x vertical depth of sand filled – vol. of piping.

No additional payment shall be made for excavation done for welding of field joints.

6.4 Excess earth shall be carted to a place specified by Owner / Consultant (as decided by EIC). Owner / Consultant may direct the Contractor to transport part of earth even before backfilling is done. The carted earth shall be stacked, spread and leveled properly in the area earmarked.

6.5 The trenches shall be filled with fine sand from River up to centre line of pipe line over which ordinary excavated earth (excluding stones, boulders and any other hard materials) shall be used for filling balance portion of the trench taking sufficient care to achieve proper compaction. Before back filling, piping shall be hydrotested; area near field welded joints shall be coated and wrapped as per specifications and to meet quality requirements for coating and wrapping. Only after satisfactory testing of coating and wrapping of the field joints, back filling shall be started.

6.6 For welds inspection shall be carried out by Owner/Consultant in accordance with the following:

Visual examinations: All finished welds shall be visually examined 100 percent to check the profile and smoothness of the weld, root penetration etc. visual examination shall show the following features:

a) Welds shall blend smoothly and gradually into the parent metal with no significant undercutting or overlapping at the sides of the groove. The depth of local undercut shall not exceed 10 percent of pipe thickness of 0.8 mm whichever is smaller.

b) The welds shall be reasonably smooth and uniform with no excessive high or low spots. External weld reinforcements shall not exceed the following limits:

Component Thickness	Reinforcement thickness (max)
Up to 12 mm	1.6 mm
Over 12 to 25 mm	2.4 mm
Over 25 mm	3.2 mm

c) The stop and start of each run of weld shall merge smoothly and shall show no pronounced hump or crater on the weld surface.

d) The weld shall fuse the pipe / pipe fitting at the root suitably without penetrating excessively into the bore of the pipe. The maximum permissible penetration of the root bead into the bore shall be within the limits specified below:

N.B	Maximum penetration In bore	Maximum restriction in bore
Under ½”	1.6 mm	1.6 mm
½” – 2”	3.2 mm	3.2 mm
Over 2”	3.2 mm	4.8 mm

e) The root concavity shall not exceed 1.2 mm and at no point shall the weld be thinner than the calculated design thickness of the pipe.

f) The root bead shall merge smoothly into the adjacent surface.

g) All the materials which are in Contractor’s scope shall be inspected and tested as per relevant material specifications.

h) All weld joints made after hydrotest, whether in shop or in the field or in the trenches, shall be kept uncoated and accessible without backfilling till final hydro test is completed.

7.0 HYDROTESTING OF PIPING SYSTEM

After all the piping have been laid in the trenches field joints welded, radiograph found OK, the system shall be pressurized and hydro tested as per work instruction of EIC or as per EIC guidelines in convenient loops (as per mutual agreement between Owner / Consultant and Contractors, so as to avoid inconvenience of Owner/other agencies working at site) shall be at a test pressure of 1.5 times the maximum operating pressure in the system. After hydro testing has been completed successfully, the area in the vicinity of the field joints (left uncoated for welding) shall be coated and wrapped with the same specifications and workmanship as defined for the shop coating and wrapping. This coating and wrapping executed in the field must be thoroughly checked using high voltage spark testing to ensure defect-free coating and wrapping.

All materials required for hydrotesting such as but not limited to hydrotest pump, temporary piping, pressure gauges (duly calibrated), blanks, blind flanges, temporary bolts, nuts, vents and drain connection etc shall be supplied by Contractor at his cost. After completion of hydrotesting, blanks and blind flanges shall be removed and ends of pipes, fitting and piping spools shall be suitably prepared.

This hydrotest shall be undertaken in convenient loops as per the directions of Owner/Consultant, without obstructing the other agencies working at site.

8.0 ELECTRODES

For welding of root run, electrodes to confirm AWS specifications. However, in case it is all welding shall be as per specifications and shall be of radiographic quality. Electrodes and filler wires to be used at site in this job shall be procured from the approved vendors only. Electrodes and filter wires shall be **D&H, Advani Orlikon or ESAB, Mailam and Bohler group make only**

Electrodes shall be baked at suitable temperature for the requisite time before they are used strictly as per manufacturer.

9.0 NON DESTRUCTIVE TESTING

10% of the welded joints shall be radiographed. Location of radiography weld joints shall be selected by Engineer-in-Charge. The cost of defective radiograph and its repair shall be to Contractor's account and payment shall be made by Owner / Consultant for only for those joints, which are found acceptable refer S.O.R.

Spark testing of 100% area of wrapping coating to be done. Even field joints to be tested, contractor to make necessary arrangement.

10.0 WELDERS QUALIFICATION

Welders proposed to be deployed at site shall be tested for procedure and quality in the presence of Owner/Consultant strictly as per ASME Section IX. All such materials and facilities as required for this test shall be arranged by Contractor at his own cost.

11.0 MISMATCHING

For making weld joint end preparation shall be carried out as per work instruction of EIC. During end preparation and while making the joint, if internal diameters of pipe and pipe fittings/ valves / flanges etc. do not match with each other for any reasons what-so-ever, Contractor shall be required to undertake necessary rectification for matching internal diameters without any extra cost to Owner/Consultant.

12.0 ROAD CROSSINGS

At road crossing, Contractor may be required to provide casing pipe and / or suitable road culverts. At such road crossing number of pipe lengths depending upon the width or road, shall be aligned, welded, hydrotesting and erected independently of the total system to avoid blockages for longer duration.

13.0 METHOD FOR MEASUREMENT

13.1 For payment purposes actual measurement shall be taken along the centre line of the pipe line system from end to end which will include pipe fittings, flanges, valves, etc. No additional payment shall be made for instrument tappings.

13.2 Measurement for branch connection shall be taken from the root of stub in connection.

13.3 No additional payment shall be made for instrument tapings.

13.4 Reducers shall be paid along with piping of larger diameter.

13.5 Payment for radiography shall be made on the basis of actual weld length radiographed and payment shall be made for the joints found acceptable. Radiography for defective joints shall not be paid.

13.6 Measurement and payment for excavation shall be worked out based on trench dimensions as mentioned without slope i.e. as per base Width x Depth.

13.7 No additional payment shall be made for excavation done for the welding of field welding/wrapping coating.

13.8 Measurement and payment for sand filling shall be worked out as per work instruction of EIC.

14.0 LIST OF STANDARDS & DRGS & DOCUMENTS

The following standards, drawings & documents form part of this enquiry:

INTERNATIONAL STANDARD

i) ANSI B 31.3 : Process Piping

ii) ASME Sec. IX : Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, Welding and Brazing Operators.

a. NDT work, being on specialized job, must be carried out through approved agencies only.

b. The works of underground piping is of specialized nature and as such the same has to be got done through agency specialized in such works. The agency shall be as approved by Owner / Consultant.

c. Coating and wrapping being a specialized job must be getting done through approved agencies only.

d. Contractor shall be required to submit the following documents as and when asked for by Owner / Consultant:

i) Material certificate for materials supplied by Contractor

ii) Radiography report with radiographs

iii) Test Certificates for coating and wrapping materials

iv) Welders performance qualification report part

15.0 BACKFILLING FOR TRENCHES FOR PIPELINES

a. The Backfilling of underground pipe trenches shall be done as per scope of work, Technical specification and instruction of Owner / CONSULTANT.

b. The filling shall commence only after approval by Engineer-in-charge is obtained and after the structures or pipes getting buried are tested and approved. Otherwise it shall be the responsibility of the Contractor to uncover the buried portion and refill the same.

c. Care must be exercised to protect cables, pipes, joints and other features from damage due to backfilling and consolidation.

16.0 DISPOSAL OF SURPLUS EARTH

a. This work shall be performed according to scope of work, specification and instruction of Owner /Consultant's Engineer-in-charge.

b. The surplus earth to be transported / disposed shall include the earth generated due to voids in the backfilled volume of earth.

TECHNICAL SPECIFICATON

OF

WRAPPING & COATING

(TAPE TYPE)

0	**30.10.17**	**FOR ISSUANCE**	**DILIP**	**DILIP/GC**	**SM**
REV	REV ATE	PURPOSE	PREPD	REVWD	APPD

INDEX OF CONTENTS

1.0 SCOPE

This specification covers the requirements for application and inspection of protective coating for underground steel piping.

2.0 GENERAL

2.1 Protective coating shall consist of a coating system employing Primer, Inner Wrap and Outer Wrap.

2.2 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. Wrapping machine shall normally be used for pipe size 10" and above. For pipe sizes below 10" wrapping shall be done manually.

2.3 Coating and wrapping materials shall be handled, transported, stored and applied strictly in accordance with the manufacturer's instruction.

2.4 Wrapping Coating material is Cold tape type from **Polyken/Denso/Atla** shall be used.

3.0 MATERIALS

Materials for line coating and wrapping shall be of Tape coating system (Polyethylene backed tape with butyl rubber based adhesive system) as described below :-

(A) Primer

Base	: Rubber and Synthetic Resins
Solvent	: Heptane
Total Solids	: 20%
Weight / Gallon (Weight / litre):	6.4 lbs (0.77 kg)
Viscosity	: Thin Syrup
Flash Point	: + 10°F (-12°C)
Color	: Black
Shelf Life	: Excellent

(B) Inner Wrap (3 PLY)

BACKING:-
Polyethylene, high/low density Colour: Black
ADHESIVE:-
Butyl Rubber (to be applied on both sides of the PE backing), Synthetic Resin

PHYSICAL PROPERTIES	ENGLISH
Total Thickness	30 mils
Backing Thickness	12 mils
Adhesive Thickness	9 mils (each)
Tensile Strength	30 lb/in width
Elongation	200%
Adhesion to Primed Steel	200 oz/in width

ELECTRICAL AND MOISTURE RESISTANCE:-

Dielectric Strength	22

Insulation Resistance	1,000,000 megohms
Water Vapor Transmission Rate	< 0.2g / 100 in^2/24hr

TEMPERATURE RANGE:-

Normal Application (ambient)	-30° to 160°F (-34° to 71°C)
Normal Service (operating temperature)	-30° to 185°F (-34° to 85°C)

TEST METHODS: (Latest Version)
1. ASTM D-257 2. ASTM E-398

(C) Outer Wrap (2PLY)

BACKING : Polyethylene, low density.
Colour: White

ADHESIVE : Butyl Rubber, Synthetic Resin(on one side of the PE backing)

PHYSICAL PROPERTIES	ENGLISH
Total Thickness	20 mils
Backing Thickness	15 mils
Adhesive Thickness	5 mils
Tensile Strength	25 ib/in width
Elongation	200%

TEMPERATURE RANGE:-

Normal application (ambient)	-30° to 160°F (34° to 71°C)
Normal Service (operating temperature)	-30° to 185°F (34° to 85°C)

TEST METHODS : ASTM D – 1000

4.0 CLEANING

4.1 The external surface of all piping shall be thoroughly cleaned before application of the protective coating by shot blasting to the specification **ISO 8501-1: 1988 SA 2.5.**

4.2 The cleaning process shall remove all oil, grease, loose mill scale, weld spatter, weld slug, rust, paint, dirt, dust, weeds and any other foreign matter from the pipe external surface.

4.3 Oil and grease shall be removed using suitable solvent.

4.4 Mechanical cleaning wherever applicable (field joints and tie-in joints) shall be carried out by means of portable power driven wire brushes, flexible sanding discs etc. which are capable of producing a surface finish to SA - 3

4.5 Mechanical cleaning machines shall not employ knives or other tools which may produce notches or gauges on the pipe surface and shall be fitted with a device to prevent of foreign matter on the pipe surface.

4.6 Mechanical cleaning machines shall be maintained in correct adjustment and replacement tools shall be available throughout the cleaning process.

4.7 The cleaning method employed shall not result in visible thinning of the pipe wall.

4.8 Cleaning shall be carried out immediately before application of the priming coat. If, before the priming coat is applied, the outside of the pipe becomes contaminated with any foreign matter, the outside surface shall be re-cleaned.

5.0 APPLICATION

5.1 Prime Coat

a) After Surface Preparation as detailed above, apply one coat of Zinc Rich Epoxy primer (50-75micron) allow it to dry.

b) Apply Polyken primer #1027 (in shop) / primer # 1029 (at site) WFT 60 micron or Equivalent.

c) Primer shall be thoroughly stirred before drawing from the drum.The approved thinners may only be added to the primer an proper mixing and blending of thinner when primer thinner is essential

d) Primer shall be applied to the piping system by means of rollers or brushes. The priming coat shall be continuous and free form holidays, runs and globules, and special care shall be taken to ensure continuity of primer film at welds.

e) Primer shall be applied at an average rate of 0.12 litre per square meter to give dry film thickness of between 0.05 and 0.08mm.

f) Primed pipe shall be protected from contamination by moisture, dust and foreign matters before application of the tape wraps.

5.2 Tape Wrapping

a) Immediately after application of the primer, the piping shall be coated with Inner Tape Wrap(3ply) and Outer Tape Wrap(2 ply). Before applying inner tape wrap, it shall be ensured that the Polyken primer or Equivalent is wet condition(touch dry condition). The tape wraps shall be applied with constant tension controlled to provide a uniform, tightly adhering coating free of wrinkles, packers, voids or breaks. Minimum tension shall be 0.1 kg per mm of tape width.

b) The tape wrapping shall be provided with the following minimum overlap under conditions stated :

CONDITION	MIN. OVERLAP
(i) Tape is applied on the line with a mechanical wrap – around machine with constant tension brakes in normal soil conditions.	1 inch
(ii) Tape is applied on irregular sections of The line with hand wrap machines.	2 inch
(iii) Same as (i) above except pipe is laid in swampy areas where water is standing in the ditch (no concrete coating)	50% overlap
(iv) Pipe is laid in swampy areas but is Weight coated:	

20 mils Inner Wrap	1 inch
40 mil Outer Wrap	1 inch
Applied as in (i) above.	

5.3 Polyken wrapped pipes shall not be exposed to direct sun light over a long time. It shall be ensured that Polyken coated pipe spools are covered to wand off damage due to exposure to sun light.

5.4 The details of Polyken tapes to be used as given below.

Pipe Size	Tape Size
3" and below	2"
4" to 6"	4"
Above 6"	6"

6.0 INSPECTION AND TEST

6.1 All coating shall be subjected to 100% visual inspection and 100% inspection with an electrical holiday detector (6000 – 8000 volts) before being lowered into the trench or before back filling the existing UG pipe line.

6.2 Visual inspection shall ensure that the coating is continuous that the overlap is correctly maintained and that there are no wrinkles in the tape.

6.3 The Holiday Detector shall be used to check that there is a continuous coating over the pipe surface, Particular attention shall be given to bends and to areas where the tape has been spliced or repaired.

6.4 The holiday detector setting shall be checked at least twice per day while it is in use.

6.5 The Holiday Detector shall be operated strictly in accordance with the manufacturer's instruction at all times.

6.6 At no time shall the Holiday Detector be permitted to remain stationary around a coated pipeline with the operating voltage switched on.

6.7 All defects, whether discovered visually or by means of the Holiday Detector, shall be clearly marked.

6.8 After acceptance of holiday test, the coated pipes shall be transported to site. Proper care shall be taken during handling /transportation. The coated pipes always be kept on sand bags during transportation.

6.9 Holiday test shall be conducted again at site and after acceptance the coated pipes shall be lifted / lowered in to the trench using nylon belts.

7.0 REPAIRS TO COATING

7.1 All defects in the coating shall be made good immediately after their detection.

7.2 Holidays (Pin holes / minor defect)

After cleaning the affected area Inner tape wrap and Outer tape wrap shall be carried out over the affected area on the existing wrapping by ensuring that wrapping covers the extended surface area around the defect (Min 150mm). Use Holiday detector for locating pinholes / other defects before erection of pipe in trench / back filling of existing pipe line.

7.3 Holidays or localized defects in the Inner Tape Wrap shall be repaired by the following procedures :

(a) Strip off Outer Wrap from affected area after ensuring that completed coating on either side is properly secured.

(b) Strip off Inner Wrap and primer from the affected area and thoroughly clean the pipe surface.

(c) Re-prime in accordance with this specification.

(d) Apply patch of Inner Wrap not smaller than 150mm s 150mm.

(e) Test for repaired Inner Wrap with Holiday Detector before replacing Outer Wrap.

(f) Replace Outer Wrap and secure firmly.

(g) Conduct holiday test before erection of the pipe in trench / back filling of existing pipe.

PAINTING SPECIFICATION

FOR

HURL, GORAKHPUR

0	12.04.18	SPECIFICATION FOR ISSUANCE	DILIP	DILIP/GC	SM
REV	**REV ATE**	**PURPOSE**	**PREPD**	**REVWD**	**APPD**

CONTENTS

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.

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.

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.

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^{o} C above the dew point temperature. The relative humidity should preferably be below 50% during cold weather and shall never be higher than 60% in any case.

Abrasive blast cleaning shall be performed with a clean, sharp grade of abrasive. Grain size shall be suitable for producing the specified roughness. Abrasives shall be free from oil, grease, moisture and salts, and shall contain no more than 50ppm chloride. The use of silica sand, copper slag and other potentially silica containing materials shall not be allowed

The blasting compressor shall be capable of maintaining a minimum air pressure of 7 kPa at the nozzle to obtain the acceptable surface cleanliness and profile.

The blast cleaning air compressor shall be equipped with adequately sized and properly maintained oil and water separators. The air supply shall be checked to ensure no oil and water contamination at the beginning of each work shift.

Blast cleaning abrasive shall be stored in a clean, dry environment at all times. Recycling of used abrasive is prohibited.

After blast cleaning, the surfaces shall be cleaned by washing with clean water (Pressure $7kg/Cm^2$ 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,
- 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.

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.

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.

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 5^0C (depending on local condition)
- The metal temperature is less than 3^0C 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.

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.

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.

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 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 No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks
01	Structural Steel work with operating temp. Up to 90^{O} C (Steel structures, Piping support, uninsulated CS piping, flanges, valves, stairways, walkways etc. except grating).	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1 Finish coat: one coat of two packs. Polyamide Cured Epoxy.	Primer : 50 microns Finish: 120 microns per coat	Total dry film thickness of paint system: 170 microns.
02	Uninsulated CS piping, flanges, valves with operating temp. From 90^{O} C to 200^{O} C.	Blast cleaning to near white metal grade Sa-2½, of Swedish Standards SIS-05-5900 (Latest)	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat: Two coats of single pack special Oleo resinous based heat resistant ready mixed Aluminium Paint.	Primer: 75 microns Finish: Two coats of 20 microns for each coat Total - 115 microns.	Total dry film thickness of paint system: 115 microns.
03	Uninsulated CS piping, flanges, valves with operating temp. Over 200^{O} C.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat: Two coats of Heat Resisting Silicon Aluminium Paint.	Primer: 75 microns Finish: Two coats of 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^{O} C	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of high temperature epoxy phenolic Finish Coat: One coat of high temperature epoxy phenolic.	Primer :100 microns Finish : 100 micron	Total dry film thickness of paint system: 200 microns.

Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks
05	Insulated CS piping, flanges, valves with operating temp. From 90^{O} C to 200^{O} C.	Blast cleaning to near white metal grade Sa-2½, of Swedish Standards SIS-05-5900	Primer: One coat of high temperature epoxy phenolic Finish coat: One coat of high temperature epoxy Phenolic. (novolac)	Primer: 100 microns Finish: 100 micron	Total dry film thickness of paint system:200 microns
06	Insulated CS piping, flanges, valves with operating temp. Over 200^{O} C.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat: Two coat of Heat resisting Silicon Aluminium paint.	Primer: 75 microns Finish: 2 x 25 micron	Total dry film thickness of paint system: 125 microns.
07	Uninsulated CS equipment with operating temp. Up to 90^{O} C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of two pack zinc rich epoxy polyamide cured Primer meeting SSPC Paint 20 level 1 Finish coat : One coat of two pack Polyamide Cured Epoxy	Primer: 50 microns for each coat. Finish: 120 microns for each coat	Total dry film thickness of paint system: 170 microns.
08	Uninsulated CS equipment with operating temp. From 91^{O} C to 200^{o}C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat: Two coats of single pack special Oleouresinous based heat resistant ready mixed Aluminium Paint.	Primer: 75 microns Finish: Two coats of 20 microns for each coat Total - 115 microns.	Total dry film thickness of paint system: 115 microns.
09	Uninsulated CS equipment with operating temp. Over 200^{o}C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat: Two coats of Heat Resisting Silicon Aluminium Paint.	Primer: 75 microns Finish: 25 microns for each coat Total - 50 microns.	Total dry film thickness of paint system: 125 microns.

Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks
10	Insulated CS equipment with operating temp. Up to 90^{O} C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of high temperature epoxy phenolic (novolac) Finish coat: One coat of high temperature epoxy phenolic (novolac)	Primer: 100 micron Finish: 100 microns	Total dry film thickness of paint system: 200 microns.
11	Insulated CS equipment with operating temp. From 91^{O} C to 200^{o}C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of high temperature epoxy phenolic (novolac) Finish coat: One coat of high temperature epoxy phenolic (novolac)	Primer: 100 microns Finish: 100 micron	Total dry film thickness of paint system: 200 microns.
12	Insulated CS equipment with operating temp. Over 200^{o}C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat: Two coats of Heat resisting Silicon Aluminium paint.	Primer: 75 microns Finish: 2 x 25 microns	Total dry film thickness of paint system: 125 microns.
13	Surface of structural steel for furnaces, external surface of furnaces, external surface of flue duct, metal stacks and similar with operating temp. Up to 200^{o}C. (With exclusion of stair ways, walk ways etc.).	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat: Two coats of single pack special Oleouresinous based heat resistant ready mixed Aluminium Paint.	Primer: 75 microns Finish: 2 x 20 microns for each coat Total - 40 microns.	Total dry film thickness of paint system: 115 microns.
14	For external surfaces of flue ducts, metal stacks, and similar with operating temp. Above 200^{o}C.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat: Two coats of Heat Resisting Silicon Aluminium Paint.	Primer: 75 microns Finish: 2 x 25 microns for each coat Total - 50 microns.	Total dry film thickness of paint system: 125 microns.
15	For surfaces of air cooler heads not galvanized with	Blast cleaning to near white metal	Primer: Two coats of two pack zinc	Primer: 50 micron for	Total dry film thickness of

Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks
	operating temperature up to 90^0 C, treated at manufacturer's shop.	grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	rich epoxy polyamide cured Primer meeting SSPC Paint 20 level 1 Finish coat: One coat of two pack Polyamide Cured Epoxy.	each coat. Finish: 120 microns	paint system: 170 microns.
	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.				
16	For surfaces of air cooler heads not galvanized with operating temperature up to 91^0 C TO 200^OC, treated at manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat: Two coats of single pack special Oleouresinous based heat resistant ready mixed Aluminium Paint.	Primer: 75 microns Finish: 2 x 20 microns for each coat Total - 40 microns.	Total dry film thickness of paint system: 115 microns.
	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).	Primer: One coat of two pack zinc rich epoxy polyamide cured Primer meeting SSPC Paint 20 level 1 Finish coat: One coat of two pack Polyamide Cured Epoxy.	Primer: One coat of 50 microns. Finish: 120 microns	Total dry film thickness of paint system: 170 microns.
b)	CS Storage Tanks, Excluding indicated in Sl. No. (a)	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat: One coat of two pack Polyamide Cured Epoxy.	Primer: 50 microns Finish: 120 microns for each coat. Top Coat: 50 microns	Total dry film thickness of paint system: 220 microns.

Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks
			Top Coat: Two-pack aliphatic Iso Cynate cured acrylic finish paint		
19	Cold Insulated Carbon Steel and low alloy Steel (1-$^1/_4$ Cr through 9 Cr) Piping and Equipment.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat: One coat of Epoxy Coal Tar / Tar Free Epoxy paint suitably pigmented	Primer: 75 microns Finish: 100 microns	Total dry film thickness of paint system: 175 microns.
20	Cold Insulated high alloy Steel piping and Equipment	Lightly Blast cleaned as per Sa 1.0 Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of high temperature epoxy phenolic (novolac) Finish coat: One coat of high temperature epoxy phenolic (novolac)	Primer: 100 microns Finish: 100 microns	Total dry film thickness of paint system: 200 microns
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).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat : Temperature indicating paint	Primer: 60 microns Finish: 25 microns for each coat Total - 50 microns. (Interzinc 2280 + Intertherm 715)	Total dry film thickness of paint system: 110 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).	Primer: One coat of two pack zinc rich epoxy polyamide cured Primer meeting SSPC Paint 20 level 1 Finish coat: One coat of two pack Polyamide Cured Epoxy.	Primer: 50 micron for each coat. Finish: 120 microns	Total dry film thickness of paint system: 170 microns.
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).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1	Primer: 75 microns Finish: 20 microns for each coat	Total dry film thickness of paint system: 115 microns.

Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks
			Finish coat: Two coats of single pack special Oleouresinous based heat resistant ready mixed Aluminium Paint.	Total - 40 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).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat: Two coats of Heat Resisting Silicone Aluminium Paint.	Primer: 75 microns Finish: 25 microns for each coat Total - 50 microns.	Total dry film thickness of paint system: 125 microns.
d)	Package in Carbon Steel and low Alloy Steel (1-$^{1}/_{4}$ Cr through 9 Cr) with cold insulated surface treated at manufacturer's shop	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat: One coat of Epoxy Coal Tar / Tar Free Epoxy paint suitably pigmented	Primer: 75 microns Finish: 100 microns	Total dry film thickness of paint system: 175 microns.
e)	Package in Cold Insulated high alloy Steel.	Lightly Blast cleaned as per Sa 1.0 Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of high temperature epoxy phenolic (novolac) Finish coat: One coat of high temperature epoxy phenolic (novolac)	Primer: 100 microns Finish: 100 microns	Total dry film thickness of paint system: 200 microns
f)	DELETED				
24	For external 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).	Primer: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 Finish coat: Two coats of two pack Epoxy Polyamine (immersion grade)	Primer: 50 microns Finish: 100 microns for each coat Total - 200 microns.	Total dry film thickness of paint system: 250 microns.
25	For underside (soil side) of the tank bottom (CS) below only of the fixed tanks, bottom & shell shall be treated as	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-	Primer : None Finish Coat: Two coats of Epoxy Coal Tar / Tar Free Epoxy paint suitably	200 microns for each coat Total: 400 microns	Total dry film thickness of paint system : 400 microns

Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks
	follows:	05-5900 (Latest).	pigmented		
26	CS Equipment and associated piping subject to cyclic, intermittent or regeneration operating condition (e.g. Molecular Sieve Driers) subjected to very severe corrosion with wide operating temperature range.	Blast cleaning to near white metal grade 3, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of Thermal spray Aluminium paint and sealed with a Silicon Aluminium seal Finish Coat: One coat of Thermal spray Aluminium paint and sealed with a Silicon Aluminium seal.	Primer: 125 microns Finish: 125 microns	Total dry film thickness of paint system 250 microns.

NOTES:

Primers

ZINC ETHYL SILICATE PRIMER

The zinc ethyl silicate consists of two packs. One pack contains the ethyl silicate binder with suitable solvents. The other pack contains zinc dust. Zinc dust shall be ASTMD 520 Type II. They have to be mixed in suitable proportions before application as recommended by manufacturer.

Volume solids	**:**	**65+/-2**
Colour	:	Grey
Application	:	Spray (airless/air)
Drying time (dry to handle)	:	Within 4 hours
Curing	:	Within 24 hrs @ 30 Deg C and 65% RH
% of total metallic zinc in dry film (As per the ASTM D520 – Spherical size)	:	80% by wt.
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

The zinc rich epoxy consists of two packs. One pack contains the epoxy binder with suitable solvents. The other pack contains zinc dust with additives. They have to be mixed in suitable proportions before application as recommended by manufacturer.

Volume solids	**:**	**65+/-2**
Colour	:	Grey
Application	:	Spray (airless/air)
Drying time (dry to handle)	:	4 hours
Hared Dry	:	Within 6 hrs @ 30 Deg C
% of total metallic zinc in dry film	:	80% by wt.

(As per the ASTM D520 – Spherical size)		
Specific Gravity	:	
Storage life	:	6 months under sealed conditions

Finish Paints

HIGH BUILD EPOXY FINISH

This finish paint is high build, Two-pack polyamide cured epoxy resin medium suitably pigmented

Volume solids	:	**65 ± 3%**
Colour	:	**Brown**
Binder	:	**Epoxy Resin, the material shall be based on pure epoxy resin, with no filler resins.**
Application	:	**Brush or spray**
Drying time	:	**Touch dry – 1 hour**
Over coating time	:	**Minimum – over night**
Storage life	:	**12 months under sealed conditions**

HIGH BUILD EPOXY FINISH (Immersion Grade)

This finish paint is high build, Two-pack polyamine cured epoxy resin medium suitably pigmented

Volume solids	:	**65 ± 2%**
Colour	:	**Brown**
Binder	:	**Epoxy Resin, the material shall be based on pure epoxy resin, with no filler resins.**
Application	:	**Brush or spray**
Drying time	:	**Touch dry – 1 hour**
Over coating time	:	**Minimum – over night**
Storage life	:	**12 months under sealed conditions**

HEAT RESISTANT ALUMINIUM FINISH PAINT :

It is a two pack system based on oleoresinous binder and leafing aluminium pigment given separately in paste form.

Volume solids	:	**25%**
Main pigment	:	**Aluminium (ASTM 962)**
Colour	:	**Metallic Aluminium**
Pigment Volume Concentration	:	**15 – 20%**
Application	:	**Brush or spray**
Drying time	:	**Surface dry/1hr.**
		Hard dry 8 hrs.
Storage life	:	**6 months under sealed conditions**

HEAT RESISTANT SILICON ALUMINIUM FINISH PAINT :

It is a two pack system based on moisture curing silicone binder and leafing aluminium pigment.

Volume solids	:	**20%**
Main pigment	:	**Aluminium (ASTM 962)**
Colour	:	**Metallic Aluminium**
Pigment Volume Concentration	:	**15 – 20%**
Application	:	**Brush or spray**
Drying time	:	**Surface dry/1hr.**
		Hard dry 8 hrs.
Storage life	:	**6 months under sealed conditions**

TWO PACK ALIPHATIC ACRYLIC POLYURETHANE FINISH PAINT

It Consists of Acrylic Resin in Part A. Part B consists of an aliphatic polyisocyanate with appropriate solvents and additives.

Volume solids	:	**50%**
Main pigment	:	Suitable pigments to get the desired colour
Colour	:	Metallic Aluminium
Binder	:	Shall not contain any binder other than acrylic resin; should not contain any alkyd / acrylated alkyds.
Application	:	Brush or spray
Drying time	:	Surface dry/1hr.
		Hard dry 8 hrs.
Storage life	:	6 months under sealed conditions

TEMPERATURE INDICATING PAINT :

It is a single pack temperature indicating system based on silicone binder

Volume solids	:	**42%**
Main pigment	:	**As per shade requirement**
Colour	:	**As per manufacturer**
Binder	:	**Based in silicone Resins**

Application	**:**	**Brush or spray**
Drying time	**:**	**Surface dry/1hr.**
		Hard dry 8 hrs.
Storage life	**:**	**12 months under sealed conditions**

COAL TAR / TAR FREE EPOXY

A high build two component epoxy coal –tar / tar free product meant for excellent performance. It is blend of epoxy and coal tar / tar free pitch in suitable ratios. The tar free can be utilized with alternate converter for low temperature or fast recoat applications.

Volume solids	**:**	**Minimum 70%**
Application	**:**	**By brush or airless spray**
Dry film thickness/coat	**:**	**150-200 microns**
Spreading rate (Theoretical)	**:**	**4-5 sq.m/l.**
Drying time	**:**	**Touch Dry within 4 hrs. @ 30 Deg C**
		Hard dry – in 16 hours
Storage life	**:**	**12 months under sealed conditions**

TWO PACK EPOXY BASED TANK LINER

These coatings are high build paints based on epoxies and cured with polyamines or modified epoxy-phenolic (novolac) and cured with amine adduct. They are specially meant as liners to interiors of petroleum tanks formulated to permit application at a DFT of 100 microns per coat.

Volume solids	**:**	**77±3%**
Binder	:	Epoxy phenolic / Epoxy novolac
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 necessary Electrical and Instrument Equipment shall be restored at site by Contractor with suitable finish.

7.0 COLOURS:

These shall be as required by specification and in particular for:

Description	Colour	Ra1	Correspond. Asian Paint colors to be defined – See Note-2
- Piping with temperature less than 90°C	GREY	7035	
- Piping, hot surface, flue gas ducts and stacks with temperature above 90°C	SMOOTH	ALUMINIUM	"
- Cooling Water Piping	SEA GREEN		"
- Fire fighting Piping	Red	3002	"
- Structures upto 2 MT	BLACK	9005	"
- Structures above 2 MT	GREY	7010	"
- Stair cases – ladders	BLACK	9005	"
- Walkwais	GREY	7010	"
- Handrails assemblies	YELLOW	1004	"
- Equipment	GREY	7035	"
- Hot equipment	SMOOTH	ALUMINIUM	"
- Fire fighting equipment	RED	3002	"
- Valves in general	GREY	7035	"
- Hot valves	SMOOTH	ALUMINIUM	"
- Safety and Fire fighting valves	RED	3002	"
- Valves handwheels	BLACK	9005	
- Electric Rotary Machines	SKY BLUE	5012	
- Electric Static Machines	GREY	7035	
- Machinery (compressors & pumps) with operating temperature less than 90°C	GREY	7035	"
- Machinery (compressors & pumps) with operating temperature above 90°C	SMOOTH	ALUMINIUM	"
FURNACES			
- Cassing and connected steel works	SMOOTH	ALUMINIUM	"
- Steel work not connected to casing	SMOOTH	ALUMINIUM	"
AIR COOLER			
- High Temperature Surfaces (Temp. > 90°C)	SMOOTH	ALUMINIUM	
- Low Temperature surface (Temp. ≤ 90°C)	GREY	7035	"
- Flare ≤ 90°C	GREY	7035	"
- Flare ≥ 90°C)	SMOOTH	ALUMINIUM	"
TANKS			

Description	Colour	Ra1	Correspond. Asian Paint colors to be defined – See Note-2
- Shell of fixed roof	WHITE	9010	"
- Roof of fixed roof tank	WHITE	9010	
-			"
- T-303	WHITE	9010	"

NOTE-1: The colours shall be according to IS2379:1990/International STD. RAL or BS, proposed by Contractor or Manufacturer

8.0 PARTICULAR DESCRIPTION

The abrasive Grit Blasting shall be used for surface preparation. **Sand blasting is prohibited due to environmental regulations.**

Primerized surface shall be faultless and shall not have mud-cracking, dripping over thickness and dry sprays.

Blast cleaning and painting shall not be carried out on wet surfaces.
Blast cleaning shall not be done when surfaces temperatures are less than 3°C above dew point, or temperature is below 5°C.

No acid washes or other cleaning solutions or solvents shall be used on metal surfaces after they have been blasted.

The surface preparation of all steel surfaces to be coated shall be free of all mill scale, rust corrosion product, oxides, paint, oil or other foreign matter

Only dry abrasive blasting procedures will be allowed. The compressed air supply used for blasting shall be free of detrimental amounts of water and oil. Adequate separator and traps shall be provided and these shall be kept emptied of water and oil. Any blast cleaning set up without functioning moisture separators shall be removed from blast cleaning areas. All welded areas and appurtenances shall be given special attention for removal of welding flux in crevices. Welding splatter, slivers, laminations and underlying mill scale exposed during sand blasting shall be removed or repaired.

The blast-cleaned or power brushing surfaces shall be coated with primer within four hours of surface preparation.

No primer or intermediate or finishing coating shall be applied without prior notification to the Company.

The application of the products shall be carried out in strict compliance with the paint manufacturer's recommendation.

The Contractor shall provide suitable protection for all adjacent plants or equipment from 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.

Access shall be granted for inspection of all paint work, and witnessing of test work. This shall not however relieve the Contractor of their own QA/QC responsibilities.

10.0 ADHESION TEST RESULTS

For all type of primer the Contractor shall guarantee the Classification of Adhesion Test Results as per ASTM D3359. The acceptable Rate Adhesion Test Results shall be for sandblasted and primerized surfaces shall be minimum 3A (or Higher)

For primer plus finishing coat(s) the Contractor shall guarantee the Classification of Adhesion Test Results as per ASTM D 3359. The acceptable Rate Adhesion Test Results shall be for blast cleaned and painted surfaces shall be minimum 3A (or higher).

After test, the surface must be repaired according to the system applied.

11.0 SUBMISSION OF DATA

Contractor shall submit in phase of bid the original technical data sheet and system for all material supplied by him to apply for the permanent works and test report for the paint in compliance to IS101.This material shall be subject to Owner's approval.
The test certificates of zinc silicate shall provide the specific gravity of mixed paint.

12.0 LETTER AND NUMBER INSCRIPTION

Inscriptions letters, as herebelow indicated, shall be made on equipments, piping, storage tanks, machinery etc.

12.1 Geometric forms and dimensions

Letters and numbers dimensions shall be orientatively fixed according to following:

(A – Dimension of side of unitary elements of grid)

a) Storage Tanks A – 60 mm
b) Equipments and piping with O.D. above 600 mm A– 40 mm and
c) Equipments and pipings with O.D. from 300 to 600 mm and for machinery of great dimensions A – 20 mm
d) Equipments and pipings with O.D. less than 300 mm and for machinery with small dimensions A – 10 mm

12.2 Inscription's Colours

Inscriptions shall be Black ENI 901 (RAL 9005) on light base

Inscriptions shall be White ENI 101 (RAL 9010) on dark base

12.3 Spaces and Interspaces

Spaces between words and assemblage of numbers shall have dimensions equal to 2A

Interspaces between letters or numbers shall have dimensions equal to A.

13.0 Colour Band for piping ;-

As a rule minimum width of colour band shall confirm to the following Table:-

Nominal pipe Size	Width L (mm)
3” & below	25
4” NB-6” NB	50
8” NB-12”NB	75
14” OD & above	100

14.0 LIST OF MANUFACTURERS :

1. M/s Berger Paints
2. M/s Jensons & Nickolson
3. M/s Asian Paints
4. M/s Grauer & Weil (India) Limited
5. M/s Shalimar paints
6. M/s Garware Paints
7. M/s Goodlass Nerolac Paints Ltd
8. M/s.HEMPEL Paints
9. International Paints (Akzo Nobel Brand)
10. Jotun Paints
11. M/s Carboline (India) Pvt. Ltd.
12. Mohan Paints

15 GUARANTEES:

Contractor along with Paint Manufacturer jointly shall develop the paint specification stating the duration and extent of guarantee on the paint system adopted.

Failure of paint system due to poor workmanship, wrong selection of paints and other paint manufacturing defects etc, shall be rectified by the contractor at his own cost immediately upon brought to notice.

TECHNICAL SPECIFICATION

FOR

THERMAL INSULATION

HOT SERVICE

0	12.07.2018	ISSUE FOR USE	DILIP	DILIP/GC	GC
REV	DATE	PURPOSE	PREPD	REVWD	APPD

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a) General

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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 for Hot Service. TS -6700 is supplementary to this standard and all the applicable requirements of TS-6700 shall be complied with in conjunction with the requirements specified here in.

1.2 REFERENCE STANDARDS

TS-6700	Thermal Insulation – General Requirements
IS:14164	Code of Practice for Industrial Application and finishing of thermal insulation material at temperature -80^{0}C and up to 750^{0}C.
IS:8183	Specification for bonded mineral wool
IS: 9842	Specification for performed fibrous pipe insulation
IS:8154 / IS:9428	Calcium silicate pipe sections & blocks
IS:9743	Insulating cement
IS:9742	Specification for spray able mineral wool.
IS : 15402	Specification for Ceramic Fibre Insulation
ASTM C-680	Standard Practice for Heat Loss or Gain and Surface Temp.
ASTM C-795	Standard Specification for Insulation use over Austenitic Stainless Steel.

1.3 DEVIATIONS

Should unforeseen difficulties arise to comply with requirements of this standard.

- Alternative materials and application techniques equivalent or superior to the requirements of this standard may be submitted with complete details for approval of PDIL.
- In case of contradiction between requirements of this standard and the NIT/work order, the latter will be followed.

1.4 LIMITATIONS

Temperature Limits

This standard deals with insulations applied externally on piping / equipments etc. for temperature ranging from 60^{o}C to 750^{o}C.

1.5 GENERAL REQUIREMENTS

1.5.1 Personnel Protection (PP)

Insulation for personnel protection is usually called for when the surface temperature is above 60°C and process requirement does not necessitate any insulation. Wherever, requirement of such insulation for P.P. is indicated, extent of insulation will be as follows:

a) Insulation all such portions of the surface which could be touched in the course of normal operation / maintenance duties.

b) Insulate up to a height of 2.5 M above grade level/working platform level.

c) Insulate all portions of the surface within a distance of 600 mm from the edge of any walk way / operating platform/ladder.

2.0 MATERIAL REQUIREMENTS

2.1 INSULATION MATERIALS

2.1.1 General

- Wherever reference to any standard is made it is presumed that the latest revision as on date should be considered.

2.1.2 Specification and other requirements as per table below:

Sl. No.	Specification	Applied density Kg/m^3 (minim.)	Temp. limit °C	Maxim. Thermal conductivity mW/cm °C at 100°C mean temp. # .
1	2	3	4	5
A)	For Vessels/Equipments/Large Pipes			
	i) Bonded rock wool mattress/slabs as per IS:8183 Gr.3	100	400	0.51
	ii) Bonded glass wool mattress/slabs as per IS:8183 Gr.3	85	400	0.51
	iii) Bonded rock wool mattress / slabs as per IS:8183 Gr.3	150	401-550	0.51
B)	For Pipes			
	i) Preformed bonded Rock wool/glass wool pipe sections as per IS:9842 Gr. 2	85	400	0.51

	ii) Preformed bonded rock wool pipe sections as per IS:9842 Gr. 2	150	550	0.51
	iii) Preformed calcium silicate pipe sections as per IS:8154/9458 & ASTM C 533.	250	750	0.6
C)	Ceramic Fibre Blanket Insulation as per IS : 15402	128	750	0.76 at 200ºC
D)	Ceramic Fibre Pad Insulation	128	750	0.76 at 200ºC
E)	Inner layer Ceramic Fibre and subsequent outer layers Rockwool Insulation	128 & 150	501-750	0.76 at 200ºC
F)	Ceramic Fibre Rope 18-24mm for Insulation of Impulse / Small dia pipelines (1 ½ inch & below) as per IS : 15402	250	750	0.76 at 200ºC

Please also refer Thermal Conductivity Values at different mean Temperatures.

NOTES:

1. Insulation material manufactured from slag is not acceptable.
2. Bonding agent will not be more than 4.5% by weight in the insulation material.
3. Insulation material on application directly over austenitic stainless steel (upto 450ºC) shall not contain leachable chloride more than 10 ppm. For application on C.S. & A.S. surfaces and on S.S. surfaces covered with aluminium foil (upto 450ºC), leachable chloride in the insulation material up to 100 ppm could be permitted. In case of calcium silicate, suitable corrosion inhibiter (sodium silicate) shall be added and sodium silicate content shall not be less than 20 ppm for each ppm of leachable chloride. Factory inhibited insulation shall be preferable, whereby sodium silicate solution will be sprayed on to the Insulation at factory.
4. Where foot traffic is expected on the insulated surface, the minimum density of applied insulation will be 150 Kg/m^3 irrespective of temperature.
5. Sprayable Mineralwool as per IS: 9742 or Ceramic Pads as per IS:15402 may be considered for irregular shaped equipments like turbines, pumps, valves, flanges etc.
6. All optional requirements as per cl.3.10.3, 3.10.5, 3.10.6, 3.10.7 of IS: 8183 and cl.3.12.1, 3.12.4 of IS: 9842 shall be complied with.
7. Large pipe means pipe having nominal size 26” NB and higher.
8. Pipe sections shall be applied up to 14” NB Dia pipelines.
9. For multi layer insulation, only first layer to be pipe sections and subsequent layers with mattress insulation.

10. For water prone areas Water Repellant Grade insulation to be used as per BS: 2972.

2.2 AUXILIARY MATERIALS

2.2.1 Paints

a) Heat resisting (for application on S.S. surface Hot Service)

Type	Single pack
Composition	Silicon resin based with aluminium flakes as pigment.
Dry film thickness	20 microns / coat (minim.)
No. of coats	2 coats
Other requirement	It should be suitable to with stand temperature up to 550°C.

2.2.2 Insulation Cement

This is used for filling voids & surface irregularities. This shall be high grade mineral wool/calcium silicate plastic composition based cement having a volumetric shrinkage not exceeding 20% of wet coverage and with a max thermal conductivity of 0.01 mw/cm degree C at 205°C mean temperature.

2.2.3 Hard Setting Plaster

Hard setting plaster shall be a mixture of cement sand or cement mineral fibre or plaster of paris - mineral fibre. This will be applied over the specified wire netting/chain link mesh. The plaster shall conform to IS: 9743.

2.2.4 Wire (for netting, lacing or stitching)

Wire netting for machine stitched mattresses shall be galvanized steel wire of dia 0.56 mm (minimum) making 25 mm hexagon meshes. Lacing wire to bind the ends of wire netting shall be galvanized steel wire of minimum dia 0.56 mm.

2.2.5 Banding Wire

Wire for securing insulating blankets or sections shall be galvanized soft, annealed steel wire of 1.625 mm diameter for pipes and 2.640 mm dia for vessels.

2.2.6 Lacing Wire

Lacing Wire to stitch wire netting of adjacent mattresses shall be of G.I. wire of 22 SWG.

2.2.7 Bands for securing Insulation material
Shall be aluminium or S.S. 20x0.5 mm. For spherical surfaces only S.S. bands will be used.

2.2.8 Foil for wrapping S.S. surfaces

Aluminium foil of 0.1 thicknesses, free from pin holes.

2.2.9 Spacer Ring

1. Spacer rings shall be provided when mattress insulation is used to provide frame work on which aluminium sheeting (Refer Fig. 1) used for protecting the insulation, is cladded. These rings shall be fabricated from 25 x 3 mm MS flats.

   Spacer rings are not required when pipe lines are insulated with performed pipe section.

   The outside dia of these rings shall be equivalent to the diameter of the pipes/vessels measured over the insulation. Spacer rings shall not be required when insulation in the form of performed rigid pipe sections is used.

2. Spacer rings may not be used for pipes where insulation O.D. is less than 150 mm.

3. Spacer rings shall be provided with "Z" shaped stays fabricated from the same size MS flats. Stays shall be provided at intervals of not more than 300 mm along the circumference of the insulation, subject to a minimum of 3 stays spacer rings shall be provided on the pipes at a pitch of not more than 900 mm.

4. To minimize direct heat conduction through the stays, a packing of 2 sheets of 3 mm thick Ceramic Fibre Paper (density 320 kg/m3) shall be provided at the joints of the stays and pipes, while the joints of stays and MS rings shall be riveted by 6 mm dia. MS rivets with 2 sheets of 3 mm thick Ceramic Fibre paper interposed as shown in Fig. 1.

2.2.10 Aluminium cladding with inner side coated with Polysurlyn coating – As per TS: 6700

2.2.11 Heat transfer putty (viz. thermo bond) for tracers.

3.0 APPLICATION OF INSULATION

3.1 THICKNESS OF INSULATION

Insulation thickness shall be as specified in the insulation schedule/specification/isometric drawings prepared for equipments/piping. Wherever the thickness is not indicated the same may be selected from Table – I.

3.2 GENERAL REQUIREMENT

3.2.1 Extent of Insulation

- All steam traced lines, steam jacketed piping and vessels shall be insulated.
- Stem trap and piping downstream of it shall not be insulated.
- Turbines, pumps and compressors operating below 120°C shall not be insulated unless otherwise specified.
- Flanges & flanged valves on lines operating above 65°C but below 200°C shall normally not be insulated expect for personnel protection. In such cases, insulation shall terminate at such a distance from the joints as to provide sufficient space for removal of bolts.

- Drain and vent piping for hot service up to the first valve on insulated equipment shall be insulated with similar type of insulation and finish as the equipment to which attached.
- Steam supply headers, and tracer lines used for steam tracing as shown on steam trap hook-ups shall be insulated.
- All instruments which are steam traced shall be insulated for heat conservation.
- All sample connections and drains on steam lines shall be insulted.
- All name plates and vessel markings should remain visible.

3.2.2 Insulated of S.S. Surface

For operating temperatures up to 450°C the stainless steel surface shall be wrapped with Minimum 0.05 mm thick aluminium foil with 50 mm overlap at longitudinal and circumferential joints before application of insulation. All joints of the aluminium foil shall be lapped and sealed to be Proof against leakage. Aluminium foil shall be firmly secured on to the stainless surfaces by aluminium bands at a pitch of 450 mm. Care shall be taken while applying aluminium foil over the pipes to ensure that the foil is not punctured at any place during wrapping and clapping with aluminium bands.

For operating temperatures from 451 to 550°C, the stainless steel surfaces shall be painted with two coats of heat resistant paint before application of insulation. When the paint becomes dry, the painted surfaces shall show no discontinuity.

In case of factory made inhibited grade insulation within 10 ppm, same can be applied directly on to the SS surface upto 450ºc

3.3 INSULATION PROCEDURE

The application procedure described in for rock/glass wool. For other insulations, the application procedure shall be submitted by the tenderers.

3.3.1 **Vessels and Columns**

3.3.1.1 **General**

Insulation blankets shall be applied with the retaining wire mesh exposed on the outside. The edges of blankets shall be well butted up to each other and laced together with galvanized wire and secured to the vessel with circumferential bands as shown in Fig. 2, 3, 4 & 5 when two layers are to be applied the first layer may be secured by means of galvanized wire in lieu of the bands.

On flat surfaces, blankets/blocks/slabs shall be applied by impaling them over 9 gauge galvanized wire pins welded perpendicular to the surface. The extending ends of the wires shall then be bent upward at right angles and pressed into the blanket. The edges of blankets shall be tightly butted and laced together with galvanized wire. Where more than one layer of insulation is applied, securing bands of the layers shall not coincide with each other. All joints in successive layer shall be staggered.

3.3.1.2 **Vessel Heads**

Insulation on heads shall be secured by radial bands from a floating ring centered at the crown of head and tied to a circumferential band placed approx 300 mm inside the tangent line on insulation O.D. Ref. Fig. 2. On to heads of vertical vessels, these radial bands protecting the blanket insulation shall be provided with distance pins placed every 300 mm and of a length equal to insulation thickness. The pins shall be welded or riveted to the strip steel.

For bottom heads, in all skirt supported vessels insulation supports are provided inside the skirt as indicated in the equipment drawings. Floating rings or wire loops around the nozzle and bands may be used to support downward facing of insulation. Such a floating ring may be supported from the lagging support ring fixed inside the skirt. Blanket shall be shaped and secured on to the head by means of bands stretched across the floating ring and insulation support rings. The insulation shall be covered with galvanized wire netting firmly laced together and secured in place. Insulation details shall be as per Fig. 6. All wire ends shall be cut short and turned into the insulation.

For vertical vessels having temperatures more than or equal to 450^{o}C, the upper 600 mm of the supporting skirt shall be insulated both on inside and outside.

3.3.2 **Tanks**

The details of support cleats will be as indicated in Fig. 7.

- Mineral wool mattresses faced with galvanized iron wire netting shall be pressed onto the supporting pins of 8 SWG GI wire. All joints shall be closely butted as shown in Fig. 7 A, B.
- For the top of tank the following procedure shall be adopted where angle supports/wire lugs are not provided by fabricator. All these will be supplied by insulation contractor.
- Laying of central and peripheral angle rings and details are shown in fig. 3, 3a, 3b.
- Welding M6 studs of length T + 6 mm (where T = thickness of insulation) at 300 mm pitch to MS flats shall then be laid on the tank top connecting the central and peripherical rings riveted/welded at both ends. Fix the 15 x 6 mm flat cross stiffeners with stud welded.
- Fix resin bonded mineral wool slabs of required thickness by pressing on to the studs.
- Stretch 20 SWG chain link mesh, anchoring it to the M.S. studs by means of speed washers.
- Apply approx. 19 mm thick hard setting plaster trowelled to a smooth and even finish.
- When hard setting compound is completely dry apply a standard four course bitumen felt, water proof treatment as per IS: 1346 or 3mm thick APP modified Bitumen Felt.
- Fix a “shed-water” shroud constructed from 200 galvanized iron plain sheet at the periphery of the tank. This shall be fitted prior to the application of the hard setting compound.

3.3.3 **Heat Exchangers**

Exchangers shall be insulated with insulation mattresses as specified for vessel. Channels and channel covers will be insulated with removable aluminium covers lined with insulation. Unless otherwise mentioned flange bolting shall be left un-insulated for hot service ref. Fig. 4.

3.3.4 Machineries like pumps, turbines, compressors etc.

In general these will be insulated in such a way that the same is of removable type to allow easy maintenance. The contractor shall supply insulation detail to engineer-in-charge for approval.

3.3.5 **Piping**

a) General

- Vertical lines shall be provided with welded support rings Ref. Fig. 8 spaced at approximately 4000 mm. Expansion/contraction joints shall be provided under each support ring for hot./cold service.

- Insulation around support shoes etc. shall be trimmed closely and thoroughly sealed with vapour seal mastic. For hanger support special care shall be given for weather proofing jacket and sealing mastic. Ref. Fig. 9 & 10.

b) **Hot Service**

The performed pipe section of required thickness shall be fixed on the pipe surface with the help of 20 mm x 24 SWG aluminium band.

The blankets shall be wrapped round the pipe closely, completely covering the outer surface. Edges shall be tightly butted and laced with galvanized wire Ref. Fig. 11 & 12. The blankets shall be secured in place with galvanized bands/wires spaced at 300 mm. Ends of the wire loops shall be twisted and pressed back into the insulation. All voids, irregularities and joints shall be painted up and trowelled smooth with insulations cement. Longitudinal joints in jackets on horizontal pipes shall be located 30^{o} below center line of pipe. Spacer rings as shown in Fig. 1 shall be installed at 100 mm interval to support the jacket.

In consideration of possible pipe line movement with change in fluid temperature different pipes should be separately insulated.

For temperatures above 500^{0}C, combination of first layer Ceramic Fibre (25mm) followed by Rockwool Mattress will be tied with SS bands.

Flanges, valves & expansion joints shall be insulated with removable type pad arrangement as per requirement of TS: 6700.

For Small dia pipes of 1 inch & below Ceramic Fibre rope (18-24mm dia) may also be used and covered with Aluminium tape wherever exposed to atmosphere.

c) **Steam Traced Lines**

The steam traced line shall first be wrapped with 24 SWG x ¾" hexagonal mesh GI wire netting so that it passes round the supporting hooks for the racer line or lines. Thus ensuring tracer pipe bearing tightly against the line which is steam traced. This prevents the insulating material from entering the air jacket formed between the insulation and the pipes. The details are give in Fig. 13 & 14. In case of steam traced lines with thermo-bond or with Al foil the material supply and application, as per ES: 6016 will be in the scope of insulation contractor.

For stainless steel main lines having steam tracer, the method of application of insulation shall be the same as described in above except that an aluminium foil, shall be wrapped round the main pipe and tracer pipe as per the procedure described in clause 3.3.2.

For Electric traced lines, the tracer wires to be wrapped over the pipes and held in position with aluminium tape. Subsequently insulation mattress to be applied and tied with bands.

3.3.6 Aluminium cladding with inner side (in contact with insulation) coated with Polysurlyn shall be applied over the finished insulation surface as per TS:6700.

4.0 INSULATION OVER VALVES, FLANGES and TURBINES for High Tem.

Providing and fixing Flexible Removable Reusable Insulation pad over Valves Flanges and Turbines secured tightly with 1.5mm SS wire passing through hooks placed over the pads. The pads shall be made out of non-combustible Ceramic Fibre Blanket 128 kg/m3 having thermal conductivity value of 0.150 W/mK at 500 deg.C mean temperature conforming to IS:15402 and suitable upto 1425 deg.C, encased in fibre glass fabric with external top cover fabric (for cold face) Polymer coated fibre glass fabric temperature resistance 300 deg.C, oil, water & UV resistant, external bottom cover fabric (for hot face) high silica cloth for Temperature Resistance upto 900 deg.C. and stitched with 0.028mm SS wire at the edges using 7-10 stitches per 25mm. There will be industrial hooks stitched on top at 200-300mm centre to centre. The pads shall be of 25mm thickness for usage upto 200 deg.C, 50mm upto 400 deg.C and 75mm above 400 deg.C. The Pads will be wrapped over the Valve & Flange surface and held in position tightly with the help of SS Wire. The pads will have overlap upto 75mm at the ends. Wherever required SS wire mesh to be lined on inner side of the cover as an option. The prefabricated pads shall be tailor-made to the size of Valve & Flange and manufactured at the factory.

THICKNESS OF CERAMIC FIBRE PAD

0-200 deg.C – 25mm
201-400 deg.C – 50mm
401-500 deg.C – 75mm

TABLE-1
INSULATION THICKNESS (MM) FOR HOT SERVICE

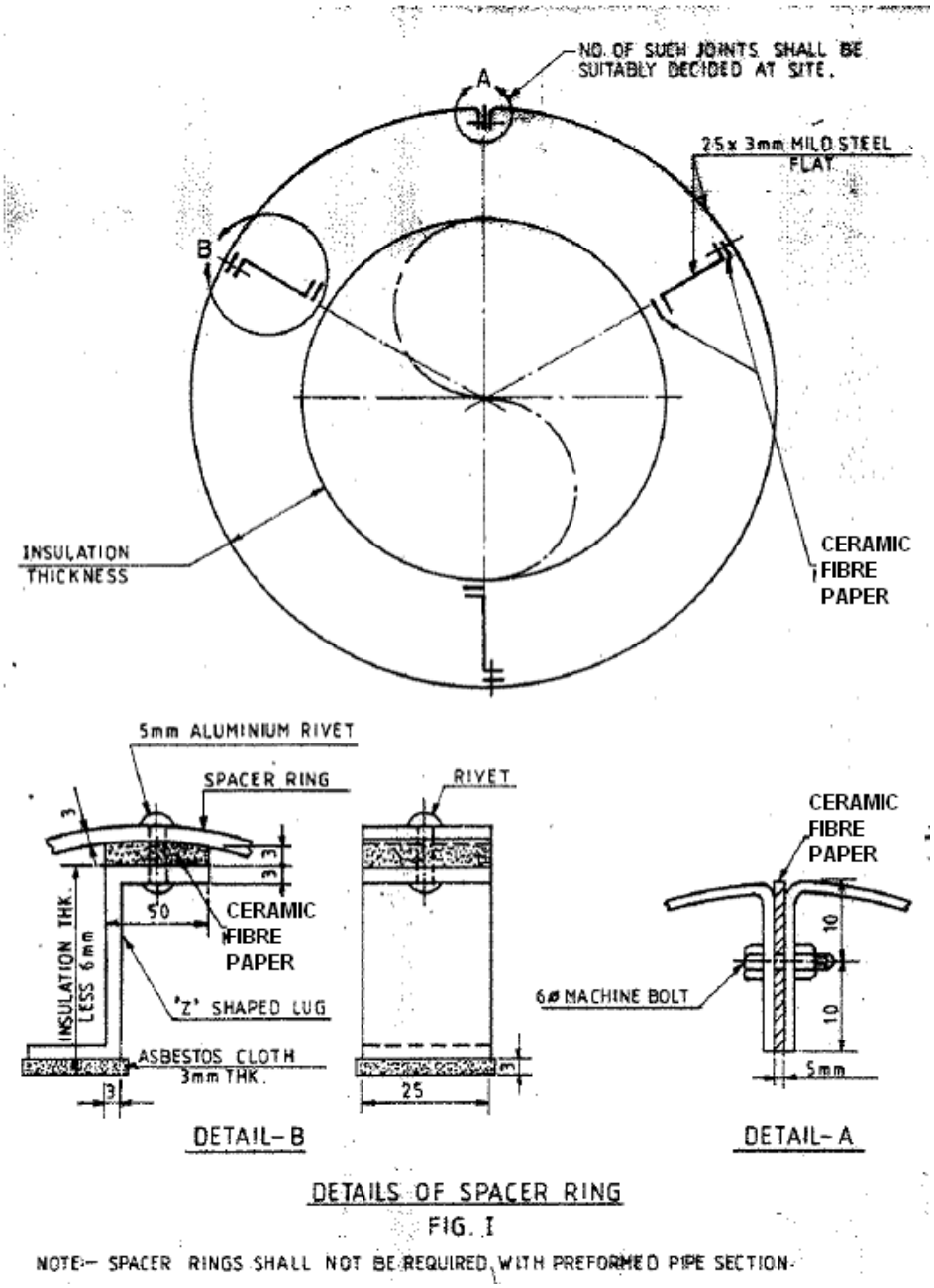
DESIGN CRITERIA
AMBIENT TEMPERATURE :35 Deg. C
SURFACE TEMPERATURE : 60 Deg. C
WIND VELOCITY : 1 m/s
DESIGN HEAT LOSS : 150 Kcal/hr.m2
MATERIAL : ROCKWOOL (Density =100 Kg/m3 up to 400 Deg. C & 150 Kg/m3 from 401-650 Deg. C as per IS 8183 Gr. 3)

OPERATING TEMPERATURE (Deg. C)														
HOT INSULATION												PERSONNEL PROTECTION		
PIPE DN (MM)	<=150	151-200 °C	201-250 °C	251-300 °C	301-350 °C	351-400 °C	401-450 °C	451-500 °C	501-550 °C	551-600 °C	601-650 °C	UPTO 250 °C	251-400 °C	401-500 °C
15	25	25	35	40	50	60	70	80	80	95	110	30	30	30
20	25	25	35	45	55	65	75	85	85	100	115	30	30	30
25	25	30	35	45	55	65	80	90	90	105	125	30	30	30
32	25	30	40	50	60	70	80	95	95	110	130	30	30	30
40	25	30	40	50	60	70	85	100	100	115	135	30	30	30
50	25	30	40	50	60	75	90	105	105	125	140	30	30	30
65	25	30	40	55	65	80	90	105	110	130	150	30	30	30
80	25	30	45	55	65	80	95	110	115	135	155	30	30	30
100	25	35	45	55	70	85	100	120	125	145	165	30	30	40
125	25	35	45	60	75	90	105	125	130	150	175	30	30	40
150	25	35	45	60	75	90	110	130	135	160	185	30	30	40
200	25	35	50	65	80	95	115	135	145	170	200	30	30	50
250	25	35	50	65	80	100	120	145	155	180	210	30	40	50
300	25	35	50	65	85	105	125	150	160	190	220	30	40	50
350	25	35	50	65	85	105	130	150	160	190	225	40	40	50
400	25	35	50	70	90	110	130	155	165	195	230	40	40	50
450	25	40	55	70	90	110	135	160	170	200	235	40	40	50
500	25	40	55	70	90	110	135	160	175	205	240	40	50	50
550	25	40	55	70	90	115	135	160	175	210	245	40	50	50
600	25	40	55	75	90	115	140	165	180	210	245	40	50	50
>600/ Flat Surface	25	40	60	80	100	130	160	195	220	270	325	40	50	50

NOTE 1: For temperatures above 500deg.C,first layer of 50mm Ceramic Fibre Blanket of density 128 kg/m3 to be applied and subsequent layers with Rockwool Mattress
2- Flat surface includes Equipments and large dia pipes (DN>600).

Thermal Conductivity Table for Insulation Materials

Sl.No.	Mean Temp.	Rockwool			Rockwool			Calcium Silicate		Ceramic Fibre	
	Deg.C	Density-100kg/m³ IS 8183			Density-150/144 kg/m³ IS 8183/9842			Density-250 kg/m³ IS 8154		Density -128 kg/m³ IS 15402	
		w/mk	mW/cm	kcal/mhr	w/mk	mW/cm	kcal/mhr	w/mk	kcal/mhr	w/mk	kcal/mhr
			deg. C	deg C		deg. C	deg C		deg C		deg C
1	100	0.052	0.52	0.0447	0.052	0.52	0.0447	0.06	0.052		
2	150	0.062	0.62	0.0533	0.062	0.62	0.05331	0.07	0.06		
3	200	0.073	0.73	0.06276	0.068	0.68	0.05795	0.08	0.069	0.076	0.06535
4	250	0.084	0.84	0.07222	0.08	0.8	0.06878	0.09	0.077		
5	300	0.095	0.95	0.08168	0.09	0.9	0.07738	0.1	0.086	0.081	0.06964
6	400									0.122	0.1049
7	500									0.15	0.12897



DETAILS OF SPACER RING

FIG. I

NOTE:- SPACER RINGS SHALL NOT BE REQUIRED WITH PREFORMED PIPE SECTION.

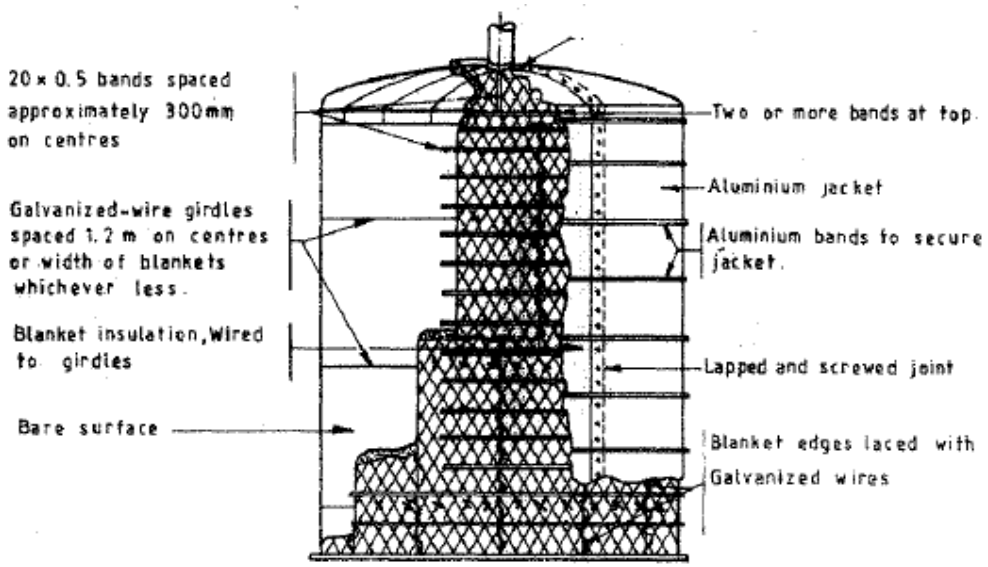


FIG. 2 Application of mineral wool blanket insulation for tanks 3m dia and above.

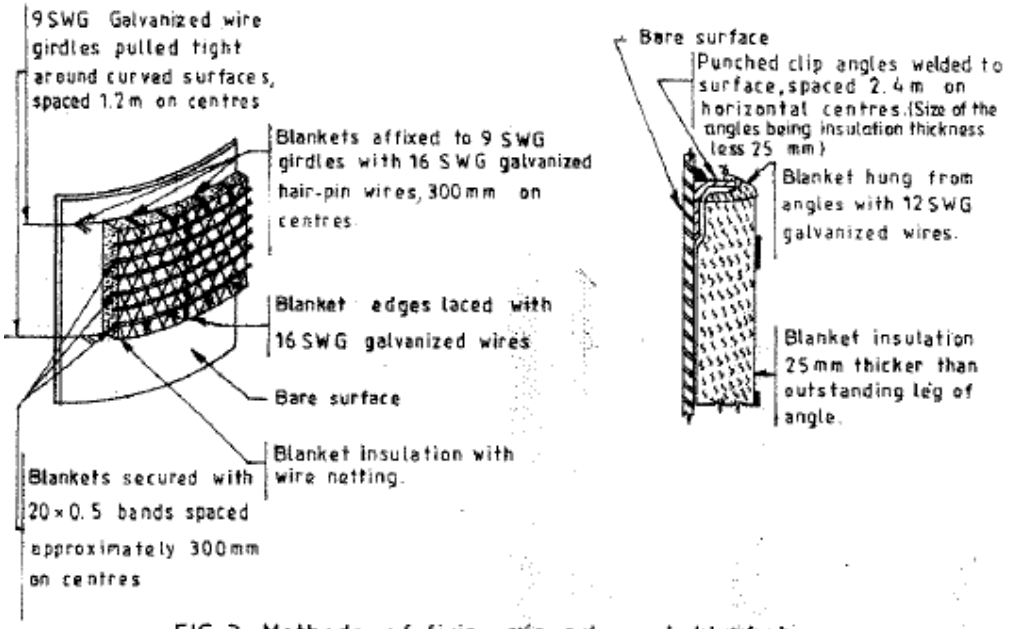


FIG. 3 Methods of fixing mineral wool blankets

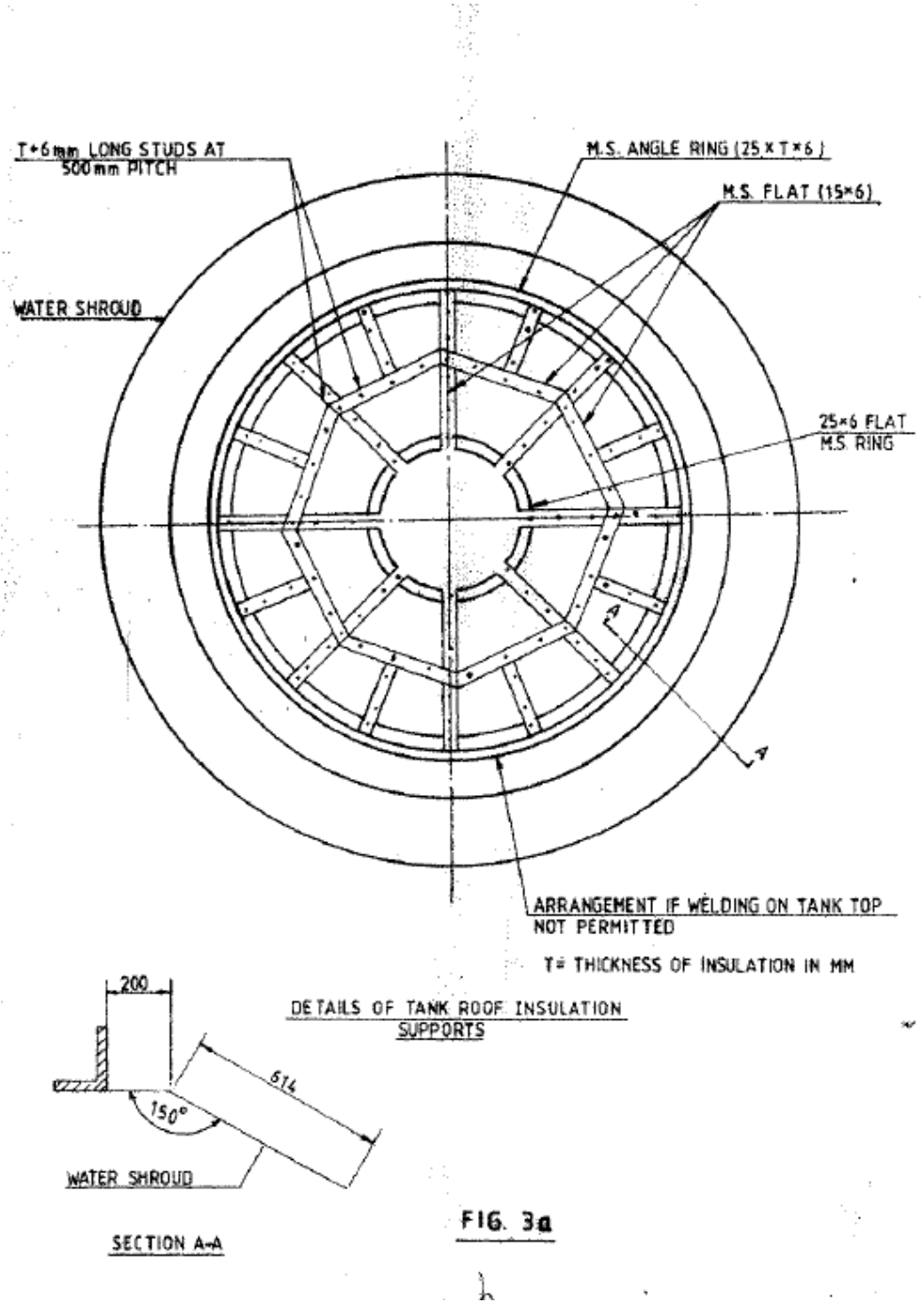
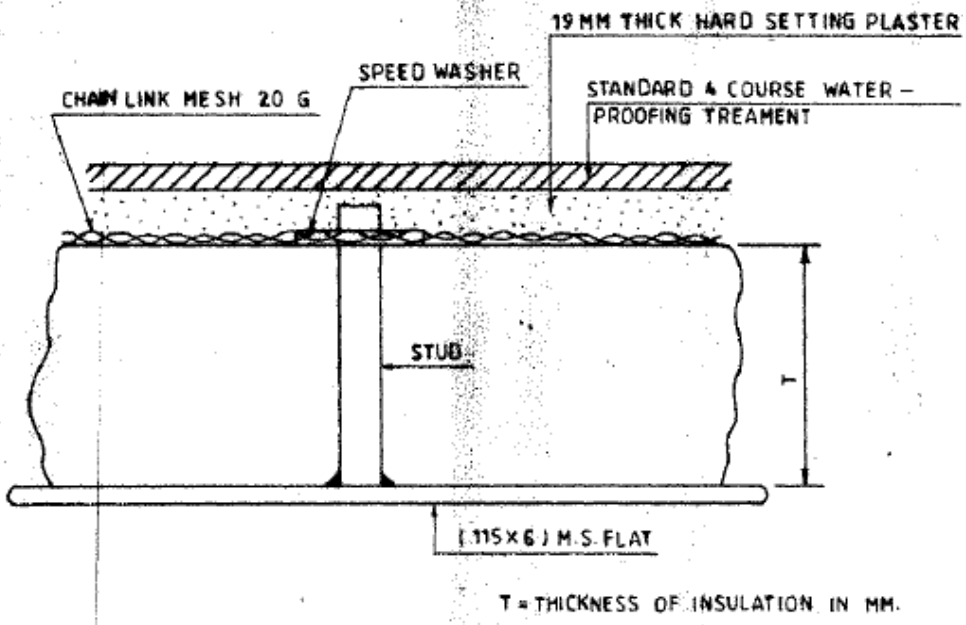


FIG. 3a



DETAILS OF TANK TOP SETTING PLASTER FINISH

FIG. 3b

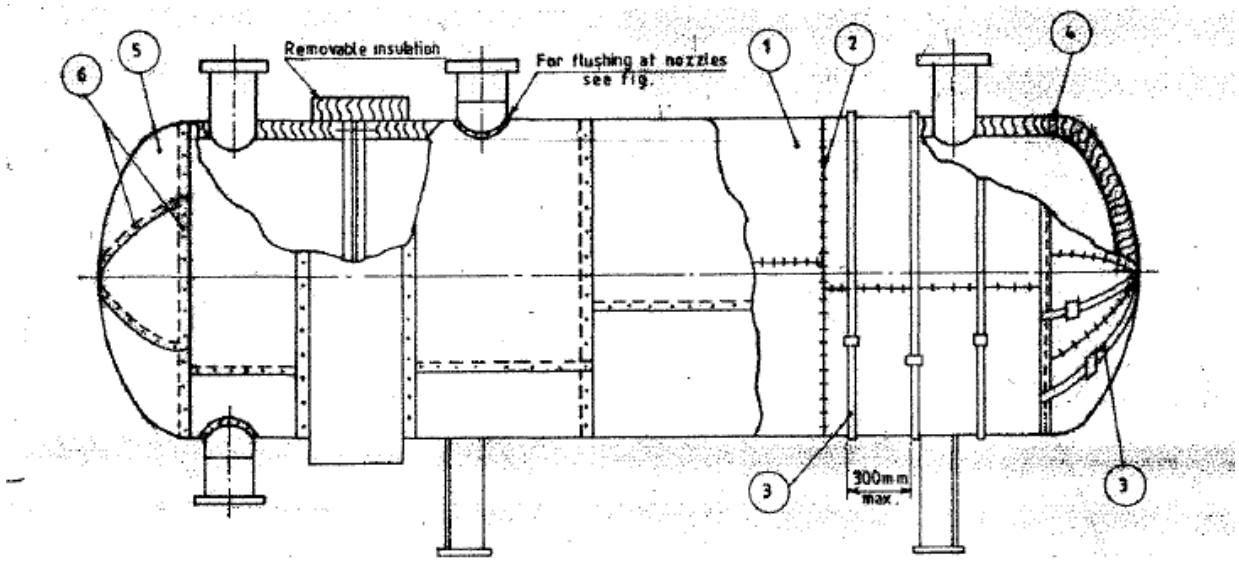


FIG. 4 HORIZONTAL VESSELS AND EXCHANGERS–HOT INSULATED

1. Insulation material blankets or blocks
2. Hog clips spacing 100mm (When blanket insulation)
3. Band ⏀ 20 × 0.5
4. Angle ring and brackets
5. Aluminium jacket
6. Self tapping screws

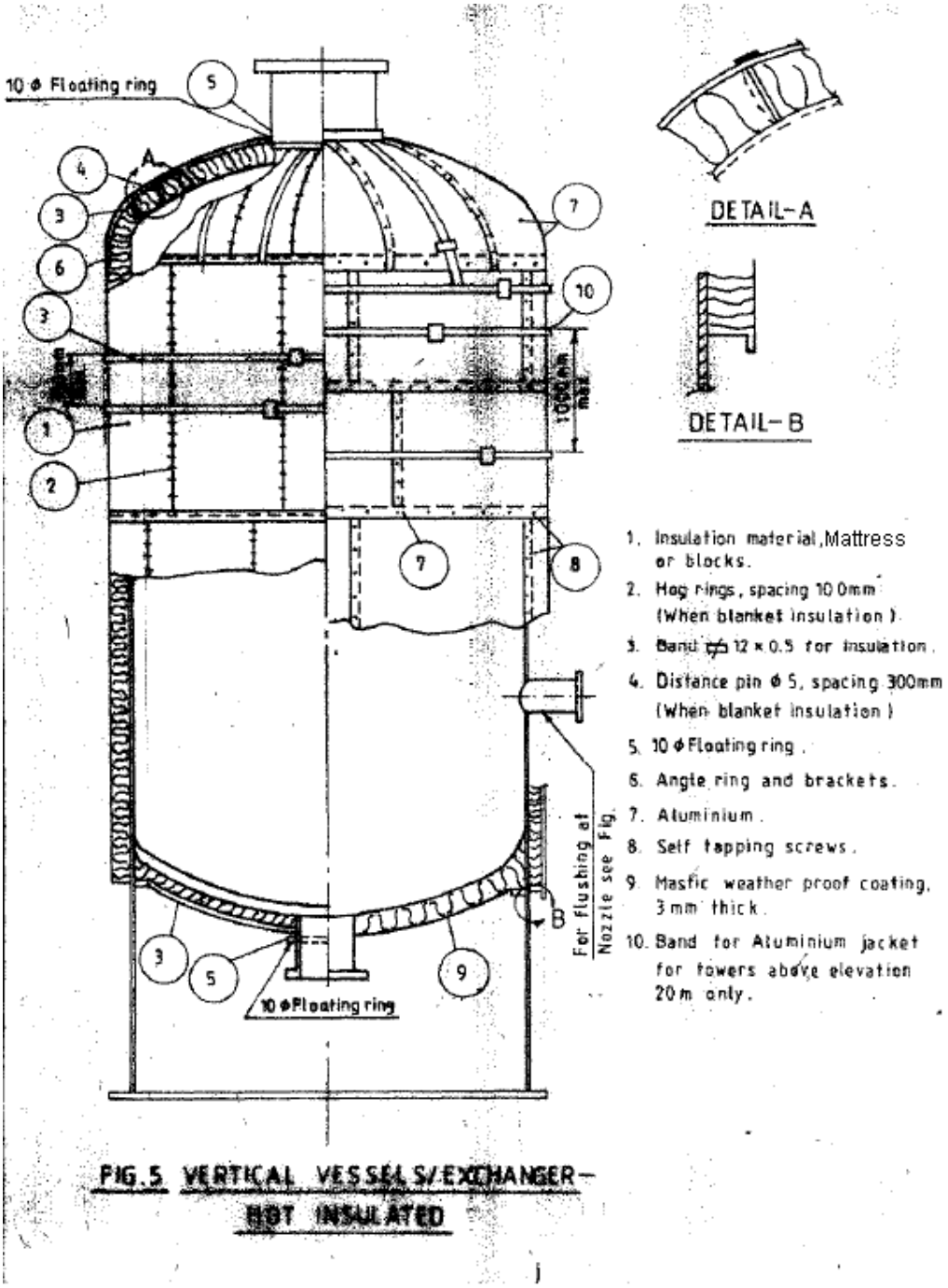


FIG.5 VERTICAL VESSEL S/EXCHANGER – HOT INSULATED

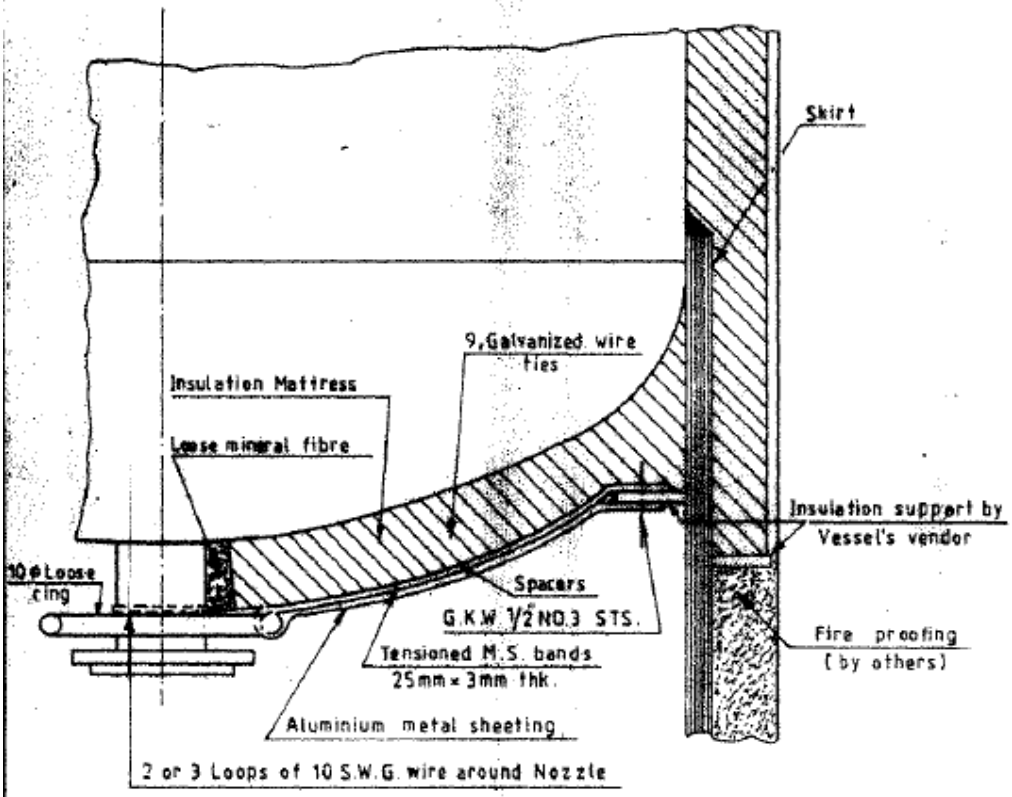


FIG. 6 BOTTOM HEAD WEATHER PROOFING FOR VERTICAL VESSELS

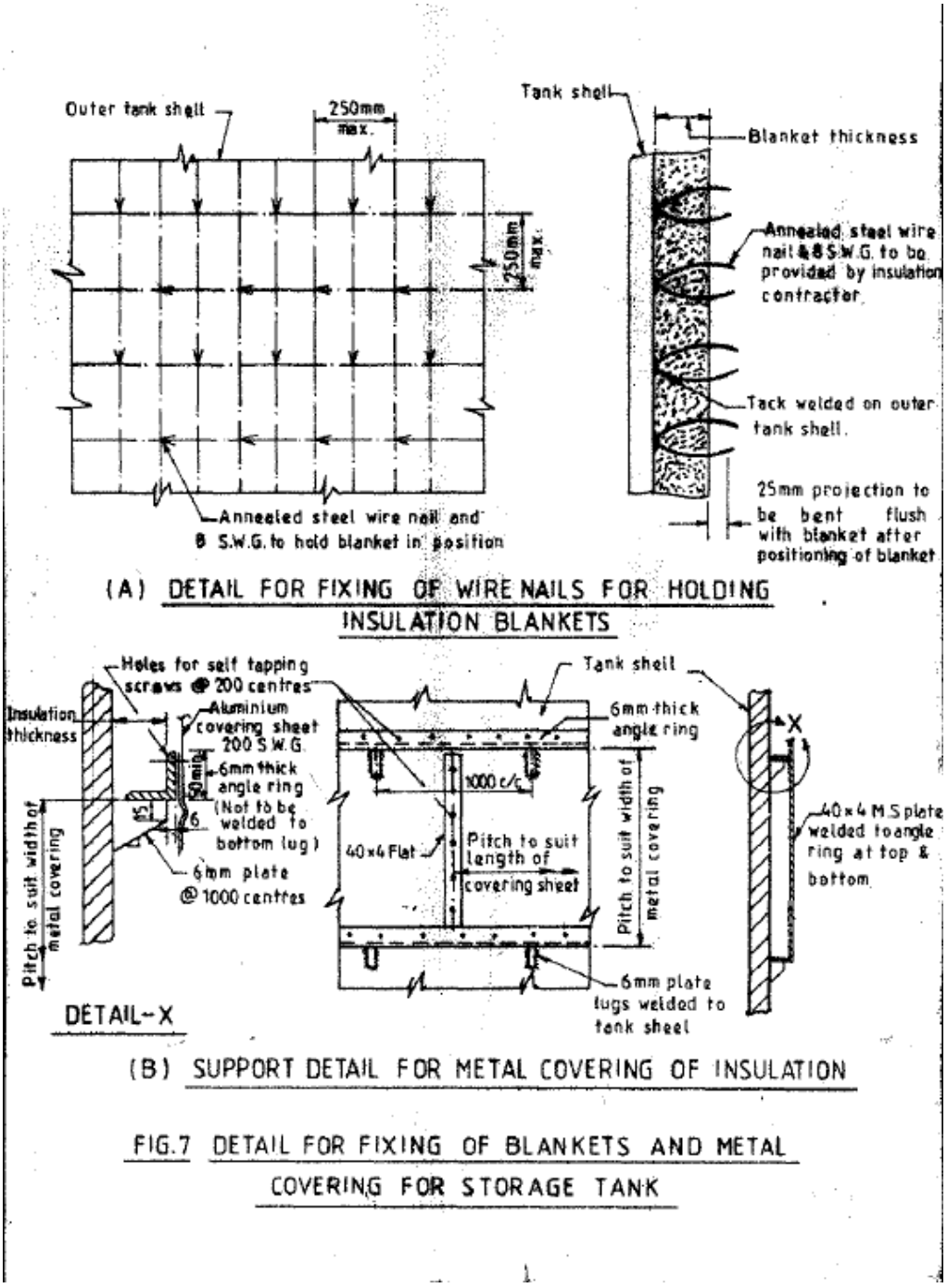


FIG.7 DETAIL FOR FIXING OF BLANKETS AND METAL COVERING FOR STORAGE TANK

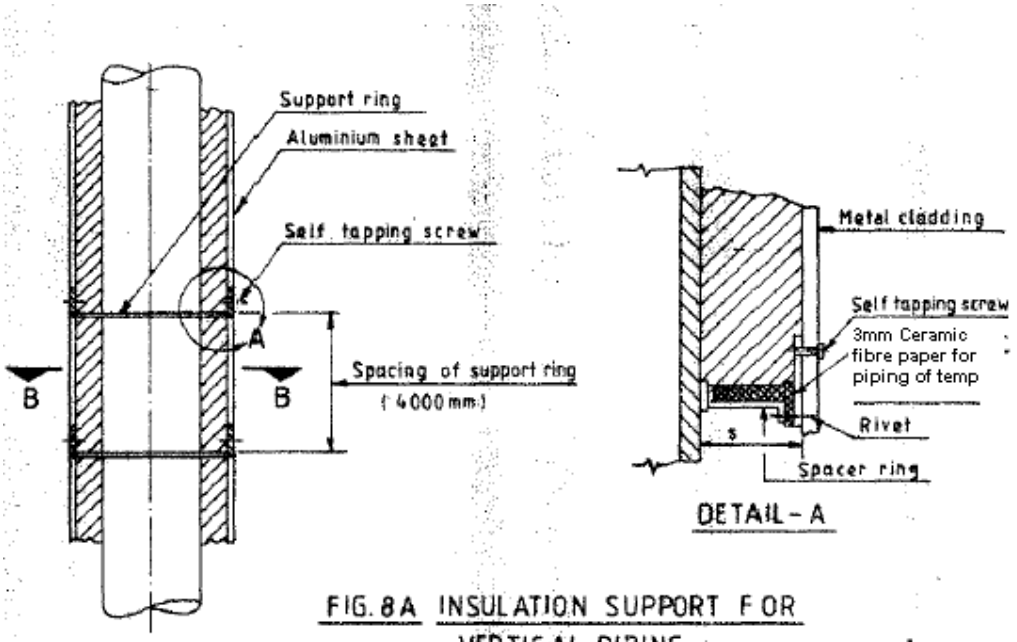


FIG. 8A INSULATION SUPPORT FOR VERTICAL PIPING

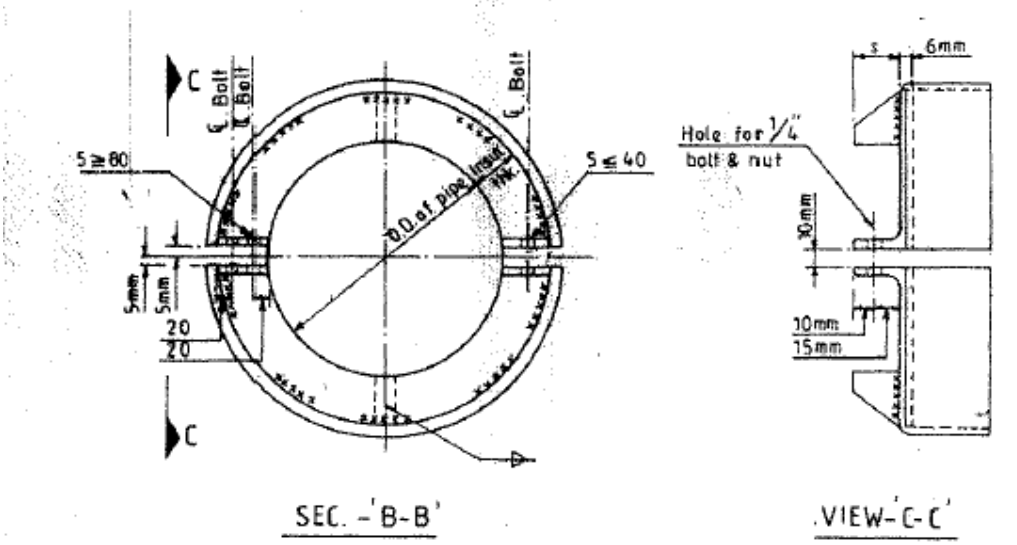
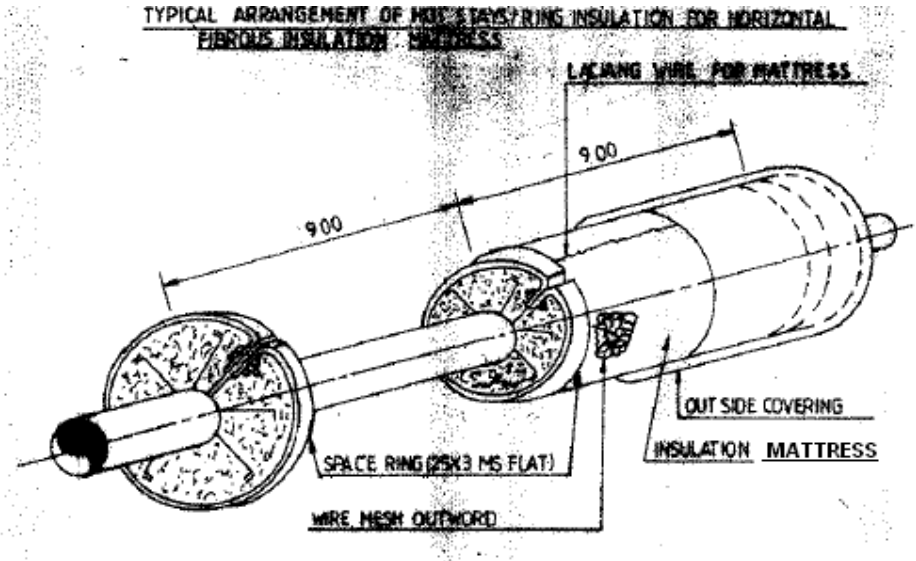
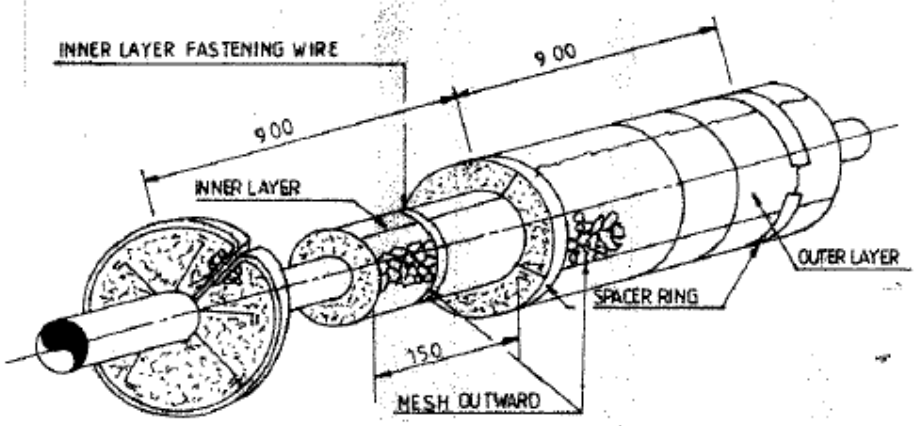


FIG. 8B SUPPORT RING FOR VERTICAL INSULATED PIPING



SINGLE LAYER MATTRESS INSULATION WITH ALUMINIUM SHEET FINISH.

FIG. 8c



MULTIPLE LAYER FIBROUS INSULATION SPACER RING FOR HORIZONTAL PIPE

FIG. 8d

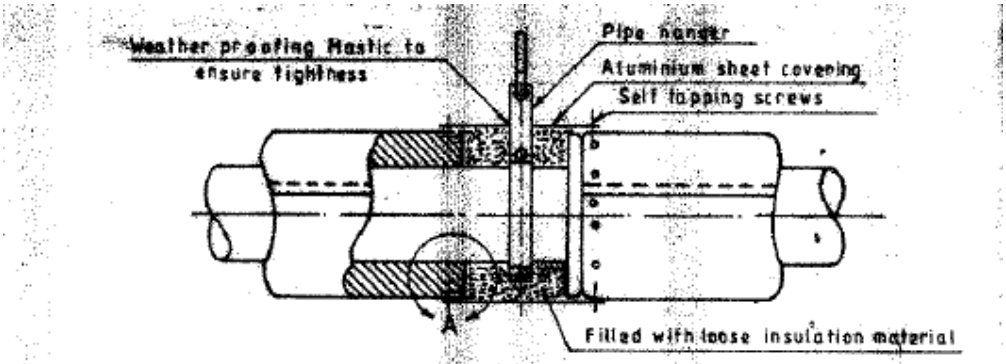
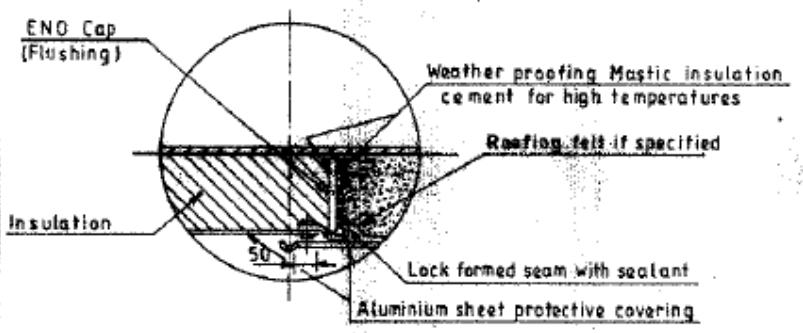


FIG. 9 HANGER SUPPORT (Hot service)



DETAIL-A

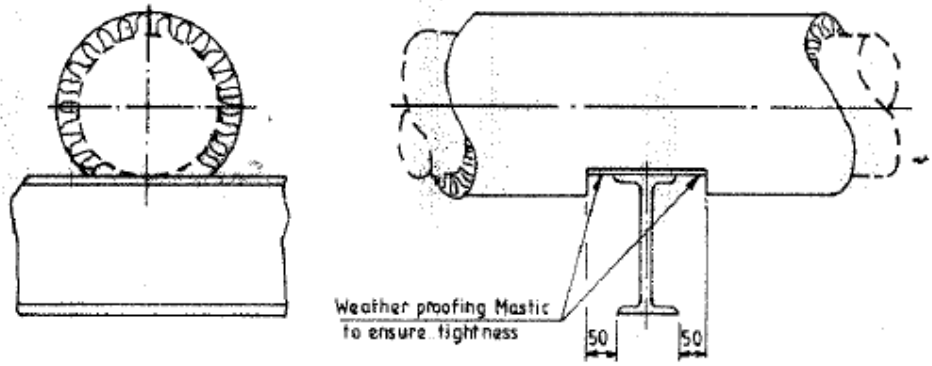


FIG. 10 RESTING SUPPORT (Hot service)

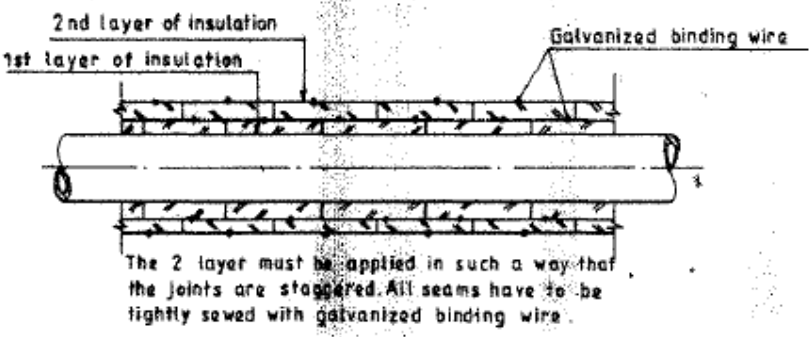


FIG.11 DOUBLE THICKNESS INSULATION

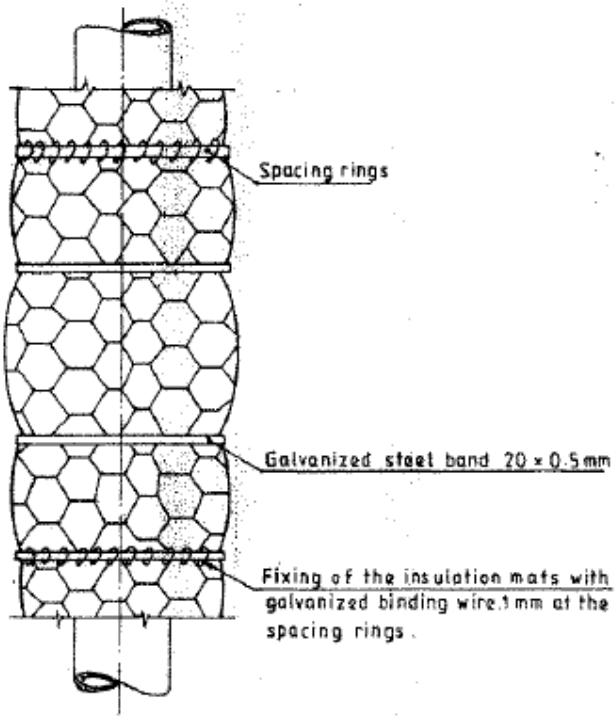


FIG.12 APPLICATION OF INSULATION MATS ON VERTICAL LINES

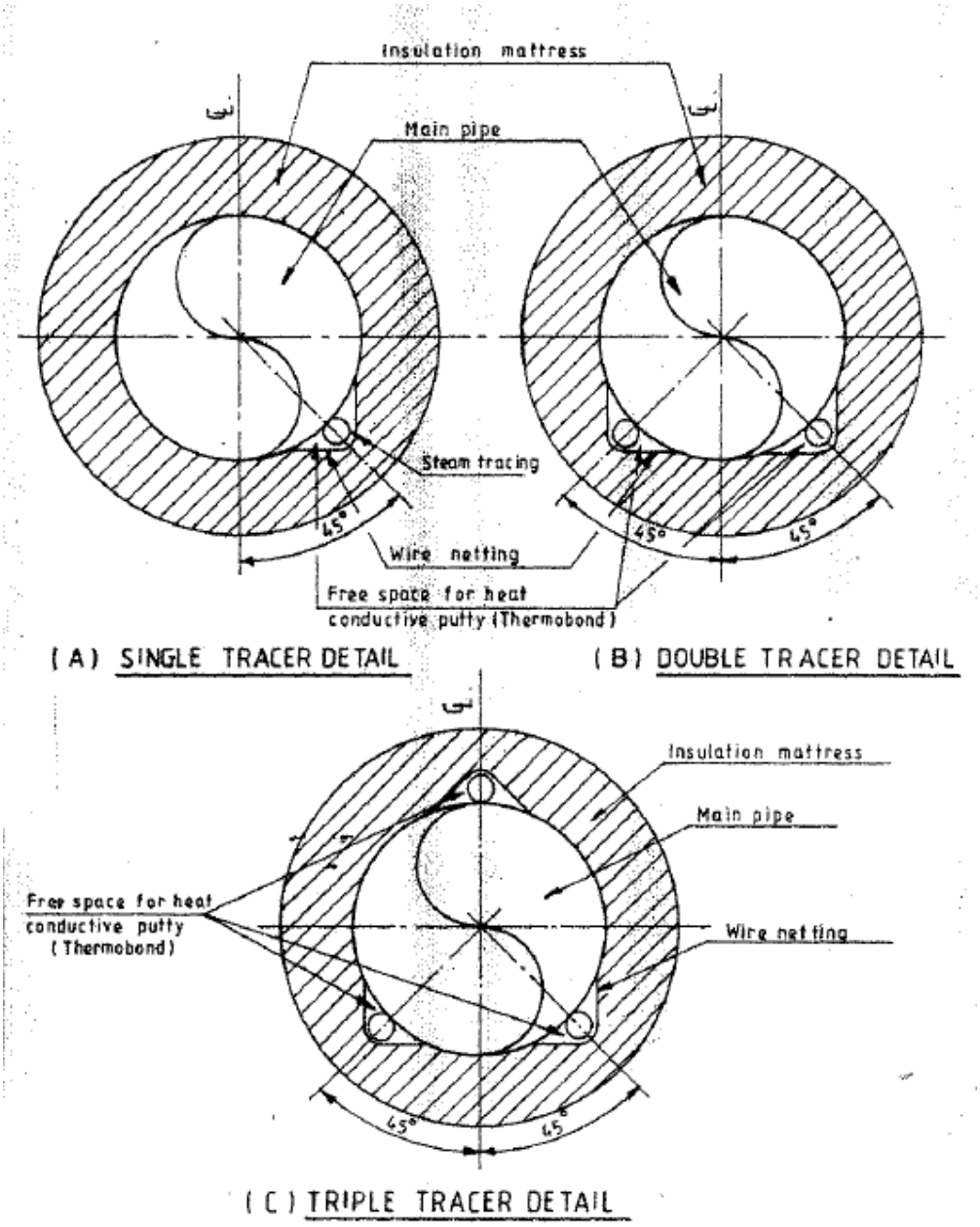
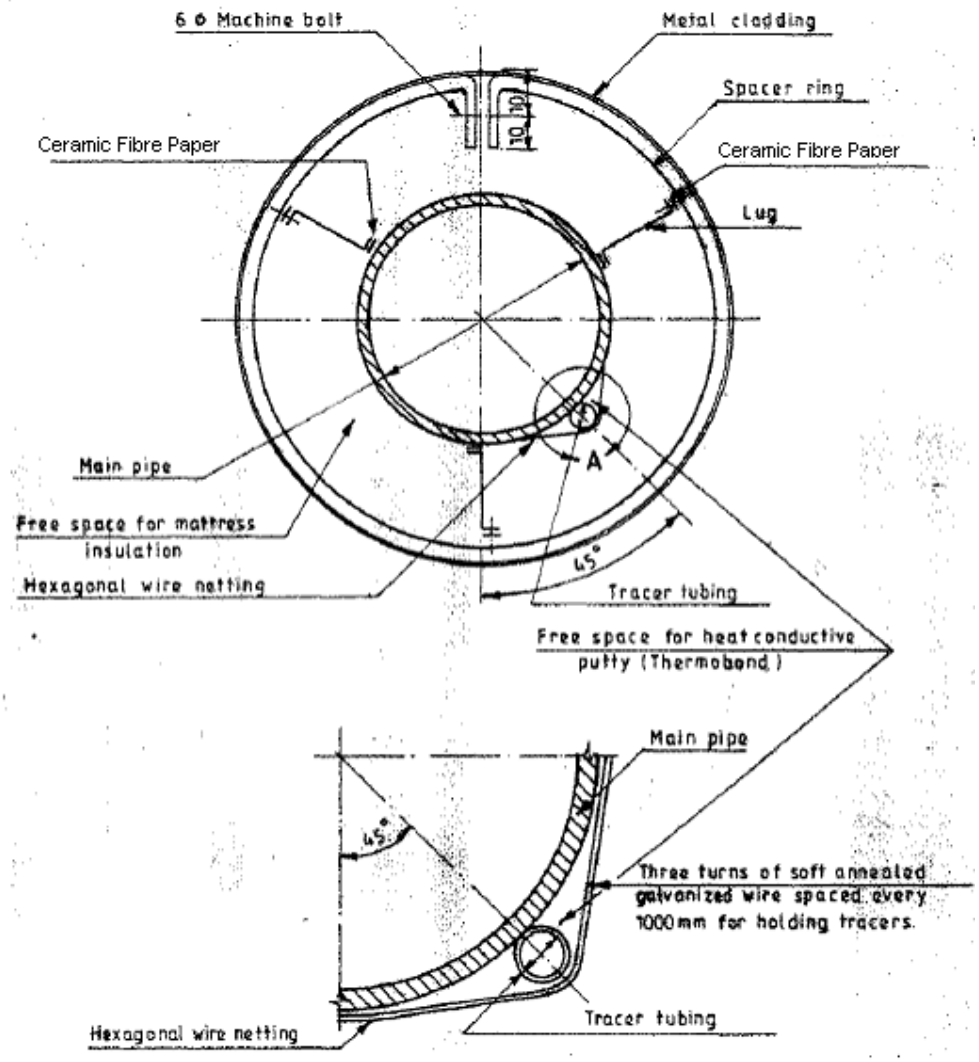


FIG.13 STEAM TRACING INSULATION



DETAIL A

FIG.14 DETAILS OF INSULATION ON STEAM TRACING (WITH SPACER RING)

SPECIFICATIONS

FOR

E.O.T. CRANE

CONTENTS

1.0 INTENT

1.1 Design, detailed engineering, manufacturing, shop testing, painting, supply, transportation to site, unloading and storage at site, erection, load testing at site, final painting and commissioning of 1 no. Electric Over head Travelling Crane along with runway rails and supply of spare parts for crane as per the technical specifications, terms and conditions mentioned in this Technical Specification.

2.0 SCOPE OF SUPPLY & ERECTION

The scope of supply & erection shall be, but not limited to, the following:

Sl. No.	Description	Qty.
1.1	7.5 Tonnes capacity EOT Crane including its drives and all other relevant electricals	1 No.
1.2	Runway Rails for crane along-with necessary fixtures for fixing the rails on structural steel girder, along-with electrical interconnection for the earthing of rails.	As required
1.3	Mechanical stoppers on both the ends of runway rails for LT motion and for CT motion).	4 Nos. for each motion
1.4	Festoon flexible cable type down-shop leads system along with necessary insulators, brackets etc.	As required
1.5	Isolator in sheet steel enclosure with double compression cable glands to receive 3 ½ core power cables from owner's PCC (Supply of feeder cable is excluded).	1 Set for each
1.6	Supply of drawings & documents	As per Annexure-I
1.7	2 years spare parts	As per spare parts list (Annexure-II)

Note: Electrical power shall be provided at single point; further distribution shall be done by bidder.

3.0 GENERAL DESIGN REQUIREMENTS:

3.1 Whole supply & erection shall confirm to the following standards and specifications except as modified herein:

3.2 The Vendor shall be responsible for complying with any other statutory requirements governing the work.

DESIGN OF MECHANISM

For the hoist mechanism of cranes electric motor shall be connected to the reducer through floating shaft and half geared couplings. Coupling of the output shaft of the reducer to single or double drum shall be by means of geared coupling.

BEARINGS

All running shafts and wheels running on fixed axle shall be fitted with ball or roller bearings.

COUPLINGS

1. All couplings shall be gear couplings, except that rigid coupling may be used on long transmission shafts.

2. All couplings shall be of steel. Cast Iron shall not be used.

GEARINGS

All gear boxes shall be in totally enclosed construction and gears shall be spur or helical type with machine cut teeth suitably hardened and tempered and shall conform to AGMA standard. The surface hardness of pinion shall be between 255 to 300 BHN and for gear 217 to 255 BHN. Difference in hardness of pinion and gear must not be less than 20 BHN.

For Accurate fixing of unit mechanism (reducer, brakes, motor etc.) and as well as to exclude the possibility of misalignment while working, support surfaces shall be machined level.

TRACK WHEELS

In case where crane and trolley have more than four wheels, balancers shall be used.
The body of the balancer may be fabricated from steel plates or from cast steel.

BRAKES

Hoisting Motion: - The brake shall be automatic electro-mechanical or thrusters release brake applied directly to the hoist motor shaft.

Traversing Motion: - The traversing motion (CT) of every electric overhead travelling crane shall be fitted with an automatic electro-mechanical brake irrespective of traversing speed.

Capacity of hoist brakes shall be determined as follows:

Mt= K. Mct Kg-m where,

Mct = Static Moment on the braking shaft, due to action of the load, considering the maximum efficiency of the mechanism.

K= Co-efficient of reserve of braking, taking from following figures, corresponding to the class of duty of the mechanism.

For light duty (Class I) K = 1.5
Medium duty (Class II) K = 1.75
Heavy duty (Class III) K = 2.0

In case of hoist mechanism with two drives, each drive must have at least one brake. Co-efficient of reserve of braking of each brake is taken not less than 1.25, considering that the full load can be held by one brake.

In case where two brakes are used for each of the two drives co-efficient of reserve of braking must not be less than 1.1 for each brake.

Required capacity of braking in case of traverse and travel motions shall be 0.8 – 1.0 times the static moment on the respective braking shafts due to action of inertial forces, considering maximum efficiency of the mechanism.

Brake drums shall preferably be made of steel castings or steel forging.

HOOKS

Hooks shall conform to the relevant Standards.

The crane hooks shall be provided with spring loaded safety locking arrangement.

No repair work on hook made to shall be allowed without prior approval from purchaser.

MEANS OF ACCESS

Platforms: - An adequately guarded platform minimum 750 mm wide shall be provided on both sides for the full length of the bridge. All platforms and ladders shall have non-skid chequered plate treads and shall be provided with handrails and toe guards. Opening on guard railings for access from outside shall be provided with safety chains.

LUBRICATION

All the grease points shall be brought to a safe and easily accessible place which shall be prominently displayed.
All gear boxes shall be sealed for life. There will be no centralised lubrication system.

BUFFERS

Bridge of crane and trolley shall be provided with buffers for soft dashing with end Stop. Buffers ends should be made of rubber or iron & wood.

Welding: Welding shall be in accordance with relevant Standards.

3.5 ELECTRICAL DESIGN

All electrical including electro-magnetic brakes, limit switches, cables, wirings, lightings etc. shall be in accordance with the Electrical Specifications enclosed.

4.0 SPECIFIC DESIGN REQUIREMENTS:

The Cranes shall be suitable for the duty conditions as given in the specifications sheets.

4.01 No copper or copper alloy should be used for any part of the crane.

4.02 Cranes shall be suitable for outdoor installation but placed under the roof.

4.03 All gear boxes shall be fully enclosed type.

4.04 The rail and roller support for the flexible cable shall be designed for maximum reliability and minimum maintenance requirements. The roller supports shall be interconnected by flexible steel wire in order to protect the flexible cables against mechanical stress. DSL trolleys shall be provided with four wheels. Rollers shall be of a type which do not need greasing.

4.05 Mechanical safety lowering brake shall be supplied by the Vendor which shall be capable of holding the test load in addition to electro hydraulic thrusters brake for all the hoisting motions.

4.06 The Vendor shall provide non-sparking type aluminium guards for couplings.

4.07 The Vendor shall, if required, provide a clearance certificate from a Competent Authority regarding following the safety rules and regulations.

4.08 All the Bearings shall be antifriction type. Bush Bearings are not acceptable.

4.09 1 No. rotary type and 1 No. gravity type limit switches will be provided for each hoist.

4.10 2 Nos. one way lever type limit switch will be provided for trolley and 1 No. anti-collision device and 1 No. one way type limit switch will be provided for LT.

Anti collision device will consist of 1 No. one way lever type limit switch and striker arm.

4.11 Micro speed arrangement on main hoist, CT *and LT* will be achieved through separate sq. cage motors, 1 No. thruster brake and planetary gear box arrangement.

5.0 BATTERY LIMITS

The following items are excluded from the supply.

Building structure including beams supporting crane rails.

Gangways and ladders along building walls.

Earth connection to gantry rails.

5.1 It is the obligation of the vendor to ensure no lack of supply at supply limits.

6.0 EXTENT OF SUPPLY & ERECTION

6.1 General

Inside the battery limits, as defined in Articals-5.0 above, the supply includes Design, calculations and all materials and services needed for satisfactory and safe operation of the cranes including :

erection on site
pre-commissioning and start-up
load testing which will be performed after erection.

6.2 The supply shall include but not be limited to:-

6.2.1 Design, engineering and fabrication.

6.2.2 The electrical equipment including isolator, flexible feeder cables/internal connection and the control system as per electrical specifications.

6.2.3 The roller supports, fixing material and rails for flexible supply cables.

6.2.4 Crane rails including support plates, cleats, etc. and electrical inter-connections for earthing of rails.

6.2.5 Mechanical stops and buffers for LT & CT motions.

6.2.6 Gangways and steps on the cranes but not on the building.

6.2.7 Workshop tests according to Clause No. 7.0

6.2.8 Painting according to brief specification as described in Article 9.0

6.2.9 The documentation in accordance with Annexure – I.

6.2.10 The spare parts for 2 years operation as per Annexure - II.

6.2.11 Inspection programme as per Clause No. 7.0

6.2.12 The name plate in the English Language with indication of max. permissible load.

6.2.13 Alignment of sole plates, erection and alignment of rails, and down shop leads including supporting arrangement for DSL, wherever required.

7.0 INSPECTION, TESTING & REPAIRS

7.1 Inspection & Testing programme shall be furnished by the Vendor after placement of order for Principal's approval.

7.2 Inspection and testing shall conform to relevant standards.

Parts found defective or not conforming to the Standards as to workmanship or materials shall be rejected and replaced by the Vendor free of cost.

Waiving of inspection or acceptance of material or equivalent by the purchaser shall not relieve the manufacturer from the responsibility of furnishing material or workmanship in accordance with the relevant Standards.

All welding shall be carried out by qualified welders. Manufacturer shall furnish evidence acceptable to Principal's Inspector of qualification tests of welders as required by relevant Indian Standards. All welding shall be subject to inspection by Principal's Inspector, who will have the option to call for radiography or other non-destructive examination of welds to check soundness.

The main bridge girder shall be completely radiographed and radiographs produced. However, butt welds of bridge girder will be 100% radiographically tested on tension zone and 25% at random on compression zone.

7.3 TESTS AT MANUFACTURER'S WORKS

All electrical and mechanical equipment shall be tested in accordance with the appropriate Standards at either the crane maker's or the equipment manufacturer's works and test certifications shall be furnished.

The cranes shall be tested at manufacturer's works under no-load. Travelling gear may be run light to check shaft and gear alignments.

TESTS AT SITE

For testing of electrical installation, refer Electrical Specification.

Test for Operation:

After the supply has been connected, and before the complete crane installation is put into commercial service, tests shall be carried out to prove the following :

Satisfactory operation of all motors under no-load conditions.

The satisfactory operation of each controller, switches contractor, relay and other control devices and in particular the correct operation of all limit switches under the most unfavourable conditions:

The correctness of all circuits and interlocks and sequence of operation.

The satisfactory operation of all protective devices:

The satisfactory operation of each motion of the cranes.

The compliance of the crane with the specified performance requirements: and

Tolerance on specified speeds at full load shall be with = ± 10%.

7.4 DEFLECTION TESTS:

The deflection test shall be carried out *at site* with the safe working load at rest and with the crab in a central position. The measurement shall not be taken on the first application of the load. The datum line for measuring the deflection shall be obtained by placing the crab on the extreme end of the crane span with smaller hook approach.

7.5 OVERLOAD TESTS:

After tests but before the crane is put into service, it shall, with overload relays approximately set, be tested to lift and sustain a minimum test load of *110 percent* of the working load, when the load is located at the centre of the span.

During the overload test each motion in turn shall be manoeuvred in both directions and the crane shall sustain the load under full control. The specified speeds need not be attained but the crane shall show itself capable of dealing with the overload without difficulty.

8.0 PREPARATION FOR SHIPMENT

8.1 Each transport unit shall be suitably prepared for shipment, properly braced and loose parts secured to prevent damage during shipment. All material shipped shall be properly marked with the item number for which it is intended by means of a metal tag.

8.2 The vendor shall give all information concerning the protection needed for preservation of the equipment.

9.0 PAINTING

9.1 For Painting as per applicable standards.

10.0 DRAWINGS AND DOCUMENTS:

The drawings, documents and data to be supplied after placement of the order shall be as per Annexure – I.

11.0 GUARANTEE:

The crane shall be guaranteed by the supplier to be of accepted design, free from inherent defects in either workmanship or materials and to safely handle its rated capacity load without any undue deflections on its structure or mechanism.

Any part proving defective within the warranty period shall be replaced free of charge by the Vendor.

11.1 Performance Guarantee:

The cranes with its drives and other equipment shall be tested at site to verify the electric consumption, various speeds, deflection and other performance figures guaranteed by the Vendor.

Noise levels at 1.0 M distance from package machine's surface shall not exceed 85 d B(A).

12.0 PRIORITY:

In case of any conflict between the data sheets & the technical documents referred / enclosed, the information given in data sheets shall govern.

ANNEXURE – I

13.0 REQUESTS FOR DOCUMENTS & DATA FOR E.O.T. CRANES

The following table indicates the documentation to be furnished by the vendor together with the Offer and after placement of order.

COLUMN 'A' - Refers to the documentation to be sent to the Principal Alongwith the offer.

COLUMN 'B' - Refers to the documentation to be sent after the issue of LOI on the required date for approval.

COLUMN 'C' - Refers to the final documentation to be sent on the required date.

13.1 No. of documents to be submitted by the Vendor shall be as per the following matrix:

Legend : H : Hard copies S : Soft copies

Sl. No.	Documentation	A	B		C	
		No. of copies	No. of copies	Forwar-ding dt.	No. of copies	Forwar-ding dt.
1. a.	Data sheets – completely filled in PDIL proforma : EM250-PNMC-530-MDS-001	10H	14 H + 4 S	4 Weeks from LOI.	14 H + 4S	3 Months after LOI.
b.	Information to be supplied by manufacturer / Vendor	10H	14 H + 4S	4 Weeks from LOI.	14 H + 4S	3 Months after LOI.
2.	General arrangement Drg. showing various details & all principal dimensions of the assembled unit, horizontals and vertical clearances and approaches.	10H	14 H + 4S	4 Weeks from LOI.	14 H + 4S	3 Months after LOI.
3.	List of spare parts with individual part Nos. and prices.	15H				
4.	Descriptive literature / catalogue	10H				
5.	Detailed manufacturing programme Time-Bar Chart.	10H				
6.	Individual structural drgs. For main girders and End-carriages.				14 H + 4S	3 Months after LOI.
7.	Mechanical calculations (Brakes, Gear boxes, gears, pinions coupling, Bearing, Rope-drum, Wire-rope etc.		14 H + 4S	30 days after LOI	14 H + 4S	3 Months after LOI.
8.	Civil load data drawing, Cross-sectional detailed drawings of sub-assemblies part nos., materials of construction and heat treatment details wherever applicable :	10P	14 H + 4S	30 days after LOI	14 H + 4S	3 Months after LOI.
	a) General Assembly Drg. Showing the complete mechanical details.				14 H + 4S	3 Months after LOI.
	b) Main hoist sub-assy. Details showing inching alse.				14 H + 4S	3 Months after LOI.

Sl. No.	Documentation	A	B		C	
		No. of copies	No. of copies	Forwar-ding dt.	No. of copies	Forwar-ding dt.
	c) Main hoist bottom block assy.				14 H + 4S	3 Months after LOI.
	d) Hook for Main hoist	--	--	--	14 H + 4S	3 Months after LOI.
	e) Hook for Aux.hoist (Where applicable)	--	--	--	14 H + 4S	3 Months after LOI.
	g) L.T. Wheel assy. (Driving & Trailing)	--	--	--	14 H + 4S	3 Months after LOI.
	h) Main hoist gear box assy. Cross sectional details showing heat treatment details.	--	--	--	14 H + 4S	3 Months after LOI.
	i) Main hoist drum assy.	--	--	--	14 H + 4S	3 Months after LOI.
	j) Aux. Hoist gear box and drum assy. With gear treatment details.	--	--	--	14 H + 4S	3 Months after LOI.
	k) C.T. gear box assy. With heat treatment details.	--	--	--	14 H + 4S	3 Months after LOI.
	l) L.T. gear box assy. With heat treatment.	--	--	--	14 H + 4S	3 Months after LOI.
	m) Micro-speed gear box assy. With heat treatment details.	--	--	--	14 H + 4S	3 Months after LOI.
	n) L.T. gear box assy. With heat treatment.	--	--	--	14 H + 4S	3 Months after LOI.
	p) Aux.hoist sub-assy. Details.	--	--	--	14 H + 4S	3 Months after LOI.
	q) Aux.hoist bottom block assy.	--	--	--	14 H + 4S	3 Months after LOI.
	r) End carriage details	--	--	--	14 H + 4S	3 Months after LOI.
9.	Crane rail & end stops fixing arrangement.	--	14 H + 4S	Within 60 days of LOI.	14 H + 4S	3 Months after LOI.
10.	Material test certificates (including the originals) of load bearing parts e.g.	--	--	--	14H	3 Months after LOI.
	i) Hook	--	--	--	14H	15 days after test.
	ii) Gear & gear boxes	--	--	--	14H	15 days after test.
	iii) Drum & Sheaves	--	--	--	14H	15 days after test.
	iv) Wheels & axles	--	--	--	14H	15 days after test.

Sl. No.	Documentation	A	B		C	
		No. of copies	No. of copies	Forwar-ding dt.	No. of copies	Forwar-ding dt.
	v) Wire ropes	--	--	--	14H	15 days after test.
	vi) Bearings	--	--	--	14H	15 days after test.
	vii) Coupling	--	--	--	14h	15 days after test.
	viii) Springs	--	--	--	14H	15 days after test.
11.	Test certificates of motors (including the originals)	--	--	--	14H	15 days after test.
12.	Certificates of No load, load, over load defection Test duly witnessed by the Inspector	--	--	--	14H	15 days after test.
13.	Operation & Maintenance Manual (including the lubrication schedule also.)	--	--	--	14H	Within 3 Months of LOI.
14.	Drg. Showing the supporting arrangement of flexible cable with main bridge and trolley.		14 H + 4S	Within 3 Months of LOI. Of order	14H	Within 3 Months of LOI.

14.0 SPARE PARTS

ANNEXURE - II

SPARE PARTS LIST

Spare considered desire able for 2- years' trouble free operation

Sl. No.	Item	Qty.
	MECHANICAL SPARES	
1.	Wire rope for Main hoist	
2.	Wire rope for Auxiliary hoist	
3.	Rope guide for Main Hoist	
4.	Rope guide for Auxiliary Hoist	

15.0

ANNEXURE – V

LIST OF SUB-VENDORS (Note)

Sl. No.	Description	Sub-Vendor
1.	Hoist, Drives etc.	

Note: The Sub vendor manufacturer/ Supplier must have supplied similar model, size for two similar installations & service which are working satisfactorily for at least last Two years. Feed Back report for the same shall be furnished along with the offer.

EQUIPMENT	:	E.O.T. Crane of 7.5 Tonne
ITEM NO.	:	
QUANTITY	:	ONE
REQUISITION NO.	:	
PURCHASE ORDER NO.	:	
MANUFACTURER	:	
MANUFACTURER W.O. NO.	:	

NOTES :

1. THIS SPECIFICATION MUST BE COMPLETELY FILLED - IN BY THE VENDOR AND SUBMITTED FOR APPROVAL.
2. IN CASE OF CONFLICT BETWEEN THIS SPECIFICATION AND THE TECHNICAL DOCUMENTS REFERRED / ENCLOSED, INFORMATION GIVEN IN THIS SPECIFICATION SHALL GOVERN.

पी डी आई एल PDIL	**CLIENT :** HURL GORAKHPUR	PROJ. NO.: EM250	UNIT:
	PROJECT: OSBL PROJECT	SPEC. NO. EM250-PNMC-530-MDS-001	
	LOCATION : GORAKHPUR, U.P, INDIA	SHEET **2** OF 4	REV. 0

ELECTRIC OVERHEAD TRAVELLING CRANE - SPECIFICATION SHEET (Note-1)

GENERAL DATA

EQUIPMENT: 7.5 TONNE EOT CRANE	ITEM NO.:
REQN. NO. :	P.O. NO. :
MANUFACTURER:	MODEL :
NOS. REQD. :	INSTALLATION : ☐ INDOOR ☐ OUTDOOR ☒ UNDER SHED
NOTE : ☒ INDICATES APPLICABLE	DESIGN SPECS. : **IS : 807, IS : 3177, \ES : 8208**

DUTY AND CONSTRUCTION CHARACTERISTICS

SERVICE :	CENTRE TO CENTRE RUNWAY RAILS - **A** mm
TYPE : ☐ SINGLE GIRDER [ ] DOUBLE GIRDER	MAXIMUM LIFT OF HOOK - **B** mm
SAFE WORKING LOAD : MAIN / AUXILIARY **/ -** tonnes	MAX. HEIGHT OF HOOK ABOVE FLOOR LEVEL- **C** mm
CLASS OF CRANE :	FREE WIDTH OF STRUCTURE - **D** mm
CRANE STRUCTURE : **STEEL / ~~CONCRETE~~**	FREE HEIGHT - **E** mm
AREA CLASSIFICATION : ☐ SAFE [ ] HAZARDOUS	OVERHEAD CLEARANCE - **G** mm
HAZ. AREA CLASS.:ZONE GAS GR. TEMP. CL.	TOTAL RUNWAY LENGTH : mm
CONTROL SYSTEM : PENDANT WITH PUSH BUTTONS	OPERATING FLOOR LEVEL : mm

MOTION	HOIST			TROLLEY (CROSS TRAVEL)		BRIDGE (LONG TRAVEL)
	MAIN		AUXILIARY	MAIN	AUXILIARY	
	NORMAL	CREEP				
SPEED (m/min.)			---		---	
FROM FLOOR / CAB			---	**FLOOR**	---	**FLOOR**
ELECTRIC / MANUAL				**ELECTRIC**	---	**ELECTRIC**

RAIL SIZE		OPERATOR'S CABIN	☐ FIXED TO CRANE BRIDGE
DOWN SHOP LEADS	[ ] FESTOON		☐ OPEN ☐ CLOSED
	☐ REELING DRUM	TROLLEY LEADS :	[ ] CABLE ☐ BARE CONDUCTORS
	☐ BARE CONDUCTORS	PENDANT LEADS :	[ ] CABLE

ELECTRICAL EQUIPMENT

MOTORS	HOIST			TROLLEY (CROSS TRAVEL)		BRIDGE (LONG TRAVEL)
	MAIN		AUXILIARY	MAIN	AUXILIARY	
	NORMAL	CREEP				
TYPE			---		----	
RATING kW			---		---	
SPEED rpm			---		---	
VOLTS / PHASE / FREQ.						
LIMIT SWITCHES			---		---	

CONSTRUCTION

BRAKES

MOTORS	HOIST			TROLLEY (CROSS TRAVEL)		BRIDGE (LONG TRAVEL)
	MAIN		AUXILIARY	MAIN	AUXILIARY	
	NORMAL	CREEP				
TYPE			---		----	
NUMBER OF BRAKES			---		---	
MECHANICAL	---	---	---	---	---	---
E.H.THRUSTOR			---		---	

HOOKS			ROPES		
	MAIN HOIST	AUXILIARY HOIST		MAIN HOIST	AUXILIARY HOIST
TYPE		---	TYPE		---
SAFE WORKING LOAD(tonnes)		---	NUMBER OF FALLS		---
ANTI RELEASE DEVICE		---	UNIT BREAKING LOAD (kN)		---
			ROPE DIAMETER (mm)		---

पी डी आई एल PDIL	**CLIENT :** HURL GORAKHPUR	PROJ. NO.: EM250	UNIT:
	PROJECT: OSBL PROJECT	SPEC. NO. EM250-PNMC-530-MDS-001	
	LOCATION : GORAKHPUR, U.P, INDIA	SHEET 3 OF 4	REV. 0

ELECTRIC OVERHEAD TRAVELLING CRANE - SPECIFICATION SHEET

WHEELS

		TROLLEY (CROSS TRAVEL)		BRIDGE (LONG TRAVEL)
		MAIN	AUXILIARY	
TYPE OF WHEELS				
DIAMETER OF WHEELS	mm		----	
NUMBER. OF WHEELS			----	
TYPE OF WHEEL BEARINGS			----	
TYPE OF LUBRICATION			----	
MAXIMUM WHEEL LOADS (WITHOUT IMPACT)	kg		----	
WHEEL BASE	mm		----	
TOTAL WIDTH OF BRIDGE CARRIAGE	mm			
TYPE OF FIXED STOP FOR BRIDGE		☒ BUFFERS ☒ END STOPPERS		
TYPE OF FIXED STOP FOR TROLLEY		☒ BUFFERS ☒ END STOPPERS		
TYPE OF SIGNALLING DEVICE		☐ ACOUSTIC ☐ LIGHT (INDICATING LAMPS)		
TYPE OF ACCIDENT PREVENTION DEVICE		☒ **GRAVITY LIMIT SWITCH**		

MATERIALS OF CONSTRUCTION

MAIN HOOK		TROLLEY FRAME	
AUXILIARY HOOK	----	ROPE DRUM	
MAIN HOIST ROPE		BUFFERS	
AUXILIARY HOIST ROPE	----	GEARS	
BRIDGE GIRDER		PINIONS	
☐ **COPPER OR COPPER ALLOYS SHALL NOT BE USED**		WHEELS	

WEIGHTS

UNLADEN CRANE :	kg	UNLADEN CRAB :	kg

TESTS AND INSPECTION

TEST	PERFORMANCE	OVERLOAD	DEFLECTION
WITNESS	☒ IN SHOP ☒ AT SITE	☒ IN SHOP ☒ AT SITE	☒ IN SHOP ☒ AT SITE
NON - WITNESS	☐ IN SHOP ☐ AT SITE	☐ IN SHOP ☐ AT SITE	☐ IN SHOP ☐ AT SITE

☒ **RADIOGRAPHY FOR BRIDGE GIRDER WELDS**

☒ **LOAD TO BE ARRANGED BY THE PURCHASER FOR OVERLOAD TEST AT SITE**

SCOPE OF SUPPLY

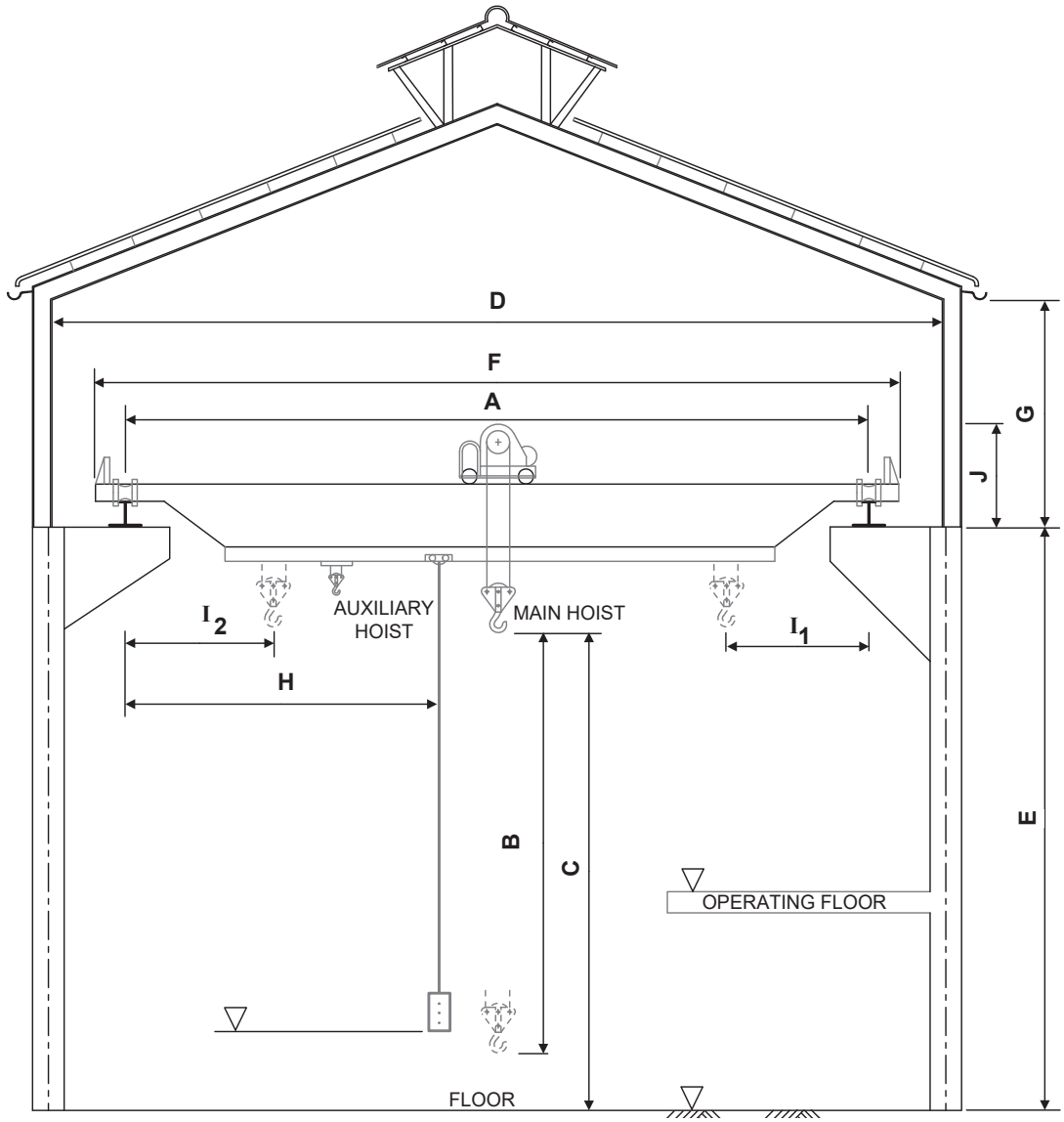
☒ RUNWAY RAILS	☒ RAIL FIXING BOLTS AND CLAMPS
☒ DOWN SHOP LEADS WITH GUIDES AND TROLLEYS	☒ SOLE PLATES AND CLAMPS FOR RAIL FIXING
☒ END STOPPERS FOR BRIDGE, TROLLEY & AUXILIARY HOIST	☒ TESTS IN SHOP
AUXILIARY HOIST - ELECTRICALLY OPERATED	☒ TESTS AT SITE
☒ ERECTION OF CRANE AT SITE	☒ PAINTING
☒ INSTALLATION OF RUNWAY RAILS	☒ SPARE PARTS (2 YEARS + COMMISSIONING)
	☒ DRAWINGS & DOCUMENTS IN ENGLISH LANGUAGE

Note-1: Vendor to submit the Completely filled & Signed Mechanical data sheet.

Note-2: copper & Copper alloys shall not be used in any part of machine.

PDIL पी डी आई एल ENGINEERING THE FUTURE	**CLIENT :** HURL GORAKHPUR	PROJ. NO.: EM250	UNIT:
	PROJECT: OSBL PROJECT	SPEC. NO. EM250-PNMC-530-MDS-001	
	LOCATION : GORAKHPUR, U.P, INDIA	SHEET 4 OF 4	REV. 0

SKETCH & DIMENSIONS



DIMENSIONS (TO BE INDICATED BY VENDOR)

		A	B	C	D	E	F
MAIN HOIST	mm						
AUXILIARY HOIST	mm	----	----	----	----	----	----
		G	H	I_1	I_2	J	
MAIN HOIST	mm						
AUXILIARY HOIST	mm	----	----	----	----	----	----
		SAFE WORKING LOAD (in kg)					
MAIN HOIST							
AUXILIARY HOIST		---					

TECHNICAL SPECIFICATION (ELECTRICAL)

FOR

SUPPLY & ERECTION

OF

7.5 TONNES E.O.T. CRANE

FOR

AMMONIA UREA FERTILIZER PLANT

HURL, GORAKHPUR(OSBL)

0	18.01.19	18.01.19	ISSUED FOR CLIENT COMMENT	DKG	AP	SK
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD

CONTENTS

LIST OF ATTACHMENTS

1.0 SCOPE OF SUPPLY

Design, detailed engineering, manufacture, shop testing, painting, supply, transportation to site, unloading and storage at site, erection, load testing at site, final painting and commissioning of one no. Electric Over head Travelling Crane along with reeling drum, runway rails and supply of spare parts for cranes for Instrument Air package at HURL Gorakhpur, as per terms and conditions mentioned in the Technical Specifications EM250-PNEL-TS--802, ES-8208 & ES-8102.

2.0 REFERENCE CODES & DOCUMENTS

2.1 This specification shall be read in conjunction with the following document attached:

i. Engg. Standard of EOT Crane: - Doc. No. ES – 8208_.
ii. Engg. Standard of Induction motor: - Doc. No. ES – 8102

2.2 The design, manufacture and testing of equipment shall be in compliance with all applicable Indian Standards, Codes and Regulatory requirements.

3.0 GENERAL INSTRUCTIONS TO BIDDER

3.1 All electrical items shall be suitable for use in specified hazardous area.
3.2 The Bidder shall be responsible for complying with any other statutory requirements governing the work.
3.3 Electrical power shall be provided at single point to bidder's on-load isolator located at 1.5M from operating floor & further distribution shall be done by bidder.
3.4 Bidder shall provide Load list with offer.
3.5 All electrical including electro-magnetic / thruster brakes, limit switches, cables, wirings, lightings etc. shall be in accordance with the Electrical Specification No. EM250-PNEL-TS--802, ES-8208 & ES-8102.

4.0 SPECIFIC DESIGN REQUIREMENTS:

4.1 All electrical items shall comply with relevant latest IS/ IEC acts and rules.
4.2 Lighting on bridge shall be in bidder's scope. Lighting fixtures shall conform to specified area. Illumination level shall be suitable for operation and maintenance on bridge.
4.3 Separate sq. cage motors shall be used for CT, LT, Main Hoist & Micro Hoist motions confirming to the enclosed specifications.
4.4 All panels including switch socket, handlamp with transformer etc shall be weatherproof type.

5.0 DRAWINGS AND DOCUMENTS:

The bidder shall supply all documents in requisite no. as per annexure-I of ES: 8208. All documents shall be supplied in hard copies as well as soft copies in CD in place of Reproducible (R). Also provide panel G.A drawing with mentioned drawing and documents for review and approval.

6.0 TESTING & INSPECTION.

6.1 Testing and inspection of EOT Crane shall be as per relevant IS and as per ES: 8208.
6.2 QAP shall be furnished by the successful bidder for approval.

7.0 SPARES

Spare parts for 2 year trouble free operation shall be quoted with recommended quantities as per annexure-II of ES: 8208.

8.0 DEVIATION

Deviation, if any, from this specification/standard shall be clearly indicated in the offer.

SPECIFICATION SHEET
ELECTRICAL EQUIPMENT FOR CRANE & HOISTS

CLIENT : M/s HURL ,Gorakhpur	PROJECT : : Ammonia Urea Complex			PLANT : EOT Crane
ISSUED FOR : PROPOSAL ☐	ENQUIRY ☐	ORDER ☐		FINAL ☐

GENERAL			
Item No. : EOT crane	Ref. Stds. : IS ☒	IEC ☒	
Quantity : 1	Encl. Docs. : ES-8208 ☒		
Description : EOT Crane for Instrument Air Package	Make :		
Code No. :	Maker's Type. :		
TESTS: Routine ☒	Type ☐	Others	

SERVICE CONDITIONS			
SYSTEM DETAILS	**AMBIENT CONDITION**		
Rated Voltage with ± % : 415V ± 10 %	Temp. Max./Min./Design Ref. 47 /1.7/ 50ºC		
No. of phases : 3 phase, 4 wire	Relative Humidity 100%	Alt. above sea : <1000 M	
Rated Frequency With ± % : 50 Hz ± 5 %	**ATMOSPHERIC POLLUTION**	Dusts : Urea dust	
Combined V & F variation : ± 10 %		Vapour : Ammonia Vapour	
Fault Level : 36 MVA	**AREA**	Safe ☒	Hazardous ☐
Earthing Mode : Solidly Grounded	**HAZ. AREA CLASS.**	Zone :	Temp. Class
Control Supply Voltage : 240 V AC		Encl. Gr.:	
Lighting & Fan Supply Voltage : 230 V AC	**Location :**	Indoor ☒	Outdoor ☐
Hand Lamp Supply Voltage : 24 V AC			

MISCELLANEOUS DATA			
POWER FEED METHOD		**PAINTING**	
Flexible Cable :		Type : EPOXY	
Overhead Bar Conductor :		Shade : 631 of IS : 5	
Incoming Cable	Type : **1.1kV,XLPE-A-FRLS PVC**		
	size : Later	**SPARE PARTS**	
		Required ☐	For Period of Years

CONTROLS	
Pendant Control Station :	
Operator's Cabin :	

MAKE OF EQUIPMENT AND COMPONENTS	
Motors :	ABB, SIEMENS, KEC, Crompton Greaves Ltd, Bharat Bijlee Ltd
Switch :	SIEMENS,L&T
Contactor :	SIEMENS,L&T
Fuse :	SIEMENS,L&T
Push Button :	SIEMENS,L&T,TECHNIC
Limit Switch :	
Brake :	
Cable :	
Control Transformer :	
Lighting fixture :	
Junction Box :	
Terminal Block :	
Control Panel :	

Note: All unfilled data shall be filled by bidder & submitted with bid.

SPECIFICATION SHEET
INDUCTION MOTOR

CLIENT : M/s HURL ,Gorakhpur	PROJECT : : Ammonia Urea Complex		PLANT : EOT Crane	
ISSUED FOR : PROPOSAL ☐	ENQUIRY ☒	ORDER ☐	FINAL ☐	
GENERAL				
Item No. : **	Ref. Stds. : IS ☒		IEC ☒	
Quantity : **	Encl. Docs. : ES-8102 ☒			
Description : Main & Micro Hoist Motor	Make : **			
Code No. :	Maker's Type. : **			
TESTS: Routine ☒	Type ☐	Others		
SERVICE CONDITIONS				
SYSTEM DETAILS	**AMBIENT CONDITION**			
Rated Voltage with ± % : **415 V ± 10 %**	Temp. Max./Min./Design Ref.: 47 /1.7/ 50ºC			
No. of phases : **3**	Relative Humidity **100%**	Alt. above sea : <1000 M		
Rated Frequency With ± % : **50±5% Hz**	**Atmospheric Pollution**	Dusts : Urea dust		
Combined V & F variation : **± 10 %**		Vapour : Ammonia Vapour		
Fault Level : **36 MVA**	**Area**	Safe ☒	Hazardous ☐	
Space Heater Supply : Refer Cl. no. 7.1 of ES: 8102	**Haz. Area class:** Temp. class : Encl. Gr.			
Low Voltage Heating Supply : Refer Cl. no. 7.1 of ES: 8102	**Location** : Indoor ☒	Outdoor ☐		
INSTRUMENT CONTACT RATING A.C. :	**COOLING WATER**			
INSTRUMENT CONTACT RATING D.C. :	Inlet Press. : Kg/sq.m.	Inlet Temp. ^{O}C		
Aux. Motor Supply :	Fauling Factor :	Outlet Temp. ^{O}C		
BASIC DATA				
RATING & DUTY	**DRIVEN M/C DATA ****			
Rated Output : **	Type :			
Syn. Speed : **	Make :			
Duty : Refer attached ES : 8208	Absorbed Power :			
Rotor Type : squirrel cage	Coupling :			
Starting Method : **DOL**	Torque-Starting / Max. :			
Max I Start/I Rated : **	GD^2 at Motor Speed :			
Min. V Start at Terms : 80% of rated voltage	Thrust - Radial / Axial :			
Min. Starting Torque at V_R : **	Addl. Data :			
EXECUTION	**ACCESSORIES**			
Degree of Protection : **IP-55**	Foundation Bolt ☒	Space Heater ☒		
Addl. Degree of Protection :	Lifting Eye Bolt ☒	Drain Plug ☐		
Mounting Arrangement : **	Cable Glands ☒	Cable Lugs ☒		
Direction of Rotation : Bi-directional	Diff. C.T.s ☐	C.W. Flow Indicator ☐		
Insulation Class: **Class F with temp. rise limited to B**	**RTDs for** Wdgs. ☐	Hot Air ☐	Bearings ☐	
Cooling Method : **IC-411, TEFC**	**Thermometer For**	Hot Air ☐	Bearings ☐	
Stator Connection : **DELTA CONNECTED**	**Earthing Terminals**	On Body ☒	In T.B. ☐	
CABLING DATA	Name Plate : ☒	Addl. name plate : ☐		
Power cable :	Rain Protecting Hood : ☐	Thermistor ☐		
Heater cable :	**SPARE PARTS**			
C.T. cable :	Required ☒	For Period of 2 Years		
R.T.D. cable :	Bearings (DE & NDE) ☒	Cooling Fan ☒		
Alarm cable :	1 Sample Stator Coil : ☐			
CABLE GLAND Type : Double Compression	Grease Nipple & Plug : ☒			
CABLE GLAND Material : Aluminium	Terminal Block ☒			
PAINTING				
Type : **Epoxy Painted**	Shade **631** of IS : 5			

NOTE: ** VENDOR TO FURNISH UNFILLED DATA
Power and space heater cables shall be of 1.1 KV grade XLPE-A-FRLS PVC.

SPECIFICATION SHEET
INDUCTION MOTOR

CLIENT : M/s HURL ,Gorakhpur	PROJECT : : Ammonia Urea Complex		PLANT : EOT Crane	
ISSUED FOR : PROPOSAL ☒	ENQUIRY ☒	ORDER ☐	FINAL ☐	
GENERAL				
Item No. : **	Ref. Stds. : IS ☒		IEC ☒	
Quantity : **	Encl. Docs. : ES-8102 ☒			
Description : Long & Cross Travel motor	Make : **			
Code No. :	Maker's Type. : **			
TESTS: Routine ☒	Type ☐	Others		
SERVICE CONDITIONS				
SYSTEM DETAILS	**AMBIENT CONDITION**			
Rated Voltage with ± % : **415 V ± 10 %**	Temp. Max./Min./Design Ref.: 47 /1.7/ 50ºC			
No. of phases : **3**	Relative Humidity **100%**	Alt. above sea : <1000 M		
Rated Frequency With ± % : **50±5%__ Hz**	**Atmospheric Pollution**	Dusts : Urea dust		
Combined V & F variation : **± 10 %**		Vapour : Ammonia Vapour		
Fault Level : **36 MVA**	**Area**	Safe ☒	Hazardous ☐	
Space Heater Supply : Refer Cl. no. 7.1 of ES: 8102	**Haz. Area class:** Temp. class :	Encl. Gr.		
Low Voltage Heating Supply : Refer Cl. no. 7.1 of ES: 8102	**Location** : Indoor ☐	Outdoor ☒		
INSTRUMENT CONTACT RATING A.C. :	**COOLING WATER**			
INSTRUMENT CONTACT RATING D.C. :	Inlet Press. : Kg/sq.m.	Inlet Temp. ^{O}C		
Aux. Motor Supply :	Fauling Factor :	Outlet Temp. ^{O}C		
BASIC DATA				
RATING & DUTY	**DRIVEN M/C DATA ****			
Rated Output : **	Type :			
Syn. Speed : **	Make :			
Duty : Refer attached ES : 8208	Absorbed Power :			
Rotor Type : squirrel cage	Coupling :			
Starting Method : **DOL**	Torque-Starting / Max. :			
Max I Start/I Rated : **	GD^2 at Motor Speed :			
Min. V Start at Terms : 80% of rated voltage	Thrust - Radial / Axial :			
Min. Starting Torque at V_R : **	Addl. Data :			
EXECUTION	**ACCESSORIES**			
Degree of Protection : **IP-55**	Foundation Bolt ☒	Space Heater ☒		
Addl. Degree of Protection :	Lifting Eye Bolt ☒	Drain Plug ☐		
Mounting Arrangement : **	Cable Glands ☒	Cable Lugs ☒		
Direction of Rotation : Bi-directional	Diff. C.T.s ☐	C.W. Flow Indicator ☐		
Insulation Class: Class F with temp. rise limited to B	**RTDs for** Wdgs. ☐	Hot Air ☐	Bearings ☐	
Cooling Method : IC-411, TEFC	**Thermometer For**	Hot Air ☐	Bearings ☐	
Stator Connection : DELTA CONNECTED	**Earthing Terminals**	On Body ☒	In T.B. ☐	
CABLING DATA	Name Plate : ☒	Addl. name plate : ☐		
Power cable :	Rain Protecting Hood : ☒	Thermistor ☐		
Heater cable :	**SPARE PARTS**			
C.T. cable :	Required ☒	For Period of 2 Years		
R.T.D. cable :	Bearings(DE & NDE) ☒	Cooling Fan ☒		
Alarm cable :	1 Sample Stator Coil : ☐			
CABLE GLAND Type : Double Compression	Grease Nipple & Plug : ☒			
CABLE GLAND Material : Aluminium	Terminal Block ☒			
PAINTING				
Type : **Epoxy Painted**	Shade : **631** of IS : 5			

NOTE: ** VENDOR TO FURNISH UNFILLED DATA
Power and space heater cables shall be of 1.1 KV grade XLPE-A-FRLS PVC.

TECHNICASL PARTICULAR
ELECTRICAL EQUIPMENT FOR
CRANE & HOISTS

CLIENT :		PROJECT :		PLANT :	
ISSUED FOR :	PROPOSAL ☐	ENQUIRY ☐	ORDER ☐	FINAL ☐	
POWER CONTROL PANEL					
GENERAL	Make & Maker's Type				
	Ref. Standard				
	Service				
	Degree Of Protection				
	Matl. Of Construction & Thickness				
	Gasket Material				
	External Hardwares				
	Clearance Available on all sides				
BUS BAR	Material Of Construction				
	Size & Rating				
	Minimum Clearances / Creepage Distance				
	Insulation & Temp. Rise				
	Support Details				
SWITCHES	Make & Maker's Type				
	Ref. Standard				
	Duty Category				
	Rated Voltage & Current				
	Making / Breaking Speed				
	Making / Breaking Capacity				
FUSES	Make & Maker's Type				
	Ref. Standard				
	Duty Category				
	Rated Voltage				
	Rated Current				
	Prospective Current				
	Fuse Puller : Included				
	Distance of Gland Plate from Bottom				
CONTACTORS	Make & Maker's Type				
	Ref. Standard				
	Utilization Category				
	Rated Voltage & Thermal Current				
	Making / Breaking Capacity				
	Coil Voltage				
PUSH BUTTON	Make & Maker's Type				
	Ref. Standard				
	Rated Voltage & Current				
	No. of Aux. Contacts	NO			
		NC			
CONTROL TRANSFOR-MER	Make & Maker's Type				
	Ref. Standard				
	Rating				
	Class Of Insulation				
SIGNAL LAMPS	Make & Maker's Type				
	Ref. Standard				
	Rated Voltage / Wattage				
	Type Of Lamp & Lamp Holder				
LIMIT SWITCH	Make & Maker's Type				
	Ref. Standard				
	Duty Category				

CLIENT :		PROJECT :		PLANT :	
ISSUED FOR : PROPOSAL ☐	ENQUIRY ☐	ORDER ☐		FINAL ☐	
MOTORS					
Description					
Code No.					
Make					
Maker's Type					
Rating					
Rated Output					
Synchronous Speed					
Duty					
Rotot Type					
Starting Method					
Max I Start / I Rated					
Min. V Start at Terms					
Min. M Start at VR					
EXECUTION	Degree of Protection	**IP**	**IP**	**IP**	**IP**
	Addl. Degree of Protection				
	Insulation				
	Cooling Method	**IC**	**IC**	**IC**	**IC**
	Stator Connection				
ELECTRICAL DATA	No. of Starts / Stop per Hour				
	Torque-Starting / Pull Up / Pull Out				
	Safe Stall Time at V_R / 1.1 V_R				
	Stator Time Constant				
	Max. Temp. Rise				
	Current at FL / 0.85 FL				
	Push Pull with Stand Capacity				
	Max. V Deep for 1 Sec. / 10 Sec.				
	Space Heater Rating				
ACCESSORIES	Lifting Eye Bolt				
	Earthing Terminals On Body				
	Earthing Terminals In T.B.				
	Name Plate				
	Addl. Name Plate				
CABLING DATA	Power Cable				
	Heater Cable				
	Cable Gland Type				
	Cable Gland Material				
MECHANICAL DATA	Frame Size / Weight				
	Ref. Dimensional Drg.				
	Material of Insulation				
	Size of Wdg. Wire				
	Type & Material of Fan				
	Lubrication Specification				
	Interval of Lubrication				
	Bearing Type with No. DE / NDE				

ENGINEERING STANDARD

INDUCTION MOTOR

REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD
2	20.01.07	01.02.07	ISSUED FOR IMPLEMENTATION	AV	BKC / SC	BB
1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	AV	BKC	BB
0	SEP. '97	--	ISSUED FOR IMPLEMENTATION	RNS/JKT/SC	JKT	HSW

CONTENTS

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 specification sheets 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-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 specification sheet.

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 specification sheet.

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 al so 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: 4691, unless otherwise specified.

4.1.2 Motors for outdoor service shall be pr ovided with special seals for the enclosure, joints, bearing housing, terminal boxes etc. so that no extra protective covering for ingress of water shall be required.

4.1.3 Vertical motors for outdoor installati on shall be provided with a rain protective hood.

4.1.4 All external hard wares 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 f an 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 indicated in the specification sheet are such that corrosive agents are present in the su rroundings, 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 as indicated in the specification sheet. Trays shall be provided for collection of leaking water with arrangement for its drainage.

4.2.6 The cooling fans shall be suitable for bidirectional rotation of motors. These shall be fastened to the motor shaft by means of compensating rings or will be balanced independent of the motor. Guide key or reference points shall be supplied to prevent wrong assembly. The cooling air shall be sucked from the non-driving end.

4.2.7 The cooling fans shall be made of non-sparking materials such as cast Aluminium (LM-6 alloy) / cast iron.

4.3 **Direction of Rotation**

4.3.1 Motors shall be suitable for both directions of rotation. In case of any design limitation, the same shall be indicated in the offer.

4.3.2 In either case, a plate showing the direction of rotation corresponding to the phase terminal markings shall be fitted at the driving end shield of the motors.

4.4 **Stator**

4.4.1 The stator laminations shall be made from suitable magnetic sheet iron varnished on both sides. Where ventilation is required, these shall be arranged in suitable packs, each pack being separated by spacers to form ventilating ducts for circulation of air.

4.4.2 The slot shall be open type with coils so arranged that the coils can be easily removed for inspection and repair.

4.5 **Rotor**

4.5.1 The rotor shall be of squirrel cage construction, unless otherwise specified.

4.5.2 For small motors, the squirrel cage shall preferably be of pressure die-cast construction. For large motors, the rotor bars and the end rings shall be of copper or copper alloy. The bars shall be firmly placed in slots to prevent vibration during start up / locked rotor condition. Conductor ends shall be securely fixed to the end rings using the latest brazing techniques. Retaining rings shall be provided for high speed machines for the end rings. The rotor cage shall be designed for the required starting and duty cycles.

4.5.3 Wherever wound rotor is specified, the windings shall have the same features as detailed for the stator windings. The rotor voltage shall not exceed the stator voltage.

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 class B or F insulation as indicated in the specification sheet with tropical and fungicidal treatments.

4.6.4 Wherever class F insulation is specified, the windings shall be easily replaceable type and the temperature rise shall not exceed that of class B insulation.

4.6.5 The winding coils shall be dried, properly impregnated with suitable varnishes to withstand the site conditions and properly baked. At least two additional impregnations and baking shall be applied to the assembled stator coil, making a total of three impregnations and baking. Finally the windings shall be painted with special anti-acid and anti-alkali paints to withstand the site conditions.

4.6.6 The windings shall be well brazed and capable of withstanding thermally and mechanically the transient disturbances specified under clause 3.2.2.

4.6.7 Lead-in wire between the windings and the outside terminals shall be made through bushings in H.V. motors. For M.V. motors, heat resistant insulated conductors shall be used as lead-in wire.

4.6.8 The windings shall be star connected for high voltage motors and delta connected for medium voltage motors.

4.7 **Slip Rings and Brushes**

4.7.1 Slip rings shall be located in the non-driving side. The material of construction shall be copper alloy. The slip rings and the brush gear shall be cooled by the motor cooling fan.

4.7.2 For explosion proof motors, the slip rings and brush gear shall be housed in a flameproof housing. In case this is not possible, the housing shall be pressurised type with flameproof pressure switch for interlocking with the motor. In either case, glass covers shall be provided for inspection.

4.7.3 The starting rheostats shall be designed for intermittent duty and rated for 10 minutes. Where speed regulation is required, the rheostats and the controllers shall be suitable for such duty and be continuously rated. Auxiliary contacts shall be provided on the controllers for connections to the motor supply controls to prevent wrong operations during starting.

4.8 **Bearings**

4.8.1 All motors shall be provided with bearings suitable for the application. The bearings must be guaranteed to ensure a smooth operation and a life not shorter than 30,000 hrs.

4.8.2 Where external thrusts are specified, the motors shall be fitted with special roller thrust bearings capable of withstanding the specified thrust. In such cases, the guaranteed life of the bearings shall not be less than 20,000 hours.

4.8.3 The bearing housing shall be effectively sealed against ingress of dust and water and creepage 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 90ºC for grease lubricated bearings and 70ºC for oil lubricated bearings.

4.8.10 Wherever shaft end-play has been specified, the bearings shall be capable of providing the specified end-play.

4.9 **Terminal Box**

4.9.1 All the terminal boxes shall have identical degree of protection as that of the motor.

4.9.2 The power terminal box shall be mounted on the right hand side of the motor as viewed from the coupling end. For M.V. Motors, design of terminal boxes shall be such that it may be possible to arrange top/bottom/side entry of cables at site.

4.9.3 The power terminal boxes shall be as follows:

a) For H.V. motors - Phase segregated type capable of with standing the system fault level for 0.2 Sec. or more.

b) For M.V. motors - Manufacturer's standard box with epoxy or SRBF moulded terminal board.

4.9.4 The mounting arrangement of power and neutral side terminal boxes for HV motors shall be identical so that it shall be possible to interchange the boxes at site.

4.9.5 In case of H.V. motors, all the six leads of the motors shall be taken out, three on one side and three on the other side to separate terminal boxes. However, neutral shorting link shall be provided on the neutral box for star connection.

4.9.6 In case of M.V. motors, all the six leads of the motors shall be taken out to a common terminal box. Shorting links for delta connections shall be provided in the terminal box for motors 112 frame and above.

4.9.7 For increased safety motors and for motors with type of protection "n", the terminals shall be provided with positive locking device so that they do not become loose during normal operation.

4.9.8 The power terminal boxes shall have adequate clearances in between the terminals and also between the terminals and cable gland for proper termination of cables. Where more than one cable is required to be terminated in parallel, the spacing in the box shall be adequate for easy termination.

4.9.9 Separate terminal boxes shall be provided for connection of power, control and space heater cables.

4.9.10 All terminal boxes shall be comple te 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 star ting 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 through out the starti ng 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 as indicated in the specification sheet.

5.1.3 The starting current shall not be greater than 6 time s the rated current when the motors are started at full voltage including tolerances, unless otherwise specified.

5.1.4 The motors shall be suitable for the following starting cycle:

a) With the motor at ambient temperat ure - 2 successive starts and 3rd start after 5 minutes.

b) With the motor at steady state l oad 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 pr ovided, wherever required, to fulfil the starting conditions.

5.2 Locked Rotor Condition

5.2.1 The locked rotor withstand time (t_E), under hot condition at 110% of rated voltage shall be more than the starting time of the motor coupled to the load even at the lowest stipulated starting voltage by 2 secs. for motors, having starting time up to 10 secs. and by 5 secs. for motors, having starting time more than 10 secs.

5.2.2 For increased safety motors, t_E under hot condition shall not be less than 10 secs. The value of t_E shall be determined in the presence of purchaser's representative unless test certificate from an independent testing authority is submitted for similar motors. The time t_E and the locked rotor current shall be stamped on the name plate as well as indicated in the test certificates.

5.2.3 For deciding the time t_E in all cases, the temperature of the insulated stator and rotor shall not exceed the value stipulated under clause no. 5.4.3.

5.3 Running

5.3.1 All motors shall be continuous maximum rated (S1 duty as per IS: 325), unless otherwise specified.

5.3.2 The motors shall be capable of delivering the rated output without exceeding the specified temperature rise under the system voltage and frequency variation conditions as specified in the Specification Sheet.

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 10ºC 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 200ºC.

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	-	300ºC
For wound rotor	-	As applicable to the insulation class
For explosion proof motor	-	As per temperature class of the hazardous gases / vapours, without exceeding the above temperature as applicable

6.0 COUPLING DETAILS

6.1 Unless otherwise specified, all motors shall be coupled to the driven equipment through flexible coupling.

6.2 Normally the coupling half for the motor shaft shall be supplied by the driven equipment supplier. The coupling half shall be keyed on the shaft with a tapered joint or shrunk with a straight joint. For this purpose, the motor manufacturer shall coordinate all details of the coupling system with the driven equipment manufacturer, wherever required.

6.3 Where rigid coupling is specified, the motor shaft shall have the desired class of accuracy.

6.4 For all vertical flange mounted motors, the limitations on shaft extension, run out, perpendicularity and eccentricity, as required by the driven machine supplier shall be complied with by the motor supplier.

6.5 i) If the motor is to be coupled to a reciprocating pump or compressor requiring fluctuating torque, the motor supplier shall ensure that the inertia of the driving and driven machine assembly shall be such that the variation in the armature current shall not exceed ±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.

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 the accessories as indicated in the specification sheet.

7.1 Space Heaters

7.1.1 Space heaters rated for 240 V A.C. shall be provided to keep the winding dry for all high and medium voltage motors, except for motors rated below 30 KW which shall be suitable for space heating by connecting 24 V A.C to any of the two motor winding terminals.

7.1.2 The location of the space heaters shall be such as to allow easy access for inspection, maintenance and replacement.

7.2 **Name Plates**

7.2.1 The name plates shall be of stainless steel with letters embossed on them.

7.2.2 The name plate shall contain all the relevant details as per IS: 325 and in addition shall indicate the following:

i) The description and code no. of motor

ii) Degree of protection of enclosure

iii) Temperature rise of windings under running condition

iv) Designation of bearings

v) Recommended type of lubricant and interval of lubrication

vi) Direction of rotation

vii) Mounting Arrangement

7.2.3 Flameproof motors shall have additional name plate containing relevant particulars as per IS: 2148.

7.2.4 Increased safety motors shall have additional name plate containing relevant particulars as per IS: 6381.

7.2.5 Motors with type of protection “n” shall have additional name plate containing relevant particulars as per IS: 9628.

7.3 **Embedded Temperature Detectors**

7.3.1 All high voltage motors shall be provided with 6 nos. of evenly distributed embedded resistance temperature detectors for measurement of winding temperature. These shall be located in positions at which the highest temperatures are likely to occur.

7.3.2 In addition, the high voltage motors shall be provided with

i) 1 no. RTD for hot air temperature measurement

ii) 2 nos. RTDs (1 on each side) for bearing temperature measurement of oil lubricated bearings. For grease lubricated bearings, RTD shall be provided only where specified

7.3.3 These RTDs shall be of platinum having 100 ohm resistance at 0ºC and temperature coefficient as 3.850×10^{-3}.

7.3.4 The RTDs shall be 3 lead type having power frequency insulation level of 2KV.

7.3.5 The RTDs shall comply with the requirements laid down in IS: 2848.

7.4 **Dial Type Thermometers**

7.4.1 In high voltage motors, the measurement of hot air and bearing temperature (of oil lubricated bearings) by dial type thermometers shall be provided wherever specified.

7.4.2 The arrangement shall consist of a dial type of mercury-in-steel thermometer so mounted that its stem shall be located in the maximum temperature region.

7.4.3 The thermometer shall have two potential free contacts for alarm and trip.

7.4.4 All contacts shall be rated for 2 Amps. at 110 V D.C.

7.4.5 For bearing temperature measurement, separate thermometers shall be provided for each bearing.

7.4.6 For grease lubricated bearings, temperature measurement arrangement shall be provided only where specified.

7.5 **Oil Supply System**

7.5.1 For large sized motors, where forced oil lubrication system is considered, a common oil supply system for the moto r 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 t he bearings must not exceed the limits specified in IS: 12075, unless otherwise stipulated in the specification sheet.

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 acce ssories shall be painted with two coats of anti-rust paint and two coats of anti-corrosive paint after suitable pre-treatment.

10.2 Epoxy paint, wherever specified, 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 motors hall be subject to stage inspection at works and inspection at site for final acceptance.

11.5 These inspections shall, however , not absolve the vendor from their responsibility for making good any defects which may be noticed subsequently.

12.0 PACKING

12.1 The motors shall be properly packed to safeguard against weather conditions and handling during transit.

12.2 The shaft shall be properly clamped / supported.

12.3 Rust inhibiting agents shall be applied to fittings and sliding surfaces.

12.4 All flanges shall be closed with blanking plates to avoid entry of foreign materials.

12.5 The loose pieces of the motor / spare parts / Instruments shall be separately wrapped in moisture resistant paper and marked with identification marks and name plate of the corresponding motors.

12.6 The packing box / crate shall include a copy of installation, operation and maintenance manual.

13.0 DRAWINGS AND DOCUMENTS

13.1 Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.

13.2 All drawings and documents shall have the following descriptions written boldly:

- Name of client
- Name of consultant
- Enquiry / order number with plant / project name

- Motor Code No. and Description

14.0 SPARES

14.1 Spares for operation and maintenance

Item wise unit prices of spare parts with recommended quantity shall be quoted along with the motors as listed in the specification sheet.

14.2 Commissioning Spares

Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.

14.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.

14.4 All spare parts shall be identical to the parts used in the motors.

15.0 DEVIATIONS

15.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

15.2 Deviations, if any, from the data furnished in specification sheet shall be indicated therein beside the data by encircling it.

ANNEXURE - I

DOCUMENTATION FOR INDUCTION MOTORS

Sl. No.	Document Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet and Technical Particulars completely filled-in	Y	Y	Y
2.	Dimensional Drawings	Y	Y	Y
3.	Drawings and data for air / water heat exchangers, if necessary	N	Y	Y
4.	Drawings and data for oil system, if necessary	N	Y	Y
5.	Characteristic curves			
	a) Thermal withstand curve	N	Y	Y
	b) Load Vs FL current	N	Y	Y
	c) Load Vs Efficiency	N	Y	Y
	d) Load Vs Power factor	N	Y	Y
	e) Load Vs Speed	N	Y	Y
	f) Voltage Vs Thermal Withstand time	N	Y	Y
	g) Starting current Vs Time	N	Y	Y
6.	Connection diagram for RTDs, thermometer etc.	N	Y	Y
7.	Terminal Box drawings	Y	Y	Y
8.	Illustrative and Descriptive catalogues	Y	N	Y
9.	Catalogues of bought out accessories	Y	N	Y
10.	Spare parts list	Y	N	Y
11.	Installation, Operation and Maintenance manual	N	N	Y
12.	Test certificates			
	a) Routine	N	N	Y
	b) Type	N	N	Y
	c) For enclosure	Y	N	Y
13.	Guarantee Certificates	N	N	Y

Note:

1. 4 hard copies & 1 soft copy shall be supplied with bid.
2. 4 hard copies & 1 soft copy shall be s upplied for approval after order within 4 weeks from the date of LOI.
3. 8 hard copies & 2 soft copies in CD sha ll 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

ENGINEERING STANDARD

ELECTRICALS FOR OVERHEAD CRANES & HOISTS

REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD
2	20.01.07	01.02.07	ISSUED FOR IMPLEMENTATION	AV	BKC / SC	BB
1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	AV	BKC	BB
0	FEB'98	--	ISSUED FOR IMPLEMENTATION	RNS/JKT/SC	JKT	HSW

CONTENTS

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 and specification sheet.

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 specification sheet.

3.2 **System Details**

These shall be as indicated in specification sheet.

3.3 The owner shall provide only three phase power at the specified medium voltage. For lighting, control and plug s upply the vendor shall provide necessary single phase step-down transformers.

3.4 All the electrical equipm ent shall be so designed that enable the crane / hoist to operate at its rated capacity and specif ied duly cycle with t he system variation under the ambient conditions indicated in specification sheet 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 sha ll 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: 13947 / IS: 4691.

4.4 Equipment to be loca ted outdoor shall be weather proof and have IPW-55 protection as per IS: 13947 / IS: 4691 and s hall also be provided with canopy as far as practicable.

4.5 The equipment to be located in hazar dous 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 specification sheet. 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 hazar dous areas, the loop between the pendant push button and the crane control panel shall be made intrinsically safe by using suitable isolators. Alternatively cert ified 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 ensur e that the parts to be opened for inspection and maintenance retain their dust ti ghtness 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 am bient conditions and atmospheric pollution.

4.10 All live parts shall be adequately protect ed to prevent inadvertent or accidental contact.

4.11 The minimum clearance and creepage dist ance 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 so ckets and identification marks shall be provided on the enclosure of all electr ical equipment. The number of terminals shall be two for equipment rated above 240V and one for those rated 240V and below. Additional internal earthing arr angement shall be provided for flameproof equipment.

4.14 All equipment shall be prov ided with stainless steel nam e plates containing the particulars as per relevant IS al ong with the descripti on and code nos. of equipment

4.15 All the electrical equi pment shall be provided with separate terminal box, heavy duty double compression type rolled alum inium cable glands, proper crimping lugs and anti-vibration type terminals suitable for the cable sizes required.

4.16 Enclosure for limit switches, pendant push button, junction boxes and magnets etc. shall be of cast aluminium. Encl osure for control panel, transformer and resistors may be of sheet steel. The th ickness 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 m entioned in the attached specification sheet.

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 s hall 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 indicated in specification sheet.

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)

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 l oad current of the circuit.

5.2.6 The power contactors shall be interlo cked 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 fo r hoisting/travel motors tripping on overload.

5.2.9 The panel shall be insta lled on properly levelled base frame fabricated out of channels of suitable size.

5.3 Motors

5.3.1 The design and specification of all mo tors shall comply with requirements stated elsewhere in the specifications and relevant specification sheets.

5.3.2 The power rating of the motors sha ll 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 st arting and stopping the motor in quick succession shall be guaranteed.

5.3.4 The motors for main hoist and micro hoi st 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 brak e shall be wound with fibre gl ass covered annealed copper conductor suitable for class H application. An additional covering with glass taps shall be provided over t he coil. The maximum temperature of the coil for continuous operation shall be limited to 140º 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 seri es type shall be used in control and power circuit.

5.5.2 These shall be heavy duty type and of st urdy 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 su fficient to avoid slippage of contact with the striker.

5.5.6 The striker provided for operating thes e limit switches sha ll have rubber padding on surface which will make c ontact 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 gr avity 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 s witch fuse unit on thei r primary side of suitable rating. One side of secondary windings of the transformers shall be earthed and other shall be provided with fuse of suitable rating.

5.6.3 The rating of the transformers shall be at least 2.5 times the continuous load.

5.7 Junction Box

Junction boxes shall be of cast alumin ium construction and adequately sized to enable easy termination of cables.

5.8 Hand Lamps

5.8.1 Provision shall be made in the crane for use of hand lamps by installing 2 nos. 24 volts, 2 pin metal clad switch socke ts. One of the sockets shall be on the bridge (outside the panel) and the other on the trolley.

5.8.2 The transformer primary and sec ondary voltage shall be 250V and 25V respectively.

6.0 CABLES, CABLE TERMINATION AND CONNECTIONS

6.1 The cables used for fixed wiring sha ll be 1.1 KV grade PVC insulated armoured and PVC sheathed overall, and shall conform to IS: 1554 Part-I.

6.2 The flexible cable used for power supply to crane and also for interconnection of equipment mounted on moving and fixed part of the crane shall be 1.1 KV grade heavy duty type.

6.3 All cables shall be properly laid and supported with adequately sized aluminium clamps at 500 mm interval.

6.4 Cable entry on all electrical equipment e.g. panels, motors, limit switches, brakes, junction boxes etc. shall be through double compression type rolled aluminium cable glands.

6.5 The internal power wiring of panels shall be carried out by PVC insulated stranded copper flexible cable.

6.6 The wiring shall be arranged in a neat fashion and supported on PVC channel or PVC stand of screw support.

6.7 For equipment mounted on the doors, the wiring shall be carried out with flexible stranded copper cables in such a way that no strain is put on the wires and equipment when the door is opened for inspection and maintenance.

6.8 External looping of wires shall be done through separate dust tight junction boxes.

6.9 The sizes of power cables to be used shall be subject to owner's approval. The minimum size of power and control cables shall be 16 sq. mm (Al) & 2.5 sq. mm (Cu) respectively.

7.0 EARTHING

7.1 The earthing of all electrical equipment shall be carried out in accordance with IS: 3043.

7.2 The enclosures of electrical equipment shall be connected to an aluminium earth ring on the crane which in turn shall have effective electrical connection with the bridge.

7.3 The crane bridge shall be earthed through the bridge travel runway rails on both sides which in turn shall be earthed to owner's earth ring located on the ground floor.

7.4 Further the power supply cable for the crane shall have an additional conductor for earth connection. Both sides of this conductor shall be earthed.

7.5 All earth conductors shall be of aluminium.

7.6 This size of earth conductor shall be equal to half the size of the power conductor subject to a minimum size of 10 sq. mm.

8.0 CONTROL DESK / CONTROL STATION

8.1 The crane shall be controlled either from the floor by means of a pendant control station or from bridge mounted control desk as indicated in the mechanical data sheet.

8.2 In either case, the units shall have the following control devices:

- Main off push button with padlocking arrangement.
- Indication lamps for supply 'ON'
- Control push buttons, as specified in the mechanical data sheet.
- All other devices required for safe and proper operation of the crane / hoist.

8.3 All push buttons shall be momentary contact type, coloured as per IS: 6875 and have 1 NO and 1 NC contacts.

8.4 The bridge mounted control desk, where specified, shall be of totally enclosed and dust tight construction. All controlling equipment shall be mounted on the top. It shall be located at most convenient location to allow movement of the operator. The installation shall be equipped with adjustable chair, fan, light and main isolating switch.

8.5 The pendant control station, where specified, shall be in a single enclosure and in totally enclosed dust light execution. The unit shall be suspended and supported from the bridge platform by flexible steel wire rope. The connection shall be made with a multi core flexible copper conductor cable and shall have 20% spare cores. One core shall be provided for earth connection of the circuit.

9.0 PAINTING

Enclosures of all electrical equipment shall be painted with two coats of epoxy based primers after suitable pre-treatment. Two coats epoxy based paint of approved colour shall be provided as indicated in specification sheet.

10.0 MAKE OF ELECTRICAL ITEMS

The make of the electrical items shall be as indicated in specification sheet.

11.0 TESTS AND INSPECTION

11.1 All equipment shall be routine tested as per relevant Indian Standard Specifications.

11.2 Additional tests, wherever specified, shall be carried out on one equipment of each rating.

11.3 All the above mentioned tests shall be carried out in presence of owner's representative.

11.4 The owner's inspection shall, however, not absolve the vendor from his responsibility for making good any defects which may be noticed subsequently.

11.5 Despatch of materials shall be subjec t to written consent of owner or his representative.

12.0 INSTALLATION, TESTING AND COMMISSIONING

12.1 The vendor shall undertake installation of all electrical equipment in accordance with latest code of practices, in c onformity 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.

12.2 The vendor shall arrange all the nece ssary erection tools and tackles, testing and measuring instruments and shall supply the required erection materials including structural steel.

12.3 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.

13.0 DRAWINGS AND DOCUMENTS

13.1 Drawings and documents as per Annexur e-I shall be supplied unless otherwise specified.

13.2 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

14.0 SPARES

14.1 Spares for operation and maintenance

Item wise unit prices of spare parts with recommended quantity shall be quoted along with the equipments as listed in Annex ure-II for the period as indicated in the specification sheet.

14.2 Commissioning Spares

Commissioning spares, as required, sha ll be supplied with the main equipment. Item wise list of recommended commissioni ng spares shall be furnished for approval.

14.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.

14.4 All spare parts shall be identical to the parts used in the equipments.

15.0 DEVIATIONS

15.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

15.2 Deviations, if any, from the data furnished in specification sheet shall be indicated therein beside the data by encircling it.

ANNEXURE - I

DOCUMENTENTATION FOR ELECTRICALS FOR OVERHEAD CRANES & HOISTS

Sl. No.	Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification sheet and technical particulars completely filled in	Y	Y	Y
2.	Composite schematic diagram	Y	Y	Y
3.	Dimensional drawing showing the mounting details and general arrangement for the following equipment			
	a) Motors	N	Y	Y
	b) Power control panel	N	Y	Y
	c) Control station	N	Y	Y
	d) Limit switches etc.	N	Y	Y
4.	Down shop lead and power supply arrangement with civil scope.	N	Y	Y
5.	Inter-connection with terminal diagram and cable details	N	Y	Y
6.	Operating and maintenance instruction manual	N	N	Y
7.	Catalogues of bought out items	Y	N	Y
8.	Test certificates	N	N	Y

Note:

1. 4 hard copies & 1 soft copy shall be supplied with bid.
2. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
3. 8 hard copies & 2 soft copies in CD sha ll 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

ANNEXURE-II

LIST OF SPARES

1) Bearings of each type & no.
2) Contactor coil of various ratings.
3) Complete set of contactor of each rating.
4) Moving & fixed contact blocks of contactors of each rating.
5) Limit switches of each type.
6) Push button elements.
7) Push button actuators.
8) Fuses of various ratings.
9) Fuse fittings of various ratings.
10) Indicating lamp fittings.
11) Indicating lamps.
12) Over load relays of various ranges.
13) Brake coils.
14) Set of carbon brushes in case of S.R. motors.
15) Set of resistors for S.R. motors.
16) Any special tools and tackles required for maintenance

NOTE :

i) All the spare parts shall be identical to original parts.

ii) The tenderer shall also quote for any other spares as deemed necessary to be kept in stock for stipulated time.

TECHNICAL SPECIFICATIONS

FOR

PERMANENT CATHODIC PROTECTION SYSTEM

OF

OF COMPOSITE MECHANICAL ERECTION WORKS

HURL, GORAKHPUR

0	07.12.18	07.12.18	Issued	RKP	SK	SK
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD

CONTENTS

CONTENTS

S.N	DESCRIPTION	DOCUMENT NO.	NO. OF SHEETS
A	**CP SYSTEM SPECIFICATIONS :**		
1	Technical Specification of Anode Junction Box for Cathodic protection System	EM250-PNEL-TS-802-01	4
2	Technical Specification of Cathode Junction Box for Cathodic protection System	EM250-PNEL-TS-802-02	3
3	List of Cathodic protection vendors and Make of equipment/component	EM250-PNEL-TS-802-03	3
4	Technical Specification of Reference Electrode-Cu-$Cuso_4$ for Cathodic protection System	EM250-PNEL-TS-802-04	2
5	Technical Specification of Transformer Rectifier Unit for Cathodic protection System	EM250-PNEL-TS-802-05	20
C	**DRAWING LIST FOR EARTHING SYSTEM**	**DRAWING NO.**	
1.	Arrangement of connection of earth conductor	PDS : E : 603	6
2.	Typical details of connection in earth pit	PDS : E : 604	1
3.	Earth pit details	PDS : E : 605	2
4.	3.8m GI electrode for earthing	PDS : E : 610	1
5.	GI/Al accessories for earth pit	PDS : E : 611	2
6.	Typical Earthing arrangement across pipe joints/ valves	PDS : E : 612	1

1.0 INTRODUCTION

This specification specifies the requirement of Basic Survey, Design, Engineering, Supply of Materials, Installation, Testing & Commissioning, Monitoring of Permanent Cathodic Protection system for mitigation of external corrosion on underground cooling water pipeline for 2200 MTPD AMMONIA 3850 MTPD UREA FERTILIZER PLANT OF HURL, GORAKHPUR.

2.0 SCOPE OF WORK :

The scope of work under this NIT shall comprise of Basic Survey, Design, Engineering, Supply of Material, inspection at works as well as at site, including packing and forwarding, transportation, loading and unloading of materials from Workshop up to Project Site, quality assurance (QA) and quality control (QC), Installation, Testing & Commissioning, Monitoring of Cathodic Protection system for mitigation of external corrosion on underground pipeline.

This specification defines the basic guidelines to develop a suitable Impressed current cathodic protection system for the pipelines required to be protected. The design life for Impressed Current CP (ICCP or PCP) shall be **30 years**. All data required in this regard shall be taken into consideration by the CP bidder to develop an acceptable state of the art design and properly engineered design of the CP system. Compliance with these specifications and/or approval of any of the Bidder's documents shall in no case relieve the Bidder of his contractual obligations.

The Bidder should supply materials strictly as per specifications and approved vendors list attached with. Bidder shall give performance guarantee for CP System.

3.0 DETAIL SCOPE OF WORK

- Carrying our Basic Surveys, Current Drainage and other topographical data collection from site.
- Development of Detailed engineering Document on the Basic Survey Data and optimize the PCP System.
- Site visit to decide the location of proposed Anode bed, T/R unit, Test station etc. Supply, Laying & Terminations of power cable (buried) from Owner's Substation to TR Unit and from TR Unit to anode shall be under bidder's scope. Suitable dia. GI pipe (Heavy duty) for cable protection shall be used wherever cable route crossing the road/Rail. Road cutting/damage during cable laying shall be rectified/ restore to original position by the Bidder.
- Calculation of anode quantities and their sizes based on upon maximum current requirement and design life.
- Sizing calculation for T/R unit, anode loop resistance and potential profile on the protected structures.
- Submission of detailed engineering package of CP system which generally includes but not limited to formulae used, design calculations, BOQ, Technical Specifications and Post

Commissioning Monitoring Methodology, Data Recording Formats, Quality Assurance Control [QA/QC] methodology, test certificates for the individual equipment , preparation of construction drawings etc for approval from owner/ his representative.

- Procurement of Material and equipments, for complete PCP system including supply, factory inspection, transportation, loading and unloading of CP TRU, anodes, cables, junction boxes, reference cells and other material required for complete PCP work on FOT- project site basis.
- Submission and obtaining approval of all documents (vendor documents) related to procurement of items as mentioned above.
- Construction drawings for cable trays, fixing details, cable sizing, cable schedule, interconnection diagram, and cable tray details for complete PCP system.
- Installation details including location and fixing details of T/R unit, junction box. Anodes and control equipments.
- Installation details of anode bed, reference cell, junction box etc. of complete impressed current cathodic protection system.
- Preparation of detailed factory / laboratory testing procedures for critical equipments. Submission of test certificate for equipment installed.
- Installation and erection of PCP System.
- Development of system testing and commissioning procedures including interference testing.
- Energizing, testing and commissioning of PCP System as defined in the tender including job procedure for field testing, pre-commissioning and commissioning.
- Preparation and submission of As-built drawings, O&M manual and handing over the entire system with reports to Owner.
- All civil works associated with the complete Cathodic Protection work shall be included in the scope of contractor. This shall include providing cable trenches, foundation for equipment etc.
- CP Monitoring for three months from the date of commissioning of PCP system with monthly progress reporting to owner/ his representative & mitigation of any anomaly required to tune up the functioning of the PCP system. This includes monthly monitoring of PCP test station with data logger and weekly monitoring of TRU parameters.
- Progress reporting to owner/ his representative.
- Coordinating with other contractors working at site as well as owner to obtain permission for PCP works.
- Handling over to client and Training of Owners Personnel.

The Intending Bidder shall be deemed to have visited the Site, pipeline ROW and familiarized before submitting his bid. Non familiarity with site conditions will not be accepted as a reason either for extra claims or for not carrying out the work in total conformity with the tender specifications.

4.0 CODES AND STANDARDS

The system design, performance and materials to be supplied shall conform to the requirements of the latest revision of following standards:

- NACE Standard RP-0169: Standard Recommended Practice Submerged Metallic Piping Systems.
- NACE Standard RP-0177: Standard Recommended Practice Mitigation of Alternating Current and Lightning Effects on Metallic Structures and Corrosion Control Systems.
- NACE Standard RP-0286: Standard Recommended Practice-Electrical isolation of Cathodically Protection Pipelines.
- NACE Publication No. 54276: Cathodic Protection Monitoring for Buried Pipelines.
- NACE Standard RP-0572: Standard Recommended Practice Design, Installation, Operation and of impressed Current Deep Ground Beds.
- NFPA - National Fire Protection Association
- DNV RP-B403: Recommended Practice Monitoring of Cathodic Protection Systems.
- DNV RP-B401: Recommended Practice Cathodic Protection Design.
- BS EN 15280:2013: Evaluation of AC corrosion likelihood of buried pipelines applicable to cathodically protected pipelines.
- BS EN 50162:2004 : Protection against corrosion by stray current from direct current systems
- BS 7361 Part I: Codes of Practice for Cathodic Protection for land and marine applications.
- VDE 0150: Protection against Corrosion due to Stray Current from DC Installations.
- IS: 8062: Code of practice for cathodic protection of steel structures
- IS: 1554 Part I: PVC insulated (heavy duty) cables.
- IS: 7098 Part-I: XLPE insulated PVC sheath cable
- Any other standard applicable for the equipment being used for CP System.

a) In case of imported equipments standards of the country of origin shall be applicable if these standards are equivalent or stringent than the applicable Indian Standards.

b) The equipment shall also confirm to the provisions of India Electricity rules and other statutory regulations currently in force in the country.

c) In case of any contradiction between various referred standards / specifications / datasheet and statutory regulations the following order of priority shall govern.

- Statutory Regulations.
- Data Sheets
- Technical Specification.
- Codes and Standards

5.0 SYSTEM IMPLEMENTATION

All work to be performed and supplies to be effected as a part of contract shall require specific review of owner or his authorized representative. Major activities requiring review shall include but not be limited to the following:

- Corrosion survey data interpretation report and design basis for C.P. System.
- C.P. System design package.
- Basic & Detailed engineering package
- Purchase requisition for major equipment.
- Field-testing and commissioning procedure.
- Procedures for interference testing and mitigation measures.
- System monitoring procedures.
- As built documentation.

6.0 CORROSION DATA

6.1. GENERAL

i) Bidder to collect soil resistivity data and other data required for CP design and completeness of the job.

ii) Bidder shall carry out soil resistivity survey at impressed current anode ground bed locations for proper design of ground beds using Wenner's 4-pin method or equivalent method, approved by owner shall be used for such measurements. Survey instruments shall have maximum AC and DC ground current rejection feature.

6.2. Soil Ionic & Microbial Analysis

Soil samples to be collected along the length of the pipeline i.e. every 500 mtr and from proposed Anode bed locations at least two or more plots at each anode bed location and soil samples for Semi Deep Well anode beds to be collected from 10, 15,20,25,30,35,40,45,50,60...M depending on anode bed depth. All soil samples to be analyzed for:

1. Microbial Analysis: Presence/absence of Sulphate Reducing Bacteria [SRB].
2. Ionic Loading: All soil samples to be air dried, cone and quartered and an aqueous extract of these to be analyzed for:
3. Cations: Ca, Na, K, Mg (to report in ppm)
4. Anions: Cl^-, $S0_4^{2--}$, $C0_3^-$, HCO_3^-, PO_4^{3-}, S^{2-}, SO_3^{2-}, $N0_2^-$,$N0_3^-$ [In ppm]
5. Others: Moisture (%), Total Dissolved Solids (ppm), pH, Redox Potential

6.3. Water Table

Water table for the pipeline ROW particularly at proposed anode bed locations to be recorded either from GSI [Geological Survey of India] or by recording depth of in use wells nearby.

6.4. Topographic Surveys

Cathodic protection stations consisting of Impressed current Anode ground bed, CP Station, etc. as applicable, along with all associated cabling up to pipeline and any other related equipment and accessories for CP Station shall be demarcated on the ground.

Ground plots so demarcated shall be surveyed for all other topographical and cadastral features and topo-sheets shall be developed by bidder, which may be available for use in designing the cathodic Protection System and land acquisition etc.

6.5. **Additional Data to be Collected**

Bidder shall conduct necessary potential gradient survey for all the existing anode ground beds of the parallel running piping and any other existing anode ground beds along the pipeline that may interfere with the CP system of the piping covered under this project.

7.0 Report

On completion of all fieldwork, a report incorporating all the results generated from site surveys, Type of terrain and vegetation e.g. urban areas, industrial areas, farm land, forests, deserts, rocks, marshy areas etc and details of additional data collected shall be prepared and submitted to owner for approval. The report shall also contain detailed interpretation of survey results and resistivity data, probable interference prone areas, selected locations for impressed current anode ground beds, results, etc. to form design basis for the scheme of cathodic protection.

This report shall also include various drawings prepared in connection with the above work. The soil resistivity values shall be plotted on semi-log graph sheets. The Permanent Cathodic protection system design shall be long-line continuous anode or deep well anode bed only including stepwise calculations should be part of this report.QA/QC, Erection methodology, Bill of quantity; Technical specifications, vendor list, construction drawings etc will be included in the report for review/approval of owner/owner representative.

8.0 CATHODIC PROTECTION DESIGN PARAMETERS

The Design of Impressed current cathodic protection system shall be carried out based on following design parameters.

Pipe to soil potential shall not be more negative than (-) 1.2V (OFF“) wrt Cu-$CuSO_4$ Reference electrode.

*Actual current density to be adopted shall be decided based upon soil and other environmental Conditions, proximity or foreign pipe lines and structures affecting and causing interference. Where considered necessary for satisfactory protection of all pipelines the current density shall be suitably increased by bidder for pipeline.

Safety factor for Protection Current Density	:	1.3
Type of Coating of Pipeline	:	Cold tape type coating system (Polyethylene backed tape with butyl rubber based adhesive system)

Anode ground bed configuration	:	Semi Deep well type & linear continuous anodes
Type of Anodes	:	MMO coated (Ti) tubular & MMO coated wire Anode
Pipeline Natural Potential	:	(-) 0.45V CSE
The design life of Permanent CP System	:	30 years
Total CP System Loop Resistance	:	1 ohm (maximum)

(The output voltage rating of the CP TR Unit shall in minimum be adequate to drive the specified end of life Cathodic Protection current with safety factor, considering the total Anode Ground Bed loop resistance as the sum of the resistance specified in this clause and pipe to earth resistance.)

Permanent Cathodic Protection System shall be designed to meet the following criteria:

- The pipe to the soil potential measurements shall be in between (-) 0.85 V (OFF) and (-) 1.2V (OFF) with respect to a copper / copper sulphate reference electrode. At the location of Polarization coupons, coupons to soil potential measurement shall be between (-) 0.85 (OFF) minimum and (-) 1.2V (OFF) Maximum wrt.Cu-CuS04 reference electrodes (both being "OFF' potential) using a current interrupter.
- In rare circumstances a minimum polarization shift of (-) 100 mill volts w.r.t. Cu-CuSO4 reference electrode shall indicate adequate levels of cathodic protection for the pipeline.
- Discretion to use any of the criteria, listed above, shall solely rest with the. Owner/his representative.
- A positive potential swing of >20 mV [P-S-P] shall he considered as the criteria for presence of an Interaction situation requiring investigation and incorporation of suitable mitigation measures by the CP Bidder.

9.0 SYSTEM DETAILS

All equipment shall be new and procured from approved manufacturers. Equipment offered shall be field proven. Equipment requiring specialized maintenance or operation shall be avoided as far as possible. Prototype equipment shall not be accepted. Equipment shall conform to the relevant specifications enclosed with the tender document.

As far as possible equipment including CPTR Unit, Test Stations, Anode Junction Boxes and Cathode Junction Boxes etc. shall be located in safe non-hazardous areas. Where it is essential to install the equipment in hazardous area, such equipment shall be flameproof type and shall meet the requirement of IS: 60079-1 or equivalent International Standard and shall suitable for gas group IIA/IIB, temperature class T3 (200^0C). All Indigenous flameproof equipment shall be certified by CMIFR or any other recognized testing body and shall be approved by the concerned statutory authority. All Indigenous flameproof equipment should also be BIS marked.

a) Impressed Current (Permanent) Cathodic Protection System

The Permanent system shall include but not limited to the following major equipment/ sub-Systems unless otherwise specified in data sheet.

- Test stations
- CP TR unit with built in current interrupter and GPS based timer
- Supply, installation, testing and commissioning of Transformer Rectifier unit full compliance to technical specification, data sheets and approved drawings with built in current interrupter and GPS based Timer. This shall also includes civil foundations, structural supports, dual earthing etc. of TR unit and supply, laying & termination of incoming power cables to TR unit, Supply of recommended spares for two years operations & Maintenance.
- Factory coke backfilled MMO wire anodes and semi deep well anode ground beds with carbonaceous backfill.
- Anode & cathode junction box with shunt and resistors.
- Permanent Reference Cu-$CuSO_4$ electrodes [CSE]
- Pin Brazing for pipe to cable connection [epoxy encapsulated]
- Interconnecting cables
- Polarization Coupons for Corrosion monitoring (wherever required)
- Markers for cable route, anode bed etc.
- Any other equipments not mentioned specifically but required for complete and desired operation of PCP

External CP system design philosophy for buried plant piping shall be based on the following:

- Closed bed continuous & semi-deep well anode bed system impressed current system.
- Underground piping network intended to be cathodically protected shall be considered in electrical continuity with other foreign metallic structures within plant complex such as RCC pavement, earthing grids, foundation bolts etc which are not intended to be protected as such no isolation joints are required.
- For CW piping network continuity of pipes shall be maintained by connecting a jumper cables between pipelines or connection in junction boxes
- At road crossings, if the piping is provided with metallic sleeve, the same is required to be treated as cased crossing and provided with zinc ribbon anodes and one test station.
- Continuous anode bed system shall be long line conductive polymeric anodes or MMO wire anodes/piggy back cable with factory pre-packed calcined coke breeze encapulated with acid resistant fabric and protective braid with current output of 52 mA/meter and nominal diameter 35mm.
- Semi deep well type anode bed system using MMO tubular anodes of rating 2.5 Amp (dimension of the anode: dia 16mm & length 500mm) filled with calined coke breeze shall be installed. The semi deep wll shall be installed with a spacing of 25-30 mtrs from the pipeline.

The cathodic protection current requirement shall be calculated as follows:

- Coating defects / holidays for 30% shall be considered at the end of life for calculation of current.
- Earthing system shall be considered for ICCP designing of plant piping as 100% bare.
- Incidental structures like steel reinforcement, RCCpaving, foundations shall be taken into consideration while designing the CP system.
- Safety margin of 30% in current calculations shall be considered while designing.
- **No Insulating joints shall be installed to isolate any incidental structure from CP system within battery limit. Hence the structures intended to be cathodically protected shall be in electrical continuity with many foreign structures within the plant complex such as RCC pavements, RCC foundation, earthing grids and other underground structures which are not intended to be cathodically protected**

LOCATION	**TYPE OF ANODE**	**DIMENSIONS OF ANODE WITH CALCINED PETROLEUM COKE BREEZE**
Within Process Plant area and with congested incidental structures	Longline linear anode - Conductive Polymeric anode or factory prepackaged MMO wire anode	Dia: 38 mm
Around the pipeline area or Off-sites with sparce incidental structures	Semi deep well anodebed with MMO tubular anodes	Depth: 25-30 mtrs (or as per design) Diameter: 150 mm

i) CP Transformer Rectifier Unit

The CP TR Units shall have Automatic/Manual control and shall be metal clad, compact, suitable for outdoor type installation type, air natural cooled, dust and vermin proof systems. The components of the units shall be designed for maximum operating efficiency.

Transformer Rectifier unit shall have operating range of 230/ 415V AC and shall be natural cooled type with separate primary and secondary windings. The rating of TRU shall be selected based on actual requirement and calculation for the same shall be furnished for owner's review/ approval.

Transformer shall be vacuum impregnated with epoxy varnish and baked. The- safety factor for transformer rating shall be minimum 125%. A moulded case circuit breaker of suitable rating with thermal overload relay and short circuit release shall be provided at the input of the transformer.

The rectifier shall be made of thyristor and diodes as basic components. The diode rectifier of full wave type in the secondary of the transformer and triac or back to back connected thyristor in the transformer primary AC supply circuit may be provided. The current and voltage ratings of

thyristors, diodes shall be at least two times the actual maximum device current and maximum device voltage appears across the device.

The supply, Installation, Testing and Commissioning of Outdoor type CP TR Unit installed in a kiosk including the supply of kiosk shall be included in Bidder's scope.

The CP TR Unit shall be installed in non-hazardous (safe) area. The CP TR Unit shall install in a fenced location with door (if installed in outdoor area) For other details, refer attached "Technical Specification of TRU". Make of equipment & component as per vendor list attached elsewhere in NIT.

ii) Anode Ground Beds

The anode ground bed shall be semi deep well anode ground bed or continuous long line anode design.

a) Semi deep well Type anode bed bed/system

Semi deep well type anode bed system using MMO tubular anodes of rating 2.5 Amp (dimension of anode: dia 16mm & length 500mm) filled with calined coke breeze shall be installed. The semi deep will be installed with a spacing of 30-50 mtrs from the pipeline and a minimum depth of 25-30 mtrs, considering the same one semi deep well can be installed every 200 mtrs(approx) .Semi deep wells can be connected to one TRU through sub anode junction box and anode junction box.

All the sub anode junction boxes shall be looped to each other and connected to anode junction box.

The anode lead cable from the anode junction box to tail cables shall be of single length (no splicing) of size 1c x 16/10 Sq.mm copper HALAR/KYNAR insulated/HMWPE sheathed.The anode header cables connecting the sub anode junction box to anode junction box shall be of size 1C x 25 Sq.mm copper PVC insulated/PVC sheathed armoured cable. The main anode cable connecting to anode junction box to TRU shall be 1Cx50 Sq.mm copper PVC insulated/PVC sheathed armoured cable.Make of equipment & component as per vendor list attached elsewhere in NIT.

a.1) Mixed Metal Oxide [MMO] Anodes: LIDA Tubular

The Permanent Cathodic Protection (PCP) system will have Mixed Metal Oxide (MMO) LIDA® Tubular Anodes also known as LIDA® {Linear Distributed]. The MMO LIDA® Tubular anodes shall be centre connected scaled tubular type.

These Anodes shall be of Noble metals (group VIII) Mixed Metal Oxide coated Titanium (having Ti substrate). The LIDA [MMO] anodes shall be dimensionally stable.

The semi deep well anode-bed shall comprise of individual anodes with anode tail cable of suitable length up to anode junction box for impressed current method to protect external surface of Cold tape type coating system (Polyethylene backed tape with butyl rubber based

adhesive system) coated pipeline, against corrosion as per specifications for minimum service life of 30 years by using semi deep well anode bed construction of minimum 25-30 meter deep, with minimum 6" (150 mm) Dia MS pipe filled with Petroleum Coke Breeze of resistance ≤5 Ω ,vent pipe, dead weight & a cable string of 10/16 mm^2 size contains required no of mixed metal oxide coated titanium tubular anodes of size ST 1.6/50 cm with minimum of 10 nos.. Each MMO anode has current output of 2.5A respectively and other accessories like vent pipe. Calcined petroleum coke breeze, Rigid PVC pipe of 12" (300 mm) with minimum 5-7 mtrs in length (i.e.5-7 meter inactive anode bed), Nylon Rope, etc. from the approved vendor as per specification.

The characteristics of the [MMO] LIDA Tubular anodes are as follows:

1. Current output with carbonaceous backfill: 2.5 Amp.
2. MMO coating thickness: $\geq$ 6 gms/m^2
3. Anode consumption rate: 2 mg/Amp Yr.
4. Design life of anode: 30 years
5. Length of cable: as required to reach the junction box.
6. The Anodes shall be electrically remote to the pipeline (to be confirmed by calculations & site conditions).The first anode of the string should be at least more than 7m deep (as per NACE RP 0572 Standard) i.e. inactive zone and the actual depth shall be minimum 25-30 meter deep and as per Approved Design. However, for Deep well Anode bed, only MMO LIDA® anodes to be used.
7. Anode LIDA [MMO] cable string shall be of 10/16 mm^2 size [Kynar/ HMWPE] jointing and insulation shall be done by anode manufacturer at his shop.
8. Dimension & weight of all anodes to be checked & recorded. Negative tolerance will not be acceptable.
9. Routine & type test certificates of cable manufacturer to be furnished for anode lead cable as per IEC502-1983 or relevant BIS code. Length and identification tag to be verified by measurement.
10. Each anode to cable joint shall be tested for its electrical contact resistance & its value in ohm shall be recorded.
11. First anode to cable joint shall be subject to accelerated ageing test & destructive test to determine pullout strength of cable to anode joint as well as effectiveness of the joint insulation.
12. Manufacturer shall furnish detailed dimensioned fabrication drawing of anodes as well as details of cable connection& its insulation scaling etc. (QA/QC) to owner for approval. Manufacturing of anode will commence only after this Approval from owner.
13. Vendor shall furnish for Owner's Approval the following information;
    - Type & make of Heat Shrink cap & its properties.
    - Procedure for making the joint.

- Procedure for accelerated aging test.
- Vendor shall submit all test report for owner review

b) Continuous long line anode

Factory coke backfilled fabric jacketed conductive polymeric or MMO coated Titanium wire anode with piggy back cable shall be designed to have a single length of 150-200 meters per circuit to be fed from sub anode junction box.

The sub anode junction box will have provision for feeding 2/3 single length of continuous long-line anode through resistor and shunt to control current / voltage in each circuit.

Sub anode junction will be connected to anode junction box .Each output circuit of the anode junction box will have wire wound shunt resistor and shunt for controlling and measuring current to each sub anode junction box.

The anode lead cable connecting to sub anode junction box to conductive polymer anode or Factory pre-packaged in coke backfill MMO coated wire anode shall be size 1Cx16 mm2 copper XLPE Insulated/PVC sheathed. The anode header cable connecting the sub anode junction box to anode junction box shall be of size 1Cx25 mm2 copper PVC Insulated /PVC sheathed armoured cable . The main anode cable connecting the anode junction box to TRU shall be 1Cx50 mm2 copper PVC insulated / PVC sheathed armoured cable.

The long line anode will have a lateral separation of minimum 0.5 meter from the outer surface of the pipe. Also the anode will be so placed that there will be no incidental structure between the anode and the piping particularly earthing strips. The anode shall be laid at a suitable depth so that there will be no damage to the anode after laying during construction.

Anode cable marker shall be provided at suitable distance indicating route of buried long line polymeric /wire anode. The In-Line splice connecting the continuous long line anode and the anode lead cable shall be provided by the anode manufacturer. Suitable marker will be installed on the top of the splice indicating the location of the splice.

The continuous long-line anode shall be factory coke backfilled fabric jacketed conductive polymeric or MMO coated Titanium wire anode with piggy back cable.

The characteristics of long line polymeric anode shall be below

S.No	Description	Requirement
1	**Anode type**	Longline Conductive Polymeric anode
2	**COPPER CONDUCTOR**	

2.1	Dimension	16 mm^2 /6 AWG
2.2	Resistance	<1.5 x 10^{-3} ohm/m
3	**CONDUCTIVE POLYMER**	
3.1	Volume Resistivity	1.1 to 1.9 ohm -cm
4	**COKE BREEZE**	
4.1	Coke breeze fixed carbon content	>99%
4.2	Coke breeze resistivity	0.05 to 15 ohm-cm
5	COMPLETE ASSEMBLED ANODE	
5.1	Overall OD of anode string with calcined petroleum coke breeze and its nylon fabric jacket enclosure	D=35 mm min D=12.7 mm over conductive polymer
5.2	Weight including calcined petroleum coke breeze	>1.0 kg/m
5.3	Anode Current Rating	>52mA/m

Datasheet of Factory Coke Backfilled Fabric Jacketed MMO wire anode

Description	**Detail**
Anode Type	Factory coke backfilled fabric jacketed mixed metal oxide coated on titanium wire anode ,piggyback connected with anode lead cable, factory pre-packed with coke
Anode shape & Dimension	Wire,1.5 mm diameter
Anode weight	7gm/m(min)
Anode Material	Grade 1 or 2 titanium to ASTM B 863
Anode Design Life	30 years

Anode consumption rate (kg/A-yr) at 100 A/M^2 C.density	2 mg/ A-yr.
Metal oxide coating thickness weight (gm/M^2)	6 gms /m^2(min)
Optimum Recommended thickness current density (A/M^2)	
a) With carbonaceous backfill in soil soil/sand	100 A/m^2
Minimum rated current output in soil/sand	50mA/m(minimum)
Mechanical& Physical properties	
Electrical Resistivity of Metal oxide	<10^{-5} ohm cm (max)
Contact resistance of anode to cable	0.9 milli ohms(max)
Anode fabrication	**T**he anode assembly shall be factory coke backfilled fabric jacketed Mixed Metal oxide coated Ti wire, encapsulated in calcined petroleum coke breeze, in an acid resistant fabric jacket with nylon braid.
Spacing between consecutive anode to cable joints	3 mtr
Anode piggyback conductor metal	Copper
Anode Piggyback cable conductor size	1 C X 10 mm^2, 7 strands
Anode Piggyback cable insulation	KYNAR / HALAR
Anode Piggyback cable Sheathing	HMWPE

iii) Calcined Petroleum Coke Breeze

Lubricated Calcined petroleum coke breeze backfill material for use with LIDA single [MMO] Anodes in PCP system shall have a carbon content of 99% minimum, bulk density of 1040 kg/cubic meter and particle size of 1mm (maximum).

The calcined petroleum coke breeze material shall be tested for chemical composition, bulk density, real density, particle size and resistivity etc.

iv) Anode Junction Box

Depending on the size and configuration of anodebeds, one or more anode junction boxes shall be provided at each new anode groundbed. The junction box shall have flameproof/ weather proof enclosure, having degree of protection IP-55 with hinged lockable shutter. Enclosure shall be made of sheet steel of at last 3 mm thickness and shall be suitable for M.S. post mounting.

They shall be designed with terminals required for permanent CP system [PCP] and shall be suitable for total life of permanent CP system.

All cable tails from individual anodes shall be terminated onto the respective anode junction boxes, which shall be further connected to the main anode junction box (where applicable). The main anode junction box shall be connected to the cable coming form CP power source.

Each outgoing circuit in main junction box (where applicable) and each anode circuit in junction box shall have provision for measurement and control of individual circuit/anode current. For other details, refer attached "Technical Specification of Anode Junction Box". Make of equipment & component unit as per vendor list attached elsewhere in NIT.

v) Cathode Junction Box

A cathode lead junction box shall be provided at each CP stations, near the pipeline at the location of connection of the negative drainage cables to the pipelines. The junction box shall have flameproof/ weather proof enclosure, having degree of protection IP-55 with hinged lockable shutter. Enclosure shall be made of sheet steel of at last 3 mm thickness and shall be suitable for M.S. post mounting. The negative of the CP power source shall be connected to the incoming circuit of the cathode junction box. The junction box shall have separated out going circuit one for each pipeline to collect the negative drainage currents from each of the parallel pipelines. Twenty percent spare out going feeders subject to minimum one no. spare feeder shall be provided in the Cathode junction box. The incoming circuit shall have current measurement facility. Each out going circuit shall have provision for measurement and control of current through shunt and resistor respectively. The resistor shall be of strip coil type with fixed tapings. For other details, refer attached "Technical Specification of Cathode Junction Box". Make of eqyuipment & component unit as per vendor list attached elsewhere in NIT.

vi) Permanent Reference Cells

High purity copper/copper sulphate Permanent Reference Electrode three (3) numbers *at* each CP Station shall be provided at all CP Station along the pipeline ROW for monitoring the performance of the Cathodic Protection system.

All the three reference electrodes shall be routed individually to TRU through test station.

Reference Cell tail cable length shall be sufficient enough to reach the test station and further to the TRU without any splicing or jointing.

The reference cells shall be of silver/ silver chloride type in place of copper/ copper sulphate cells, at marshy area locations, where water table is high and chloride ion concentration is more than 300 ppm.

The life of reference cells shall be minimum 30 years under burial conditions operating on measuring instrument impendence of minimum 10 Mega Ohms.

The reference Electrode Tail Cable shall be laid in HDPE Pipe extended to the Cathodic Junction Box. Watering of the Reference Electrode can be done in future to make electrical contact. For other details, refer attached "Technical Specification of Reference Electrode $Cu/CuSO_4$". Make of equipment & component unit as per vendor list attached elsewhere in NIT.

vii) Test Stations

Test stations shall be provided every 200 mtr along the length of the pipeline with a reference acess point for placement of portable reference electrodes. The test station shall have flameproof/ weather proof enclosure, having degree of protection IP-55 with hinged lockable shutter. Enclosure shall be made of sheet steel of at last 3 mm thickness and shall be suitable for M.S. post mounting. The test stations shall he designed with terminals required for permanent CP system [PCP] and shall be suitable for total life of permanent CP system.

Make of equipment & component unit as per vendor list attached elsewhere in NIT.

viii) Earthing & Lighting Protection of A/G Portion of Pipeline

Suitable Earthing & Lightning Protection arrangement as per IS 3043 & IS/IEC:62305 for above ground cathodically unprotected pipeline section at intermediate SV stations (wherever applicable), pigging stations (wherever applicable), terminals etc shall be provided by earthing with GI earth strip & electrodes. The resistance to earth of grounding shall be limited to 5 ohm max.

The CP TR Unit shall be earthed to the station earthing system. The CP TR unit shall be earthed to the earthing system of the above ground pipeline facilities at the terminal

ix) Polarization Coupons

The steel coupons of pipeline material shall be provided along the length of the pipeline to monitor the adequacy of the CP system to polarize/protect coating holidays. Coupon shall be installed at every alternate test station to get an idea of the polarized potential of the pipeline in the plant enviroment. Coupons shall be installed at bottom 1/3rd portion of the pipeline and 250mm approx away from the pipe surface.

Coupons shall be constructed from the pipeline material and shall have uncoated surface of 100mmx100mm exposed to soil, two cables one for connection to pipeline for protection and other for potential measurement shall be provided for each coupon. The protection cable shall be

connected through a magnetic reed switch inside the test station to enable measurement of coupon 'OFF' potential.

A Reference acess point shall be provided at each test station and near the coupon to measure the potential accurately

x) Reference Cell Access Points

Reference cell access points shall be at each test station location flushed to the ground with a cover, for measurement of pipe to soil potentials. A perforated PVC pipe field with native soil and buried at the location shall be provided for the purpose. The length of the PVC pipe shall be adequate to reach the native soil below the paving.

xi) Cables

Cables shall be with annealed high conductivity, stranded copper /Al conductor, XLPE/PVC Insulated, 1100V grade, armoured, PVC sheathed confirming to IS: 7098 except for the cables for anode tail.

The minimum size of various cables are as per following, however bidder shall recommend sizes for various type of cables which is subject to owner approval. Cable size for any other purpose subject to owner approval.

Header Cable: The size of the copper conductor from TR unit to junction boxes shall be minimum 1c x 25 sq mm and armoured.

Anode Tail Cable: Minimum 1cx 10/16 sq mm (Cu), Kynar/HMWPE insulated, un armoured for anode cable from anode to junction box. The length of anodic table cable shall be sufficient enough for termination on anode junction box without any joint in between.

Potential and Reference Measurement Cable: The size of the conductor shall be1C x 6 sq mm (Cu) unarmoured for potential measurement from test station to pipeline and reference electrode to test station.

Polarization Coupon cable: The size of cable shall be 1C x 10 sq.mm.(Cu), un armoured, PVC aluminium backed by mylar/polyester tape shielded PVC sheathed.

Current Measurement cable: The size of the cable shall be 1C x 10 sq.mm.(Cu), un armoured.

Bonding cable: The size of the conductor shall be 1Cx 25 mm^2 (Cu) for bonding, polarization cell/grounding cell and isolating spark gap connection purpose.

Monitoring Cable: The Reference electrode/measurement armoured cable from Reference electrode TLP to TRU shall he minimum 10C x 2.5 sq mm (Cu)

AC Power Incomer Cable: The TR/CPPSM unit incomer cable shall be minimum 16 sq. mm Cu Conductor, 650/1100 V XLPE insulated, armoured, PVC sheathed. The cable shall be of 3 core types for single phase TR units and 4 core type for 3 phase TR units.

xii) CP Materials

The CP material to be procured from approved manufacturer/ vendor list enclosed with the tender. Make of item not mentioned in the enclosed vendor list shall be subjected to HURL/PDIL approval.

10.0 DESCRIPTION OF CP CONSTRUCTION WORK

a) **Cable Laying**

Cables shall be laid in accordance with the layout drawings to be prepared by the Bidder. No straight through joint shall be permitted. Cable route shall be carefully measured and cables cut to required length. Minimum half meter cable slack shall be provided near Anodes, Anode junction box, pipeline and Test Stations to account for any settling.

All cables inside station / plant area shall be laid at a depth of 0.75m. Cables outside station/ plant area shall be laid at a depth of minimum 1.5 m. Cables shall be laid in sand under brick cover and back filled with normal soil. For cables laid outside the station / plant area, polyethylene warning mats shall placed at a depth of 0.9 m. from the finished grade, to mark the route.

In case of above ground cable, all unarmoured CP cables shall be laid in GI conduits of sufficiently large size, up to accessible height for protecting against the mechanical damage.

All underground unarmored cables including Anode tail cables shall run through PE sleeves. The measurement cables and permanent reference cell cables, etc, routed along the pipeline shall be carried at the top of the carrier pipe by securely strapping it at intervals with adhesive tape or equivalent as required.

GI pipes for proper size shall be provided for all underground cables for road crossings. Cables shall be neatly arranged in trenches in such a manner that crossing is avoided and final take-off to equipment is facilitated.

The cables for reference cells and pipeline potential measurement shall be routed in a separate trench other than the trench provided for the rest of the CP system cables, AC cables for CP TR Units etc.

The armour of the cables from CP station to test station (potential measurement, reference cell & drainage cables etc.) CP station to ground bed (anode cable) and test station to pipeline shall be earthed only at CP station end and test station end respectively.

The cable armour shall be insulated (by taping with insulation tape) to avoid armour carrying CP current.

Cable route marker shall be installed over ground at suitable intervals, Cables shall not be passing below the underground pipeline. Cables shall be placed above underground pipeline and tightened with tape.

b) **Permanent Reference Cells**

The permanent reference cells shall be installed in natural soil conditions as per the recommendations of the cell manufacturer. Installations in highly acidic/ alkaline soil and soil contaminated by chemicals shall be avoided.

c) **Cable to Pipe Connections**

Connections of all cables other than cathode drainage cables to the pipeline or to charged pipelines shall be made by pin brazing/ Thermit welding.

Pin brazing connection shall have extremely low resistance ($\leq$1 ohm). The Pin Brazing connection shall have life not less than 30 years and suitable for all weather condition. Further cable connection through pin brazing to be field tested for contact resistance & temperature etc.

The cathode drainage cable shall be connected to a bolt welded to a metal plate, which is weld connected to the pipeline. The material of the metal plate shall be same as that of the material of the pipeline.

Pipe coating shall be repaired after connection of cable to pipeline. At cathode drainage point the cable joint including the bolt, metal plate and exposed portion of the pipeline shall be covered by the coating repair material against ingress of water / moisture.

The coating repair material shall be compatible with the original coating and shall prevent ingress of water along the cable surface and at the interface of coating repair with the original pipe coating.

d) **Electrical Bonding of Flanged Joints**

All flanged joints located in buried pipeline section that are cathodically protected must be electrically bonded. Connection shall be done with minimum 16 mm^2 cable.

11.0 Civil Works

All civil works associated with the complete cathodic protection work shall be included in the scope of CP contractor. This shall include providing cable trenches, foundation for equipment and all junction boxes etc.

12.0 Painting

The sheet steel used for fabrication shall be thoroughly cleaned and degreased to remove mill scale, rust, grease and dirt. Fabricated structures shall be pickled and then rinsed to remove any trace of acid. The under surfaces shall be prepared by applying a coat of phosphate paint and a coat of yellow zinc chromate primer. The under surfaces shall be free from all imperfections before undertaking the finished coat. After preparation of the under surface, spray painting with two coats of final paint shall be done. The finished panel shall he dried in oven in dust free

atmosphere. Panel finish shall be free from imperfections like pin boles, orange peels, run off paint etc.

All unpainted steel parts shall be cadmium plated to prevent rust formation.

13.0 Quality Plan

The following documents are to be submitted for fulfill requirement of quality plan for impressed current cathodic protection system.

- Site Quality Plan
- Bought Out Item Quality Plan
- Indicative inspection and test plan with check list.
- Site organization chart
- Manufacturers QA Plan for major items.

14.0 MATERIAL INSPECTION AND TESTING

Owner or his representative will visit the works during manufacture of various equipment to assess the progress of work as well as to ascertain the quality of raw materials used. All necessary assistance shall be provided by Bidder and vendor during such inspection.

The minimum testing and inspection requirements for all components/ equipment shall confirm to requirements as defined in the relevant codes and standards. Detailed inspection and testing procedure along with acceptance criteria shall be prepared by Bidder for Owner's approval.

Test certificates including test records, performance curves etc., shall be furnished. All test certificates shall be endorsed with sufficient information to identify the equipment to which certificates refer and must carry project titles owner name and purchase order details etc.

Owner reserves the right to ask for inspection of all or any item under the contract and witness all tests and carryout inspection or authorize his representative to witness tests and carryout inspection. Bidder shall notify the Owner / Owner's representative at least 20 days in advance giving exact details of tests dates and address of locations where the tests would be carried out.

The following minimum tests must be carried out and recorded for all equipments.

Checking : Visual inspection comparison with drawings and specifications.

Inspection: Detailed physical inspection & Dimensions measurement

Testing : Simulation tests of equipment to determine its operational fitness.

15.0 PACKING AND TRANSPORT

All equipment/material shall be protected for inland/ marine Transport, carriage at site and outdoor storage during transit and at site. All packages shall be clearly, legibly and durably marked with uniform block letters giving the relevant equipment/material details. Each package shall contain a packing list in a water proof envelope. Copies of the packing list, in triplicate, shall be forwarded to owner prior to dispatch. All items of material shall be clearly marked for easy identification against the packing list.

16.0 FIELD TESTING AND COMMISSIONING

System Testing at Site

The system testing at site described below shall be applicable both for Sacrificial Anode CP system and Impressed Current CP system.

Field tests as per the owner reviewed/ approved field testing and commissioning procedures prepared by the Bidder shall be carried out on the equipment/ systems before these are put into service. Acceptance of the complete installation shall contingent upon inspection and test results. All site tests & performance test shall be carried out by bidder.

All tools, equipment and instruments required for testing shall be provided by Bidder. Generally, the following minimum tests must be carried out and results should be recorded:

- Visual Inspection: Comparison with drawings, specifications, detailed physical inspection and, if necessary; by taking apart the component parts.
- Testing: Simulation tests of equipment to determine its operational fitness.

(i) Cables

- Cable No.
- Voltage grade
- Conductor cross section
- Continuity check
- Insulation resistance values between each core & earth, between cores.
- All cables shall be tested by 500 V megger.

(ii) Anode Ground Bed

- Location / Station
- Vertical / Horizontal/ Semi Deep Well/MMO wire Anode
- Check for actual layout and compliance with drawings.
- Resistance of each individual anode and total resistance of anode bed.
- Current output of ground bed.
- Current output of each anode
- Mutual interference

(iii) Reference Cell

- Location
- Type of cell
- Potential reading
- Installed on top / bottom level of pipeline.

(iv) Test Stations

- Location / Identification number.
- Check for wiring as per schematics.
- Type of reference cell

- Check the healthiness of reference cell.

(v) Grounding cell

- Location
- Type (no. of anodes)
- Ratings
- Surge diverter
- Location/ Identification number
- Ratings
- Check for healthiness

(vi) Polarization coupons

- Location
- Exposed area/ size of coupons.
- Coupon to soil 'ON' and 'OFF' potential
- Type of reference cell
- Magnetic reed switch rating
- Operation of magnetic reed switch rating with magnet

17.0 PRE COMMISSIONING

Bidder shall carry out pre-commissioning operations after completion of installation of the system including all pre-commissioning checks, setting of all equipment, control and protective devices. All site tests reliability and performance tests shall be carried out by Bidder.

Before the electrical facilities are put into operation, necessary tests shall be carried out to establish that all equipment, devices, wiring and connection have been correctly installed, connected and are in good working condition as intended for the required operation.

Owner / Owner's representative may witness all tests. At least one week's notice shall be given before commencing the tests.

All tools, equipment and instrument and instruments required for testing shall be provided by bidder.

a) **Anode Bed Resistance Logging**

Resistance Logging of anode beds shall be done after completion of installation of anode bed and during commissioning of CP System. The procedure for same shall be given by Bidder as a part of commissioning procedure during commissioning of CP system.

b) **Holiday Detection of Anode Leads**

To ensure the integrity of the insulation, the Bidder shall detect holiday of all anode lead cables. This test shall be conducted at the time of lowering anodes in the deep anode ground beds or trench. In case anode bed is located in hazardous area then the holiday detection test shall be conducted in the safe area before installation, after conducting test in the safe area anodes with

lead wires to be shifted in anode bed location. The Bidder shall provide an approved holiday detection instrument complete with all accessories for testing of cables at the specified voltage.

The actual procedures for the holiday detection testing shall be in accordance with the recommendation of the manufacturer of the holiday detection instrument.

No repair will be allowed on the down hole anode lead wires. Should holiday be detected, the entire cable and anode assembly shall be replaced.

c) **Energization of T/R Unit**

After installation of each CP Station is complete, the Bidder shall energize the T/R unit in the presence of the owner/ his representative to check the functioning of the CP System.

18.0 COMMISSIONING

Bidder shall furnish detailed CP commissioning procedure for approval. The CP commissioning shall be carried out as per approved procedure. The measurement carried out during CP commissioning shall be recorded. Interference situation shall be identified and necessary mitigation measures shall be taken by bidder. Interference situation shall also be identified and mitigated by comparing different sets of readings taken a same test station at different intervals of time under identical conditions.

19.0 SYSTEM MONITORING

CP Bidder has to monitor the- Permanent Cathodic Protection [PCP] system monthly after successful commissioning of the entire PCP system as per scope of work for three months period and submits the monitoring report to the owner/ owner representative for review.

CP Bidder to augment any deficiency observed during monthly monitoring the PCP system so as to ensure adequate levels of protection as specified in CP Acceptance criteria.

20.0 GUARANTEE

Bidder shall guarantee the proper performance of the complete impressed current cathodic protection system and equipment provided by him for a period of 12 months from the date of commissioning of the PCP System.

The Bidder will monitor the CP System for one year from the date of commissioning and any defects arising shall be rectified at no extra cost.

21.0 INSTRUMENTS,TOOLS AND SPARES

Bidder shall provide a list of all instruments, tools and tackles necessary for proper operation and maintenance of complete cathodic protection system and associated equipment along with prices.

As a minimum following Instrument, tools and tackles required for proper operation and maintenance & monitoring of complete PCP shall be provided by Bidder. Cost of these shall also be included in the quoted price

a) Digital Multimeter

b) Digital AC-DC Clamp meter

c) Soil resistivity meter

d) Portable Cu-$CuSO_4$ reference electrode

Bidder shall provide a spares and consumables along with prices, required for proper operation and maintenance of complete cathodic protection system for two (2) years.

22.0 DRAWINGS AND DOCUMENTS

22.1 GENERAL

a) Within two week from the date of issue of Purchase Order, Bidder shall submit four copies of the list of all drawings/ data manuals/ procedures for approval, identifying each by a number and descriptive title and giving the schedule date. This list shall be revised and extended, as necessary, during the progress of work.

b) All drawings and document shall be in English and shall follow metric system, with identification on each document by a number and descriptive title with project name, owner and consultant name.

c) Number of copies of each submission shall be as follows unless otherwise specified.

Submission	No. of copies
• For approval	4 copies
• Final/ As built drawings execution/ construction	4 copies + 2 set of (CD)
• Drawings Issued for execution/ construction	4 copies + 2 set of (CD)
• Operation/ Maintenance manual, vendor data	4 copies + 2 set of (CD)

Drawings and documents shall be furnished by bidder shall include but not limited to the following:

d) Report on corrosion survey.

e) Basis of system design, design and sizing calculations of the equipments, equipment selection criteria, and data sheets of materials.

f) Bills of materials, material requisitions and purchase requisitions.

g) Quality assurance/ Quality control Procedures.

h) Fabrication and installation details of AJB, CJB, test station, grounding cell etc with its enclosure and housing.

i) TRU Erection/ Installation Details drawing.

j) Connection scheme drawing for different type of test station used in the cathodic protection of pipeline.

k) Permanent Cu-$CuSO_4$ reference electrode installation drawing.

l) Cable- to-pipe joint details for charged and non charged pipelines.

m) Grounding Cell (Zn/ Mg anode) fabrication drawings.

n) Incorporation of anode beds, polarization cell, , test stations, etc. and other relevant features of CP system-design in Pipeline alignment sheet and other related drawings.

o) Detailed commissioning report including various measurement data at test stations etc.

p) Equipment inspection and testing procedure.
q) Construction, installation procedures.
r) Procedure for monitoring of cathodic protection after commissioning.
s) Field testing and commissioning procedures.
t) Post Commissioning Testing, Monitoring Periodicity/ Methodology.
u) Layout drawings showing anode ground bed location, test station, AJB, CJB, TR unit cased crossing, permanent reference cell location etc.
v) Cable schedule and cable layout.
w) Report comprises of details regarding interference affected sections along pipeline ROW, sources of interference, interference mitigation arrangement etc.
x) Vendor drawings and catalogues, test certificates.
y) Operation and maintenance manual.
z) Miscellaneous

TECHNICAL SPECIFICATION

OF

ANODE JUNCTION BOX

FOR

CATHODIC PROTECTION SYSTEM

1.0 SCOPE

This specification covers the minimum technical requirements for the design, manufacturer and Supply of anode Junction Boxes for CP system.

The junction boxes should be a standard product of the manufacturer regularly used for impressed current cathodic protection system.

Junction box shall have provision of termination of cable tails from individual anodes of the ground bed and provision of connection of from CP station power source.

This specification confers requirement for type, rating, manufacture and testing of Anode junction boxes. The weatherproof junction boxes shall be supplied in accordance with the following specifications and data sheets.

2.0 CODES AND STANDARDS

The Weatherproof Junction boxes shall be in accordance with the latest revisions of the following Indian standards, wherever applicable. Where appropriate Indian standard are not available, the relevant IEC standards shall apply.

a) Indian standards institution (ISI)

b) International electro technical commission (IEC)

c) American standards institution (ANSI)

d) British standards institution (BS)

e) NACE standards

f) OISD standards

3.0 DATA SHEET:

Output circuit Configuration	: Anode Bus output distributed into outgoing circuits and spare circuit in line with Current Measuring Shunt & Resister with minimum 30% spare outgoing circuits.
Shunt type	: Maganin Alloy
Shunt Rating	: 25A/25mv (To be calculated by CP contractor subject to approval by owner)
Resistor Rating	: Cressol Type (To be calculated by CP contractor subject to approval by owner)
Insulation Level in between Terminals & body	: 2 KV for 1 minute at 50 HZ.
Busbar	: Tinned Copper Bus Bar- 25mm x 6mm

Input terminals	: Stainless Steel Stud with nut, spring and plain washer.
Output terminals	: As required
Enclosure	: Minimum 3 mm thickness Completely enclosed, outdoor type, Wall/ Structure Mounted, Natural Air Cooled, IP-55 Construction. The cabinet is made from LM-6, Die cast construction, The cabinet has hinged front doors with Neoprene gasket and weather proof single compression cable gland and is Pad lockable.
Dimension	: To be specified by bidder
Cable entries	: Cable entries are through pipe and gland
Painting	: One Coat of Zinc Primer Two Coat of Epoxy Paint Shade 631 of IS: 5
Name plates and Labels	: All internal component identification labelling is done using permanent Screening / marker Name plate shall be Engraved white lettering in black Manufacturer's name, address, date of manufacture, model number, serial number, weight etc. Provided on front door

4.0 CONSTRUCTIONAL FEATURES

Anode lead cable from deep well type anode ground beds are terminated to the junction box and further extended to T/R Units. The junction box should have a tinned copper bus bar 25mmx6mm for connection of positive header cable from the transformer rectifier unit. The anode lead cable is feed from output circuit through a shunt of suitable rating and an adjustable strip wound CRESSOL type resistor of suitable rating.

All terminals should be SS-304 material and size M-8 (08mm) nut, bolts, spring washer. The termination boards should be Fabric reinforced Polyester of minimum 08 mm thickness.

The enclosure should be fabricated from LM-6. The construction should be Weather proof. Air-cooled, Dust and Vermin proof. Junction box should have a card pocket inside the door. Degree of protection should be IP55 as per IS/IEC-60529.

The enclosure should be stand alone / wall mounted type with canopy for rainwater protection. The gasket should be of neoprene rubber. The enclosure should be provided with front excess door with pad and panel key locking arrangement. Contractor needs to take prior approval of GA drg, data sheet of AJB before proceeding with fabrication/manufacturing.

The junction box should be provided with stainless steel nameplate with details.

5.0 TESTING & INSPECTION:

Weather Proof Junction Boxes shall be inspected by owner before dispatch. Testing shall be conducted in accordance with codes and standards specified in this document and also as per enclosed technical specifications.

TECHNICAL SPECIFICATION

OF

CATHODE JUNCTION BOX

FOR

CATHODIC PROTECTION SYSTEM

1.0 SCOPE

This specification covers the minimum technical requirements for the design, manufacturer and Supply of Cathode Junction Boxes for CP System.

The junction boxes should be a standard product of the manufacturer regularly used for impressed current cathodic protection system. This specification confers requirement for type, rating, manufacture and testing of different types of junction boxes. The junction boxes shall be supplied in accordance with the following specifications and data sheets.

2.0 CODES AND STANDARDS

The Weatherproof Junction boxes shall be in accordance with the latest revisions of the following Indian standards, wherever applicable. Where appropriate Indian standard are not available, the relevant IEC standards shall apply.

a) Indian standards institution (ISI)
b) International electro technical commission (IEC)
c) American standards institution (ANSI)
d) British standards institution (BS)

3.0 DATA SHEET:

Output circuit Configuration	: Cathode Bus output distributed into required no. of outgoing & incoming circuit (1 incoming & minimum 2 outgoing with 1 spare). The incoming circuit shall have a current measurement shunt. while out going circuits shall have isolation link, variable resistance of grid coil type and a current measurement shunt.
Shunt type	: Maganin Alloy
Shunt Rating	: 25A/ 25mv (To be checked and confirmed by the contractor)
Resistor Rating	: Cressol Type – Strip Wound (To be indicated by the contractor with calculations)
Insulation Level in between terminals & body	: 2 KV for 1 minute at 50Hz.
Busbar	: Tinned Copper Bus Bar- 25mm x 6mm
Input /output terminals	: Stainless Steel Stud with nut, spring and Plain washer.
Enclosure	: Minimum 3mm sheet steel ,Completely enclosed, Outdoor type, Wall / Structure Mounted, Natural Air Cooled, dust and vermin proof IP55 Construction. The cabinet is made from LM-6, Die cast construction**.** The cabinet has bolted front doors open able with Allen key neoprene gasket and is Pad lockable.
Dimension	: To be specified by bidder
Cable entries	: Cable entries are through pipe.
Painting	: Surface preparation One Coat of Zinc Primer Two Coat of Epoxy Paint Shade 631 of IS: 5
Name plates and Labels	: All internal component identification

TECHNICAL SPECIFICATION

OF

CATHODE JUNCTION BOX

FOR

CATHODIC PROTECTION SYSTEM

1.0 SCOPE

This specification covers the minimum technical requirements for the design, manufacturer and Supply of Cathode Junction Boxes for CP System.

The junction boxes should be a standard product of the manufacturer regularly used for impressed current cathodic protection system. This specification confers requirement for type, rating, manufacture and testing of different types of junction boxes. The junction boxes shall be supplied in accordance with the following specifications and data sheets.

2.0 CODES AND STANDARDS

The Weatherproof Junction boxes shall be in accordance with the latest revisions of the following Indian standards, wherever applicable. Where appropriate Indian standard are not available, the relevant IEC standards shall apply.

a) Indian standards institution (ISI)
b) International electro technical commission (IEC)
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3.0 DATA SHEET:

Output circuit Configuration	: Cathode Bus output distributed into required no. of outgoing & incoming circuit (1 incoming & minimum 2 outgoing with 1 spare). The incoming circuit shall have a current measurement shunt. while out going circuits shall have isolation link, variable resistance of grid coil type and a current measurement shunt.
Shunt type	: Maganin Alloy
Shunt Rating	: 25A/ 25mv (To be checked and confirmed by the contractor)
Resistor Rating	: Cressol Type – Strip Wound (To be indicated by the contractor with calculations)
Insulation Level in between terminals & body	: 2 KV for 1 minute at 50Hz.
Busbar	: Tinned Copper Bus Bar- 25mm x 6mm
Input /output terminals	: Stainless Steel Stud with nut, spring and Plain washer.
Enclosure	: Minimum 3mm sheet steel ,Completely enclosed, Outdoor type, Wall / Structure Mounted, Natural Air Cooled, dust and vermin proof IP55 Construction. The cabinet is made from LM-6, Die cast construction**.** The cabinet has bolted front doors open able with Allen key neoprene gasket and is Pad lockable.
Dimension	: To be specified by bidder
Cable entries	: Cable entries are through pipe.
Painting	: Surface preparation One Coat of Zinc Primer Two Coat of Epoxy Paint Shade 631 of IS: 5
Name plates and Labels	: All internal component identification

Labelling is done using anodised aluminium plate with black back ground and white letters.

4.0 Cathode/ Bonding junction Boxes:

Drainage, measurement, and reference electrode cable from the pipelines are terminated to the junction box and further extended to T/R Units. The junction box should have a Ni-Cd plated copper bus bar 25mm x 6mm for connection of negative header cable from the transformer Rectifier unit. The number of cathode circuits should be 02 + 01 including spare. The cathode lead cables feed from output circuit through a suitable shunt of 25 Amp/ 25 mV and adjustable strip wound Reputed make type ZO resistor of suitable rating.

All terminals should be SS-304 material and size M-8 (08mm) nut, bolts, spring washer.

The cabinet is made from LM-6, Die cast construction. The construction should be flameproof, Air-cooled, Dust and Vermin proof. Junction box should have a card pocket inside the door. Degree of protection should be IP55.

The termination boards should be Fabric reinforced Polyster of minimum 06 mm thickness.

The enclosure should be standalone / wall mounted type with canopy for rainwater protection. The gasket should be of neoprene rubber. The enclosure shall be provided with front excess door with bolted arrangement openable with Allen key. Contractor needs to take prior approval for GA drg & data sheet before proceeding with fabrication works/ manufacturing.

The junction box shall be provided with stainless steel nameplate with minimum information viz chainage in Km, connection scheme, distance from the nearest pipeline & other CJB.

5.0 TESTING & INSPECTION:

Weather Proof Junction Boxes shall be inspected by purchaser before dispatch. Testing shall be conducted in accordance with latest codes, standards specified in this documents and also as per enclosed technical specifications.

Labelling is done using anodised aluminium plate with black back ground and white letters.

4.0 Cathode/ Bonding junction Boxes:

Drainage, measurement, and reference electrode cable from the pipelines are terminated to the junction box and further extended to T/R Units. The junction box should have a Ni-Cd plated copper bus bar 25mm x 6mm for connection of negative header cable from the transformer Rectifier unit. The number of cathode circuits should be 02 + 01 including spare. The cathode lead cables feed from output circuit through a suitable shunt of 25 Amp/ 25 mV and adjustable strip wound Reputed make type ZO resistor of suitable rating.

All terminals should be SS-304 material and size M-8 (08mm) nut, bolts, spring washer.

The cabinet is made from LM-6, Die cast construction. The construction should be flameproof, Air-cooled, Dust and Vermin proof. Junction box should have a card pocket inside the door. Degree of protection should be IP55.

The termination boards should be Fabric reinforced Polyster of minimum 06 mm thickness.

The enclosure should be standalone / wall mounted type with canopy for rainwater protection. The gasket should be of neoprene rubber. The enclosure shall be provided with front excess door with bolted arrangement openable with Allen key. Contractor needs to take prior approval for GA drg & data sheet before proceeding with fabrication works/ manufacturing.

The junction box shall be provided with stainless steel nameplate with minimum information viz chainage in Km, connection scheme, distance from the nearest pipeline & other CJB.

5.0 TESTING & INSPECTION:

Weather Proof Junction Boxes shall be inspected by purchaser before dispatch. Testing shall be conducted in accordance with latest codes, standards specified in this documents and also as per enclosed technical specifications.

LIST OF CATHODIC PROTECTION VENDORS

AND

MAKE OF EQUIPMENT/COMPONENT

CATHODIC PROTECTION VENDOR LIST

1.	CONSTRUCTION GUILD PVT. LTD.
2.	ELECTRO PROTECTION SERVICES INDIA PVT. LTD.
3.	CORRTECH INTERNATIONAL PVT. LTD.
4.	CORROSION TECHNOLOGY SERVICES INDIA PVT. LTD
5.	SARK EPC PROJECTS PVT. LTD.
6.	RAYCHEM (RPG GROUP)

MAKE OF EQUIPMENT/COMPONENT

S.N.	Description of Material	Manufacturers / Vendor
1.	Transformer Rectifier Unit	Advance electronic systems/ Raychem RPG/ Kristron System
2.	Test stations/anode junction box/cathode junction box (weather proof)	AES/ M/s Corrosion Control Services, Mumbai/M/s Corr-Tech International, Ahmadabad/M/s Sukrit Industries, Ahemdabad/ Raychem RPG, Mumbai
3.	Test stations/ anode junction box/cathode junction box (flameproof)	FCG/ FEPL/ Flexpro/ Baliga
4.	Permanent Reference Electrode	Borin USA/ M.C. Miller USA/M/s Electrochemical Devices USA / Harco USA/ Cer Anode USA
5.	Surge Diverter for MIJ (Not applicable)	DEHN Germany/ OBO bettermann Germany
6.	Monolithic Isolating Joints (Not applicable)	AES/ ALFA Engineering/ SRL, Italy/Zunt,Italy/ R.M.A. Italy/Advance products, USA
7.	Cables	NETCO,KEI,KEC, Torrent, RR cables, ICON cables, Suyog cables
8.	Calcined Petroleum Coke Breeze	Loresco, USA/ Asbury, USA
9.	Zinc grounding Electrode/ Cell/ Zinc ribbon Anode	Sargam Metals Chennai/ Scientific metals karaikudi,
10.	Magnesium Anodes (For TCP)	Sargam Metals, Chennai/ Scientific Metals Karaikudi
11.	MMO Tubular Anodes	Titanor Components (India)/ M/s Eltech. Netherlands/ Ti- Anode Fabricators Chennai, Matcor-USA
12.	Factory prepackaged MMO wire anode/ conductive polymeric	Berry Plastic – USA, Matcor- USA,

	anode	
13.	Solid State Polarisation Cell	Dairyland, USA/ Kristron Systems ,Mumbai/Rustrol, USA
14.	Digital Multi meter	Beckmann, Fluke, Motwane
15.	DC clip-on meter	HCK (Germany)/ KYORITSU Elect (Japan)/ Fluke / Swain

NOTE :

1. Equipment/component of other make and make of equipment/ component not specified herein shall be subject to owner approval.

TECHNICAL SPECIFICATION

OF

REFERENCE ELECTRODE – Cu-$CuSO_4$

FOR

CATHODIC PROTECTION SYSTEM

1.0 SCOPE

This specification covers the minimum technical requirements for supply of permanent reference electrode for cathodic protection system.

The permanent reference electrode shall be a standard product of a manufacture regularly engaged in production. Reference Cell tail cable length shall be sufficient enough to reach the test station and further to the TR unit without any splicing or jointing.

The reference electrode shall be supplied in accordance with the following specification and data sheets & drawing attached elsewhere in ITB.

2.0 CODES AND STANDARDS

The permanent reference electrode shall be in accordance with the latest revisions of the following Indian standards, wherever applicable. Where appropriate Indian standard are not available, the relevant IEC standards shall apply.

a) Indian standards institution (ISI)
b) International electro technical commission (IEC)
c) American standards institution (ANSI)
d) British standards institution (BS)

3.0 DATA SHEET:

Type	: Cu-CuSO4
Application	: Direct Buried
Design life	: more than 30 years
Dimensions	: To be Specified by bidder
Type	: Copper/Copper Sulphate ($Cu/CuSO_4$)
Make	: As per vendor list attached
Model	: To be specified by bidder
Dimensions	: To be specified by bidder
Lead wire	: 2.5 sq.mm, Cu cable, Lead wire, 1.5” long
Temperature	: 0 to 55 Deg C
Stability	: +/- 10 mV with 3.0 micro amps load
Tube Material	: Space age ceramic tube with cap
Application	: For External CP only

4.0 TEST CERTIFICATES:

The testing shall be conducted in accordance with codes and standards specified in this document and also as per enclosed technical specifications. Test certificate shall be furnished as per routine test done by manufacturer.

TECHNICAL SPECIFICATION

OF

TRANSFORMER RECTIFIER UNIT

FOR

PERMANENT CATHODIC PROTECTION SYSTEM

1.0 SCOPE

This specification covers the minimum Technical requirements for the Design, Manufacture, Performance, Supply, Inspection, Testing and commissioning of AC operated Air natural Cooled, dust and vermin proof Transformers Rectifier Unit for CP System.

The Transformer Rectifier units shall be a standard product of a manufacturer regularly engaged in production of Cathodic Protection Power Supplies. Apart from the derating for site conditions an additional derating of 20% shall be considered for the specific use. The components of the units shall be designed for maximum operating efficiency.

The units shall be supplied in accordance with the following specifications.

2.0 CODES AND STANDARDS

The Design, Manufacturing, Testing of Air natural Cooled Transformer Rectifier Unit and their components shall be in accordance with the latest revisions of the following Indian standards, wherever applicable. Where appropriate Indian Standards are not available, the relevant IEC Standard shall apply:

a) Indian Standards Institution (ISI)

b) Indian electricity Rules (IE rule)

c) International Electro Technical Commission (IEC)

d) NACE standards & recommended practice

e) American Standards Institution (ANSI)

f) British Standards Institution (BS)

g) OISD standard & CCOE norms

Which shall include but not limited to the followings:

IS: 2026	-	Power Transformer
IS: 3700	-	Essential rating and characteristics of semi-Conductor devices.
IS: 4400	-	Methods of measurements on semiconductor Devices (General)
IS: 60898	-	Electrical accessories-Circuit breakers for over current Protection for household and similar installation
IS: 13703	-	Specification for Low voltages fuses for voltage not exceeding 1000V AC or 1500V DC
IS/IEC: 60947	-	Specification for Low voltage Switchgear & control gear
IS: 3070	-	Lightning arrestors for AC systems.

IS: 11548	-	Capacitors for surge protection for use in Voltage system above 650V and up to 33kV.
IS: 694	-	PVC insulated unsheathed and sheathed cables/ cords for working voltages up to and including 450/ 750 volts
IS: 3961	-	Recommended current rating for cables
IS: 4800	-	Enameled round winding wires
IS: 11222	-	Dial, scales and indexes for indicating analogue Measuring instruments.
IS: 1248	-	Direct acting indicating analogue electrical measuring instruments and their accessories
IS: 6236	-	Direct recording electrical measuring instrument
IS: 2419	-	Dimension for panel mounted indicating and recording electrical instrument
IS: 8573	-	Digital electronic DC voltmeters and DC Electronic analogue to digital convertors
IS: 3715	-	Letter symbols of semiconductor devices
IS: 4411	-	Code of designation of semiconductor devices
IS: 5469	-	Code of practice for the use of semiconductor junction Devices
IS: 6619	-	Safety code for semiconductor rectifier equipment
IS: 7204	-	Stabilized power supplies DC output
IS/IEC: 60529	-	Classification of degree of protection provided by enclosure
IS: 3043	-	Code of practice for earthing

In case of conflicting requirements amongst any of the above standards, the most stringent requirement shall be followed.

3.0 GENERAL REQUIREMENTS

i. The CPTR unit shall be suitable for installation in non air-conditioned room with restricted ventilation or in outdoor kiosk (as specified in data sheet), in locations having generally corrosive, warm, humid and dusty atmosphere.

ii. Design ambient temperature of 45°C and an altitude not exceeding 1000 m above mean sea Level shall be considered.

iii. TR unit shall be housed in sheet steel enclosure. The front, rear and doors shall be made by using minimum 2.64 mm thick sheet steel and side walls shall be made of minimum 1.6 mm thick sheet steel, suitable stiffeners shall be provided wherever required.

iv. The Unit shall be freestanding type. Hinged doors shall be provided at the front and back as required. The unit shall be natural cooled type. Louvered openings with wire mesh for natural ventilation may be provided.

v. Minimum Degree of protection for the panel shall be IP-41.

vi. Suitable hooks shall be provided for lifting the panel.

vii. All instruments shall preferably have panel mounted type. All fuses shall be provided inside the panel and shall be of link type.

viii. Power & auxiliary wiring shall be carried out by 660 V grade PVC insulated BIS approved wires with stranded copper conductor of size minimum 2.5 mm^2. Control wiring for electronic circuits shall be through flat ribbon cable or through copper wire of minimum 0.5 mm diameter.

ix. All wirings shall be ferruled with PVC ferrules at both ends for ease of identification.

x. Clamp type terminals suitable for termination up to 10 mm^2 conductor shall be provided for all control cable connection. Suitable power terminals shall be provided for power cables. Minimum 20% spare terminals shall be provided. The terminal blocks shall be mounted minimum 300 mm above the gland plate.

xi. All live parts shall be properly shrouded. This shall ensure complete safety to personnel intending routine maintenance by opening the panel doors.

xii. TR unit shall be suitable for bottom cable entry unless otherwise specified in the data sheet and shall be supplied complete with crimping type cable termination lugs and cable glands. Cable glands shall be of brass, nickel plated, single compression type for indoor installations and double compression type for outdoor installations. The space in the terminal chamber shall be adequate for termination of required number and sizes of cables.

xiii. The input power factor of the unit at rated load shall be 0.8 lag or better.

xiv. All the control equipment like switches, push buttons, potentiometers etc. shall be located at a convenient height of minimum 300 mm and maximum 1800 mm from the bottom of the panel.

xv. The printed circuit boards (PCBs) shall be of copper clad glass epoxy laminate. PCB tracks shall be tinned and solder masked. The PCB shall be coated with suitable lacquer to make it immune to dust, moisture and fungal growth. Where plug in type of PCBs are used gold plated male-female connectors shall be used for the purpose.

xvi. The panel shall be provided with suitable space heater to prevent moisture condensation. The space heaters shall be located at the bottom of the panel and shall be provided with a manually operated switch, HRC fuse and link for phase and neutral respectively.

xvii. Panel shall be provided with integral base frame channel. The integral base frame of panel shall be suitable for directly bolting with the help of foundation bolts and shall also be suitable for tack welding to purchaser's insert plate/ flat/ channel embedded in the floor. Amply dimensioned oblong holes shall be provided at the bottom of the panel for its bolting to the embedded insert plate/ channel.

xviii. An earth bus bar of minimum (25x3) mm^2 copper or equivalent aluminium shall be provided throughout the length of the panel. Provision shall be made for connecting this earth bus at two

ends with the plant earth grid by means of (50x6) mm^2 GI flat. All non-current carrying metallic parts of the panel and mounted equipment shall be connected to the panel earth bus. All doors and movable parts shall be connected to the earth bus by flexible copper cables.

xix. All panel mounted equipments (e.g. lamps, push buttons, switches, meters, PCBs, etc.) shall be provided with suitable nameplates. Nameplates shall be engraved out of 3-ply (black-white-black) lamicoid sheets or anodised aluminium. Back-engraved Perspex sheet nameplates may also be acceptable. Engraving shall be done with groove cutters. Hard paper or self-adhesive plastic tape nameplates shall not be acceptable. Nameplates shall be fastened by screws and not by adhesive. Labels shall be provided for every component on the cards, connecting wires as well as for the terminals in the terminal strip inside the panel.

4.0 TRANSFORMER

The Main Transformer will be the air natural cooled, dry type with input operating range of 230V or 415V AC having separate primary and secondary windings. An electrostatic shield, composed of heavy copper foil, shall be placed between the two windings and grounded to the rectifier cabinet, for this purpose a visible lead should be brought out from the copper foil which shall be connected to any of the mounting stud of the transformer core. Insulation class of winding shall be class F type with temperature rise limited to class B.

Transformer shall be vacuum impregnated with epoxy varnish and baked. The safety factor for transformer rating shall be minimum 125%·.A moulded case circuit breaker with thermal overload relay and short circuit release shall be provided at the input of the transformer.

The winding assembly shall be dipped in the thermo-setting varnish and backed. The Cabinet air temperature will not exceed 70°C at 110% full load current at ambient temperature of up to 45°C. Transformer full load efficiency will not be less than 95%. The autotransformer shall be similar to main transformer except it will have single winding and tapping for manual mode of control.

5.0 RECTIFYING ELEMENT

Rectifier shall be Silicon type made of thyristors and diodes as basic components with adequate cooling arrangement with moisture and humidity resistant finish. It shall be mounted on spindles or other suitable supports. The Power Rectification shall be through Diodes/SCRs which shall be properly selected to have adequate Safety Margin. It shall have 3 phase full wave controlled type configuration.

The thyristors/diodes shall be mounted on heat sinks which shall preferably be made of extruded aluminum. The diodes shall be connected in Bridge circuitry for full wave rectification. Adequate filtering in the form of L-C filtering circuit shall be provided on the output side to limit the ripple content to less than 5% at rated output. The input &output of the Rectifier shall be protected by HRC fuses of suitable rating. Transient surge suppressors shall also be provided across DC output terminals and AC input terminals to protect the rectifier against surges. Each diode and SCR shall be provided with suitable surge suppressers, and also with suitably designed snubber circuits.

The current and voltage ratings of thyristors, diodes shall be at least two times the actual maximum device current and minimum two times the actual maximum voltage coming across the device respectively. The thyristors/ triac/ rectifier elements shall be protected against voltage surges coming from the incoming power supply and from output side from the pipeline. Required shunt zeners / MOV shall be provided across the rectifier elements for protection.

5.0 A.C. INPUT

The transformer rectifier units shall be designed to operate on 240V/415V± 10% single/three phase AC, 50Hz±5% power supply. Inrush current limiting reactor of suitable rating to be provided at input line of the Main Transformer to avoid possibility of nuisance tripping of MCB while closing circuit using MCB.

6.0 D.C. OUTPUT

The Transformer rectifier shall be designed to operate continuously at 110% rated output current and 110% rated output voltage at input supply voltage 240V/415V, single/three phase AC without damaging any components.

Two pole moulded case circuit breaker or miniature circuit breaker (if available) rated for the DC output current, short circuit current and having thermal over load, short circuit release shall be provided in the output. A lightning arrestor rated for minimum 10KA impulse current discharge capacity and rated voltage & maximum spark over voltage rating suitable to protect the TR unit components against lightning and switching surges shall be provided at the output.

7.0 D.C. OUTPUT ADJUSTMENTS

The D.C. output control shall be available in any of the following modes, with the help of a selector switch.

8.0 MODES OF OPERATION

8.1 MANUAL MODE

Output voltage at 36 equal steps up to 110% rated voltage shall be available by means of coarse and fine tap changing switches for rated input supply voltage and 110% rated output current.

Tapping for output voltage control shall be taken from a separate Auto transformer. The controlled output voltage of the auto transformer shall be fed to main transformer input. The output of the Main Transformer shall be rectified for D.C load supply.

8.2 AUTO MODE

Either Automatic voltage-current control mode or Automatic reference mode to be provided in Auto mode.

8.2.1 AUTOMATIC VOLTAGE-CURRENT CONTROL MODE

The output voltage of the unit shall be adjustable to any value from 0V to rated voltage by means of a step less voltage setter potentiometer. The voltage regulation shall be better than ± 0.25V.

The output current of the unit shall also be adjustable to any value from 0A to rated current by means of a step less current setter potentiometer. The current regulation shall be better than ± 0.5A. The response of both current controller and voltage controller shall be ultra fast, instantaneous type.

The independent current limit circuit capable of protecting the unit even under dead short circuit across output shall be provided. The unit will be suitable of sustaining dead short circuit across output indefinitely without degrading or damaging any internal components in this mode.

The working of this mode shall be totally independent of the Auto reference mode and failure of unit in Auto reference mode shall not affect operation in this mode.

8.2.2 AUTOMATIC REFRENCE MODE

The TR Unit shall normally be working in this mode. The operation of the unit in this mode shall be controlled by a reference signal and shall be instantaneous to suppress extremely fast acting external stray currents if present. The output D.C. voltage of the unit in this mode shall vary right from 0V to rated voltage and form 0A to rated current to maintain the reference signal within ± 15 mV of the set value under all operating conditions.

Suitable monitoring arrangement shall be provided to monitor all the external reference signals as well as internal reference signals independently.Fully solid slate Automatic Reference Selector logic shall be provided to select the lowest of the three Reference Inputs automatically.

Facility shall also be provided for Manual selection of anyone out of the three reference inputs for control.

In the event of failure of the reference signals, the unit will provide alarm – “All Reference Fail” and the output of the unit shall get adjusted to a preset value which will be manually adjustable from 0V to rated voltage.

Independent ultra fast acting electronic current limit circuit shall be provided to limit the output Current of the unit in Auto mode to any value from 0 A to rated value as desired by the operator. The current limit circuit will be capable of protecting the unit even under dead short circuit across output. The unit will be suitable of sustaining dead short circuit across output indefinitely without degrading or damaging any internal components in this mode.

9.0 REMOTE MONITORING & CONTROL FACILITY

T/R Units should be provided with transducers for providing 4-20 mA output signals required for remote monitoring unit (RMU) interface for remote monitoring of T/R Unit output voltage and current. Necessary terminals are to be provided at suitable locations of the T/R unit panel for easy termination of onward wiring by others for remote monitoring purpose.

Facility will be provided for remote monitoring of following signals;

1. Analog Parameters
    a) PSP
    b) DC O/P Voltage
    c) DC O/P Current
    d) AC Supply Voltage
    e) AC Supply time Totaliser
2. Alarm Parameters
    a) Under Protection

b) Over Protection

c) Reference fail

d) AC Supply Fail

e) TR unit Door open

10.0 T/R UNIT CONTROL

The Transformer / Rectifier unit's electronic control circuitry should be able to accept remotes as well as local reference control signal for setting of output current / output voltage. The control signal for setting should be selected using a selector switch for remote or local control. At selector switch in local position, the potentiometer provided in T/R Units for continuous current and voltage adjustment in auto mode should provide local control reference signal by manual adjustment to the potentiometer. At selector switch in remote position the electronic circuitry should be suitable to accept digital reference control signals from central control room computer for remote setting of output current / voltage / PSP. In this case if communication links fails the set points should be maintained to the preset values stored in memory till communication resumes and new values are programmed.

11.0 T/R UNIT IN INTERRUPTION

Current interruption facility will be provided by means of a built-in contactor & microprocessor based synchronisable digital timer with real time clock & ON/OFF time display. The timer will have facility for adjusting the ON lime & OFF time from 0 to 9999 sec. by means of digital setting facility. Timer will have START, STOP facility through local keypad or through remote potential free contacts. The timer will have facility for Synchronization to Master Timer or similar Timer in another unit.The current interrupter should have membrane keypad and LCD display for programming of day, date, time, ON/OFF Time, Synchronization Signal etc.

12.0 DC OUTPUT RIPPLE

The filter circuit shall be designed in such a manner that Ripple Factor does not exceed 5% at rated load both in auto and manual mode.

13.0 INPUT OVERLOAD PROTECTION

Protection from overloads on the input shall be provided by Miniature circuit breaker of suitable rating on the input side. The trip point shall be unaffected by ambient temperature. The trip handles of individual poles of circuit breaker shall be mechanically linked so that all lines are opened when an overload occurs. In addition to above MCB, HRC fuse of suitable rating shall be connected before MCB so that A.C. input current is limited to max. 10% excess rated input current.

14.0 OUTPUT OVERLOAD PROTECTION

Two pole moulded case circuit breaker or miniature circuit breaker (if available) rated for the DC output current ,short circuit current and having thermal overload, short circuit release shall be provided in the output. A lightning arrestor rated for minimum 5 KA impulse current discharge capacity and rated voltage & maximum spark over voltage rating suitable to protect the CP TR unit components against lightning and switching surges shall be provided at the output. For CP TR units with multiple output circuits, each output circuit shall be provided with circuit breaker and lightning arrestor.

15.0 VOLTAGE SURGE PROTECTION

Each silicon controlled rectifier (SCR) and Diodes shall be protected from Voltage Surges by means of R-C circuitry. These R-C circuits will be rated as recommended by the manufacturer of the SCR/Diodes so that they will conduct heavily before the Peak Inverse Voltage ratings of the SCR / Diodes are reached.

In addition, Lighting Arrestors and Zener barrier type or MOV type Surge Diverters shall be provided in the A.C. input and D.C. output circuit of the Transformer Rectifier.

16.0 COOLING

The Transformer/Rectifier will be natural air cooled, completely enclosed IP55 construction. The temperature of the transformer shall not be more than 85^{o}C for ambient temperature of up to 45^{o}C.

17.0 INPUT AND OUT PUT TERMINALS

DC terminals made of tinned plated copper shall be located convenient to the cable entrance. The terminals shall be suitable for required cable sizes. Two negative and two positive output terminals shall be provided.

AC terminals shall be insulated to withstand 2000 volts, 50 Hz for 1 minute to the enclosure, shall be shielded to prevent accidental contact and shall be sized to take required cable sizes.

18.0 METERS

The transformer rectifier units shall be equipped with separate continuous reading Voltmeter and Ammeter for the D.C output and the A.C input voltage, current and PSP measurement. All meters shall be electronic digital type with LED display arrangement and should be able to indicate the current and voltage up to full ranges and have a resolution of one decimal place for DC Ammeter & Voltmeter and 3 decimal places for PSP meter. Digit size should be 12.5 mm (minimum). All meters shall be square in shape and accurate to within 2% at full load at ambient temp. They shall be Temperatures compensated to vary no more than 1% per 10% temperature changes.

All AC & DC voltmeters shall be provided with separate fuse and toggle switch where as all Ammeters shall be provided with only toggle switch.

Following Digital meters shall be provided:

a) AC Voltage : 0 to 300V/500V AC

b) AC Current : 0 to 50 A AC with CT

c) DC Voltage : 0 to 60V DC

d) DC Current : 0 to 60A DC with shunt

e) PSP : 0 to ± 19.99 V DC

19.0 ENCLOSURE

The enclosure of T/R unit shall be suitable for Floor mounting, outdoor type having one compartments contain Main Transformer, Auto-Transformer, DC choke. Panel shall be of free standing type and all cable entries shall be from the bottom only.

The SCRs, Diodes, indicating meters, protective devices, electronic control circuits/control cords etc. and shall be provided with a plexiglass viewing window. Both the compartments shall be completely enclosed type having IP 55 construction.

The enclosure shall be made of minimum 2.64mm sheet steel. Size of enclosure should be specified by Vendor. An integrated sun/rain shade of suitable size to be provided by vendor (if installed in outdoor)

The transformer rectifier shall be provided with the following accessories.

- Steel channel under the base for plinth mounting.
- Lifting lugs of size suitable for lifting complete transformer rectifier unit.
- Sunshade / rain shade (if installed in outdoor)
- Lockable control cabinet with viewing windows to IP55 as a minimum.
- Lockable doors shall be provided in the front and back

Accessibility shall be provided by hinged and removable front and back doors. A Plexiglas viewing windows shall be provided at the front door to allow the meters to be read without opening the front door. One drawing pocket shall made at inner side of the front door. One holder for 60 watt CFL connection shall be provided at a strategic point inside the cabinet to facilitate proper illumination during operation and maintenance.

The enclosure shall be supplied with an engraved warning label with the word “DANGER”. Two junction boxes one for A.C cable entries and other for D.C cable entries shall be provided. Gland plate should be provided against each junction box for fixing single compression cable glands for AC/DC control / monitoring cables. Two 240 V, 6A Socket shall be provided at a strategic point inside the cabinet to facilitate connection of soldering iron during maintenance. After fabrication the entire enclosure shall be epoxy paint/Powder Coating of shade 631 of IS-5 with proper pre-treatment and primer application as per standard Industrial Practice.

20.0 ENCLOSURE EARTHING

Earthing terminals shall be suitable for 50x6 mm GI strip connections to power supply earthing and two earthing terminals shall be made for earthing connection to the local earthing pits.

The earth connection points shall be protected against corrosion. It shall not be necessary to scrap the paint away in order to make an effective earth connection. Provision shall also be made adjacent to each gland plate for cable gland earthing connection. Enclosure earthing connection stud size shall not less than 12mm.

21.0 Cable Terminations

i. Cable glanding and terminating facilities and terminals shall be suitable for the cable type and conductor size used in PCP system. Suitable size Cable glands & lugs shall also be in the scope of bidder.

ii. Terminal blocks shall be arranged and positioned to afford easy access for carrying out external cable termination, testing, inspection and maintenance. There shall be ample clear space allowed between the terminal block and gland plate for the spreading and termination of external conductors.

iii. All terminal blocks shall be shrouded or provided with transparent covers. Pinch screw type terminals are not acceptable.

iv. Three positive and three negative post types D.C output terminals shall be provided for rectifier transformers. Each post shall be fitted with double nuts and washers.

v. Terminals for different voltages shall be separated by partitions.

vi. A terminal box or chamber with underline gland plate or entry panel of sufficient dimensions to terminate the specified incoming and outgoing cables shall be provided. Direction of cable entry shall be from bottom.

vii. Termination of single core cables shall through a non-magnetic gland plate and provision made for bonding and earthing any armour and/or concentric ground conductors.

viii. Cable terminal arrangements for power and control cables may be integrated provided that a barrier separates the two.

ix. Auxiliary wiring shall have copper conductors of the manufacturer's standards sizing (subject to buyer's approval).

x. Suitable terminals for two nos. ref. cell cables, one no. measurement cables and a selector switch for permanent ref. cell to be provided for T/R unit panel for connection to PSP meter.

Wiring shall be crimped using self-insulated compression type terminal blocks which shall be suitably identified. Conductors shall be fitted with sleeve ferrules bearing the same identification as the terminal to which they are connected. Minimum conductor size shall be 1.5 mm^2.

22.0 SPECIAL REQUIREMENTS

D.1) Built-in Microprocessor Based Programmable & Synchronisable Current Interrupter:

Current interruption facility will be provided by means of a built-in contactor & microprocessor based synchronisable digital timer with real time clock & ON/OFF time display. The timer will have facility for adjusting the ON time & OFF time from 0 to 999 sec. by means of digital setting facility. Timer will have START, STOP facility thru local keypad or thru remote potential free contacts. The timer will have facility for Synchronisation to Master Timer or similar Timer in another unit.

D.2) SCADA Monitoring Facility:

A) 4-20mA Isolated Converter Modules for Monitoring of the following Parameters
i) P.S.P.

ii) DC Output Voltage

iii) DC output Current

B) Potential Free Digital contacts for Monitoring of the following Alarms

i) Pipeline Under protected

ii) Pipeline overprotected

iii) Reference fail

iv) Unit working in AUTO REF Mode

v) Unit working in AVCC Mode

vi) AC supply Fail

23.0 NAME PLATE

A permanently stamped stainless steel metal plate shall be attached to outside of the case with the following information.

a. Manufacturer's name

b. AC input voltage & current rating

c. AC frequency / Phase

d. Output DC volts and Amps. Rating

e. Weight in Kg of T/R unit

f. Model number / Serial number

g. Year of Manufacture

24.0 RECOMMENDED LIST OF SPARE PARTS

The Bidder shall supply the following spares for T/R units along with inspection test reports, certificates as applicable.

-	D.C Voltmeter	Nos.	1
-	D.C Ammeter	Nos.	1
-	A.C Voltmeter	Nos.	1
-	A.C Ammeter	Nos.	1
-	Corrosion voltmeter	Nos.	1
-	Diodes	Set	1

-	SCR's	Set	1
-	D.C. Fuses for output side	Set.	1
-	HRC fuses for Diodes	Set	1
-	A.C fuses for input side	Set	1
-	D.C lighting arrestor	Nos.	1
-	MCB of each rating	Nos.	1
-	Electronic Control Cards each type	Nos.	1
-	Filter Circuit Capacitor	Nos.	1
-	Signal Light assembly for annunciation	Nos.	1
-	R.C. Surge Diverter	Nos.	1
-	Control transformer	Nos.	1
-	Coarse & Fine Control Switch	Set.	1
-	Auto Manual Mode Selector Switch	Nos.	1
-	Toggle Switches	Nos.	2
-	Assorted Glass Cartridge Fuses	Set	5

25.0 DATA SHEET OF T/R UNIT

A.C Input Voltage	: **240V/415V± 10%** Volt, 1/3 phase 50Hz±5 % Hz
A.C Input Current	: *
D.C Power Output	: *
KVA Rating of transformer.	: *
D.C Output Voltage	: *
D.C Output Current	: *
Reference cell	: Copper / Copper Sulphate Saturated
Number of reference cell for control	: 3
Reference EMF Setting	: -0.8V to -2.5V
Regulation of Reference	: better than ± 15 mv
Derating Factor for Transformer	: 30% excess current capacity
Derating Factor for Diodes / SCRs	: 300% factor of safety for voltage & 300% to 500% factor of safety for current
Full Load Efficiency of transformer	: Not less than 95%

Full Load Efficiency of rectifier	: More than 80%
Power Factor	: Not less than 0.85 (lagging)
Insulation Level	: 2 KV for 1 minute at 50Hz
Peak Inverse Voltage Diodes & SCRs	: 1500 V (minimum)
Filtering Circuit	: LC Filter
Ripple and Hum	: Less than 5% at rated load
Surge Diverters for	
Diodes / SCRs	: Metal oxide varistors/Zener Diodes/ R-C networks
Lightening Arrestors	: At input & output side of the TR unit.

Voltage rating 500V RMS

Impulse discharge current rating 5 KA

Protection : MCB having thermal overload and short circuit protection with backup HRC fuses for input and output. Input MCB trip alarm shall be extended to facilitate for remote indication of unit fail.

Glass cartridge fuses in lamp circuit and auxiliary power supply line of control circuit.

Fast acting electronic over current limits circuit & short circuit Protection for output.

Meters / Instruments : Digital Panel Meters (96 mm x 96 mm), Accuracy – **2% ±1** Digit of Full Scale, 1 No. AC Voltmeter, 0-300/500 Volts, Resolution **1 V.**1 No. AC Ammeter, Current Transducer Operated, **0 – 50 A,** Resolution .**1 A**, 1 No. DC Voltmeter, **0-25 V**, Resolution **0.1 V** with built in 4-20 mA transducer

1 No. DC Ammeter, **0-25 A** with shunt **25A / 25 mV**, Resolution **0.1A** with built in 4-20 mA transducers.1 No. Corrosion Voltmeter, 19.9-0-19.9V**, 0.001V** Resolution with built in **4-20mA** transducer.

Visual indications/Annunciation : The following Visual signal light Indicators shall be provided.

AC Mains ON

Auto Mode

Manual Mode

Unit in AVCC mode

Over Current Alarm

	Over Voltage Alarm
	Over Temperature
	TR output voltage
	TR output current
	Input/output MCB trip
	Pipe to Soil potential
	High temperature of instrument chamber
	All reference fail
	Reference cell 1 lowest
	Reference cell 2 lowest
	Reference cell 3 lowest
	Reference 1 fail
	Reference 2 fail
	Reference 3fail
	Individual Fuse failure LED indication
	Identifying failure of each Diode and
	DC Output Fuse with audio alarm.
Other Accessories	(a) Integral Sun and Rain shade
	(b) One holder for 60 Watt CFL
	(c) Two 240V, 5A socket for Maintenance
	(d) Glass Viewing Window
Cooling	The cabinet is natural air cooled and the temperature rise not exceeding 45^{o}C above the ambient.
Measurement and control terminals	Shrouded terminal blocks of proper size shall be provided in the control junction box.
Climate Conditions	: 6^{o}C to 45^{o}C with moderate to heavy rainfall during Monsoon and relative humidity of 97%.
Enclosure	: Completely enclosed. Plinth Mounted, IP55 construction . The top cabinet is made from 12SWG (2.64mm) mild steel. The control cabinet has hinged front and rear doors and are pad lockable. A glass viewing window is provided for front door for reading of all the meters without opening the door.

	The enclosure is also provided with lifting lugs of size and location suitable for lifting the complete rectifier unit.
Dimension of TR Unit:	:*
Weight of TR Unit:	:*
Input and Output Terminals	: Three Positive and three negative DC Post type terminals made of tinned plated copper with double nuts and washers are provided in the DC junction box. AC terminals insulated from the enclosure to withstand 2000 volts 50Hz are provided in the AC junction box. Remote Control Terminals are ELMEX/TOSHA Make Multiple Terminals, Shrouded Type
Cable entries	For Anode, Cathode, Power, Control and measurement cables through cable gland plate at the bottom of the T/R unit.
Surface Coating and Painting	Epoxy paint/Powder Coating of shade 631 of IS-5 with proper pre-treatment and primer application.
Name Plates and Labels	All component identification Labels shall be aluminum anodized. A stainless steel rating plate along with manufacturer's name, address, date of manufacture, model number, serial number, weight etc. will be provided. -A DANGER label on the Rear Door.
Voltage Setting	: 0-rated DC O/P Voltage in steps of 1V each with Two selector switches with an accuracy of ± 10% in AUTO Mode.

COARSE : 0,5V, 10V, 15V, 20V, 25V…up to rated DC o/p voltage in steps of 5V
FINE : 0,1V, 2V, 3V, 4V, 5V… up to rated DC o/p voltage in steps of 1V
The two switches are algebraically additive but maximum does not exceed rated DC o/p Voltage.

Current Setting	0-rated DC O/P Current in of 1A each with two selector switches with an accuracy of ± 10% in AUTO Mode.

COARSE: 0,5A, 10A, 15A, 20A, 25A…up to rated DC o/p current in steps of 5A.

	FINE: 0, 1A, 2A, 3A, 4A, 5A. Up to rated DC o/p current in steps of 1A
	The two switches are algebraically additive but maximum does not exceed rated DC o/p Current.
Modes of Auto Operation	**(i) AUTO Ref Mode**
	In this mode of operation "Auto Protected structure to soil potential" is sensed with respect to Cu-$CuSO_4$ (Saturated) reference to electrodes. The electronic control circuit scans up to three reference electrodes for actual PSP and automatically selects the minimum negative value of actual PSP obtained from any of the three reference electrodes.
	The desired Set PSP reference is compared with the minimum selected value of actual PSP and the output power of the CP TR is set automatically so that the measured value always remains close to the Set PSP value.
	(ii) AUTO AVCC MODE:
	In this mode of operation Output voltage & current can be varied continuously by a potentiometer depending upon the Coarse and Fine switch settings. Control of output voltage and current through SCRs and Electronic Control circuitry so that output of the unit is maintained constant irrespective of current drain and supply line voltage variations.
	Output voltage variable by a potentiometer in the range 0-rated DC o/p Voltage depending on "COARSE" & "FINE" limit settings.
	Output voltage adjustable in steps of 1V by "COARSE" & "FINE" voltage limit switches. Two switches are algebraically additive, with a maximum of rated DC output voltage.
	Output current adjustable in steps of 1A by "COARSE" & "FINE" current limit switches. Two switches are algebraically, additive with a maximum of rated DC o/p Current.
Built-in Microprocessor Based Programmable & Synchronisable Current Interrupter	Current interruption facility will be provided by means of a built-in contactor & microprocessor based synchronisable digital timer with real time clock & ON/OFF time display. The timer will have facility for adjusting the ON time & OFF time from 0 to 999 sec. by means of digital setting facility. Timer will have START,

STOP facility thru local keypad or thru remote potential free contacts. The timer will have facility for Synchronisation to Master Timer or similar Timer in another unit.

SCADA Monitoring Facility:

A) 4-20mA Isolated Converter Modules for Monitoring of the following Parameters

i) P.S.P.
ii) DC Output Voltage
iii) DC output Current

B) Potential Free Digital contacts for Monitoring of the following Alarms

i) Pipeline Under protected
ii) Pipeline overprotected
iii) Reference fail
iv) Unit working in AUTO REF Mode
v) Unit working in AVCC Mode
vi) AC supply Fail

26.0 TESTING OF T/R UNIT:

All T/R units shall be tested by bidder and inspected by purchaser/his representative before dispatch. Testing shall be conducted in accordance with codes, standards, approved QAP and enclosed specifications.

Bidder /vendor shall provide all the necessary facilities to carry out all tests of CP TR unit in his premises at his expenses.

27.0 DRAWINGS / DOCUMENTS:

Following drawings / documents shall be furnished by bidder for approval before starting of fabrication/manufacturing. Approved drawing after incorporation of comments, if any from OWNER shall be furnished in 4 copies along with reproducible during the delivery of T/R units.

- Fabrication drawings, GA drawings and data sheet of T/R unit giving dimensions, rating, weight, including installation / foundation arrangement details.
- Front view and typical sections of T/R unit panel with arrangement of equipment, control, protection and metering.
- Data sheet of all accessories and circuit element of T/R Unit including rating.
- Schematic and wiring diagram of T/R unit circuitry giving auto / manual mode of control including circuit details of all control cards.

28.0 INSTRUCTION BOOK

The instruction book/ operational manual in 4 hard copies+ 2 soft copy in CD shall be presented in such manner as to enable it to be used by personnel who are unfamiliar with the operation and maintenance of the T/R unit. The instruction book/ operational manual to be furnished along with supply of T/R unit.

The instruction book/ operational manual shall contain the following:

- A description of the T/R unit.
- Instruction for the installation, testing commissioning and safe operation and maintenance.

The information shall be presented as follows:

1. Index of contents
2. General description giving brief description of the T/R and its use.
3. Detailed description of T/R unit, This description shall include the technical characteristics, physical and mechanical limitations, and item wise the components, accessories and spare parts.
4. Description of the operation of the T/R unit. This description shall be clear, concise and in a logical sequence, using schematic diagram, wiring diagram and fabrication drawing.
5. Procedures for testing and adjusting the T/R unit. The complete procedure for testing and adjusting the T/R unit during operation, periodic maintenance and overhaul shall be covered.
6. Maintenance instructions :

   This sections shall be divided into Two parts:

   a. Preventive maintenance which shall indicate the periodic inspection required the inspection procedure and clearing procedures.

   b. Break down maintenance which shall include instruction for trouble shooting of the removal and replacement of all parts listed as spares shall be given.
7. Spare Parts.

   The instruction books shall be given all the necessary details so as to procure all the spare parts from the manufacture or from open market.
8. Each instruction book shall be accompanied with one set of final approved Drawing / Documents.

29.0 COVERING OF THE INSTRUCTION BOOKS/ OPERATIONAL MANUALS

The instruction book/ operational manuals shall be presented in a stiff covered binder with the following information printed on the cover:

- The client's name
- The location of the installation

- The name of the installation
- The title of the instruction book

SECTION-3.0

SUB-SECTION-3.1

VENDOR LIST

SECTION 3.1

PART – II: TECHNICAL

VENDOR LIST

OSBL

FERTILIZER PLANT, HURL

3.0 MECHANICAL – PIPING

3.1	CS WELDED PIPES TO API 5L SPIRAL LONG. WELDED	
1	HEAVY METAL PIPE CENTRE (UPTO 24" (UPTO SCHXXS)	INDIA
2	JINDAL PIPES LTD. (2” TO 14”)	INDIA
3	JOTINDRA STEEL & TUBES LTD. (½" TO 14")	INDIA
4	KALPESH TUBE(INDIA), (TRADER)	INDIA
5	LALIT PIPES & PIPES LTD.. (16" to 64" thickness upto 20mm)	INDIA
6	MUKAT PIPES LTD.	INDIA
7	P.K.FORGE & FITTING INDUSTRIES	INDIA
8	PRATIBHA INDUSTRIES LTD. (16" to 24" thickness 6mm to 14.27mm)	INDIA
9	RATNAMANI METALS & TUBES LTD.	INDIA
10	SAGAR STEEL CORPORATION (TRADER)	INDIA
11	SAIL	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 (FOR ANJAR AND DAHEJ PLANTS) (UPTO 72” 50 MM THK FOR DAHEJ PLANT AND UPTO 100” 30 MM THK. FOR ANJAR PLANT.)	INDIA
16	PHOCEENNE	FRANCE
17	ETS TROUVAY & CAUVIN	FRANCE
18	MANNESMANN HANDEL AG	GERMANY
19	THYSSEN-KRUPP STAHLUNION GMBH	GERMANY
20	DALMINE SPA	ITALY
21	RACCORTUBI SRL	ITALY
22	KOSEI SANGYO LTD	JAPAN
23	MARUBENI ITOCHU STEEL	JAPAN
24	MITSUBISHI CORPORATION	JAPAN
25	NIPPON KOKAN	JAPAN
26	NIPPON STEEL CORPORATION	JAPAN
27	NISHITANI & CO. LTD.	JAPAN
28	NISSHO IWAI CORPORATION	JAPAN
29	OKURA & CO. LTD.	JAPAN
30	SOJITZ CORPORATION	JAPAN
31	SUMITOMO METAL INDUSTRIES LTD.	JAPAN

32	HYUNDAI CORPORATION	KOREA
33	BRITISH STEEL CORPORATION	U.K.
34	CORUS TUBES LIMITED	U.K.
35	SAW PIPES USA, INC	U.S.A
3.2	**CS/AS LTCS SEAMLESS PIPES**	
1	BHEL	INDIA
2	CHETAN STEELS (Upto 12", SCH80)	INDIA
3	HEAVY METAL & TUBES (Upto 8", thickness upto 18.26mm)	INDIA
4	HEAVY METAL PIPE CENTRE (UPTO 24" (UPTO SCHXXS)	INDIA
5	INDIAN TUBE CO. (TATA DEV. OF TUBES & PIPES)	INDIA
6	ISMT LIMITED	INDIA
7	JINDAL SAW LTD.	INDIA
8	MAHARASHTRA SEAMLESS LTD.	INDIA
9	P.K.FORGE & FITTING INDUSTRIES	INDIA
10	RATNADEEP METAL & TUBES PVT. LTD.	INDIA
11	SAINEST TUBES PVT. LTD. (½ " NB TO 3" UPTO SCH. 160 (ASTM A 106 GR. B, A333 GR. 1 & 6 & A335 GR. P11))	INDIA
12	PHOCEENNE	FRANCE
13	ETS TROUVAY & CAUVIN	FRANCE
14	MANNESMANN HANDEL AG	GERMANY
15	HORST KURVERS GMBH	GERMANY
16	DALMINE SPA	ITALY
17	GAM RACCORDI S.P.A	ITALY
18	IBF SEAMLESS PIPES SPA	ITALY
19	RACCORTUBI SRL	ITALY
20	MARUBENI ITOCHU STEEL	JAPAN
21	MITSUBISHI CORPORATION	JAPAN
22	NIPPON STEEL CORPORATION	JAPAN
23	NISHITANI & CO. LTD.	JAPAN
24	NISSHO IWAI CORPORATION	JAPAN
25	OKURA & CO. LTD.	JAPAN
26	SOJITZ CORPORATION	JAPAN
27	SUMITOMO METAL INDUSTRIES LTD.	JAPAN
28	HYUNDAI CORPORATION	KOREA
29	AB SANDVIK STEEL	SWEDEN

30	VOMAL INTERNATIONAL LIMITED	U.K.
31	CORUS TUBES LIMITED	U.K.
32	BRITISH STEEL CORPORATION	U.K.
3.3	**SS SEAMLESS/ WELDED PIPES**	
1	APEX TUBES	INDIA
2	BHANDARI FOILS & TUBES LIMITED (SEAMLESS UPTO 4" (SCH. 80) & WELDED UPTO 20" (THK. <= 8	INDIA
3	CHOKSI TUBE COMPANY LTD.	INDIA
4	CHETAN STEELS (UPTO 6" SCH. 40)	INDIA
5	HEAVY METAL & TUBES (UPTO 8" (THICKNESS UPTO 18.26 MM))	INDIA
6	HEAVY METAL PIPE CENTRE (UPTO 8" (UPTO SCH80S) (PDIL APPROVED MANUFACTURER'S MAKE ONLY))	INDIA
7	JINDAL SAW LTD.	INDIA
8	KRYSTAL STEEL MANUFACTURING PVT. LTD. (UPTO 2" (MATERIAL UPTO GRADE SS 321))	INDIA
9	MARDALE PIPES PLUS LTD.	INDIA
10	MODERN TUBE INDUSTRIES LTD. (Upto 2" (upto SS Grade 321))	INDIA
11	NUCLEAR FUEL COMPLEX	INDIA
12	P.K.FORGE & FITTING INDUSTRIES	INDIA
13	PRAKASH STEELAGE LTD. (Seamless: upto 12" & Welded: upto 24")	INDIA
14	QUALITY STAINLESS PVT. LTD.	INDIA
15	RAJENDRA MECHANICAL INDUSTRIES LTD.	INDIA
16	RATNAMANI METALS & TUBES LTD.	INDIA
17	RATNADEEP METAL & TUBES PVT. LTD. (SMLS. 6" , WELDED 2")	INDIA
18	SANDVIK ASIA PVT. LTD. (¾" TO 2" (THK: UPTO 8.74 MM))	INDIA
19	SANGHVI METALS (TRADER)	INDIA
20	SCORODITE STAINLESS (INDIA) PVT. LTD. (UPTO 2" (UPTO SS GRADE 321))	INDIA
21	SUBHLAXMI METALS & TUBES PVT. LTD. (Seamless: upto 2" & Welded: upto 8")	INDIA
22	SURAJ STAINLESS LIMITED	INDIA
23	THE BENGAL MILL STORES SUPPLY CO.(TRADER)	INDIA
24	ZHEJIANG JIULI STAINLESS STEEL PIPE CO. LTD.	CHINA
25	ETS TROUVAY & CAUVIN	FRANCE
26	PHOCEENNE	FRANCE
27	H. BUTTING GMBH & CO. (SEAMLESS : UPTO 30" (UPTO 16MM THK) & WELDED: UPTO 72" (UPTO 64MM)	GERMANY
28	HORST KURVERS GMBH	GERMANY

29	MANNESMANN HANDEL AG	GERMANY
30	THYSSEN-KRUPP STAHLUNION GMBH	GERMANY
31	DALMINE SPA	ITALY
32	GAM RACCORDI S.P.A	ITALY
33	IBF SEAMLESS PIPES SPA	ITALY
34	RACCORTUBI SRL	ITALY
35	MARUBENI ITOCHU STEEL	JAPAN
36	MITSUBISHI CORPORATION	JAPAN
37	NIPPON STEEL CORPORATION	JAPAN
38	NISHITANI & CO. LTD.	JAPAN
39	NISSHO IWAI CORPORATION	JAPAN
40	OKURA & CO. LTD.	JAPAN
41	SOJITZ CORPORATION	JAPAN
42	SUMITOMO METAL INDUSTRIES LTD.	JAPAN
43	AB SANDVIK STEEL	SWEDEN
44	T.T.I. – TUBACEX TUBOS INOXIDABLES, S.A.	SPAIN
45	SOSTA BV (UPTO 72" (THICKNESS UPTO 25.4 MM))	NETHERLAND
46	VOMAL INTERNATIONAL LIMITED	U.K.
47	CORUS TUBES LIMITED	U.K.
48	BRITISH STEEL CORPORATION	U.K.
49	HYUNDAI CORPORATION	KOREA
3.4	**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	HEAVY METAL & TUBES (UPTO 8" (THICKNESS UPTO 18.26 MM))	INDIA
5	KRYSTAL STEEL MANUFACTURING PVT. LTD. (UPTO 50.8 MM OD (MATERIAL UPTO GRADE SS 321))	INDIA
6	MODERN TUBE INDUSTRIES LIMITED (UPTO 50.80 MM OD (UPTO SS GRADE 321))	INDIA
7	PRAKASH STEELAGE LTD. (Seamless: upto114 mm OD, Thickness upto 6 mm)	INDIA
8	RATNAMANI METALS & TUBES LTD.	INDIA
9	SANDVIK ASIA PVT. LTD. (OD UPTO 60.33 (THK: UPTO 8.74 MM))	INDIA
10	SCORODITE STAINLESS (INDIA) PVT.LTD. (UPTO 50.80 OD (UPTO SS GRADE 321))	INDIA

11	SURAJ STAINLESS LIMITED	INDIA
12	T.T.I.-TUBACEX TUBOS INOXIDABLES, S.A.(OD 15.8 MM TO 250.0 MM, WALL THK.1.0 MM)	SPAIN
3.5	**FITTINGS: CS/AS/SS SEAMLESS & FORGED**	
1	AMFORGE INDUSTRIES	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 900#, Seamless: 2” to 8”- upto SCHXXS)	INDIA
6	EBY FASTENERS	INDIA
7	EBY INDUSTRIES	INDIA
8	FIT-TECH INDUSTRIES (Forged ½” to 1 1/2”-upto 900#, Seamless: 2” to 8”- upto SCHXXS)	INDIA
9	FLASH FORGE(P) LTD.(Forged upto 4”-upto 900#, Seamless/welded: up to 42”)	INDIA
10	GUJARAT INFRAPIPES PVT. LTD.	INDIA
11	KALPESH TUBE(INDIA),(TRADER) (UPTO A MAX ORDER VALUE RS.25.0 LAKH)	INDIA
12	M.S FITTINGS MANUFACTURING CO. PVT LTD.	INDIA
13	MARDALE PIPES PLUS LTD.	INDIA
14	NAVKAR FORGINGS & FITTINGS PVT. LTD	INDIA
15	NL HAZRA (upto SCH80)	INDIA
16	P.K TUBES & FITTINGS PVT. LTD.	INDIA
17	P.K FORGE & FITTING INDUSTRIES	INDIA
18	PARAS FITTINGS PVT. LTD. (Forged: CS ½” to 2” & CS Seamless: 2” to 8”- upto SCHXXS)	INDIA
19	PARMAR TECHNO FORGE (Elbow, Tee, Reducer- ½” to 12” & Cap upto 18”)	INDIA
20	PERFECT MARKETTING PVT. LTD.	INDIA
21	PETROCHEM INDUSTRIES (Seamless: Upto 16" (All Fittings) & upto 36" (caps) SCH : XXS /80S, Forged: upto 3”-6000#)	INDIA
22	RAJENDRA FORGE INDUSTRIES (CS: UPTO 12" SCH 40 & SS: 6" SCH 40S)	INDIA
23	S & G ENGINEERS (P) LTD.	INDIA
24	SAGAR STEEL CORPORATION (TRADER)	INDIA
25	SANGHVI METALS (TRADER)	INDIA
26	SAWAN ENGINEERS	INDIA
27	SHIVANANDA PIPE FITTINGS LTD.,	INDIA

28	STEWARTS AND LLOYDS OF INDIA LIMITED	INDIA
29	TEEKAY TUBES PRIVATE LIMITED	INDIA
30	THE BENGAL MILL STORES SUPPLY CO.(TRADER)	INDIA
31	TOPAZ PIPING INDUSTRIES	INDIA
32	TUBE BEND (CALCUTTA) PVT. LTD. (CS FITTINGS ONLY)	INDIA
33	TUBE PRODUCTS INCORPORATE	INDIA
34	ZOLOTO INDUSTRIES (upto 6” (only CS Galv.))	INDIA
35	PHOCEENNE	FRANCE
36	ETS TROUVAY & CAUVIN	FRANCE
37	VALLOUREC	FRANCE
38	SEIKMANN ANLAGEN-TECHNIK GMBH.	GERMANY
39	TPS-TECHNITUBE ROHRENWERKE GMBH	GERMANY
40	MANNESMANN HANDEL AG	GERMANY
41	HORST KURVERS GMBH	GERMANY
42	PETROL RACCORD S.P.A. (Seamless: 1” to 42” (Elbow) & 1” to 56” Tee/Reducer/Cap))	ITALY
43	DALMINE SPA	ITALY
44	GAM RACCORDI S.P.A	ITALY
45	IBF SEAMLESS PIPES SPA	ITALY
46	IND MECCANICA BASSI LUIGI & C. SPA	ITALY
47	MANTOVANI SPA	ITALY
48	RACCORTUBI SRL	ITALY
49	TECHNO FORGE SPA	ITALY
58	MARUBENI ITOCHU STEEL	JAPAN
51	NIPPON KOKAN	JAPAN
52	NISHITANI & CO. LTD.	JAPAN
53	NISSHO IWAI CORPORATION	JAPAN
54	OKURA & CO. LTD.	JAPAN
55	SOJITZ CORPORATION	JAPAN
56	SUMITOMO METAL INDUSTRIES LTD.	JAPAN
57	HAITIMA CORPORATION	TAIWAN
58	CORUS TUBES LIMITED	U.K.
59	BRITISH STEEL CORPORATION	U.K.
60	EUROTUBE LIMITED	U.K.
61	VOMAL INTERNATIONAL LIMITED	U.K.
62	BONNEY FORGE	U.S.A.
3.6	**FORGED FLANGES**	

1	AJAY FORGING PVT. LTD	INDIA
2	AMFORGE INDUSTRIES	INDIA
3	ANANDMAYEE FORGINGS PVT. LTD.	INDIA
4	C D ENGINEERING	INDIA
5	CHAUDHARY HAMMER WORKS (P) LTD.	INDIA
6	CHETAN STEELS (UPTO 6", 150#)	INDIA
7	`ECHJAY INDUSTRIES LTD	INDIA
8	FERROUS ALLOYS FORGING PVT. LTD	INDIA
9	GOOD LUCK ENGINEERING CO. (½"-12" (UPTO 2500#), 14"-16" (UPTO 900#), 18"-32" (UPTO 600#), 34"-48" (UPTO 300#),	INDIA
10	J.K FORGINGS	INDIA
11	KUNJ FORGINGS PVT. LTD.(MATERIAL CS/SS/AS) (upto 60" (upto 300#) & upto 12" (upto 2500#))	INDIA
12	MAHESH INDUSTRIES (Upto 8" -150#, material ASTM A105 only)	INDIA
13	P.K TUBES & FITTINGS PVT. LTD. (Upto 24"(upto1500#) & Upto 12"(upto2500#) Spectacle Blind and Spacer & Blinds only)	INDIA
14	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
15	PERFECT MARKETING (P) LTD.	INDIA
16	PUNJAB STEEL	INDIA
17	R D FORGE (A UNIT OF R D CHEMICALS PVT LTD) (Upto 54" (150#), 42" (upto 600#), 20" (upto 1500#) & 12" (2500#))	INDIA
18	RAJENDRA FORGE INDUSTRIES (CS & SS : UPTO 12", 300#)	INDIA
19	S & G ENGINEERS (P) LTD.	INDIA
20	SANGHVI FORGINGS & ENGINEERING LTD	INDIA
21	SANGHVI METALS (TRADER)	INDIA
22	SAWAN ENGINEERS	INDIA
23	TECHNO FORGE LTD. (UPTO 42" (UPTO 300#), UPTO 24" (600#), UPTO 20" (900#), UPTO 16" (1500#),	INDIA
24	TUBE BEND (CALCUTTA) PVT LTD	INDIA
25	PHOCEENNE	FRANCE
26	ETS TROUVAY & CAUVIN	FRANCE
27	HORST KURVERS GMBH	GERMANY
28	I.S. INTERNATIONAL	ITALY
29	MANTOVANI SPA	ITALY
30	OFFICINE NICOLA GALPERTI & FIGLIO S.P.A	ITALY
31	RACCORTUBI SRL	ITALY
32	NICHINAN SANGYO CO. LTD.,	JAPAN
33	NISHITANI & CO. LTD.	JAPAN

34	SOJITZ CORPORATION	JAPAN
35	VOMAL INTERNATIONAL LIMITED	U.K.
3.7	**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.	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#)	INDIA
9	CHEMTECH INDUSTRIAL VALVES PVT. LTD.	INDIA
10	CRAWLEY & RAY (FOUNDERS & ENGINEERS) PVT. LTD. (<=300#, (only CS))	INDIA
11	DATRE CORPORATION LTD. (Upto 300#, 2" to 8" (Gate), 2" to 6" (Globe & Check Valves))	INDIA
12	DEWRANCE MACNEILL & CO. LTD.	INDIA
13	ECONO VALVES PVT. LTD.	INDIA
14	EXPERT ENGINEERING ENTERPRISES	INDIA
15	FLOCON SYSTEMS PVT. LTD. (CS upto 6" – 1500#)	INDIA
16	FLOVEL VALVES PVT. LTD.(SINGLE DISC , DULA PLATE & NOZZLE CHECK VALVES ONLY : UPTO 48" (150#) & 24 (UPTO 600#)	INDIA
17	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
18	FORWARD ALLOYS & CASTINGS (UPTO 14")	INDIA
19	GURU INDUSTRIAL VALVES PVT. LTD. (Cast CS only: upto 24"(150#), 20"(300#), 10" (600#) & Forged : upto 2" (800#)	INDIA
20	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
21	HAWA VALVES INDIA PVT. LTD. (CS upto 6", 150#)	INDIA
22	HI-TECH VALVES PVT. LTD. (CS,<=800 #, SIZE ½-2, <=300# FOR SIZE 2-6")	INDIA
23	INTERVALVE INDIA LTD. (CAST UPTO 24" (UPTO 300#) & UPTO	INDIA

	12” 600# , FORGED UPTO 2” (800#))	
24	JC VALVES & CONTROLS INDIA PVT. LTD. (CAST UPTO 48” (150#) & 24” (UPTO 600#) & FORGED UPTO 2” (800#))	INDIA
25	KIRLOSKAR BROTHERS LTD.(CS UPTO 12” , 300#)	INDIA
26	KSB PUMPS LIMITED (VALVES DIVN)	INDIA
27	LARSEN & TOUBRO LIMITED (1/2" TO 24")	INDIA
28	LEADER VALVES LTD. (Casting<=20”-600#, 300-150#, Forging<=2”-800#)	INDIA
29	M.H. VALVES PVT. LTD. (1/2” to 1 1/2”-800#, 2” to 6”-600#)	INDIA
30	MICON ENGINEERS (HUBLI) [PVT. LTD.(Cast: Upto 12” (150# & 300#), 6” (600#) & Forged: upto 2” (800#))	INDIA
31	MICROFINISH VALVES LTD.	INDIA
32	NSSL LTD. (UPTO 80” (150#), 56” UPTO 600# & FORGED UPTO 2” (800 #))	INDIA
33	NITON VALVES INDUSTRIES PVT. LTD.	INDIA
34	OSWAL IND. LTD. (UPTO 48” (150#), 32” (300#) & 24” (600#)	INDIA
35	S & M INDUSTRIAL VALVES LTD. (CS Gate & Globe Valves 2” – 24” <=300#)	INDIA
36	SHALIMAR VALVES PVT. LTD. (Cast Upto 24” (Upto 600#), Forged: ½” to 1 ½” (800#))	INDIA
37	SHREERAJ INDUSTRIES (CS upto 150#)	INDIA
38	STEEL STRONGVALVES (I) PVT. LTD. (Upto 42”)	INDIA
39	VENUS PUMP & ENGINEERING WORKS.	INDIA
40	VIBA FLUID CONTROL	INDIA
41	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT. LTD.) (Cast UPTO 36" (150#); 24" (300#); 12" (600#) & Forged: Upto 2” (800#))	INDIA
42	ZED VALVES CO. PVT. LTD. (Upto 14” (600#))	INDIA
43	ZOLOTO INDUSTRIES. (40 MM TO 200 MM(ONLY CS & SS))	INDIA
44	VELAN INC. (UPTO 48” , 600#)	CANADA
45	BOTELI VALVE GROUP CO. LTD.(Cast Upto 56” (150#), 36” (300#), 24” (600#) & Forged: Upto2” (800#))	CHINA
46	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
47	PEMTO VALVE	GERMANY
48	CESARE BONETTI SPA (Cast Upto 42” (Upto 300#), 24” (600#) Forged: ½” to 1 ½” (800#))	ITALY
49	FASANI S.P.A.	ITALY
50	FRIULCO SPA (UPTO 48" (150#), 32" (Upto 600#)	ITALY
51	GTC ITALIA, S.R.L.	ITALY
52	MANTOVANI SpA	ITALY
53	OMB S.P.A.	ITALY

54	PETROL VALVES S.R.L.	ITALY
55	MATSURA H. P MACHINE WORKS CO.LTD.	JAPAN
56	NISHITANI & CO. LTD.	JAPAN
57	SOJITZ CORPORATION	JAPAN
58	REDPOINT ALLOYS BV	NETHERLAND
59	WALTHAN & WEIR	SPAIN
60	POYAM VALVES (AMPO S.CCP.) (Size upto 60” (Rating upto 800#)	SPAIN
61	BABCOCK BORSIG ESPANA , S.A	SPAIN
62	SUFA LIMITED	U.A.E.
63	BEL VALVES	U.K.
3.8	**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#) Forged: Upto 2” (2500#)) FOR DUAL PLATE CHECK VALVES)	INDIA
3	ASSOCIATED TOOLINGS (I) PVT. LTD. (½” TO 2” (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: Upto 24” (900#)	INDIA
	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
7	HAWA VALVES INDIA PVT. LTD. (Forged upto 2”, 1500#)	INDIA
8	INTERVALVES INDIA 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 (1500# & 2500# UPTO 12", FORGING UPTO 2" 2500#)	INDIA
13	METROPOLITAN INDUSTRIES (SIZE=200mm, rating=2500 lb)	INDIA
14	MICON ENGINEERS (HUBLI) PVT. LTD. (FORGED: UPTO 2" (1500#))	INDIA
15	NSSL LIMITED. (CAST: Upto 36"(900#), 24” (upto 2500#) & FORGED: Upto 2” (Upto 2500#))	INDIA
16	OSWAL INDUSTRIES LTD. (Upto 12” (900# & 1500#))	INDIA
17	SHALIMAR VALVES PVT.LTD.(CAST: UPTO 20"(900#), FORGED: ½" TO 1 ½" (1500#))	INDIA

18	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT. LTD.) (Cast UPTO 12" (upto 2500#) & Forged: Upto 2" (1500#), 1" (2500#))	INDIA
19	VELAN INC. (UPTO 24" (Rating upto 2500#))	CANADA
20	BOTELI VALVE GROUP CO. LTD.(Cast Upto 16" (Upto 1500#), 12" (2500#) & Forged: Upto 2" (1500# & 2500#))	CHINA
21	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
22	BFE BONNEY FORGE VALVE LICENSEE	ITALY
23	CESARE BONETTI SPA (Upto 24" (Upto 2500#)	ITALY
24	FASANI S.P.A.	ITALY
25	FRIULCO SPA (UPTO 32" (900#); 24" (1500#); 14" (2500#))	ITALY
26	GTC ITALIA S.R.L.	ITALY
27	OMB S.P.A.	ITALY
28	PETROL VALVES S.R.L.	ITALY
29	VALVITALIA SPA	ITALY
30	MATSURA H. P MACHINE WORKS CO.LTD.	JAPAN
31	NISHITANI & CO. LTD.	JAPAN
32	BABCOCK BORSIG ESPANA, S.A.	SPAIN
33	POYAM VALVES, (AMPO S. COOP.) (SIZE UPTO 30" (RATING UPTO 2500#))	SPAIN
34	SUFA LIMITED	U.A.E.
35	BEL VALVES	U.K.
3.9	**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 material)	INDIA
5	CHEMTECH INDUSTRIAL VALVES PVT. LTD.	INDIA
6	CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25)	INDIA
7	DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#))	INDIA
8	FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#)	INDIA
9	FLOW CONTROL	INDIA
10	FLOWCHEM INDUSTRIES (UPTO 300# and upto 10")	INDIA
11	FLUIDTECH EQUIPMENT PVT. LTD(UPTO 4" (300#))	INDIA
12	FORWARD ALLOYS AND CASTINGS (Upto 900#)	INDIA
13	GURU INDUSTRIAL VALVES PVT. LTD. (Cast CS only: Upto 12" (Upto 300#), 4" (Upto 900#) & Forged: Upto 2" (800#))	INDIA
14	HAWA ENGINEERS LTD. (Upto 16" (150# & 300#), Upto 12" (600# & 900#))	INDIA

15	INTERVALVE INDIA LTD. (Forged: Upto 2" (800#), Cast: Upto 12" (Upto 300#))	INDIA
16	JC VALVES & CONTROLS INDIA PVT. LTD. (CAST UPTO 28" (upto 600#),12" (900# , 1500#) & 10" (2500#))	INDIA
17	KSB PUMPS LTD. (VALVES DIVN.) (CS upto 100DN, 20 bar)	INDIA
18	LEADER VALVES LTD. (Casting upto 600#, 6" & forging upto 800#, 2")	INDIA
19	MICON ENGINEERS (HUBLI) PVT. LTD. (Cast: Upto 6" (150# & 300#) & Forged: Upto 2" (800#)	INDIA
20	MICROFINISH VALVES (P) LTD.	INDIA
21	NSSL LTD. (Upto 12" (150# & 300#))	INDIA
22	OSWAL IND. LTD. (Upto 24" (150#, 300# & 600#))	INDIA
23	SHALIMAR VALVES PVT. LTD. (Upto 18" (600#) Material: CS/AS/SS)	INDIA
24	VIBA FLUID CONTROL (Upto 300#)	INDIA
25	VIRGO ENGINEERS LTD. (Upto 16" (upto 600#))	INDIA
26	WEIR BDK VALVES (Cast: Upto 30" (150# & 300#), 20" (600#), 16" (900#), 12" (1500#) & Forged: Upto 2" (800#))	INDIA
27	XOMOX SANMAR LTD.(FISHER XOMOX)	INDIA
28	BHDT GMBH	AUSTRIA
29	BOTELI VALVE GROUP CO. LTD. (Upto 32" (150# & 300#), 30" (600#), 24" (900#)	CHINA
30	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
31	VELAN INC.(UPTO 16", 600#)	CANADA
32	ETS TROUVAY & CAUVIN	FRANCE
33	PERRIN GMBH (2500#, SIZE UPTO 24")	GERMANY
34	FRIULCO SPA (UPTO 48" (150# & 300#); 20" (upto 1500#); 12" (2500#))	ITALY
35	CESARE BONETTI SPA (Cast: Upto 4" (150#) & Forged: Upto 1" (800#) Floating only)	ITALY
36	GTC ITALIA S.R.L	ITALY
37	MANTOVANUI SPA	ITALY
38	PIBIVESSE SRL (UPTO 48" , 600#)	ITALY
39	PETROL VALVES S.R.L	ITALY
40	METSO AUTOMATION	SINGAPORE
41	POYAM VALVES (AMPO S. COOP.) (Size upto 42" (Rating upto 2500#))	SPAIN
42	HATIMA CORPORATION	TAIWAN
3.10	**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,	INDIA

	AS & SS material)	
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 INDIA LTD.(UPTO 12” , 150#).	INDIA
7	JC VALVES & CONTROLS INDIA PVT. LTD. (CAST 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 (P) LTD.	INDIA
10	NSSL LIMITED (Upto 12" NB, (150# & 300#))	INDIA
11	OSWAL INDUSTRIES LTD. (UPTO 24" (150#, 300#, & 600#))	INDIA
12	VIRGO ENGINEERS LTD. (UPTO16" (UPTO 600#))	INDIA
13	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
14	VELAN INC. (SIZE UPTO 16" (Rating Upto 600#))	CANADA
15	BOTELI VALVE GROUP CO. LTD. (Upto 32” (150# & 300#), 30” (600#), 24” (900#)	CHINA
16	ALFA VALVOLE SRL	ITALY
17	CESARE BONETTI SPA (UPTO 24" (150#) & 4" (UPTO 1500#) TRUNNION MOUNTED ONLY)	ITALY
18	GE POWER (NUOVO PIGNONE SPA)	ITALY
19	GTC ITALIA, S.R.L.	ITALY
20	PETROL VALVES S.R.L	ITALY
21	PIBIVIESSE (48”, 600#)	ITALY
22	VALVITALIA SPA	ITALY
23	PERRIN GMBH (SIZE UPTO 24" (RATING UPTO 2500#))	GERMANY
24	RED POINT ALLOYS BV	NETHERLAND
25	FRIULCO SPA (UPTO 48" (150# & 300#); 20" (UPTO 1500#); 12" (2500#))	ITALY
26	POYAM VALVES, (AMPO S. COOP.) (SIZE UPTO 42" (RATING UPTO 2500#))	SPAIN
27	METSO AUTOMATION	SINGAPORE
28	ORBIT VALVES PLC	SINGAPORE
3.11	**BUTTERFLY VALVES**	
1	A V VALVES LIMITED (UPTO 48" (150#))	INDIA
2	ADVANCE VALVES (RUBBER LINED AND METAL SEATED)	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 INDIA 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.(150#, upto 16")	INDIA
20	MATHER & PLATT (INDIA) LTD. A SUBSIDIARY OF WILO SE GERMAN (UPTO DN 1600,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 250#), 24" (300#))	INDIA
26	XOMOX SANMAR LIMITED (FISHER XOMOX)	INDIA
27	TOMOE VALVE CO. LTD. (Upto 48"(150# & 300#), Upto 24"(600#, 900# & 1500#))	JAPAN
28	BHDT GMBH	AUSTRIA
29	VELAN INC. (Size upto 48"(Rating upto 600#)	CANADA
30	BOTELI VALVE GROUP CO. LTD. (Upto 36" (150# & 300#)	CHINA
31	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
32	GRISS SAPAG INDUSTRIAL VALVES	FRANCE
33	ADAMS ARMATUREN	GERMANY
34	GTC ITALIA, S.R.L.	ITALY

35	HAITIMA CORPORATION	TAIWAN
36	WEIR VALVES & CONTROLS DIVISION.	U.K
37	LEEDS VALVE LTD	U.K
38	CURTIS WRIGHT FLOW CONTROL CORPOARATION	U.S.A.
39	LEAR SIEGLER MEAS. CTRLS. CORP	U.S.A.
40	TYCO INTERNATIONAL INC.,U.S.A.	U.S.A.
41	EMERSON PROCESS MGT	U.S.A.
42	SPX VALVES & CONTROLS	U.S.A.
43	XOMOS (CRANE CO.)	U.S.A.
3.12	**PLUG VALVES (NON LUBRICATED)**	
1	A V VALVES LIMITED (UPTO 48" (150#))	INDIA
2	AUDCO INDIA LTD (L&T VALVES DIVN.)	INDIA
3	AZ ARMATUREN GMBH (1/2” TO 20”(150#, 300# & 600#), Matl. CS, AS &SS)	INDIA
4	BDK PROCESS CONTROL PVT LTD.	INDIA
5	CHEMTECH INDUSTRIAL VALVES PVT LTD	INDIA
6	CRAWLEY & RAY (FOUNDERS & ENGINEERS) PVT. LTD (DN 200)	INDIA
7	FLUIDTECH EQUIPMENT PVT. LTD. (Upto 4” (300#))	INDIA
8	GURU INDUSTRIAL VALVES PVT. LTD. (Cast CS only: Upto 12” (Upto 300#), Upto 4” (Upto 900#)) & Forged: Upto 2” (800#))	INDIA
9	HAWA ENGINEERS LTD. (1/2” TO 8” (150#))	INDIA
10	JC VALVES & CONTROLS INDIA PVT. LTD. (Upto 12” (Upto 300#))	INDIA
11	L&T LTD (1/2" TO 24")	INDIA
12	LEADER VALVES LIMITED (Upto 6” (Upto 300#))	INDIA
13	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT. LTD.) (UPTO 16"(150#), 12" (300#), 3" (600#))	INDIA
14	XOMOX SANMAR LIMITED (FISHER XOMOX)	INDIA
15	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
16	O.M.S. SALERI DI SALERI P & FIGLI S.M.C.	ITALY
17	POYAM VALVES, (AMPO S. COOP.) (UPTO 30" (UPTO 900#) FOR LIFT PLUG VALVES ONLY.)	SPAIN
3.13	**FLAT GASKETS**	
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	PACKING & JOINTINGS (P) LTD.	INDIA
11	PERFECT MARKETING (P) LTD,	INDIA
12	PRASHANT ENGG STORES	INDIA
13	REIN TALBROS PVT. LTD.	INDIA
14	SPIRALSEAL GASKETS PVT. LTD. (CAF & Teflon)	INDIA
15	STARFLEX SEALING INDIA PVT. LTD.	INDIA
16	THE BENGAL MILL STORES SUPPLY CO. (TRADER)	INDIA
17	UNIQUE INDUSTRIAL PACKINGS PVT. LTD.	INDIA
3.14	**SPIRALLY WOUND GASKETS**	
1	GASKETS (INDIA) PVT. LTD	INDIA
2	GOODRICH GASKET PVT. LTD.	INDIA
3	IGP ENGINEERS LIMITED	INDIA
4	MADRAS INDUSTRIAL PRODUCTS	INDIA
5	PACKINGS & JOINTINGS PVT. LTD	INDIA
6	PERFECT MARKETING (P) LTD,	INDIA
7	PRASHANT ENGG STORES	INDIA
8	SPIRASEAL GASKETS PVT. LTD.	INDIA
9	STARFLEX SEALING INDIA PVT. LTD.	INDIA
10	THE BENGAL MILL STORES SUPPLY CO. (TRADER)	INDIA
11	UNIQUE INDUSTRIAL PACKINGS PVT.LTD. (UPTO 42"(600#) & UPTO 24" (2500#))	INDIA
12	ZHEJIANG JIEHUA VALVE CO. LTD.	INDIA
3.15	**EXPANSION JOINTS & BELLOWS**	
1	CORI ENGINEERS PVT. LTD.	INDIA
2	D.WREN & CO. (For Rubber & Fabric)	INDIA
3	FLEXATHERM EXPANLLOW PVT. LTD. (Circular: Upto 240", Rectangular No bar for size, (Upto 600#))	INDIA
4	FLEXICAN BELLOWS & HOSES PVT. LTD	INDIA
5	FLUIDYNE ENGG. (I) PVT. LTD	INDIA
6	KELD ELLENTOFT INDIA PVT. LTD	INDIA
7	LONESTAR INDUSTRIES	INDIA
8	MB METALLIC BELLOWS (INDIA) PVT. LTD	INDIA
9	PRASHANT ENGG. STORES	INDIA
10	STANDARD PRECISION BELLOWS	INDIA

11	TUBOFLEX	GERMANY
12	FLEXIDER S.P.A.	ITALY
3.16	**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#)	INDIA
7	KWIKFLO FILTERS PVT. LTD.	INDIA
8	LEADER VALVES LTD. (upto 300# & upto 12" size)	INDIA
9	MULTITEX FILTERATION ENGINEERS LTD	INDIA
10	MOD FABRICATORS	INDIA
11	ZOLOTO INDUSTRIES (15MM TO 100MM)	INDIA
12	BOTELI VALVE GROUP CO. LTD. (Y - TYPE ONLY: 14" (150#) & 3" (300# & 600#))	CHINA
3.17	**STEAM TRAPS**	
1	GREAVES LTD.	INDIA
2	PENNANT ENGINEERING PVT. LTD.	INDIA
3	VIRGO ENGINEERS LTD. (1/2" to 4" (upto 600#) (CS/SS))	INDIA
4	YARWAY CORPORATION	INDIA
5	ZOLOTO INDUSTRIES (15 mm to 25 mm)	INDIA
6	GESTRA AG	GERMANY
7	ARMSTRONG INTERNATIONAL INC.	U.S.A
8	OGONTZ CORPORATION	U.S.A
9	TYCO INTERNATIONAL INC.,U.S.A.	U.S.A
3.18	**SPRING SUPPORTS**	
1	MYRICS PIPING SYSTEM PVT.LTD.	INDIA
2	PIPE SUPPORTS INDIA PVT. LTD.	INDIA
3	PIPING & ENERGY PRODUCTS (P) LTD.	INDIA
4	SARATHI ENGG. ENTERPRISES PVT. LTD.	INDIA
5	SPRING SUPPORTS MFG. CO.	INDIA
6	FLEXIDER S.P.A.	ITALY
3.19	**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	INDUSTRIAL ENGINEERING CORPORATION (SIZE UPTO 4" (M100))	INDIA
8	MEGA ENGINEERING PRIVATE LIMITED (½" TO 3" MATERIAL: CS/AS/SS)	INDIA
9	METRO MECHANICAL PVT.LTD.	INDIA
10	NAGBHUSHANAM INDUSTRIES	INDIA
11	NIREKA ENGG. CO. PVT. LTD.	INDIA
12	PACIFIC FORGING & FASTENERS PVT. LTD. (M 10 TO M125)	INDIA
13	PERFECT MARKETING (P) LTD,	INDIA
14	PIONEER NUTS & BOLTS PVT. LTD.	INDIA
15	PRECISION AUTO ENGINEERS	INDIA
16	PRECISION ENGINEERING INDUSTRIES	INDIA
17	PTD FASTNERS PVT. LTD.	INDIA
18	SANGHVI METALS (TRADER)	INDIA
19	SUNDARAM FASTENERS LIMITED	INDIA
20	UDHERA FASTENERS	INDIA
3.20	**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
3.21	**HOSE PIPE (NON-METALLIC) & CAM LOCK COUPLING**	
1	CHHATARIA RUBBER CHEMICALS INDUSTRIES	INDIA
2	D. WREN & CO.	INDIA
3	GAYATRI INDUSTRIES	INDIA
4	GAYATRI INDUSTRIAL CORPORATION (UPTO 8” ID)	INDIA
5	HELIFEX HYDRAULICS & ENGG CO. LTD.	INDIA
6	PADMINI INDUSTRIES LIMITED	INDIA
7	PYROTEK INDUSTRIES (INDIA) PVT. LTD.	INDIA
8	SENIOR INDIA PVT. LTD.	INDIA

3.22	**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 (½" to 6")	INDIA
5	GOOD LUCK STEEL TUBES LTD. (15 mm to 150 mm dia)	INDIA
6	GUJRAT STEEL TUBES LTD.	INDIA
7	HI-TECH PIPES LTD. (ERW MS / GI Pipes:½" NB to 6" NB, (Thickness 2.2 mm to 6.0 mm))	INDIA
8	INDIAN TUBE CO. (TATA DIV. OF TUBES & PIPES) (For >200M)	INDIA
9	INDUS TUBES LIMITED (½" to 6")	INDIA
10	JINDAL PIPES LTD. (1/2" to 4")	INDIA
11	JOTINDRA STEEL & TUBES LTD. (½" to 6")	INDIA
12	KALPESH TUBE(INDIA), (TRADER) (upto a max order value Rs.25.0 lakh)	INDIA
13	MUKAT PIPES LTD	INDIA
14	NAVRATAN PIPE AND PROFILE LTD. (Upto 6")	INDIA
15	P.K.FORGE & FITTING INDUSTRIES	INDIA
16	SAGAR STEEL CORPORATION (TRADER)	INDIA
17	SANGHVI METALS (TRADER)	INDIA
18	SURINDRA ENGINEERING CO. PVT. LTD.	INDIA
19	SURYA ROSHNI LTD. (15mm to 150mm)	INDIA
20	THE BENGAL MILL STORES SUPPLY CO.(TRADER)	INDIA
21	WELSPUN GUJARAT STAHL ROHREN LIMITED (ANJAR) (Upto 6")	INDIA
22	ZENITH LIMITED	INDIA
3.24	**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	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	JINDAL PIPES LTD. (8" to 14")	INDIA
10	JOTINDRA STEEL & TUBES LTD. (6" to 14")	INDIA
11	KALPESH TUBE(INDIA), (TRADER)	INDIA
12	LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm)	INDIA

13	MUKAT PIPES LTD	INDIA
14	NAVRATAN PIPE AND PROFILE LTD. (Upto 10")	INDIA
15	P.K.FORGE & FITTING INDUSTRIES	INDIA
16	PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to 20 mm)	INDIA
17	RATNAMANI METALS & TUBES LIMITED	INDIA
18	SAGAR STEEL CORPORATION (TRADER)	INDIA
19	SANGHVI METALS (TRADER)	INDIA
20	SAW PIPES	INDIA
21	SHRI RAM METALS	INDIA
22	STEEL AUTHORITY OF INDIA LTD.	INDIA
23	SURINDRA ENGINEERING CO. PVT. LTD.	INDIA
24	SURYA ROSHNI LTD. (6" to 16" ,(150mm to 400mm))	INDIA
25	THE BENGAL MILL STORES SUPPLY CO.(TRADER)	INDIA
26	WELSPUN GUJARAT STAHL ROHREN LIMITED (DAHEJ) (Upto 72" (50 mm thk.))	INDIA
27	WELSPUN GUJARAT STAHL ROHREN LIMITED (ANJAR) (Upto 100" (30 mm thk.))	INDIA

NOTE:

1. 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.
2. 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.

VENDOR LIST
EOT CRANE

1.0 EOT CRANE

1.	Avon Cranes	India
2.	Samco Engineering Pvt. Ltd.	India
3.	The Acme Manufacturing Co. Ltd.	India
4.	WMI Cranes	India

SECTION-3.0

SUB-SECTION-3.2

DOCUMENTS & DRAWINGS
(PLOT PLAN, EQUIPMENT WEIGHTS etc.)

ATTACHMENT- I

LIST OF NEW EQUIPMENTS WEIGHT < 65 MT TO BE ERECTED AT HURL

Sl. No.	Equipment Code	Equipment Name	UNIT	Qty	Tentative Weight (MT)		Erection Level	Position H/V	Dimention	Remarks
					Each	Total				
1.		COLD BOX	INERT GAS UNIT	1	20	20	GROUND	V	NA	DETAIL WILL BE PROVIDED
2.		APU SKID	-DO-	1	10	10	GROUND	H	NA	
3.		APU Vessel (Each)	-DO-	1	1.5	1.5	GROUND	V	NA	
4.		LIN Vaporisers	-DO-	1	5	5	GROUND	V	NA	
5.		Refrigeration Unit	-DO-	1	7	7	GROUND	V	NA	
6.		AIR RECIEVER (BIG)	IA	01	10	10	GROUND	V	NA	
7.		AIR RECIEVER (SMALL)	IA	01	5	5	GROUND	V	NA	
8.		DRYERS	IA	02	10	10	GROUND	H	NA	
9.		OTHER MISC.	IA	01	10	10				
		Activities: - i. Check the accessibility and approach of the crane. ii. The minimum working radius is to be measured between the CG of both the equipment and crane to avoid fouling of equipment with boom or frame. iii. Check the dimension of template, co-ordinate of the template and level of the template. iv. Design the suitable lifting arrangements. v. Erection new Equipment at its position.								

		vi. Check the verticality of the equipment by total station instrument/theodolites/ water level /plumb as per the specified tolerance mention by equipment supplier, in absence of this, tolerance of IS 800 & MD 40 F will prevail as per the guidelines of client/consultant. vii. Tightening the foundation bolts as per required torque tolerance and sequence. viii. Alignment of all nozzles elevation & orientation. ix. Hook-up of pipe lines as per P& ID box-up and testing.

PIPE CONDITION DETAIL

FLUID CODE	OPERATING PRESSURE(kg/cm2g)	OPERATING TEMPERATURE (C)	DESIGN PRESSURE(kg/cm	DESIGN TEMPERATURE(C)
DW	7	AMBIENT	10	70
DM	6.5	AMBIENT	10	70
PW	6	AMBIENT	10	70
PC(NOTE1)	3.5	47	7	85
PC(NOTE2)	2.5	70	11	120
TC(NOTE3)	3.5	50	7	70
TC(NOTE4)	3.5	50	14.5	85
TC(NOTE5)	3.5	50	10	80
IA	8.5	AMBIENT	10.5	70
PA	10	AMBIENT	11.5	70
IG	8	AMBIENT	10	70
WW				
WW(NOTE6)	1.5	50	5	100
WW(NOTE7)	1	40	7	70
WW(NOTE8)	0.5	AMBIENT	6	70
WW(NOTE9)	0.5	AMBIENT	6	70
WW	3.5	AMBIENT	7	70
BD(NOTE10)	0.1	43	8.5	70
CWS	4	33	8.5	70
CWR	2.5	43	8.5	70
NG	53.03	55	58.5	70
LS	-		8/FV	200
IS	6.5	250	8/FV	300

NOTE:

1. FOR LINE NO PC-101
2. FOR LINE NO PC-102
3. FOR LINE NO. TC-101
4. FOR LINE NO TC-102
5. FOR LINE NO TC-103
6. FOR LINE NO WW-103
7. FOR LINE NO WW-102
8. FOR LINE NO. WW-101
9. FOR LINE NO WW-104
10. FOR LINE NO BD-101

REFERENCE DRAWINGS

S.N.	DESCRIPTION	DRAWING NO.
01	LAND AREA REQUIREMENT– GORAKHPUR	0000–0000–0001
02	SURVEY DRAWING (CIVIL)	0000–0000–0001

PROPOSED FACILITIES

TABLE–1

S.N.	BLOCK DESCRIPTION	SIZE(M)	REMARKS
01	AMMONIA PLANT	217 X 138	
02	UREA PLANT	125 X 75.5	
03	AMMONIA COOLING TOWER (ACT)	175 X 75	
04	UREA COOLING TOWER (UCT)	125 X 75	
05	AMMONIA STORAGE	116.5 X 100	
06	MAIN CONTROL ROOM (CCR)	187 X 61	
07	AMMONIA AND UREA MAIN SUBSTATION		
08	GTG/CAPTIVE POWER PLANT	130 X 67	
09	EMERGENCY DG SET (EDG) + HSD	75 X 38	
10	LAB TECH BUILDING	42 X 25.5	
11	FLARE	R95	
12	SWITCH YARD	80 X 75	
13.1	AMMONIA STORAGE CONTROL ROOM & SS	61 X 37	
13.2	ACT–UCT SUBSTATION	65 X 35.5	
13.3	CPP SUBSTATION AND CONTROL BUILDING	111.25 X 56.5	
14.0	NEEM OIL STORAGE & COATING SYSTEM	15 X 7.5	

TABLE–2

S.N.	BLOCK DESCRIPTION	SIZE(M)	REMARKS
1	INTAKE WELL/RAW WATER RESERVOIR	---	CHILWATAL
2	RAW WATER TREATMENT PLANT	150 X 100	
3	DM PLANT	120 X 100	
4	FIRE WATER PUMP HOUSE	40 X 15	
5	INSTRUMENT AIR/ PLANT AIR UNIT	40 X 25	
6	INERT GAS GENERATION UNIT	40 X 27	
7	EFFLUENT TREATMENT PLANT+STP+HP+GP	145 X 100	
8	TECHNICAL BUILDING	70 X 30	
9	CANTEEN BUILDING	60 X 40	
10	FIRE & SAFETY/FIRE STATION+FIRST AID	65 X 30	
11	CENTRAL WORKSHOP	97.5 X 26.7	
12	WAREHOUSE+OPEN STORAGE AREA	60 X 20	
13	CHEMICAL/LO./CATALYST STORAGE	36 X 30	HOLD
14	SECURITY	24 X 20	
15	WEIGH BRIDGE		
16	UREA SILO	365 X 50	
17	UREA BAGGING PLANT BUILDING	150 X 26	
18	RAILWAY PLATFORM	660 X 25	
19	TRUCK PARKING AREA	150 X 100	
20	FIRST AID	15 X 15	
21			
22	ADMINISTRATION BUILDING (HOLD)	56 X 22	EXISTING
23	NEEM OIL RECOVERY SYSTEM (TOYO PLOT)	7.5 X 11.5	
24	GAS METERING STATION	80 X 80	BY OTHERS

TABLE–3

S.N.	BLOCK DESCRIPTION	SIZE(M)	REMARKS
1	SS–1: UTILITY & OFFSITE SUB–STATION	55 X 28	
2	SS–2: RWTP+FWPH+DM PLANT+CP SS	35 X 30	PACKAGE
3	SS–3: GUARD POND+ETP+STP+HOLDING POND	35 X 30	PACKAGE
4	SS–4: SILO+BAGGING+NEAR BY FACILITIES	42 X 22	PACKAGE
5	SS–5: NON PLANT BUILDING	----	HOLD
6	SS–6: CONSTRUCTION SUB–STATION	20.5 X 16.5	

LEGENDS:–

- PLANT BOUNDARY
- PROPOSED NEW FACILITIES (ISBL)
- PROPOSED NEW FACILITIES (OSBL)
- PROPOSED GREEN BELT
- BUILDINGS TO BE HANDED OVER TO CONTRACTOR FOR REFURBISHMENT & PROJECT USE (AS REQUIRED)
- PROPOSED ROAD
- PROPOSED OSBL PIPE RACK/SLEEPER (OWNER SCOPE)
- RAILWAY LINE
- FENCING

NOTES:–

1. ALL DIMENSIONS AND COORDINATES ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. FINISHED FLOOR LEVEL
   a. FGL 99.700M CORRESPONDS TO (78.3)ABOVE MSL. ()
   b. FFL/HPP LEVEL = 100.000M
3. REFRENCE BENCH MARK ⊕ POINTS IS W.R.T GLOBAL CO–ORDINATES HAVING N–2968639.118 & E–734876.417 (GRID COORDINATES N–967.672, E–975.720)
4. BENCHMARK POINTS FROM SURVEY DRAWING/REPORT SHOWN.OTHER SPECIFIED.
5. EQUIPMENT SIZES AND LOCATIONS ARE TENTATIVE.
6. BLOCK SIZE OF FACALITIES ARE TO BE FINALIZED AFTER GETTING VENDOR INFO.
7. PIPE RACK LOCATION & SIZES MARKED ARE SCHEMATIC.
8. CO–ORDINATES/DIMENSION OF EXISTING EQUIPMENTS/ROADS/UNDERGROUND TO BE VERIFIED.
9. FOR ISBL AREAS, REFER RESPECTIVE AREA PLOT PLANS.
10. FOR BUILDINGS, REFER ARCHITECTS DRAWING.
11. PERIPHERAL ROAD EXIST ℄ COORDINATE TO BE MAINTAINED AS PER SITE.
12. * INDICATES HOLD

REV.	DATE	DESCRIPTION	PPD.	CKD.	APPD.
03					
02	22.10.18	UPDATED & REISSUED	MN	AB/NS	DM/PK
01	24.09.18	UPDATED & REISSUED	MN	AB/NS	DM/PK
00	30.05.18	UPDATED & REISSUED (IFP)	MN	AB/NS	DM/PK
PB	31.01.18	UPDATED & ISSUED FOR PLANNING	MN	ABH	
PA	30.11.17	ISSUED FOR PLANNING	AD	ABH	

CLIENT: HINDUSTAN URVARAK & RASAYAN LIMITED

CLIENT DOCUMENT NO.: ---

PROJECT: AMMONIA UREA FERTILIZER PROJECT AT GORAKHPUR

PROJ. NO.	PLANT	SECTION	DEPT.
--	-	-	-

TITLE: OVERALL PLOT PLAN

DWG.NO. 5001–0000–0002 | SCALE: 1 : 3000 | SHEET: 1 OF 1 | DWG. SIZE: A0+3INCH 1189X841

PDIL: izsktsDV~I ,.M MsoyiesaV bafM;k fyfeVsM uk3.M PROJECTS & DEVELOPMENT INDIA LTD., NOIDA

SECTION-4.0

HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT

SECTION-4.0

HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT

FOR

M/s HURL

0	30.10.17	30.10.17	FOR ISSUANCE	DILIP	GC	SM
REV	**REV DATE**	**EFF DATE**	**PURPOSE**	**PREPD**	**REVWD**	**APPD**

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 The purpose of the present document is to outline the minimum safety requirements applicable to personnel, equipment and facilities during erection, pre-commissioning and commissioning activities of OWNER / CONSULTANT Construction Sites. Constructing safe structure and providing safe working environment to the personnel is a vital factor in successful construction business. Safety and health are as much as part of effective project planning and control as the cost, schedules, procurement and quality. Indeed they are all closely interrelated. Productivity, safety and quality can move forward in close proximity.

1.2 OBJECTIVES

OWNER/CONSULTANT Site Management has following main objectives regarding safety at site.

a) No Accident
b) To make the environment safe
c) No harm to people
d) Safety is everyone's responsibility
e) To make the job safe

2.0 GENERAL

2.1 These rules do not exempt the Contractor from statutory Health, Safety and Environmental duties but are intended to assist in attaining a high standard of compliance with those duties, in order to provide a safe and healthy working environment.

2.2 OWNER/CONSULTANT will assist Contractors in any practical way to facilitate safe working, and requires full co-operation in observing these rules.

2.3 The rules for Health and Safety specified herein are in no way intended to relieve the Contractor from any obligation or liability under the Contract, nor is it intended to relieve the Contractor of any of his legal obligations for the avoidance of accidents.

2.4 In all matters arising in the performance of the Contract, the Contractor shall conform with all Statutory Regulations and By-Laws made with statutory authority by Government Departments or by Local or other Authorities that shall be applicable to the Works.

2.5 The Contractor, in the performance of the Contract, shall not endanger the safety or unlawfully interfere with the convenience of the public in any manner.

2.6 The Contractor's representative on Site shall communicate details of these rules for Health, Safety and Environment to all Contractors' employees and to all Subcontractors and Subcontractors' employees employed on the Site.

2.7 The requirements of the Client/Owner's existing Site Rules/Regulations form part of the Contract and in the case of conflict between the OWNER/CONSULTANT'S rules, the highest standard shall be applied.

2.8 At the tender stage OWNER/CONSULTANT will require to see a copy of the Contractor's policy, organization and arrangements for the Health and Safety at Work. The Contractor shall submitted complete documents Health and Safety Questionnaire. Contractor shall deploy safety officer of adequate experience at each work site or during each shift including Sunday/holiday with approval of EIC/Owner.

3.0 SITE HEALTH, SAFETY AND ENVIRONMENT INDUCTION

3.1 All personnel shall receive OWNER/CONSULTANT and Contractors' site Health, Safety and Environment induction before they commence work on site. The induction shall comprise information on the various hazards which they may come into contact with, instructions on the site emergency procedures, warning and alarm systems, and permit to work system, first aid locations, welfare facilities, access routes and project specific rules.

3.2 It is the responsibility of the Contractor to familiarize all new personnel to the Project on the actual location of muster points, fire alarm points, first aid stations and the like.

4.0 DEMARCATION

4.1 Construction personnel are restricted to the construction areas shown on the Contract Drawings. Any personnel found on/in or interfering with the existing works/plant, without permission, will be dismissed from site. Any work outside of these areas may only be carried out with the written agreement of OWNER/CONSULTANT.

Before any work is started on the site, the Contractor's representative shall report to OWNER/CONSULTANT, who will confirm to the Contractor's representative, the limits of the working area(s) and shall be informed of any special requirements appertaining thereto.

5.0 ACCESS TO THE CLIENT'S FACILITIES/BUILDINGS

5.1 The Client's Facilities, including the canteen/cafeteria and toilets shall not be used by Construction Personnel.

5.2 Construction Personnel shall not enter any of the Owner's building unless escorted by a member of the OWNER/CONSULTANT'S staff (or working with prior agreement to Owner's Permit to Work System).

6.0 BEHAVIOR ON SITE

6.1 All Contractors' personnel shall treat everyone with respect and will refrain from any sexually suggestive or abusive comments or behavior.

7.0 SMOKING, EATING AND DRINKING

7.1 Smoking, eating and drinking is allowed in designated areas.

8.0 DRUGS AND ALCOHOL

8.1 The possession or use of illicit drugs and alcohol on site is not permitted. Anyone who is found, or suspected to be, under the influence of either will be removed from site (subject to the Contractors' disciplinary procedure).

8.2 Anyone taking prescriptive drugs shall advise their employer, in particular those drugs that may impair their performance. Their employer may make arrangements to assign them to more suitable work, but shall ensure that the OWNER/CONSULTANT Construction manager is informed without delay.

9.0 PERMIT TO WORK SYSTEM

9.1 All construction works will be carried out under a permit to work system. It is designed to protect personnel and plant and consists of an organized and predefined safety procedure. It forms a clear record of all foreseeable hazards which have been considered in advance of construction operations.

9.2 The identities of the permit "Issuing Authority" will be OWNER and the "Permit Acceptor" will be the Contractor.

9.3 The following types of permits will be issued:

- Clearance Certificate - all other permits are invalid without this Certificate, (this certificate can be used for general work).
- Hot Job Work Permit.
- Electrical Work Permit.
- Confined Spaces Work Permit.
- Excavations Work Permit.
- Working at Height work Permit.
- Radiography Work Permit.
- Cold Job Work Permit.
- Road Closure Work Permit.

9.4 Written requests for permits must be submitted to Owner at least twenty-four hours in advance and the permits will be issued daily. Permits shall be given to Safety Officers of the contractor, by representatives authorized by Owner in approved formats.

10.0 ACCESS, SITE PASSES AND SECURITY

10. 1 Passes

All personnel and vehicles shall enter and leave the site via the entrance authorized for construction personnel and traffic. Contractors' employees shall not enter any part of the site other than for the purpose of carrying out the Works.

All personnel shall be issued with a site pass. The site pass must be carried (or displayed on the pass holder's lapel) at all times. Details of all personnel requiring site passes shall be submitted to OWNER/CONSULTANT at least seven working days in advance of the

planned start-on-site date. Site passes shall be submitted for inspection on entering or leaving the site, or when requested for inspection by OWNER/CONSULTANT or Security.

Loss of site passes must be reported immediately to Owner/Consultant. Lack of a site pass may mean delay at the site entrance. Owner/Consultant shall not accept any responsibility for lost time or costs incurred.

On completion of their assignment, or termination or their employment, all personnel will return their site pass to Owner or Owner representative/ Owner authorized personal.

10.2 **Security**

The security of Contractor's plant, tools, equipment, materials (including free issue materials properly handed-over by Owner/Consultant) are the responsibility of the Contractor. It is the Contractor's responsibility to satisfy themselves that the security arrangements in existence on the site are adequate. The Contractor shall provide any other security measure that he deems necessary for the control and security of Contractor owned equipment and plant, including for free-issue plant and materials, both within the site establishment area and the working areas on the site.

Owner accepts no liability for any loss, damage or deterioration to the Contractor's plant tools equipment and materials.

Owner reserves the right to search at random all personnel, any Contractor's employee, or employees of its servants, agents, Contractors or any vehicle entering or leaving the site. Any package or container being taken into or out of the site may be opened and inspected by security staff or any other persons authorized by Owner/Consultant to make such a search or inspection.

It is the Contractor's obligation and responsibility to ensure that OWNER / CONSULTANT right to search and inspect persons and property, extends to and is brought to the attention of all his personnel.

Personnel shall give all possible assistance and make available any facilities required to assist OWNER/CONSULTANT and the Police in pursuance of the prosecution of any person(s) responsible for alleged malicious damage or loss to the Works or existing installations.

Owner shall not accept any responsibility for the loss or damage of personal effects. The security and safekeeping of personal effects is the responsibility of each individual.

10.3 Construction personnel will not be admitted to the Construction Areas unless they have undergone Owner/ Consultant’s induction, and received a security pass.

No Induction, No Pass, No Access to the Site

10.4 OWNER/CONSULTANT reserves the right to deny access to the Construction Site/Areas and/or the Construction Car parks to any person, or vehicle.

10.5 Individuals may be excluded from and refused future entry to the Site and/or Construction Areas for any breach of Safety or Security Rules, or exceeding the speed limit (20 mph on roads leading to the site off the public highway and 5 mph in the construction area).

10.6 No plant/skips waste or materials may leave the Construction Area without the clearance of OWNER/CONSULTANT.

10.7 The taking of photographs on the site is prohibited.

10.8 Vehicles with children under the age of 16 years or animals onboard will not be allowed access.

10.9 Visitors will only be allowed by appointment (two days' notice to OWNER/CONSULTANT is required). Visitors shall be accompanied by a member of the Contractor's team (who has received Health, Safety and Environment Induction) at all times. The visitor will have to obtain a visitor's pass, and be collected from and returned to the main gate.

10.10 Each Contractor will keep a daily register of who is on site. The register will record name, pass number, time-in and time-out (records on time-clocks will not be permitted). This information shall be used to check personnel (role call) in the event of an emergency

11.0 PARKING, DELIVERIES AND VEHICLE PASSES

11.1 Contractors' personnel shall not be allowed to park any vehicle on the main car park or site. All contractors shall park in the Contractors' Temporary Car Park.

11.2 The Contractor shall arrange transport between the parking area(s), the main site gate and the Contractor's establishment and working areas if judged to be necessary.

11.3 Vehicles used solely for transporting of tools and equipment may be allowed access to the working area(s) for unloading/loading only.

11.4 Owners of vehicles parked illegally will have their car pass taken off them and told to remove the vehicle from site. They may have their site pass withdrawn and be refused further access to the Construction Site.

11.5 The Construction Areas will be restricted to construction plant and delivery vehicles.

11.6 The speed limit on site is 10 mph on the approach roads leading to the site off the public highway and 5 mph on the construction areas

12.0 SITE OPENING AND CLOSING TIMES

12.1 The site will be open from 8.00am to 6.00pm Monday to Saturday. Work outside the agreed normal working hours will be by agreement with Owner (subject to two working days'

notice). All applications for out of hour working will identify the scope of work, supervision arrangements and a list of personnel.

13.0 SITE SUPERVISION

13.1 The Contractor must ensure that an employee of suitable seniority and authority, with responsibility for Health and Safety, is always present on site during the course of the works, to supervise and direct the Works and to receive and implement instructions from OWNER/CONSULTANT. Seven days before commencing works on site, the Contractor must notify OWNER/CONSULTANT of the name of that employee.

13.2 All supervisory staff shall be made aware of their responsibilities for safety.

14.0 TRAINING, COMPETENCE OF EMPLOYEES AND NOTIFICATION OF HAZARDS

14.1 Each Contractor must ensure that all his supervision and employees have had adequate safety training and are experienced to carry out their work safely, prior to starting on site. Training should be continuous throughout a project and should include regular toolbox discussions, (on site briefings at the start of each working day/shift).

To this end, the Contractor must also ensure that specific hazards likely to be experienced on the Site, whether notified to them or discovered by them, are notified to their workforce together with any precautions to be taken and local rules to be observed. Similarly, such hazards should be notified to their Subcontractors and, where discovered by them, to OWNER/CONSULTANT.

14.2 Where particularly severe or unusual hazards may arise on site, OWNER/CONSULTANT reserves the right at no additional cost to request Contractors' employees to attend special safety training and instruction sessions, whether carried out on site or externally. OWNER/CONSULTANT also requires Contractors' employees to undergo specified induction safety training. These aspects should be checked prior to submission of Tenders or execution of the works.

15.0 METHOD STATEMENTS

15.1 Contractors shall submit Safety Method Statements and JSA for all work activities, for example:

- Piling Operations.
- Excavation works.
- Lifting operations, as specified.
- Steel erection.
- Hot work operations.
- Radiography/NDT.
- Entry into confined spaces.
- Pressure testing.
- Working at height.
- Shot fired tools.

- Installation of pre-cast concrete planks.
- Pre-cast concrete structure.
- The erection of safety nets and fall arrest equipment.

Safety method statements must also be submitted for activities which have been identified as being of significant risk during the risk assessment process and activities selected by OWNER/CONSULTANT.

15.2 All Safety method statements must be submitted to OWNER/CONSULTANT at least seven days before planned commencement of the works.

15.3 The Safety method statement shall detail:

- The job to be undertaken.
- The individual activities required to complete the job.
- The individual trades/disciplines involved in each activity.
- Plant, equipment and tools be used in each activity.
- Any substances/chemicals to be used and where, and during which activity they will be used (together with a COSHH assessment).
- The Name(s) of the Supervisor(s) for each activity.
- The Name of the person in overall charge of the job.
- A detailed description of how the work will be done including control measures and procedures to complete each activity and the overall job safety.
- All hot work.

15.4 Compliance with the contents of the safety method statement shall be monitored on a daily basis and addressed during Contractors' safety management meetings.

15.5 The Contractor must ensure that employees executing the works are fully briefed and are made aware of the details within the approved Safety Method Statements, prior to starting the task, this includes highlighting hazards associated, associated risk assessments and reduction measures.

16.0 RISK ASSESSMENTS

16.1 Contractors will be required to produce risk assessments for all works under their control. The risk assessment shall be submitted as part of the Safety Method Statement to OWNER/CONSULTANT at least seven days before the job commences, and include the following information:

- Identification of all hazards applicable to significant risk activities.
- Details of measures in place to control the risk.
- Justification that the existing control measures are adequate or if not, a detailed action plan on how the risk(s) shall be controlled.

16.2 The use of Generic Risk Assessments is only acceptable if they follow the logical progression of the method statement and that specific operation, otherwise, task specific risk assessments will be required.

16.3 All risk assessments must be communicated to the workforce who will be responsible for undertaking the work.

17.0 COMPLIANCE WITH STATUTORY REGULATIONS

17.1 Contractors shall carry out their work in accordance with statutory legislation.
It is the duty of the Contractor to have knowledge of all relevant legislation and take account of it in the planning and execution of the work on OWNER/CONSULTANT' Sites.

18.0 INFORMATION TO BE PROVIDED AND POSTED

18.1 Contractors shall have in place, and issue to OWNER/CONSULTANT the following documents or information prior to commencement of their work, (where detailed within these rules):

18.1.1 Safety, Health and Environmental Policy.
18.1.2 Employer's Liability Insurance Certificate.
18.1.3 A detailed Health, Safety and Environment Plan, compliant with the project plan developed by the Planning Supervisor and/or Principal Contractor.
18.1.4 Work Method Statement Lifting Studies.
18.1.5 COSHH Procedures and Assessments.
18.1.6 Noise Procedures and Assessments.
18.1.7 Name of the individual appointed as the Site Safety Supervisor/Advisor.
18.1.8 Test certificates and examination for lifting gear, plant and appliances to be used on site. (Duplicates to be provided for OWNER/CONSULTANT's records.)
18.1.9 Drawings and calculations relating to false work, designed scaffolds, ground works and supporting temporary works.
18.1.10 Details of young persons to be employed on site.
18.1.11 Information relating to hazards associated with plant, operation and materials used in the works.
18.1.12 Proof of training for all personnel engaged in the works.
18.1.13 Daily Labour Returns.
18.1.14 Monthly Return of Accident Statistics to submitted OWNER/CONSULTANT format (Nil returns required).
18.1.15 Personal Injury Report to submitted to OWNER/CONSULTANT format (all injuries, however minor, to be reported). OWNER/CONSULTANT may request a detailed investigation into an accident. OWNER/CONSULTANT' decision on which incidents require detailed investigation is final.
18.1.16 Dangerous Occurrences, Incidents, Damage to Equipment and/or Property report to be submitted to OWNER/CONSULTANT format.
18.1.17 All entries/records of accidents entered into the Contractor's Accident Book shall also be copied into OWNER/CONSULTANT' Accident Book by the Contractor.
18.1.18 Copies of all Statutory Registers to be submitted weekly to OWNER/CONSULTANT.
18.1.19 Copies of the Contractor's Safety Officer/Advisor's reports of their findings on site visits/inspections.

18.2 **Accidents, Incidents, Dangerous Occurrences and Notifiable Diseases**

18.2.1 Accidents/Incidents/ Dangerous Occurrences/Near Misses

All accidents/incidents/dangerous occurrences/near misses must be notified to OWNER/CONSULTANT immediately, and a report prepared.

For reportable incidents, a copy the report to the Authority must be submitted to OWNER/CONSULTANT on completion but no later than two calendar days after the accident.

18.2.2 OWNER/CONSULTANT reserves the right to decide which accident, incidents or minor injuries shall be Investigated, and to what extent/format/contents of any investigation.

Note: All such notification or reports to OWNER/CONSULTANT do not release the Contractor of his statutory duties to report such matters to the Authorities by the quickest possible means (viz, telephone, fax and e-mail) immediately following the incident/accident.

19.0 PERSONAL PROTECTIVE EQUIPMENT/CLOTHING

19.1 All personnel on OWNER/CONSULTANT' site must wear as a minimum safety helmet, hi-vis vest, safety glasses and protective footwear. Additional personal protective equipment may be required dependent on the tasks being undertaken or as dictated by the risk assessment.

19.2 Contractors shall provide all necessary personal protective clothing and equipment for their employees and renew as necessary. Records of the issue of such equipment must be maintained for inspection by OWNER/CONSULTANT.

19.3 The Contractor shall:

- Provide personal protective equipment which is comfortable and fit for purpose.
- Maintain and clean personal protective equipment.
- Replace free of charge defective, broken or lost personal protective equipment.
- Provide storage for personal protective equipment when not being used.
- Ensure that personal protective equipment is properly used.
- Give training, information and instruction on its use to employees.
- Ensure that all personnel wear suitable clothing at all times **(no shorts, no sports shirts and no colours that may invite aggression - HSE "Keep Your Tops On" is enforced).**
- OWNER/CONSULTANT reserves the right to direct the contractor to change/replace personal protective equipment if they determine that it is unsuitable or inadequate for its proposed use.

20.0 SUBSTANCES (Control of Substances Hazardous to Health – COSHH)

20.1 Substances hazardous to health must be identified prior to taking them onto site and, if they cannot be substituted or eliminated, assessments stating how the substances will be controlled and what precautions will be introduced must be carried out and recorded in writing by a competent person. This assessment must be communicated to, and

understood by, the members of the workforce who are likely to come into contact with the substance(s). A copy of all assessments should be submitted to OWNER/CONSULTANT.

20.2 Hazardous substances may only be brought to site with OWNER/CONSULTANT' permission. They shall be kept to a minimum and must be stored in secure, appropriate containers with the contents clearly labelled. The containers must be stored in a secure area, preferably quarantined from the main stores areas, with suitable warning notices and signage posted.

20.3 Hazardous materials must not be allowed to discharge into natural watercourses or drainage systems.

20.4 All hazardous material waste must be kept separate from normal waste and be disposed of in a specialist disposal facility.

21.0 NOISE

21.1 When any operation of a Contractor is likely to expose any employee on site to an average noise level of 85 dB(A) and above, an assessment shall be carried out, by the Contractor, and records maintained for OWNER/CONSULTANT' inspection. In such circumstances, the Contractor must keep stocks of adequate ear defenders or other suitable hearing protection.

21.2 In addition to the foregoing, noise must be kept to a minimum at all times and must not exceed acceptable and/or locally specified rules and conditions relating to noise imposed by the Contract. Due regard must always be given to noise levels, and their effects on the local community and persons not involved in the operations. Permissible times for noisy work operations, and other restrictions, may be imposed by the Local Authority. Contractors receiving Notices or Prohibition Notices under the related legislation must notify OWNER/CONSULTANT of such Notices.

22.0 FIRST AID

22.1 All Contractors shall provide or ensure that they are provided with, such equipment and facilities as are adequate and appropriate in the circumstances for enabling first-aid to be rendered to any of their employees if they are injured or become ill at work.

22.2 No work shall commence on site until Contractors have trained first aid personnel on site. Contractor at all times during execution, shall station at site an emergency vehicle without any extra cost or claim.

23.0 TOOL BOX TALKS

23.1 Tool Box Talks will be implemented by all Contractors. The agenda for these talks will be agreed with OWNER/CONSULTANT prior to the commencing of work.

24.0 HEALTH, SAFETY AND ENVIRONMENT INSPECTIONS/HEALTH, SAFETY AND ENVIRONMENT ADVISORS

24.1 The OWNER/CONSULTANT' Health, Safety and Environment Engineer/Advisor will visit the sites and carry out Site Safety Inspections. Contractors must co-operate in these

inspections. Whenever Contractors' own Health, Safety and Environment Advisors visit site they must report their arrival and departure to the OWNER/CONSULTANT' Senior Representative, and provide a report of their findings and any necessary corrective action to be undertaken.

24.2 Contractors on the project must provide a full-time site based Health, Safety and Environment Advisor, when the intensity of the work requires or at the request of the OWNER/CONSULTANT.

24.3 Contractors who do not have full-time site based Health, Safety and Environment Advisors, shall ensure that their Health, Safety and Environment Advisor visits site once per week as a minimum.

24.4 **Appointment of Health, Safety and Environment Supervision**

The Contractor shall appoint safety supervision. The name of each appointee, together with evidence of his or her competence to carry out the requirements of the role, shall be submitted to OWNER/CONSULTANT for their approval.

25.0 HEALTH, SAFETY AND ENVIRONMENT MEETINGS

25.1 Health, Safety and Environment will form part of the agenda at all Site Progress Meetings. The Contractor's Safety Advisor may be asked to attend these progress meetings.

25.2 Once per month OWNER/CONSULTANT' Resident Construction Manager shall convene a Health Safety and Environment Meeting of all Contractors. Attendees at the meeting shall be all Contractors' Safety Advisors and Site Managers.

26.0 HEALTH, SAFETY AND ENVIRONMENT COMMITTEES AND SAFETY REPRESENTATIVES

26.1 OWNER/CONSULTANT encourages the workforce to nominate Safety Representatives as a way of improving communication on Health, Safety and Environment issues. Wherever Contractors' Safety Representatives have been appointed, OWNER/CONSULTANT must be informed of their appointment in writing.

27.0 HOUSEKEEPING

27.1 Contractors are expected to carry out their work in a clean, safe and orderly manner.

27.2 Dust shall be kept to acceptable levels for the work being carried out. Waste materials and rubbish shall be cleared up as the work progresses and not left to introduce a safety hazard for other personnel engaged on the works.

27.3 Construction waste should never obstruct emergency exit routes, Firefighting equipment, emergency alarm call points or other emergency facilities.

27.4 From time to time as judged necessary, at the expiration of the contract, or when instructed to do so by OWNER/CONSULTANT, the Contractor shall undertake to clean and tidy his areas of occupation and work to the satisfaction of OWNER/CONSULTANT. Should the

Contractor fail to do this, OWNER/CONSULTANT reserves the right to remove all offending materials and debris and to deduct the cost of this operation from the Contract Price. OWNER/CONSULTANT accepts no responsibility for any materials and/or tools which may be removed during this operation.

27.5 The Contractor must ensure that the following requirements are strictly enforced:

- Ample provision of refuse bins for all rubbish including organic waste such as food scraps, etc.
- Daily clearance of all such bins to the area designated for this discharge.
- No discharge of deleterious matter such as oils or other industrial waste.

27.6 All site offices, toilets, eating facilities, changing rooms, drying areas, stores, etc, which are the responsibility of the Contractor, shall be cleaned daily as a minimum by the Contractor. These facilities shall be checked for vermin on a two weekly rota.

28.0 FIRE PREVENTION

28.1 Before welding, flame or arc cutting of metals, or other processes involving heat or naked lights are permitted, a fire risk assessment shall be carried out by the contractor and arrangements agreed with OWNER/CONSULTANT who will issue a Permit to Work.

28.2 Contractors shall familiarize both themselves and their employees with the fire safety arrangements, fire alarms, means of escape and emergency evacuation procedures.

28.3 Before leaving the premises and site, contractors shall ensure that naked lights and other ignition sources have been extinguished and electrical apparatus, where practicable, switched off and/or disconnected.

28.4 Contractors shall store Highly Flammable Liquids and Liquefied Petroleum Gases in a manner approved by OWNER/CONSULTANT.

28.5 OWNER/CONSULTANT' fire protection equipment shall only be used in an Emergency. Fire extinguishers/fire blankets for use when carrying out hot work shall be provided by the Contractor.

29.0 REMOVAL OF WASTE FROM CONSTRUCTION SITES

29.1 The removal of waste shall only be undertaken by Licensed Waste Carriers.

29.2 Where there is any doubt of the composition of excavation spoil, it must be analyzed before it is removed from site.

29.3 Evidence of compliance shall be submitted to OWNER/CONSULTANT prior to the removal of any waste from site.

29.4 Controlled waste is any kind of household, industrial or commercial waste. This includes, for example:

- Scrap metal.
- Building, construction, demolition and excavation waste, including waste from any repair or renovation.
- Clinical waste.
- Anything which is unwanted because it is surplus, broken, worn out, contaminated or spoiled in some other way.

Controlled waste disposal must be managed via a chain of transfer notes, maintained by the contractor and readily retrievable for OWNER/CONSULTANT' inspection.

30.0 EXCAVATIONS AND OPENINGS

30.1 No excavation work shall be commenced by the Contractor unless a valid excavation permit has been issued. The Contractor shall have on site at all times while excavation work is being carried out, detection equipment which meets the latest technology.

30.2 Prior to the start of any excavation, OWNER/CONSULTANT shall be consulted and the presence of overhead and buried service records shall be checked. Where "live" services are present, hand excavation must be carried out until the location of the service has been identified, recorded and made safe.

30.3 The Contractor must erect suitable solid edge protection (i.e., double handrails) around excavations or openings. During the hours of darkness any excavations, openings or obstructions near or on roadways and walkways must be indicated by a sufficient number of warning lamps.

30.4 The sides of all excavations should be properly shored, battered or stepped to prevent collapse. No excavation work shall commence unless there are adequate resources present to ensure the stability of the excavation. Excavations shall be inspected prior to, or re-commencement of the work to ensure the excavation is still in a safe condition.

30.5 All excavations shall have a proper ladder access point provided.

30.6 Spoil from excavations must be piled at least 1m from the edge of the hole.

30.7 Vehicular traffic shall be restricted from the edges of excavations, to prevent possible collapse.

31.0 ELECTRICITY

31.1 All Contractors must provide their own electrical power supplies or as per Technical ITB.

31.2 Contractors must not interfere with, or work on any of, the Client's electrical installations or equipment without written consent.

31.3 Where Contractors have to work in the vicinity of electrical equipment they must carry out a risk assessment prior to commencement of any works.

ALL EQUIPMENT MUST BE TREATED AS "LIVE" UNLESS ISOLATED/LOCKED OFF AND TAGGED.

31.4 Repair or installation of any electrical equipment must only be carried out by a competent qualified electrician.

31.5 The electrical supply to powered hand tools must not exceed permissible volts, centre tapped giving appropriate volts to earth. Where this is not possible, due to the type of tool being used, the approval of OWNER/CONSULTANT must be sought in writing.

Electrical lighting for use in confined spaces must not exceed 24 volts (and be explosion proof where applicable). Powered hand tools used in confined spaces should, where possible, be air operated.

31.6 Contractors requiring to install temporary electrical supply equipment shall submit a temporary electrical supply procedure to OWNER/CONSULTANT for approval. The procedure shall, where necessary, cover installation of 380/440 volt system, installation of 110 volt system, lighting system, welding equipment installation, inspection testing operation and maintenance of temporary electrical systems.

31.6.1 **Distribution Boards** - Semi-permanent or Long Term

These should be accommodated in weatherproofed locations and be so arranged, if possible, that they will not need to be moved during the Contract. They should be proofed against interference or unauthorized operation and they should be large enough to accommodate all the necessary apparatus required. Each circuit should be clearly labeled and a circuit diagram should be located at each board.

31.6.2 **Distribution Boards** – Temporary

These are usually small portable panels or boards containing two or three socket outlets. They must be of robust construction, preferably all-insulated and should be supplied by heavy duty flexible cables, these cables shall not be spliced. Socket outlets, plug connectors and cable couplers should comply with High Standards or equivalent industry standard.

31.6.3 **Distribution Cables**

These cables run from the main distribution boards to the local distribution boards throughout the site.

The cables will normally be multi-strand multi-core armored PVC cables but, in certain cases, may take the form of Mineral Insulated Copper Clad (MICC) cables. The latter type should be sheathed with PVC.

The installation must be so arranged as to prevent the need for long trailing cables. Socket outlets should be located as near the working point as possible.

Power and lighting circuits should be kept separate.

A full record should be made of all parts of the installation and should be kept up to date when alterations or extensions are made.

31.6.4 **Underground Cables**

Cables may be provided by the Contractor and laid underground or overhead to connect the supply or metering point to the semi-permanent site distribution boards.

The cables must be suitable for the duty and loading expected, e.g., armored PVC cables.

The cables should be buried at a safe depth or taken from a height so as not to obstruct the movement of persons and vehicles and their routes clearly marked both on the site and on the site plans.

The cables should be properly terminated and be provided with efficient circuit protection.

Cable routes should be so arranged that the minimum of obstruction is caused. The cables should be treated with care and given the same supervision and protection as other cables.

31.7 No temporary electrical supply shall be installed or modified without the agreement and approval of OWNER/CONSULTANT.

31.8 Any tool, plant or equipment exceeding 110 volts (55v to earth) shall be connected to an earth leakage circuit breaker (ELCB).

32.0 WORK IN CONFINED SPACES

32.1 All work in confined spaces must be covered by a safety method statement.

Safety method statements for work in confined spaces should include arrangements for the following as a minimum:

- Issue of a permit to work
- Work scope and method.
- Nominated Supervisor.
- Tally man.
- Rescue procedures and equipment.
- Training.
- Tools and equipment to be used, including low voltage or pneumatic.
- Lighting requirements, including standby/emergency.
- Explosion proof fittings.
- Low voltage or pneumatic tools.
- Ventilation.
- Access.
- Bonding to prevent both electrical shock and static discharge.
- Work cycles, to reduce risk of heat exhaustion.
- Fire safety and extinguisher requirements.

32.2 Contractors shall not enter or commence work in any excavation, tank, vessel, pipe or chamber or other enclosed space, until a valid permit to work has been issued. Where Contractor's operations result in a dangerous atmosphere arising during the monitoring of the work activity, the permit to work issuing authority must be informed and all personnel removed from the area.

No new activity shall be introduced into a confined space without the permission and signed approval of the permit to work issuing authority.

Whilst work is ongoing within a confined space, the Contractor will be required to provide a trained standby/tally man.

32.4 All personnel who have to enter confined spaces must have undertaken the training appropriate to this task.

33.0 MOBILE CRANES

33.1 All cranes (including piling rigs, fork lift trucks, mobile elevated work platforms, hand lorries and similar equipment), whether owned by the Contractor or hired, must carry relevant test certificates and thorough examination reports, together with the manufacturer's handbook. Copies of this documentation must be submitted to Owner/Consultant prior to commencing work.

33.2 Only persons who are certificated as competent and authorized shall be allowed to operate cranes. The Contractor must be able to prove the competence of their employees to operate such equipment prior to its use.

33.3 Crane operators or other competent persons must carry out daily inspections and enter these in the crane register. Failure to maintain the register properly may lead to suspension of operations. This obligation is the responsibility of the crane hirer when he is supplying the crane and the operator. In addition, the Contractor will implement a regular inspection and maintenance programme to ensure that all components of the lifting device are in good condition.

33.4 Travel routes for cranes and crane standing must be agreed with OWNER/CONSULTANT in order to avoid such things as overhead lines and other structures, underground services, excavations, made up ground, etc. Load spreader pads of sufficient size and thickness area, and of suitable material, e.g., metal plates, timber, etc, are to be placed under each outrigger foot, before all crane lifting operations are allowed to commence.

33.5 Crane duty charts (Load Radius Tables) must be displayed on or be available in the crane for easy reference. In addition, crane manufacturers' rigging/de-rigging instructions must be available on site. During rigging/de-rigging of jibs/booms, provision must be made to support sections/either side of rigging points, from below, utilizing tightly packed blocks.

33.6 All cranes shall be fitted with:

- A reverse warning audible alarm.
- Load radius indicator.
- Automatic safe load indication.
- Crane hooks with safety catches.

All of which must be serviceable.

33.7 All lifting equipment accompanying the crane shall comply with the requirements of lifting regulations.

33.8 The assembly, rigging and de-rigging of any crane components, including fly jibs, shall only be done under the supervision of a competent lifting supervisor. An approved risk

assessment, together with the manufacturers' rigging/de-rigging instructions must be in place covering rigging activities for the equipment.

33.9 Every Contractor involved in lifting operations with a crane (including a piling rig) or mobile crane shall appoint, in writing, a lifting supervisor to oversee all lifting operations.

33.10 No crane shall travel with a suspended load.

33.11 Outriggers, when installed, must always be used.

34.0 LIFTING OPERATIONS

34.1 A Lifting Study and Safety Method Statement must be prepared for all heavy lifts exceeding 10 tons, or of a complex nature, e.g., tandem lifts or as specified by the Construction Manager (or the Rigging and Lifting Supervisor) and submitted to OWNER/CONSULTANT for review.

34.2 Every lifting operation must be properly planned by a nominated, competent person.

34.3 Every lifting operation shall be appropriately supervised.

34.4 All slinging and rigging of loads must be carried out by competent personnel.

34.5 Clear communications between the crane operator and the person responsible for controlling the lift must be established.

All statutory Inspection Reports/Certification/Documentation and proof of the driver's training shall be photocopied and handed to OWNER/CONSULTANT prior to the setting up of the crane. Certification for lifting equipment to be used in the lift shall be identified and cross checked with the item of plant

35.0 STEEL ERECTION

35.1 The weight of each component in excess of 500 kg shall be clearly marked upon it.

35.2 Erectors must be fully informed of the correct erection sequence, by their supervisor, prior to each stage of work commencing.

35.3 Vertical access provision should, whenever possible, be fixed to the steel before it is lifted into position. Where this is not possible permanent access, ie, stairways or permanent metal ladders, shall be installed as early as possible.

35.4 Where horizontal access along structural members is required, as much work as possible must be completed before the steel is lifted into position. This includes:

Fixing of handrails or posts for securing steel wire ropes to be used in conjunction with safety harnesses or inertia reels.

The fixing of scaffold tubes (needles) to the lower flange of an I-beam to allow a working platform to be erected.

Where scaffold tubes (needles) are used they shall not support a working platform wider than three boards, or one lightweight staging without being "picked up".

Where no ladder access, permanent stairway, etc, leads onto working platforms, as described above, employees must use man riding baskets or mobile elevated work platforms as far as reasonably practicable to access working areas.

36.0 SCAFFOLDING

36.1 All scaffolding must be of good quality, be erected in compliance Good Practices for Access and Working Scaffolds, and special scaffold structures in steel. In addition to the main guard rail, an additional guardrail is required such that the gap between the toe-board and main guardrail does not exceed 470mm and all boards must be secured, without causing a tripping hazard.

36.2 All scaffolding shall be erected, modified and inspected by qualified competent scaffolders.

36.3 Where materials are to be positioned on scaffolding the Contractor's supervision must ensure that the scaffolding is not overloaded.

36.4 Before use, scaffolding shall be inspected by an authorized Scaffold Inspector who shall complete a "scaffold tag" and secure it in a prominent position at the base of all ladder access points. The scaffolding tag will clearly show the following information as a minimum:

- Location.
- Reference number.
- Requested by.
- Access Scaffold Classification.
- Maximum distributed load/working lift.
- Maximum number of working lifts to be used simultaneously.
- Date erected.
- Erected by.
- Inspected by.

36.5 Scaffolds shall be inspected at weekly intervals or after storms by the authorised Scaffold Inspector who shall sign and date the "Scaffold Tag" after each inspection. Scaffolding not considered safe shall have the Scaffold Tag withdrawn and a prominent "DO NOT USE" sign displayed.

36.6 A scaffold register shall be maintained by the authorized Scaffold Inspector. This shall contain:

- Date of first and subsequent weekly inspections.
- Individual identifications of all scaffolds which shall be cross-referenced to the Scaffold Tag identity number.
- Clear name and signature of the authorized Scaffold Inspector against each separate scaffold inspected.

36.7 No scaffold may be erected which impedes normal access or can be accidentally struck by moving plant without prior consultation with OWNER/CONSULTANT to ensure that a safe system of work is in place.

36.8 Contractors are not permitted to erect or carry scaffolding near live overhead electrical cables, or equipment because of the danger of tubes making accidental contact with electrically charged apparatus.

36.9 If there is any doubt about the security of any anchorage, suspension points or ties for a scaffold, e.g., strength of existing buildings/structures, or those under construction, OWNER/CONSULTANT must be consulted before proceeding with erection.

36.10 All scaffolds must be provided with suitable access. Where ladders are used for this purpose they must be of adequate length and properly secured by lashing or fixing to prevent displacement.

36.11 Action shall be taken to warn personnel against using partly erected or dismantled scaffolds. A prominent “DO NOT USE” sign shall be clearly displayed.

36.12 OWNER/CONSULTANT shall approve the sitting of the scaffold material racks/compounds.

36.13 Mobile tower scaffolds shall not be constructed with a height greater than 3 times the minimum base width and shall only be used on level ground. Towers shall only be erected by trained personnel.

36.14 In addition to weekly inspections, wooden scaffold boards shall be subject to a monthly inspection to ensure wood has not rotted or been subject to insect damage

36.15 The Contractor shall ensure that the system of work employed for the erection and dismantling of scaffolding shall not expose the Scaffolders to any risk.

36.16 All scaffolding must be erected and dismantled to the requirements laid down in the current regulations and guidance notes and to the requirements of OWNER/CONSULTANT.

37.0 LADDERS/STEPS

37.1 Ladders must be in good condition and free from defects, i.e., broken rungs, split stiles.

37.2 Ladders must not be painted.

37.3 Ladders must:

- Be securely fastened at the top.
- Be properly positioned at the base.
- Extend at least 1m (5 rungs) above the working platform.
- Be at an angle of 300mm out for every 1.2m vertical drop.

37.4 **All steps used on the project Site**.

37.5 Only one person must be allowed on a set of steps at any one time.

37.6 Persons must work with a set of steps of the appropriate height for the task.

37.7 The top rung of the steps must be kept at waist height, no work to be carried out above this height on steps.

37.8 Ladders are to be used as a means of access not as a working platform except for light, minor or one off activities. Then the person must wear a harness and tie-off to a suitable anchorage whilst carrying out the minor task.

38.0 FALL PROTECTION

38.1 Depending on the task and the risks, harnesses and appropriate anchorages/running lines will be used for activities carried out above a height of 2 meters.

38.2 Fall protection equipment shall be subject to regular inspection by a competent person, and a register maintained for OWNER/CONSULTANT' inspection.

38.3 During the execution of work at height, where it is not practicable to work from within a standard working platform with double handrail and toe boards (for example erection of structural steelwork, installation of roof components, etc), safety netting capable of catching a falling person must be installed as far as reasonably practicable.

38.4 The provision of safety netting does not relieve individuals from utilizing fall protection devices during the execution of the works.

38.5 The safety nets should be manufactured to Indian Standard and erected in accordance with good practices by a competent person.

38.6 The safety nets must bear a label stating the normal size of the net; the date of manufacture, the deflection at the centre of the net during the prescribed test and the maximum distance below the working height for which the net is designed to be used.

38.7 Test certificates must be provided for all safety nets, which will state the breaking strength of the net and provide details of the drop test carried out.

38.8 All safety nets must be periodically tested at intervals not exceeding three months – and records of these tests must be retained.

38.9 A formal inspection of safety nets must be carried out weekly to check for damage, loose ties, changes in anchorage points, etc. Records of these inspections must also be retained.

39.0 MOBILE ELEVATED WORK PLATFORMS

39.1 The term Mobile Elevated Work Platform (MEWP) covers the following types of equipment:

- Scissor lifts.
- Telescopic booms or jibs.
- Articulating and telescopic booms.

39.2 Anyone who is to operate a MEWP must be competent and have received formal training accredited by manufacturer.

39.3 Prior to any MEWP being used on site, a formal risk assessment must be carried out to identify any potential hazards which may exist as a consequence.

39.4 Whilst working within the platform of a MEWP, all personnel must wear a safety harness which is attached to a secure anchorage point within the platform.

39.5 Before commencing work from a MEWP, the surrounding area should be cordoned-off to prevent personnel straying into a potentially hazardous area.

39.6 The Safe Working Load specified on the MEWP must not be exceeded.

39.7 If the MEWP has been manufactured with outriggers or stabilizers, they must always be deployed.

39.8 Prior to commencing work, ground conditions must be checked to ensure that the ground bearing capacity will not be exceeded by the loading from the MEWP. Where required, spreader plates shall be used to distribute the loading.

39.9 The MEWP shall only be permitted to travel with the platform occupied and/or the boom extended if it is within the machine's specified operational capabilities.

39.10 MEWP shall not be used as a jack, prop or support.

39.11 MEWP shall not be used as a crane or lifting device.

39.12 MEWP shall not be used primarily for the transport of goods or materials.

39.13 MEWP shall not be used in wind speed exceeding 30 mph (12.5 m/s).

39.14 All MEWPs must be subjected to a regular maintenance and inspection regime, which as a minimum will require weekly inspections by a competent person and a thorough examination every six months.

40.0 CONTRACTORS' TOOLS AND EQUIPMENT

40.1 All Contractors' tools and equipment must be fit for purpose. Tools should be CE marked.

40.2 Guards and electrical trip switches must work effectively and must not be removed or by-passed.

40.3 All tools shall be of good quality and maintained in a safe working condition. Home made tools are not permitted.

40.4 The Contractor shall provide suitable storage with suitable racks and bins for storing tools and equipment.

40.5 All temporary construction leads, lighting and portable electric tools shall be of appropriate volts.

40.6 The Contractor shall nominate or employ the services of a competent qualified person to inspect and tag electrical power hand tools, transformers, distribution boards, extension cables, etc, on an at least a three monthly basis (PAT testing). The tag shall display name, signature of the individual inspecting the tool and date of inspection.

40.7 The Contractor shall keep, on site, a register of all electrical power hand tools in use. The register shall detail:

- Individual identity number of the tool.
- Name, signature and company of the qualified electrician carrying out the inspection.
- Date of inspection.
- Maintenance and Inspection schedule.
- Remarks on condition of tool and whether repaired or withdrawn from use.

40.8 No electrical powered hand tool shall be used unless it is tagged with a current "INSPECTION" tag.

40.9 All electrical leads must be connected to the power source through standard industrial waterproofed plugs and sockets, which shall be in good condition.

41.0 MECHANICAL PLANT AND EQUIPMENT

41.1 Mechanical plant and equipment is defined as:

- Earthmoving plant.
- Road making plant and equipment.
- Concrete batching plant and mixers.
- Forklift trucks.
- Miscellaneous plant, including generators and compressors.
- Mobile elevating work platforms (e.g., star- lift, cherry picker, etc).

41.2 All items of mechanical plant transported to the project shall be in a safe and sound condition and shall be properly maintained. Emissions shall be to acceptable limits and no smoke shall be discharged.

41.3 A programme of regular, preventative maintenance shall be established by the Contractor, as per the manufacturer's handbook, to ensure that all plant equipment is systematically inspected, maintained and repaired as necessary.

41.4 The preventative maintenance programme and the Contractor's employee responsible for taking the action shall be clearly detailed, identified and given to OWNER/CONSULTANT.

41.5 A safe system of work must exist during all maintenance and repair operations to ensure that no part of the machinery is set in motion while work is being carried out.

41.6 Plant maintenance must not be carried out within the main construction site.

41.7 Where refueling is required, facilities provided shall be adequately covered by fire extinguishers, earthing, warning signs, bonding and proper fuel dispensers. Refueling areas shall be curbed to avoid spills.

41.8 Waste oil removed from vehicles after servicing shall be sent to the appropriate off-site waste disposal facility and this is the responsibility of the Contractor.

41.9 The OWNER/CONSULTANT'S tools, plant and equipment may not be used by Contractors without their express permission.

42.0 COMPETENCY/PLANT EQUIPMENT

42.1 All drivers and operators of mobile plant (mechanically propelled vehicles) shall be in possession of the appropriate license for the class of vehicle.

42.2 It is the responsibility of the contractor to ensure that all drivers, operators and banks men of mobile plant (mechanically propelled vehicles) are certificated as competent.

42.3 **General**

42.3.1 Every dangerous part of machinery shall be securely guarded.

42.3.2 Any guards removed for maintenance or repair purposes must be replaced before the machine is set in motion.

42.3.3 No mobile plant (mechanically propelled vehicles) shall carry passengers unless a proper fixed seat is provided, except when the equipment is specifically designed for standing personnel.

42.3.4 Mobile plant (mechanically propelled vehicles) must be parked on firm level ground when unattended, the engine stopped, brakes on and any load or attachment lowered to the ground and the keys left in the ignition.

42.3.5 No mechanical plant or equipment shall be sited on or operated on any area of the project without express the permission of OWNER/CONSULTANT.

42.3.6 All items of mobile plant (mechanically propelled vehicles) shall be fitted with a reverse warning audible alarm.

42.3.7 All drivers/operators of mobile plant (mechanically propelled vehicles) shall strictly obey the instructions of the site security, traffic regulations and speed limits. A banks man shall be in attendance during all reversing procedures.

42.4 **Inspection**

All mobile equipment (mechanically propelled vehicles) shall be inspected by a competent person appointed by the Contractor prior to use on site. Equipment considered to be unsafe, by OWNER/CONSULTANT, shall not be allowed access to the site.

42.5 Flame Arrestors

42.6 All mobile plant for use in Petro Chemical Live Plant Areas, or during the Start-up and Commissioning Phase of the project, must be fitted with Exhaust Flame Arrestors and Chalwyn Valves where there is a risk of flammable gas releases.

43.0 MACHINERY GUARDING

43.1 Unauthorized personnel must not operate, interfere or tamper with plant or equipment.

43.2 Persons authorized to use machines must first check that guards are in position and that any other safety devices, e.g., emergency stops, are in working order.

43.3 All plant or equipment brought onto the site must be properly guarded to prevent injury and be CE marked.

NO GUARD OR FENCE MAY BE REMOVED FROM MACHINERY.

44.0 WELDING

44.1 Welding sets shall be in good condition, properly maintained and earthed.

44.2 Isolation switches on welding sets shall be readily accessible.

44.3 Terminals and live components shall be adequately protected.

44.4 Cables shall be frequently inspected to ensure the insulation is intact.

44.5 Damaged cables or electrical holders shall be properly repaired or replaced.

44.6 The welding return cable shall be secured onto the work piece. If this is not practical it shall be as near as possible.

44.7 Proper cable connectors shall be used when connecting runs of cables.

44.8 Welders shall wear:

- Face and eye protection with correct grade of filter.
- Welder's gauntlets.
- Long sleeved flame retardant overalls.

Welders shall wear safety helmets at all times, except whilst welding, when it is agreed as impractical and written permission is granted by OWNER/CONSULTANT, subject to mitigation of hazard, i.e., no work overhead, or shielded from falling objects.

44.9 Welding areas should whenever possible be screened off using flame retardant blanket or other suitable material. All combustible materials must be cleared from the vicinity of all welding operations.

44.10 Asbestos material shall not be used on the project.

44.11 Electric Arc Welding equipment and accessories shall conform to Latest Engineering Standards.

44.12 Fire extinguishers must be provided and kept adjacent to any welding or cutting activity.

45.0 ABRASIVE WHEELS

45.1 Contractors must ensure that any of their employees authorized to change Abrasive Wheels have attended an approved course of training and have been appointed in writing.

45.2 Details of each employee trained must be entered in the training register kept on site. Contractors must produce certificates and registers on request.

45.3 Machines used to drive Abrasive Wheels must be in good condition and properly guarded.

45.4 Pedestal or bench mounted grinders must have an emergency stop button and be fitted with a properly adjusted tool rest and guard.

45.5 All hand held grinders shall have a “Dead Man” switch and appropriate guards fitted.

45.6 The use of hand held angle grinders over 115mm shall only be permitted for specific tasks, subject to Owner’s / Consultant’s approval.

46.0 USE OF GAS AND OXYGEN EQUIPMENT

46.1 Compressed gas cylinders shall:

- Be in good condition and not suffering from corrosion.
- Be properly colour coded (reference should be made to National Standards).
- Be individually identified.

Hoses shall be properly colour coded to the internationally recognized standard for the gas being used, in good condition and fitted with hose connectors attached by permanent clips.

Check valves and flashback arrestors must be used on both hoses at all times.

46.2 Users shall check the equipment for perished, damaged hoses, regulators, and pressure gauges, etc. Defects must be reported to their supervisors and faulty equipment must be replaced.

46.3 When on site, cylinders must be in trolleys or secured in an upright position at all times. A bottle key shall be kept with cylinders in use.

46.4 Stored oxygen and fuel gas cylinders shall be kept separate with minimum separation distance of 5m. Cylinders must never be stored or used in a horizontal position cylinders must be secured in an upright position. Empty cylinders must also be separated from full cylinders. Cylinders shall be stored in lockable open mesh bottle cages.

46.5 All gas cylinders must be handled with care and they must not be misused or abused. They must be properly shut off when not in use and safety caps must be fitted when being moved.

46.6 Great care must be taken to ensure that gas equipment, including hoses, are not allowed to cause obstruction of roadways, walkways, manholes, ladders or other means of access where they can cause hazards or be damaged. Hoses not in use should be coiled up and put in a safe place. Hoses should whenever possible be supported off the ground.

46.7 Where any operation involves the use of gas and oxygen equipment in enclosed or semi-enclosed spaces, Contractors' supervision must carry out frequent checks to ensure these procedures are complied with.

46.8 During meal breaks and at stopping times, hoses and equipment must be removed from confined spaces or excavations. Oxygen or gas cylinders must not be taken into confined spaces for use or storage.

46.9 No modification to tanks or drums which have contained flammable liquid shall be undertaken at the site.

47.0 ABRASIVE AIR BLAST CLEANIN

47.1 Blast cleaning shall be carried out in an enclosed designated area.

Provision shall be made to prevent the spread of grit and dust out of the blast area and to collect and dispose of the spoil to an approved location.

47.2 The blast cleaning area shall be indicated by prominent warning signs.

47.3 Only approved abrasives having no free silica shall be used.

47.4 Personnel involved in the actual blasting of material shall be protected by a positive pressure, blast hood, meeting approved standards and providing both respiratory and eye protection, with breathing air supplied via a suitable filter.

47.5 The nozzle shall be fitted with a properly functioning dead man's handle, and anti-static abrasive blast hoses. It is required that all equipment be grounded and checked for ground potential

47.6 A standby man shall stay by the blast pot.

48.0 COMPRESSED AIR

48.1 All air receivers and compressors shall be in good condition and properly maintained.

48.2 Air receivers shall be individually identified and marked with their safe working pressure.

48.3 Air receivers shall be accompanied by a valid test certificate which shall be kept on site by the Contractor and shown to OWNER/CONSULTANT before bringing the vessel onto site.

48.4 All air receivers must be fitted with a properly set pressure relief valve.

48.5 Air receivers shall be examined and the pressure relief valve tested by an independent examiner at yearly intervals.

48.6 There shall be a register of all air receivers containing:
- Individual identification numbers.
- Dates of independent inspections.
- Name and signature of independent examiner.
- Rates safe working pressure.
- Pressure at which pressure relief valve lifted shall be kept on site by the Contractor along with all current certification.

48.7 The requirements inclusive also apply to compressor mounted air receivers.

48.8 All compressed air fittings shall be wired and/or restrained to prevent them from whipping should the coupling separate.

48.9 Only hose clamps designed for compressed air service shall be used. Worm drive (Jubilee) clips are not acceptable.

COMPRESSED AIR MUST NEVER BE USED FOR CLEANING CLOTHES.

48.10 Nozzles used for air blowing must be fitted with a “Dead Man” valve.

49.0 MOBILE PHONES AND PAGERS

49.1 Radios, personal CD and tape players are not allowed in the construction areas.

49.2 Mobile phones and pagers are prohibited in the designated construction areas by any hands-on personnel. External to the designated construction areas, providing it does not detract the user from any safety requirements and the user is stationary, then mobile phones and pagers may be used. **Other uses of this equipment will be at the discretion of OWNER/CONSULTANT.**

50.0 RADIOGRAPHY/NDT

50.1 Contractors who carry out radiography/NDT on the site must comply with safe systems of work. In particular, they MUST ensure that:
- Radiography areas are clearly marked using barrier tapes, notices and flashing lights.
- Audible warning (horns) must be sounded before a source is exposed.
- Only Classified Workers are engaged in radiography work.
- All other personnel are clear of the area before radiography takes place.
- Radiography work is supervised by a Qualified Radiological Protection Supervisor. Such supervisors must be nominated in writing and notified to OWNER/CONSULTANT.
- Any incident which may have resulted in over-exposure of any personnel is brought to the attention of OWNER/CONSULTANT for investigation.
- They have a written emergency procedure to be followed in the event of loss of an isotope or damage or malfunction of associated equipment. This procedure must be submitted to OWNER/CONSULTANT for approval before commencement.
- A certified meter is available on site.

- Radiography is carried out at the times agreed with OWNER/CONSULTANT normally this will only be during silent hours. OWNER/CONSULTANT requires twenty-four hours notice of such planned work.

50.2 Contractors who are not involved in radiography work must ensure that their employees observe warning notices, alarms and barriers in use where such work is being carried out.

50.3 Contractors must ensure that statutory notification is made to the authorities of radiography works.

50.4 Disposal of spent radioactive sources shall be agreed with OWNER/CONSULTANT.

51.0 WORKING OVER WATER/DIVING OPERATIONS

51.1 The Contractor shall provide a buoyancy aid to any employee working over (or near) water where there is a likelihood of falling in.

The Contractor shall also supply a sufficient number of life buoys to be permanently located at the point(s) of danger. The life buoys shall be attached to a throwing line.

Where rescue of a person falling into the water may be difficult, OWNER/CONSULTANT may require the Contractor to supply a standby boat, crewed by a competent boatman trained in rescue and resuscitation techniques.

51.2Diving operations may only be carried out using approved specialist diving contractors, employing certified commercial divers, and upon acceptance by OWNER/CONSULTANT of their Health, Safety and Environment plan and method statements (Diving Rules).

52.0 ASBESTOS

52.1 Only certified Contractors are allowed to handle asbestos.

53.0 IMPROVEMENT AND PROHIBITION NOTICES

53.1 In the event of an Improvement or Prohibition Notice being served by an Inspector, the OWNER/CONSULTANT Senior Representative must be notified immediately and the Contractor shall comply with the terms of such Notice immediately.

54.0 CARTRIDGE OPERATED FIXING TOOLS

The use of Cartridge Operated tools shall only be permitted with the express permission of OWNER/CONSULTANT, subject to an approved method statement and risk assessment, and use only by competent, trained operators).

55.0 SITE ESTABLISHMENT AND AMENITIES

55.1 Details of temporary services to be provided by Contractor or as Per Technical portion of ITB.

56.0 ACCOMMODATION

56.1 An area will be allocated for temporary site establishment facilities/services.

56.2 When required by the Contract, the Contractor shall provide and maintain (including de-watering when necessary) a suitable level and hardcore surface in the area allocated for temporary buildings such as offices, stores, workshops, mess huts and a stores compound.

56.3 When required by the Contract, the Contractor shall provide all site offices, stores facilities, workshops and mess huts for the accommodation of staff/site personnel. Proposals for the Contractor's temporary buildings shall be submitted to OWNER/CONSULTANT for approval with their tender.

56.4 **Storage in Permanent Buildings**

No Plant, Contractor's Equipment or Construction Aids shall be stored in any permanent building without first obtaining the written permission of OWNER/CONSULTANT. Such permission will not relieve the Contractor of the obligation to protect the building from damage whilst used as a store. If permission to use the building is refused by OWNER/CONSULTANT, the Contractor shall provide alternative storage facilities at no additional cost to OWNER/CONSULTANT.

56.5 **Sanitary Facilities**

All toilets and washing facilities shall be provided by the Contractor.
The supply and installation of necessary water sewage/drainage pipe work, pits, etc, for the facilities and the regular emptying and servicing are the responsibility of the Contractor.

56.6 **Canteen**

The Contractor must provide mess-huts for his employees and arrange any canteen facilities required for his employees and those of any others employed by him in connection with the Work.

57.0 TEMPORARY SERVICES

57.1 **Telephone, Facsimile, etc**

Arrangements for the provision of telephones, computer modems and/or facsimile facilities shall be made directly with providers of such facilities by the Contractor.

57.2 **Electricity**

If under the contract the Contractor is responsible for providing electricity for the site establishment amenities and working area(s), the Contractor shall ascertain the type, location and available spare capacity of the electrical point(s) of supply and provide cable, connections, isolating switches and earth leakage protection of approved specification.

If the Contractor's requirements for temporary electrical supplies exceed those agreed and render the available service inadequate, the Contractor shall provide the additional requirements at no extra cost to OWNER/CONSULTANT.

Electrical installations including all cables, temporary connections, wandering leads and all electrical facilities and/or equipment required for the execution of the Works shall be properly installed and maintained by the Contractor.

Temporary electrical installations must comply with all appropriate statutory requirements, the latest edition of the Institution of Electrical Engineers Regulations, COP for Distribution of Electricity on Construction and Building Sites and Electrical Safety on Construction Sites.

Electrical equipment and installation shall at all times be subject to inspection and approval by OWNER/CONSULTANT but this shall not relieve the Installer/User of their responsibilities for the safety of the system.

Electrical equipment or cables forming part of the permanent installation shall not be used by the Contractor for temporary services.

Temporary buildings shall have an external isolating switch.

The Contractor shall supply, install and maintain any temporary workface lighting.

57.3 **Water**

Supply of potable water for drinking and raw water for washing/toilet facilities, mixing concrete, hydrostatic testing and other construction purposes shall be in Contractor's scope. The Contractor shall ascertain the location of the supply point and shall provide and install any temporary pipe work necessary for the provision, use and disposal of such water.

58.0 DISCHARGES INTO THE INTERNAL AND EXTERNAL DRAINAGE SYSTEMS, LAND AND CONSTRUCTION AREAS

58.1 All proposed controlled discharges into the site drainage systems shall be agreed with OWNER/CONSULTANT.

58.2 Any water discharged on existing roads, hard shoulders or drainage systems shall first pass through a filtering interceptor (which must be regularly cleaned) to prevent the discharge of sludge or solids.

58.3 Any damage to the Works caused by prolonged or excessive pumping and any damage or nuisance arising out of pumping operations shall be the liability of the Contractor.

58.4 Subsequent to filling with water and testing of any part of the Works for hydraulic testing, the Contractor shall be responsible for safe disposal of the water, and shall ensure that the rate of discharge is controlled and kept within the capabilities of any drainage system utilized.

58.5 The Contractor shall provide all requisite equipment and materials to ensure that all drains, rivers, streams or waterways are safeguarded against pollution.

59.0 MAINTENANCE OF ROADS AND DRAINS

59.1 Existing roads, road gullies and drains shall be inspected by OWNER/CONSULTANT and the Contractor prior to work commencing. A record of this inspection shall be compiled and on the completion of the Works, a further inspection will be carried out and any necessary repairs to road surfaces or cleaning of drains shall be to the Contractor's cost.

59.2 The Contractor shall provide temporary protection to any existing roads to prevent all possibility of damage whatsoever arising from the Works.

59.3 The Contractor shall at all times in the execution of the work maintain all public and site roads in a clean condition to the satisfaction of OWNER/CONSULTANT.

59.4 The Contractor shall immediately remove all mud, earth and debris from road surfaces.

59.5 Track-laying cranes and similar vehicles must not travel on finished roads without written authority from OWNER/CONSULTANT and then only with the use of timber mats or approved precautions to prevent damage to the roads. Timber mats or other approved precautions shall be supplied by the Contractor.

60.0 MATERIALS – STORAGE AND CONTROL

60.1 The Contractor must give a minimum of twenty-four hours notice of the intention to uplift and transport materials/equipment supplied free-issue from OWNER/CONSULTANT/Client' storage facilities to the point of erection or Contractor's storage facility.

60.2 Free-issue materials/equipment furnished by OWNER/CONSULTANT shall be accepted by the Contractor and become the responsibility of the Contractor until acceptance of the Works. Any damage caused to free-issue materials after acceptance shall be repaired or replaced by the Contractor to OWNER/CONSULTANT' satisfaction.

60.3 **Storage of Petrol, Fuels, Lubricants etc**

All fuel and construction materials which may contaminate the site drains, land or watercourses shall be stored in bounded areas. Refueling of plant shall be via bounded bowers. All construction plant in static locations shall have drip trays which shall be cleared daily.

60.4 **Environmental Impacts**

The Contractor shall, prior to commencement of the work, present to OWNER/CONSULTANT for their approval a register of environmental impacts that necessarily arise from their works.

Each identified environmental impact shall be accompanied by an individual Risk Assessment, clearly showing the reduction measures put in place to ensure mitigation of residual risk.

61.0 PENALTY

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

The amount of penalty shall be limited to 0.5 % (Zero decimal five percent) of the contract value.

The amount of penalty applicable for the Contractor on different types of HSE violations is as below.

1. For not using personal protective equipment (Helmet, Shoes, Goggles, Gloves, Full body harness, Face shield, Boiler suit, etc.) **Rs 500/- per day/ Item / Person.**

2. Working without Work Permit/Clearance **Rs 20000/- per occasion.**

3 Execution of work without deployment of requisite field engineer / supervisor at work spot **Rs. 5000/- per violation per day.**

4. Unsafe electrical practices (not installing ELCB,using poor joints of cables, using naked wire without top plug into socket, laying wire/cables on the roads, electrical jobs by incompetent person, etc.) **Rs 10000/- per item per day.**

5. Working at height without full body harness, using non-standard/ rejected scaffolding and not arranging fall protection arrangement as required, like handrails, life-lines, Safety Nets etc.**Rs. 10000/- per case per day.**

6. Unsafe handling of compressed gas cylinders (No trolley, jubilee clips double gauge regulator, and not keeping cylinders vertical during storage/handling, not using safety cap of cylinder).**Rs 500/- per item per day.**

7. Use of domestic LPG for cutting purpose / not using flash back arresters on both the hoses/tubes on both ends. **Rs. 3000/- per occasion.**

8. No fencing/barricading of excavated areas /trenches.Rs. 3000/- per occasion.

9. Not providing shoring/strutting/proper slope and not keeping the excavated earth at least 1.5M away from excavated area. Rs.5, 000/- per occasion.

10. Non display of scaffold tags, caution boards, list of hospitals, emergency services available at work locations.Rs.1000/- per occasion per day

11. Traffic rules violations like over speeding of vehicles, rash driving, talking on mobile phones during vehicle driving, wrong parking, not using seat belts, vehicles not fitted with reverse horn / warning alarms / flicker lamps during foggy weather. Rs. 2000/- per occasion per day

12. Absence of Contractor's RCM/SIC or his nominated representative (prior approval must be taken for each meeting for nomination) from site HSE meetings whenever called by Consultant/Owner & failure to nominate his immediate deputy (in the site organ gram) for such HSE meetings. Rs10000/- per meeting.

13. Failure to maintain HSE records by Contractor Safety personnel, in line with approved HSE Plan/Procedures/Contract specifications.Rs 10000/- per month.

14. Failure to conduct daily site safety inspection (by Contractor's safety engineers/safety officers), internal HSE meeting, internal HSE

Awareness/Motivation Program, Site HSE Training and HSE audit at predefined frequencies (as approved in HSE Plan).Rs.10000/- per occasion.

15. Failure to submit the monthly HSE report by 5th of subsequent month to Project's Engineer-in-Charge /Owner Rs. 10000/- per occasion and Rs.1000/- per day of further delay.
16. Poor House Keeping Rs. 5000/- per occasion per subject

17. Failure to report & follow up accident (including Near Miss) reporting system within specific timeframe.Rs. 20000/- per occasion

18. Degradation of environment (not confining toxic spills, spilling oil/lubricants onto ground).Rs10000/- per occasion

19. Not medically examining the workers before allowing them to work at height / to work in confined space / to work in shot-blasting / to work for painting / to work in bitumen or asphalt works, not providing ear muffs while allowing them to work in noise polluted areas, made them to work in air polluted areas without respiratory protective devices,etc. Rs 5000/- per occasion per worker.

20. Violation of any other safety condition as per job HSE plan / work permit and HSE conditions of contract (e.g. using crowbar on cable trenches, improper welding booth, not keeping fire extinguisher ready at hot work site, unsafe rigging practices, non-availability of First-Aid box at site, not using hood with respiratory devices by blaster for shot//grit blasting, etc.) Rs. 5000/- per occasion.

21. Failure to carry-out Safety audit in time (internal & external), close-out of identified shortfalls of Observations of Safety Aspects(OSA),etc. Rs. 20,000/- per occasion.

22. Carrying out sand blasting instead of grit/shot blasting Rs. 50,000/- per day.

23. Failure to deploy adequately qualified and competent Safety Officer Rs. 10000/- per day per Officer.

24. Utilization of hydra/ back-hoe loader for material shifting or any other unauthorized /unsafe lifting works Rs 25,000/- per occasion.

25. Any violation not covered above to be decided by Consultant/Owner.

26. Any physical injury - maximum of Rs.2,00,000 per injury

27. Fatal accident - Rs. 25,00,000 per fatality

62.0 FOLLOWING SHALL BE APPLICABLE FOR MANDATORY MEDICAL EXAMINATION OF CONTRACTOR WORKERS BEFORE DEPLOYMENT AT WORK SITE:

Medical examination will be in the scope of the contractors.

Medical examination to be conducted by a doctor with minimum MBBS qualification, having registration number for practicing.

Certificate issued should have endorsement on the photo & clearly mention general health/fitness of the candidate to carryout work inside plant, including eye sight, Vertigo, BP,Heart, convulsion problem etc.

Certificate of fitness is to be issued on letter head of doctor and to be produced with application for photo Gate pass to the E-I-C for the job.

Validity of medical certificate will be for one year from the date of issuance.

Gate pass issued by CISF will bear “Medically Fit” stamp based on the E-I-C‘s recommendation.

Accordingly, this shall be treated as part of the tender.

MEDICAL CERTIFICATE

Affix latest PHOTO impression of the workmen half covering the photo.

Form for Medical Check Up for the Workman engaged by the Contractor

Certified that I, _____ have examined Shri _____Age _____
who has signed / thumb impression above on the photo in my presence. The details of his examination
as required are given in the enclosed medical examination report. I certify that all clinical and pathological tests were done in my hospital/dispensary under my instructions. General and physical examinations of Shri _____ do not reveal any abnormality. He does not suffer from any
acute / chronic disease or any contagious or infectious disease. He is medically fit to work inside plant. He is free from Vertigo, Epilepsy or Fits, general giddiness and height related disease. His B.P.Pulse, Eyesight etc. are normal.

In my opinion, Shri _____ is physically and mentally fit for undertaking physical labour inside the plant.

Sign_____
Date: _____

Signature and Rubber stamp of medical practitioner with name

Note: This certificate is to be given on the letterhead of the registered medical practitioner who is possessing MBBS qualification as recognized by the Indian medical council. Below the signature, the
rubber stamp of the medical practitioner should be affixed. The letterhead normally should contain the following:

1) Name of the Medical practitioner:
2) Qualifications:
3) Registration Number:

4) Designation:
5) Address*:*

63.0 ADDITIONAL SAFETY REQUIREMENT

A. Strict implementation of IS marked safety helmets & IS/CE marked safety shoes for contract personnel

All the contractors working inside the plant shall ensure that their supervisors/labourers compulsorily wear IS marked safety helmets & IS/CE marked safety shoes while entering plant premises. No contract personnel shall be allowed inside battery area without wearing IS marked safety helmets & IS/CE marked safety shoes. All EIC's/site engineers and F&S department shall sensitize and spread awareness among the contract personnel.

Name of Tenderer: …..……..

Signature & Seal of Tenderer: ……

SECTION-5.0

SCHEDULE OF RATES (SOR)

SECTION-5.1

PREAMBLE TO SOR

SECTION-5.1

PREAMBLE

TO

SCHEDULE OF RATES

FOR

COMPOSITE MECHANICAL ERECTION WORKS AT HURL GORAKHPUR

(OSBL)

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1.0 GENERAL

The BIDDER shall note that the quantities in different part and of the different items, as given in the "Schedule of Rates" are tentative based on tentative tender drawings and are subject to variation and they shall not be entitled to claim any extra or compensation on this account.

Owner/Consultant does not give any guarantee work under each item of the Schedule of Rates. Quantum of individual item may vary to any extent; however the total quantum of work may vary up to ± 25% of the total awarded contract value and on this account: no variation of quoted rates of items will be permissible. Payment of bills shall be made on actual measurements on quantities of work done.

The quantities mentioned in the SOR (Section-5 of Part-II, Technical) are tentative. Contractor to take confirmation for firm quantity from Owner/Consultant before placement of order against the supply items.

2.0 PREAMBLE TO SCHEDULE OF RATES

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

ii. The rates shall be applicable for all floors, heights and depths: -

a Pre-fabrication of piping shall be done on covered and paved floor area. The flooring shall be made available by Contractor during mobilisation period on his own cost.

b This being an item rate contract, the unit rate shall prevail, does any dispute arise. In the event of unit rate being different in figures & words, the unit rate in words shall be taken as final. Correction, if any required, in the figures /total lump-sum price written by the bidders will be done for evaluation and arriving at the Contract Value.

c Owner/Consultant reserves the right to interpolate or extrapolate the rate for any item from the rates available for similar work in the Schedule of Rates.

d Whenever it is mentioned in the specifications that the Contractor shall perform certain work or provide certain facilities/materials or certain item or activity is in Contractor's

scope of services it is understood that the Contractor shall do so at his cost within the item rates unless expressly stated otherwise.

e The unit rates of fabrication and erection of piping with primer and painting /valves/supports/on-line instruments / equipments/package items etc., shall also cover welding of dissimilar materials wherever required and nothing extra shall be payable on this account.

f Unit rates shall include the cost of labour, supervision, and consumables, primer & painting as per spec, cost towards providing necessary tools and tackles, and providing all the required facilities for execution and inspection, testing, statutory approval, guarantees etc. as per Scope of work and Technical Conditions etc. listed in ITB.

g Rates shall cover any expenses arising from Contractor's own choice where these choices are permitted by technical specifications.

h Bidder should quote balanced rates for all items. If any bidder quoted low rate for any item and the bid is accepted by OWNER and order placed, no request for any compensation on this account shall be entertained at a later date.

i If gratings are cut, then the galvanising of affected areas shall be repaired by cold zinc spraying within the quoted rates. The thickness of galvanising shall be 80 microns.

j Rates for similar type of work quoted under various sub-clauses must be same. However, if any contractor quotes different rates for similar work, the lowest rate shall be used for evaluation and payment purpose.

k The portion, which is under "HOLD" shown in the approved drawing or the portion, which would be brought under "HOLD" during execution on account of co-ordinating different activities of other working agencies shall be taken up by the contractor to execute only after the said "HOLD" is withdrawn. The Contractor on this account shall not be entitled to claim for any compensation.

l All activities related to pre-commissioning and commissioning such as cardboard blasting / steam blowing etc is deemed to be covered in the quoted rates for fabrication and erection of piping. Moreover, all cost related to fabrication of spool pieces / jump over, temporary blinds, blow stacks etc are also deemed to be covered in the quoted rates for piping. In addition, dismantling / boxing up of manhole covers, dropping / reinstallation of valves etc as per instruction of Owner / Consultant are also covered in the quoted rates.

m The quantities and items of work given in schedule of rates are tentative and approximate. The Owner reserves the right to order variation of works during the currency of the contract upto plus/minus 25% (Twenty Five Percent) of the contract value. The variation of work may be that the quantity of individual item of work may vary upto any extent; and /or any item may be deleted altogether; and / or any extra item may be added etc. The contractor shall not be entitled to any claim whatsoever on account of any variation in the quantities and/or omission/deletion of items from/to the schedule of rates as long as the contract value finally determined on the basis of the certified final quantities and the contract item rates is within the stipulated variation of ± 25% (Twenty Five Percent) of the original contract value."

n The quoted rates shall be firm for contract completion period of 12 months plus extendable period, if any.

o All work shall be done as indicated in SOR in respective parts.

The pre-fabricated piping and structural shall be shifted at painting Contractor's painting yard and bring back to erection site after painting nothing extra is payable for this activities.

p Contractor shall have to prepare the hydrotest pack file before doing hydrotesting of pipelines completed in all respect with reference to different stages of inspection, NDT and PWHT reports.

q Preparation of "AS-BUILT" construction drawings incorporating all approved changes at site shall be in contractor's scope of work and it shall be considered included in appropriate unit price items.

r The prices quoted in SOR shall be inclusive of mobilisation and demobilisation charges for mentioned in synopsis.

s The rate for particular size of pipe of the same material but of different thickness shall be arrived at from the nearest available rate for same size material as follows:

New rate = Available rate x New thickness / Existing thickness

t For other thickness and diameters, rate may be calculated by interpolation or extrapolation by Bidder and submitted for approval from Owner /PMC

SECTION-5.2

SUB-SECTION-5.2.1

SOR FOR MECHANICAL WORKS
(SUPPLY & ERECTION)

SCHEDULE OF RATES
FOR
MECHANICAL WORKS (SUPPLY & ERECTION)
FOR
COMPOSITE MECHANICAL ERECTION WORKS
AT
HURL, GORAKHPUR

0	28.12.18	For Issuance	DILIP	DILIP	GC
P	08.12.18	Issued for review & Comment	DILIP	DILIP	GC
REV	**DATE**	**DESCRIPTION**	**PREPARED BY**	**CHECKED BY**	**APPROVED BY**

1.0 SCHEDULE OF RATES FOR EQUIPMENTS AND PIPING WORKS

1.1.a UNLOADING OF EQUIPMENT

Unloading from trailer, truck, etc. and placing on firm ground over suitable support / sleepers etc. as desired by Owner/Consultant at a place to be decided by Owner/Consultant of equipment foundations. However, effort shall be made to erect the equipment directly from tailor to foundation to avoid unloading for which payment shall not be made against unloading of equipment. The list of new equipments are attached as **Attachment -I**

S.No	DESCRIPTION	UNIT	Approx QTY (MT)	UNIT RATE (Rs.)	Total Amount (Rs.)
1	Static equipments (Less than 65 MT, per piece)	MT	120	2000	2,40,000.00
2	Moving machineries	MT	10	2000	20,000.00
				SUB TOTAL OF 1.1.a = Rs.	**2,60,000.00**

1.1.b ERECTION OF NEW EQUIPMENTS, MACHINERIES & SKIDS ETC.

Transportation of Equipments/SKID etc. from Owner/ Consultant's stores/storage yard; dismantling & reassembly / reinstatement of structures, building sheets (if required) etc., to facilitate for erection, assembly of parts / sub-assemblies; checking, cleaning, chipping and preparing the top of foundation and cleaning of pockets for erection; placing the equipments, machinery & SKID etc., on foundation or structure; leveling, alignment, bolting, welding, grouting; fixing of internals; first maintenance & carrying out testing / carrying out alignment, trial runs and start up runs and providing manpower for testing, rectifying and defect and completion of works in all respects including earthing protection by way of fixing strips and electrodes as per drawings & specifications.; completion of all jobs as per drawings, scope of work & technical conditions as defined in the enquiry specifications, standards, codes and all jobs are to be carried out as per the instruction and to the full satisfaction of the Engineer-in-Charge/Owner. Job also includes supplying of all types of tools, tackles, lifting arrangements, tractor trolley & equipments, machineries all consumables and labour to complete the job in a workman like manner, erection and removal of steel scaffolding wherever required, area preparation for hot job and area cleaning after completion of work including blinding, deblinding, removal of insulation, gas cutting of bolts, chipping of foundation, flushing wherever required. The list of new equipments is attached as **Attachment-I .**

Rates shall include cost of labour, deployment of tools & tackles, consumables, Materials and other associated arrangements required to execute all activities. Grouting shall be paid as per Cl. 2.0 of SOR when using SHRINKOMP or equivalent. For cost of grouting using ordinary grouting, including supply of materials shall be included in the unit rates of erection of equipments, machinery & SKID etc. without any extra cost to Owner.

S.No	DESCRIPTION	UNIT	Approx QTY	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
1	Static equipments & SKID (Less than 65 MT, per piece)	MT	120	30000	36,00,000.00
2	Moving machineries	MT	10	34000	3,40,000.00
3	Equipment Internals	MT	1	120000	1,20,000.00
				SUB TOTAL OF 1.1.b = Rs.	**40,60,000.00**
				TOTAL OF 1.0 = Rs.	**43,20,000.00**

2.0 GROUTING

Grouting works include supply of materials, manpower, and necessary arrangement for application of grouting as per technical specification, vendor's requirement and instruction of Owner/Consultant. Machineries with ≥500 H.P., Araldite of M/s CIBA Geigy or equivalent shall be used. For tall towers having height more than 10 Meter and weight more than 25 MT, SHRINKOM - 20 or Conbextra GP-2 shall be used. However, for balance equipments / machineries and structurals ordinary 1:1:2 cement grout mix added with anti-shrinkage compound shall be used without any extra cost to Owner.

S.No	DESCRIPTION	UNIT	Approx QTY	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)

1	Non Shrink GROUTING (SHRINKOM - 20 or Conbextra GP-2)	M^3	10	72000	7,20,000.00
2	Epoxy Grouting	M^3	1	750000	7,50,000.00
				TOTAL OF 2.0 = Rs.	**14,70,000.00**

3.0 SUPPLY OF PIPING ITEMS

FOR U/G PIPING

"Supply , taking over" as defined in the specifications, handling, loading, transportation, unloading and Laying of bare/coated line pipes and other materials like valve, fittings, flanges, etc. from Contractors suppliers locations/works etc. to Contractor's stock yard/workshop/work-site including preliminary activities, preparation of drawings, wherever required for crossing etc. Handling, stacking, stringing of the UG pipes , Carrying out inspection of materials including line pipes at the time of laying/ installation of line pipes, associated valves, tees, insulating joints, flanges & fittings for buried application of all sizes, thickness & ANSI class rating and accessories as per specification wherever required depending on site condition.

Arrangement of all additional lands required for Contractor's storage, fabrication, access for construction, etc. procurement and supply of all materials, consumables, equipment, labour and other inputs, carrying out all temporary, ancillary, auxiliary works, etc. make ready for commissioning of pipeline as per drawings, specifications, other provisions of Contract document and instructions of Engineer-in-charge, including but not limited to carrying out the following works.

Barricading the pipeline construction area prior to execution to the entire satisfaction of Owner / Engineer-in-charge.

FOR A/G PIPING

Complete works of Supply of pipes, flanges, fittings & Valves for aboveground installation including all taxes, duties, transportation and inspection charges but not limited to, the following items in accordance with PMS (piping material specification), relevant specifications & drawings indicated in job specification and instructions of Owner/Consultant and as per all provisions of the CONTRACT.Supply of all piping items inclusive of spares (For detail refer document No-PDIL DOC. NO. : HURL-1100-0056-MTO-1)

Supply & Transportation of all piping materials from storage point to work site/shop including from shop to work site, cleaning, stacking, prefabrication / fabrication at shop and/or site including marking, cutting, edge preparation, beveling, bending, etc., providing all branch connections, re-enforcement pads, threading etc., welding of all fitting and specials, erection including lifting, placing, installing of supports etc. at all levels and locations, leveling, aligning, jointing of flanges including insertion of gaskets, orifice plates, spectacle blinds etc., bolting, joining by threading or welding, **surface preparation & painting wherever required,** including hook up of new lines with existing lines, and welding of Tie-in points, installation of all in line fittings / all type of valves / Instruments / strainers / filters / spray nozzles / traps, safety / control valves rapture disc, flow meters, flow orifice etc. as applicable including shifting to & collection from painting contractor's shop for erection, hydro testing, flushing and blowing, seal/leak testing and making ready for commissioning as per drawings, specification ,standards ,codes, instructions of Owner/Consultant and scope of work defined in Tender. Welding shall include all the examination and testing required such as but not limited to radiography, ultrasonic, magnaflux /dye check etc and pre and post heat treatment wherever required.
Unit rates shall include the cost of supervision, labour, overheads/profits, consumables, and other associated arrangements required to execute all the related activities.
The quoted rates shall include seal welding of thermocouples, Orifice flange plug, nipple, and hydro testing drain and vents caps.

The cost towards radiography only shall be paid separately as per SOR Cl. 9

In case of IBR piping, material identification, drawing approval, hydro-test witness and final approval of fabricated piping by IBR authorities for taking the same in use, shall also be included in the quoted rate.

ITEM No.	DESCRIPTION					UNIT	QTY.	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
	ITEM	SIZE	SPECN	SCH/THK	MATERIAL				
SUPPLY OF PIPING ITEMS									
1.0 PIPES									
I	CS PIPES PE IBR	3/4",OD 26.7	ASME B36.10	SCH 80	SMLS,ASTM A106 GR.B	MTR.	66	262	17,292.00

II	CS PIPES PE	1",OD 33.4	ASME B36.10	SCH 80	SMLS,API 5L GR.B	MTR.	132	254	33,528.00
III	SS PIPES PE	1",OD 33.4	ASME B36.19	SCH40S	SMLS,ASTM A312 TP304	MTR.	36	990	35,640.00
IV	CS PIPES PE	1.5",OD 48.3	ASME B36.10	SCH 80	SMLS,API 5L GR.B	MTR.	1692	550	9,30,600.00
V	CS PIPES, THD	1.5",OD 48.3	ASME B36.10	SCH XS	SMLS,ASTM A106 GR.B,HOT DIP	MTR.	486	659	3,20,274.00
VI	CS PIPES PE	1.5",OD 48.3	ASME B36.19	SCH40S	SMLS,ASTM A312 TP304	MTR.	468	1604	7,50,672.00
VII	CS PIPES BE	2",OD 60.3	ASME B36.10	SCH 40	SMLS,API 5L GR.B	MTR.	5124	361	18,49,764.00
VIII	CS PIPES BE	2",OD 60.3	ASME B36.10	SCH XS	SMLS,ASTM A106 GR.B,HOT DIP	MTR.	918	434	3,98,412.00
IX	FRP PIPES,PE	3", OD,88.9	MF.STD/DIN 16965 PART 4	CALC	FRP DERAKANE 411 OR EQUV+ANTI	MTR.	660	2900	19,14,000.00
X	CS PIPES BE	3",OD,88.9	ASME B36.10	SCH 40	SMLS,API 5L GR.B	MTR.	3108	751	23,34,108.00
XI	CS PIPES BE	3",OD,88.9	ASME B36.10	SCHSTD	SMLS,ASTM A106 GR.B,HOT DIP	MTR.	24	901	21,624.00
XII	SS PIPES BE	3",OD,88.9	ASME B36.19	SCH10S	EFW,STR.WELD,ASTM A312 TP304	MTR.	684	1483	10,14,372.00
XIII	CS PIPES BE IBR	4",OD,114.3	ASME B36.10	SCH 40	SMLS,ASTM A106 GR.B	MTR.	990	1068	10,57,320.00
XIV	CS PIPES BE	4",OD,114.3	ASME B36.10	SCH 40	SMLS,API 5L GR.B	MTR.	2100	1068	22,42,800.00
XV	CS PIPES BE	4",OD,114.3	ASME B36.10	SCHSTD	SMLS,ASTM A106 GR.B,HOT DIP	MTR.	12	1282	15,384.00
XVI	SS PIPES BE	4",OD,114.3	ASME B36.19	SCH10S	EFW,STR.WELD,ASTM A312 TP304	MTR.	1512	1921	29,04,552.00
XVII	CS PIPES BE	4",OD,114.3	ASME B36.10	SCH 40	SMLS,API 5L GR.B,C&W	MTR.	48	1412	67,776.00
XVIII	FRP PIPES,PE	6",OD 168.3	MF.STD/DIN 16965 PART 4	CALC	FRP DERAKANE 411 OR EQUV+ANTI	MTR.	654	5053	33,04,662.00
XIX	CS PIPES BE	6",OD 168.3	ASME B36.10	SCH 40	SMLS,API 5L GR.B	MTR.	1320	1870	24,68,400.00
XX	CS PIPES BE	6",OD 168.3	ASME B36.10	SCHSTD	SMLS,ASTM A106 GR.B,HOT DIP	MTR.	522	2245	11,71,890.00
XXI	SS PIPES BE	6",OD 168.3	ASME B36.19	SCH10S	EFW,STR.WELD,ASTM A312 TP304	MTR.	426	3152	13,42,752.00
XXII	CS PIPES BE	6",OD 168.3	ASME B36.10	SCH 40	SMLS,API 5L GR.B,C&W	MTR.	24	2798	67,152.00
XXIII	CS PIPES BE IBR	8",OD,219.1	ASME B36.10	SCH 20	SMLS,ASTM A106 GR.B	MTR.	192	2462	4,72,704.00

XXIV	CS PIPES BE	8",OD,219.1	ASME B36.10	SCH 20	ERW,API 5L GR.B	MTR.	2196	2640	57,97,440.00
XXV	CS PIPES BE	8",OD,219.1	ASME B36.10	SCH 10	ERW,API 5L GR.B	MTR.	18	1980	35,640.00
XXVI	CS PIPES BE	8",OD,219.1	ASME B36.10	SCHSTD	SMLS,ASTM A106 GR.B,HOT DIP	MTR.	12	4032	48,384.00
XXVII	SS PIPES BE	8",OD 219.1	ASME B36.19	SCH10S	EFW,STR.WELD,ASTM A312 TP304	MTR.	918	3835	35,20,530.00
XXVIII	CS PIPES BE	10", OD 273.0	ASME B36.10	SCH 20	ERW,API 5L GR.B	MTR.	162	3307	5,35,734.00
XXIX	CS PIPES BE	10", OD 273.0	ASME B36.10	SCH 10	ERW,API 5L GR.B	MTR.	72	3326	2,39,472.00
XXX	CS PIPES BE	12", OD 323.9	ASME B36.10	SCH 20	ERW,API 5L GR.B	MTR.	18	6562	1,18,116.00
XXXI	CS PIPES BE	12", OD 323.9	ASME B36.10	SCH 10	ERW,API 5L GR.B	MTR.	1092	5907	64,50,444.00
XXXII	SS PIPES BE	12", OD 323.9	ASME B36.19	SCH 10S	EFW,STR.WELD,ASTM A312 TP304	MTR.	150	7393	11,08,950.00
XXXIII	CS PIPES BE	14", OD,355.6	ASME B36.10	SCH 80	SMLS,API 5L GR.B	MTR.	804	19056	1,53,21,024.00
XXXIV	CS PIPES BE	14", OD,355.6	ASME B36.10	SCH 10	ERW,API 5L GR.B	MTR.	48	4329	2,07,792.00
XXXV	CS PIPES BE	16",OD,406.4	ASME B36.10	SCH 10	ERW,API 5L GR.B	MTR.	744	4963	36,92,472.00
XXXVI	SS PIPES BE	16",OD,406.4	ASME B36.19	SCH 10S	EFW,STR.WELD,ASTM A312 TP304	MTR.	276	11624	32,08,224.00
								SUB-TOTAL	**6,50,19,900.00**
2.0 VALVE									
A- GATE VALVE									
I	GATE VALVE IBR (SOCW)	3/4”	GAV201S	800#	CS BODY ASTM A105, SOCW	No.	6	2027	12,162.00
II	GATE VALVE(SOCW)	3/4”	GAV201	800#	CS BODY ASTM A105, SOCW	No.	112	1320	1,47,840.00
III	GATE VALVE (THRD)	3/4”	GAV207	800#	CS BODY ASTM A105, SOCW	No.	14	1452	20,328.00
IV	GATE VALVE(SOCW)	3/4”	GAV501	800#	SS BODY ASTM A182 GR F304	No.	37	3696	1,36,752.00
V	GATE VALVE IBR (SOCW)	1”	GAV201S	800#	CS BODY ASTM A105, SOCW	No.	2	2640	5,280.00
VI	GATE VALVE (SOCW)	1”	GAV201	800#	CS BODY ASTM A105, SOCW	No.	2	1980	3,960.00
VII	GATE VALVE (SOCW)	1.5”	GAV201	800#	CS BODY ASTM A105, SOCW	No.	4	5866	23,464.00

VIII	GATE VALVE (THRD)	1.5"	GAV207	800#	CS BODY ASTM A105, SOCW	No.	4	4620	18,480.00
IX	GATE VALVE (FLG)	2"	GAV210	150#	CS BODY ASTM A216 GR WCB	No.	3	7366	22,098.00
X	GATE VALVE (FLG)	3"	GAV210	150#	CS BODY ASTM A216 GR WCB	No.	3	12047	36,141.00
XI	GATE VALVE (FLG)	4"	GAV510	150#	SS BODY ASTM A351 GR CF8	No.	2	29473	58,946.00
XII	GATE VALVE,IBR (FLG)	8"	GAV210S	150#	CS BODY ASTM A216 GR WCB	No.	7	39204	2,74,428.00
XIII	GATE VALVE (FLG)	14"	GAV212	600#	CS BODY ASTM A216 GR WCB	No.	2	204526	4,09,052.00
								SUB-TOTAL	**11,68,931.00**
B- BALL VALVE									
I	BALL VALVE (SOCW)	1"	BAV201	800#	CS BODY ASTM A105	No.	3	5572	16,716.00
II	BALL VALVE (THRD)	1"	BAV501	800#	SS BODY AISI 316	No.	2	18216	36,432.00
III	BALL VALVE (SOCW)	1.5"	BAV201	800#	CS BODY ASTM A105	No.	5	7164	35,820.00
IV	BALL VALVE (THRD)	1.5"	BAV501	800#	SS BODY AISI 316	No.	4	7080	28,320.00
V	BALL VALVE (FLG)	2"	BAV210	150#	CS BODY ASTM A216 GR WCB	No.	3	7960	23,880.00
VI	BALL VALVE (FLG)	3"	BAV210	150#	CS BODY ASTM A216 GR WCB	No.	2	11940	23,880.00
VII	BALL VALVE (FLG)	3"	BAV510	150#	SS BODY ASTM A351 GR CF8M	No.	2	26185	52,370.00
VIII	BALL VALVE (FLG)	4"	BAV210	150#	CS BODY ASTM A216 GR WCB	No.	3	112896	3,38,688.00
IX	BALL VALVE (FLG)	4"	BAV510	150#	SS BODY ASTM A351 GR CF8M	No.	2	102087	2,04,174.00
X	BALL VALVE (FLG)	8"	BAV520	150#	SS BODY ASTM A351 GR CF8M	No.	2	291736	5,83,472.00
								SUB-TOTAL	**13,43,752.00**
C- BUTTERFLY VALVE									
I	BUTTERFLY VALVE(LUG TYPE)	2"	BUV203	150#	CS BODY ASTM A216 GR WCB	No.	3	4723	14,169.00
II	BUTTERFLY VALVE(LUG TYPE)	4"	BUV203	150#	CS BODY ASTM A216 GR WCB,LUG	No.	2	4723	9,446.00

III	BUTTERFLY VALVE(LUG TYPE)	6"	BUV203	150#	CS BODY ASTM A216 GR WCB,LUG	No.	3	11434	34,302.00
IV	BUTTERFLY VALVE(LUG TYPE)	8"	BUV203	150#	CS BODY ASTM A216 GR WCB,LUG	No.	3	11434	34,302.00
V	BUTTERFLY VALVE(LUG TYPE)	10"	BUV203	150#	CS BODY ASTM A216 GR WCB,LUG	No.	3	20335	61,005.00
								SUB-TOTAL	**1,53,224.00**
D- GLOBE VALVE									
I	GLOBE VALVE(SOCW)	3/4"	GLV201	800#	CS BODY ASTM A105	No.	90	1320	1,18,800.00
II	GLOBE VALVE IBR(SOCW)	3/4"	GLV201S	800#	CS BODY ASTM A105	No.	6	1320	7,920.00
III	GLOBE VALVE (SOCW)	3/4"	GLV501	800#	SS BODY ASTM A182 GR F304	No.	37	3360	1,24,320.00
IV	GLOBE VALVE (FLG)	3"	GLV210	150#	CS BODY ASTM A216 GR WCB	No.	3	10800	32,400.00
								SUB-TOTAL	**2,83,440.00**
E- PLUG VALVE									
I	PLUG VALVE(THRD)	3/4"	PLV501	600#	SS BODY AISI 316	No.	14	6270	87,780.00
								SUB-TOTAL	**87,780.00**
3.0 FLANGES									
I	FLANGE (SLIP ON)	1”	ASME B16.5	150 #	ASTM A105, SO-RF 125 AARH	No.	5	172	860.00
II	FLANGE (SLIP ON)	1.5”	ASME B16.5	150 #	ASTM A105, SO-RF 125 AARH	No.	6	439	2,634.00
III	FLANGE (SLIP ON)	1.5”	ASME B16.5	150 #	ASTM A105 HOT DIP GALV.THD-RF	No.	4	528	2,112.00
IV	FLANGE (SLIP ON)	2”	ASME B16.5	150 #	ASTM A105, SO-RF 125 AARH	No.	21	317	6,657.00
V	FLANGE (SLIP ON)	3”	ASME B16.5	150 #	ASTM A105, SO-RF 125 AARH	No.	13	528	6,864.00
VI	FLANGE (LAP JOINT)	3”	MF.STD/ASME B16.5	150 #	ERW,IS 3589 GR.FE410,LJ-FF	No.	3	528	1,584.00
VII	FLANGE (SLIP ON)	4”	ASME B16.5	150 #	ASTM A105, SO-RF 125 AARH	No.	15	739	11,085.00
VIII	FLANGE IBR (SLIP ON)	4”	ASME B16.5	150 #	ASTM A105, SO-RF 125 AARH	No.	3	1087	3,261.00

IX	FLANGE (SLIP ON)	6”	ASME B16.5	150 #	ASTM A105, SO-RF 125 AARH	No.	15	1188	17,820.00
X	FLANGE (LAP JOINT)	6”	MF.STD/ASME B16.5	150 #	ERW,IS 3589 GR.FE410,LJ-FF	No.	3	1584	4,752.00
XI	FLANGE (SLIP ON)	8”	ASME B16.5	150 #	ASTM A105, SO-RF 125 AARH	No.	12	1716	20,592.00
XII	FLANGE IBR (SLIP ON)	8”	ASME B16.5	150 #	ASTM A105, SO-RF 125 AARH	No.	5	1848	9,240.00
XIII	FLANGE (SLIP ON)	10”	ASME B16.5	150 #	ASTM A105, SO-RF 125 AARH	No.	9	2772	24,948.00
XIV	FLANGE (SLIP ON)	12”	ASME B16.5	150 #	ASTM A105, SO-RF 125 AARH	No.	2	4224	8,448.00
XV	FLANGE (SLIP ON)	14”	ASME B16.5	150 #	ASTM A105, SO-RF 125 AARH	No.	3	6468	19,404.00
XVI	FLANGE (SLIP ON)	16”	ASME B16.5	150 #	ASTM A105, SO-RF 125 AARH	No.	2	7392	14,784.00
								SUB-TOTAL	**1,55,045.00**
4.0 GASKET									
I	GASKET (SPRL-WND RF)	1”	ASME B16.20	150#	TP304 SS WDG; GPH FLR; TP304 SS	No.	6	35	210.00
II	GASKET (SPRL-WND RF)	1”	ASME B16.20	150#	TP304 SS WDG;GPH	No.	12	18	216.00
III	GASKET (SPRL-WND RF)	11/2”	ASME B16.20	150#	TP304 SS WDG; GPH FLR; TP304 SS	No.	9	44	396.00
IV	GASKET (SPRL-WND RF)	11/2”	ASME B16.20	150#	TP304 SS WDG;GPH	No.	24	26	624.00
V	GASKET (SPRL-WND RF)	2”	ASME B16.20	150#	TP304 SS WDG;GPH	No.	66	38	2,508.00
VI	GASKET (3.0 MM THK FF)	3”	ASME B16.21/B16.5	150#	EPDM	No.	6	88	528.00
VII	GASKET (SPRL-WND RF)	3”	ASME B16.20	150#	TP304 SS WDG;GPH	No.	42	64	2,688.00
VIII	GASKET (SPRL-WND RF)	3”	ASME B16.21/B16.5	150#	TP304 SS WDG; GPH FLR; TP304 SS	No.	9	100	900.00
IX	GASKET (SPRL-WND RF)	4”	ASME B16.20	150#	TP304 SS WDG; GPH FLR; TP304 SS	No.	18	154	2,772.00
X	GASKET (SPRL-WND RF)	4”	ASME B16.20	150#	TP304 SS WDG;GPH	No.	51	86	4,386.00
XI	GASKET (3.0 MM THK FF)	6"	ASME B16.21/B16.5	150#	EPDM	No.	6	174	1,044.00
XII	GASKET (SPRL-WND RF)	6"	ASME B16.20	150#	TP304 SS WDG; GPH FLR; TP304 SS	No.	9	227	2,043.00

XIII	GASKET (SPRL-WND RF)	6"	ASME B16.20	150#	TP304 SS WDG;GPH	No.	45	128	5,760.00
XIV	GASKET (SPRL-WND RF)	8"	ASME B16.20	150#	TP304 SS WDG; GPH FLR; TP304 SS	No.	21	290	6,090.00
XV	GASKET (SPRL-WND RF)	8"	ASME B16.20	150#	TP304 SS WDG;GPH	No.	57	155	8,835.00
XVI	GASKET (SPRL-WND RF)	10"	ASME B16.20	150#	TP304 SS WDG;GPH	No.	24	245	5,880.00
XVII	GASKET (SPRL-WND RF)	12"	ASME B16.20	150#	TP304 SS WDG; GPH FLR; TP304 SS	No.	3	584	1,752.00
XVIII	GASKET (SPRL-WND RF)	12"	ASME B16.20	150#	TP304 SS WDG;GPH	No.	3	317	951.00
XIX	GASKET (SPRL-WND RF)	14"	ASME B16.20	150#	TP304 SS WDG;GPH	No.	6	338	2,028.00
XX	GASKET (SPRL-WND RF)	14"	ASME B16.20	600#	TP304 SS WDG;GPH	No.	18	404	7,272.00
XXI	GASKET (SPRL-WND RF)	16"	ASME B16.20	150#	TP304 SS WDG; GPH FLR; TP304 SS	No.	3	877	2,631.00
XXII	GASKET (SPRL-WND RF)	16"	ASME B16.20	150#	TP304 SS WDG;GPH	No.	6	396	2,376.00
								SUB-TOTAL	**61,890.00**
5.0 STUD & 2NUTS									
I	STUD & 2NUTS HVY HEX	3/4"	ASME B16.5	100	ASTM A193 GR.B7/ASTM A194	No.	157	72	11,304.00
II	STUD & 2NUTS HVY HEX	3/4"	ASME B16.5	100	ASTM A193 GR.B8 CL.2/ASTM A194	No.	34	221	7,514.00
III	STUD & 2NUTS HVY HEX	3/4"	ASME B16.5	100	ASTM A193 GR.B8M CL.2/ASTM	No.	22	221	4,862.00
IV	STUD & 2NUTS HVY HEX	3/4"	ASME B16.5	100	SMLS, ASTM A193 GR.B7 /ASTM A194	No.	12	88	1,056.00
V	STUD & 2NUTS HVY HEX	3/4"	ASME B16.5	110	ASTM A193 GR.B7/ASTM A194	No.	190	73	13,870.00
VI	STUD & 2NUTS HVY HEX	3/4"	ASME B16.5	110	SMLS, ASTM A193 GR.B7 /A194	No.	22	88	1,936.00
VII	STUD & 2NUTS HVY HEX	3/4"	ASME B16.5	110	ASTM A193 GR.B8 CL.2/ASTM A194	No.	78	233	18,174.00
VIII	STUD & 2NUTS HVY HEX	7/8"	ASME B16.5	120	ASTM A193 GR.B7/ASTM A194	No.	151	102	15,402.00
IX	STUD & 2NUTS HVY HEX	7/8"	ASME B16.5	120	ASTM A193 GR.B8 CL.2/ASTM A194	No.	17	233	3,961.00
X	STUD & 2NUTS HVY HEX	1"	ASME B16.5	135	ASTM A193 GR.B7/ASTM A194	No.	34	143	4,862.00

XI	STUD & 2NUTS HVY HEX	1"	ASME B16.5	140	ASTM A193 GR.B8 CL.2/ASTM A194	No.	22	470	10,340.00
XII	STUD & 2NUTS HVY HEX	1"	ASME B16.5	140	ASTM A193 GR.B7/ASTM A194	No.	45	143	6,435.00
XIII	STUD & 2NUTS HVY HEX	1/2"	ASME B16.5	70	ASTM A193 GR.B8 CL.2/ASTM A194	No.	12	78	936.00
XIV	STUD & 2NUTS HVY HEX	1/2"	ASME B16.5	70	ASTM A193 GR.B7/ASTM A194	No.	22	25	550.00
XV	STUD & 2NUTS HVY HEX	1/2"	ASME B16.5	75	ASTM A193 GR.B8 CL.2/ASTM A194	No.	17	90	1,530.00
XVI	STUD & 2NUTS HVY HEX	1/2"	ASME B16.5	75	ASTM A193 GR.B7/ASTM A194	No.	28	26	728.00
XVII	STUD & 2NUTS HVY HEX	1/2"	ASME B16.5	75	SMLS,ASTM A193GR.B7/A194GR	No.	17	31	527.00
XVIII	STUD & 2NUTS HVY HEX	13/8"	ASME B16.5	235	ASTM A193 GR.B7/ASTM A194	No.	112	599	67,088.00
XIX	STUD & 2NUTS HVY HEX	13/8"	ASME B16.5	290	ASTM A193 GR.B7/ASTM A194	No.	28	740	20,720.00
XX	STUD & 2NUTS HVY HEX	5/8"	ASME B16.5	85	ASTM A193 GR.B7/ASTM A194	No.	106	44	4,664.00
XXI	STUD & 2NUTS HVY HEX	5/8"	ASME B16.5	85	SMLS,ASTM A193GR.B7/A194GR	No.	17	54	918.00
XXII	STUD & 2NUTS HVY HEX	5/8"	ASME B16.5	95	ASTM A193 GR.B8M CL.2/ASTM	No.	12	167	2,004.00
XXIII	STUD & 2NUTS HVY HEX	5/8"	ASME B16.5	95	ASTM A193 GR.B8 CL.2/ASTM A194	No.	84	131	11,004.00
XXIV	STUD & 2NUTS HVY HEX	5/8"	ASME B16.5	95	ASTM A193 GR.B7/ASTM A194	No.	246	49	12,054.00
XXV	STUD & 2NUTS HVY HEX	5/8"	ASME B16.5	95	SMLS,ASTM A193GR.B7/A194GR	No.	22	59	1,298.00
								SUB-TOTAL	**2,23,737.00**
6.0 ELBOW									
I	ELBOW 90^0	3/4"(SOCW IBR)	ASME B16.11	3000#	ASTM A105	No.	33	96	3,168.00
II	ELBOW 90	10"(BW)	ASME B16.9	SCH 20	ASTM A234 WPB-WLDD	No.	7	3300	23,100.00
III	ELBOW 90	10"(BW)	ASME B16.9	SCH 10	ASTM A234 WPB-WLDD	No.	8	2904	23,232.00
IV	ELBOW 90	8"(BW IBR)	ASME B16.9	SCH 20	ASTM A234 WPB-SMLS	No.	11	2640	29,040.00
V	ELBOW 90	8"(BW)	ASME B16.9	SCH 20	ASTM A234 WPB-WLDD	No.	65	2376	1,54,440.00

VI	ELBOW 90	8”(BW)	ASME B16.9	SCH 10	ASTM A234 WPB-WLDD	No.	2	2376	4,752.00
VII	ELBOW 90	8”(BW)	ASME B16.9	SCH 10S	ASTM A403 WP304-WLDD	No.	31	6600	2,04,600.00
VIII	ELBOW 90	8”(BW)	ASME B16.9	SCHSTD	ASTM A234 WPB-SMLS,HOT DIP	No.	5	4032	20,160.00
IX	ELBOW 90	6"(PE)	MF.STD/DIN 16965 PART 4	CALC	FRP DERAKANE 411 OR EQUV+ANTI	No.	15	3949	59,235.00
X	ELBOW 90	6"(BW)	ASME B16.9	SCH 40	ASTM A234 WPB-SMLS	No.	48	1413	67,824.00
XI	ELBOW 90	6"(BW)	ASME B16.9	SCHSTD	ASTM A234 WPB-SMLS,HOT DIP	No.	17	1697	28,849.00
XII	ELBOW 90	6"(BW)	ASME B16.9	SCH10S	ASTM A403 WP304-WLDD	No.	13	3274	42,562.00
XIII	ELBOW 90	4"(BW)	ASME B16.9	SCH 40	ASTM A234 WPB-SMLS	No.	79	518	40,922.00
XIV	ELBOW 90	4"(BW IBR)	ASME B16.9	SCH 40	ASTM A234 WPB-SMLS	No.	24	518	12,432.00
XV	ELBOW 90	4"(BW)	ASME B16.9	SCHSTD	ASTM A234 WPB-SMLS,HOT DIP	No.	2	623	1,246.00
XVI	ELBOW 90	4"(BW)	ASME B16.9	SCH10S	ASTM A403 WP304-WLDD	No.	48	1465	70,320.00
XVII	ELBOW 90	3"(PE)	MF.STD/DIN 16965 PART 4	CALC	FRP DERAKANE 411 OR EQUV+ANTI	No.	15	2150	32,250.00
XVIII	ELBOW 90	3"(BW)	ASME B16.9	SCH 40	ASTM A234 WPB-SMLS	No.	100	251	25,100.00
XIX	ELBOW 90	3"(BW)	ASME B16.9	SCHSTD	ASTM A234 WPB-SMLS,HOT DIP	No.	5	301	1,505.00
XX	ELBOW 90	3"(BW)	ASME B16.9	SCH10S	ASTM A403 WP304-WLDD	No.	11	846	9,306.00
XXI	ELBOW 90	2"(BW)	ASME B16.9	SCH 40	ASTM A234 WPB-SMLS	No.	117	198	23,166.00
XXII	ELBOW 90	2"(BW)	ASME B16.9	SCH XS	ASTM A234 WPB-SMLS,HOT DIP	No.	17	270	4,590.00
XXIII	ELBOW 90	1"(SOCW)	ASME B16.11	3000#	ASTM A105	No.	18	170	3,060.00
XXIV	ELBOW 90	1"(SOCW)	ASME B16.11	3000#	ASTM A182 F304	No.	9	356	3,204.00
XXV	ELBOW 90	12(BW)	ASME B16.9	SCH 20	ASTM A234 WPB-WLDD	No.	3	5148	15,444.00
XXVI	ELBOW 90	12(BW)	ASME B16.9	SCH 10	ASTM A234 WPB-WLDD	No.	9	3960	35,640.00
XXVII	ELBOW 90	12(BW)	ASME B16.9	SCH 10S	ASTM A403 WP304-WLDD	No.	6	16262	97,572.00

XXVIII	ELBOW 90	14(BW)	ASME B16.9	SCH 80	ASTM A234 WPB-SMLS	No.	17	20341	3,45,797.00
XXIX	ELBOW 90	14(BW)	ASME B16.9	SCH 10	ASTM A234 WPB-WLDD	No.	3	6602	19,806.00
XXX	ELBOW 90	16(BW)	ASME B16.9	SCH 10	ASTM A234 WPB-WLDD	No.	10	9094	90,940.00
XXXI	ELBOW 90	16(BW)	ASME B16.9	SCH10S	ASTM A403 WP304-WLDD	No.	7	29007	2,03,049.00
XXXII	ELBOW 90	11/2"(SOCW)	ASME B16.11	3000#	ASTM A105	No.	46	275	12,650.00
XXXIII	ELBOW 90	11/2"(SOCW)	ASME B16.11	3000#	ASTM A182 F304	No.	15	858	12,870.00
XXXIV	ELBOW 90	11/2"(THRD)	ASME B16.11	3000#	ASTM A105 HOT DIP GALV.	No.	20	330	6,600.00
XXXV	ELBOW 45	6"(BW)	ASME B16.9	SCH 40	ASTM A234 WPB-SMLS	No.	3	924	2,772.00
XXXVI	ELBOW 45	14"(BW)	ASME B16.9	SCH 80	ASTM A234 WPB-SMLS	No.	4	11329	45,316.00
XXXVII	ELBOW 45	8"(BW)	ASME B16.9	SCH 10	ASTM A234 WPB-WLDD	No.	2	1584	3,168.00
XXXVIII	ELBOW 45	10"(BW)	ASME B16.9	SCH 10	ASTM A234 WPB-WLDD	No.	3	1408	4,224.00
XXXIX	ELBOW 45	12"(BW)	ASME B16.9	SCH 10	ASTM A234 WPB-WLDD	No.	2	2772	5,544.00
XXXX	ELBOW 45	16"(BW)	ASME B16.9	SCH 10	ASTM A234 WPB-WLDD	No.	3	5544	16,632.00
XXXXI	ELBOW 45	16"(BW)	ASME B16.9	SCH10S	ASTM A403 WP304-WLDD	No.	1	19140	19,140.00
								SUB-TOTAL	**18,25,227.00**
7.0 TEE									
I	TEE (SOCW)	1 X 3/4	ASME B16.11	3000#	ASTM A105	No.	8	350	2,800.00
II	TEE (SOCW)	1 X 3/4	ASME B16.11	3000#	ASTM A182 F304	No.	5	792	3,960.00
III	TEE (BW)	2 X 11/2	ASME B16.9	SCH 40 X SCH 80	ASTM A234 WPB-SMLS	No.	3	528	1,584.00
IV	TEE (BW)	3 X 2	ASME B16.9	SCH 40 X SCH 40	ASTM A234 WPB-SMLS	No.	5	661	3,305.00
V	TEE (BW)	3 X 11/2	ASME B16.9	SCH 40 X SCH 82	ASTM A234 WPB-SMLS	No.	4	892	3,568.00
VI	TEE (BW IBR)	4 X 4	ASME B16.9	SCH 40 X SCH 40	ASTM A234 WPB-SMLS	No.	9	1056	9,504.00

VII	TEE (BW)	4 X 2	ASME B16.9	SCH 40 X SCH 40	ASTM A234 WPB-SMLS	No.	3	924	2,772.00
VIII	TEE (BW)	4 X 3	ASME B16.9	SCH 10S X SCH 10S	ASTM A403 WP304-WLDD	No.	2	5808	11,616.00
IX	TEE (BW)	6 X 4	ASME B16.9	SCH 40 X SCH 40	ASTM A234 WPB-SMLS	No.	2	1980	3,960.00
X	TEE (BW)	6 X 3	ASME B16.9	SCH 40 X SCH 40	ASTM A234 WPB-SMLS	No.	2	1980	3,960.00
XI	TEE (BW)	6 X 4	ASME B16.9	SCHSTD X SCHSTD	ASTM A234 WPB-SMLS,HOT DIP	No.	2	2376	4,752.00
XII	TEE (BW)	6 X 3	ASME B16.9	SCHSTD X SCHSTD	ASTM A234 WPB-SMLS,HOT DIP	No.	2	2376	4,752.00
XIII	TEE (BW)	6 X 2	ASME B16.9	SCHSTD X SCH XS	ASTM A234 WPB-SMLS,HOT DIP	No.	2	2376	4,752.00
XIV	TEE (BW)	8X4	ASME B16.9	SCH 20 X SCH 40	ASTM A234 WPB-WLDD, BW	No.	2	3850	7,700.00
XV	TEE (BW)	8X4	ASME B16.9	SCH 10S X SCH 10S	ASTM A403 WP304-WLDD	No.	2	11800	23,600.00
XVI	TEE (BW IBR)	8X8	ASME B16.9	SCH 20 X SCH 20	ASTM A234 WPB-SMLS	No.	3	3432	10,296.00
XVII	TEE (BW)	12 X 10	ASME B16.9	SCH 10 X SCH 10	ASTM A234 WPB-WLDD	No.	3	6823	20,469.00
XVIII	TEE (BW)	12 X 8	ASME B16.9	SCH 10 X SCH 10	ASTM A234 WPB-WLDD	No.	2	12540	25,080.00
XIX	TEE (BW)	14 X 14	ASME B16.9	SCH 10 X SCH 10	ASTM A234 WPB-WLDD	No.	2	9900	19,800.00
XX	TEE (BW)	14 X 12	ASME B16.9	SCH 10 X SCH 20	ASTM A234 WPB-WLDD	No.	3	9900	29,700.00
XXI	TEE (SOCW)	11/2 X 3/4	ASME B16.11	3000#	ASTM A105	No.	15	403	6,045.00
XXII	TEE (SOCW)	11/2 X 3/4	ASME B16.11	3000#	ASTM A182 F304	No.	5	825	4,125.00
								SUB-TOTAL	**2,08,100.00**
8.0 REDUCER									
I	REDUCER ECC.(BW)	8"X4"	ASME B16.9	SCH 20X SCH 40,	ASTM A234 WPB-WLDD	No.	2	4752	9,504.00
II	REDUCER ECC.(BW)	2 X 11/2	ASME B16.9	SCH 40X SCH 80	ASTM A234 WPB-SMLS	No.	2	198	396.00
III	REDUCER ECC.(BW)	3 X 1	ASME B16.9	SCH 40X SCH 80	ASTM A234 WPB-SMLS	No.	2	422	844.00
IV	REDUCER ECC.(BW)	3 X 2	ASME B16.9	SCHSTD X SCH XS	ASTM A234 WPB-SMLS,HOT DIP	No.	2	365	730.00

V	REDUCER ECC.(BW)	6 X 4	ASME B16.9	SCH 40 X SCH 40	ASTM A234 WPB-SMLS	No.	3	3300	9,900.00
VI	REDUCER ECC.(BW)	6 X 4	ASME B16.9	SCHSTD X SCHSTD	ASTM A234 WPB-SMLS,HOT DIP	No.	2	1302	2,604.00
VII	REDUCER ECC.(BW)	8 X 4	ASME B16.9	SCH 20X SCH 40,	ASTM A234 WPB-WLDD	No.	2	4752	9,504.00
VIII	REDUCER ECC.(BW)	8 X 6	ASME B16.9	SCH 10S X SCH 10S	ASTM A403 WP304-WLDD	No.	2	2627	5,254.00
IX	REDUCER ECC.(BW)	14 X 8	ASME B16.9	SCH 10X SCH 20,	ASTM A234 WPB-WLDD	No.	3	3960	11,880.00
X	REDUCER ECC.(BW)	16 X 12	ASME B16.9	SCH 10S X SCH 10S	ASTM A403 WP304-WLDD	No.	1	10918	10,918.00
								SUB-TOTAL	**61,534.00**
9.0 SOCKOLET									
I	SOCKOLET (SOCW)	2"X3/4"	MSS SP 97	3000#	ASTM A105	No.	24	209	5,016.00
II	SOCKOLET (SOCW)	3"X3/4"	MSS SP 97	3000#	ASTM A105	No.	44	209	9,196.00
III	SOCKOLET (SOCW)	3"X 1"	MSS SP 97	3000#	ASTM A105	No.	2	400	800.00
IV	SOCKOLET (SOCW)	3"X3/4"	MSS SP 97	3000#	ASTM A182 F304	No.	4	440	1,760.00
V	SOCKOLET (SOCW)	4"X11/2"	MSS SP 97	3000#	ASTM A105	No.	2	495	990.00
VI	SOCKOLET (SOCW)	4"X3/4"	MSS SP 97	3000#	ASTM A105	No.	34	209	7,106.00
VII	SOCKOLET (SOCW IBR)	4"X3/4"	MSS SP 97	3000#	ASTM A105	No.	15	248	3,720.00
VIII	SOCKOLET (SOCW)	4"X11/2"	MSS SP 97	3000#	ASTM A182 F304	No.	3	990	2,970.00
IX	SOCKOLET (SOCW)	4"X3/4"	MSS SP 97	3000#	ASTM A182 F304	No.	25	407	10,175.00
X	SOCKOLET (SOCW)	4"X1"	MSS SP 97	3000#	ASTM A182 F304	No.	2	660	1,320.00
XI	SOCKOLET (SOCW)	6"X3/4"	MSS SP 97	3000#	ASTM A105	No.	20	154	3,080.00
XII	SOCKOLET (SOCW)	6"X3/4"	MSS SP 97	3000#	ASTM A182 F304	No.	7	583	4,081.00
XIII	SOCKOLET (SOCW)	8"X3/4"	MSS SP 97	3000#	ASTM A105	No.	29	220	6,380.00
XIV	SOCKOLET (SOCW IBR)	8"X3/4"	MSS SP 97	3000#	ASTM A105	No.	7	248	1,736.00

XV	SOCKOLET (SOCW)	8"X3/4"	MSS SP 97	3000#	ASTM A182 F304	No.	15	583	8,745.00
XVI	SOCKOLET (SOCW)	8"X11/2"	MSS SP 97	3000#	ASTM A182 F304	No.	2	990	1,980.00
XVII	SOCKOLET (SOCW)	10"X3/4"	MSS SP 97	3000#	ASTM A105	No.	3	154	462.00
XVIII	SOCKOLET (SOCW)	14"X3/4"	MSS SP 97	3000#	ASTM A105	No.	13	220	2,860.00
XIX	SOCKOLET (SOCW)	16"X3/4"	MSS SP 97	3000#	ASTM A105	No.	3	220	660.00
XX	SOCKOLET (SOCW)	16"X3/4"	MSS SP 97	3000#	ASTM A182 F304	No.	7	440	3,080.00
								SUB-TOTAL	**76,117.00**
10.0 BLIND FLANGE									
I	BLIND FLANGE	3	ASME B16.5	150#,RF 125 AARH	ASTM A105	No.	4	484	1,936.00
II	BLIND FLANGE	4	ASME B16.5	150#,RF 125 AARH	ASTM A105	No.	2	645	1,290.00
III	BLIND FLANGE	4	ASME B16.5	150#,RF 125 AARH	ASTM A182 F304	No.	2	2904	5,808.00
IV	BLIND FLANGE	12	ASME B16.5	150#,RF 125 AARH	ASTM A105	No.	2	4290	8,580.00
								SUB-TOTAL	**17,614.00**
11.0 CAP (CS)									
I	CAP, THD	3/4"	ASME B16.11	3000#	ASTM A105	No.	146	55	8,030.00
II	CAP, THD	3/4"	ASME B16.11	3000#	ASTM A182 F304	No.	53	132	6,996.00
III	CAP, THD	3/4"	ASME B16.11	3000#	ASTM A105 HOT DIP GALV.	No.	11	152	1,672.00
IV	CAP, THD IBR	3/4"	ASME B16.11	3000#	ASTM A105	No.	11	127	1,397.00
V	CAP, PE	3/4"	MF.STD/DIN 16965 PART 4		FRP DERAKANE 411 OR EQUV+ANTI	No.	20	292	5,840.00
VI	CAP, THD IBR	1	ASME B16.11	3000#	ASTM A105	No.	2	193	386.00
VII	CAP, BW IBR	4	ASME B16.9	SCH 40	ASTM A234 WPB-SMLS	No.	9	399	3,591.00
VIII	CAP, BW IBR	8	ASME B16.9	SCH 20	ASTM A234 WPB-SMLS	No.	3	1045	3,135.00

								SUB-TOTAL	**31,047.00**
12.0 NIPPLE									
I	NIPPLE, PLN-PLN	3/4"	ASME B36.10	SCH160	SMLS,API 5L GR.B	No.	163	187	30,481.00
II	NIPPLE, PLN-THD, NPT	3/4"	ASME B36.10	SCH160	SMLS,API 5L GR.B	No.	161	198	31,878.00
III	NIPPLE, PLN-PLN IBR	3/4"	ASME B36.10	SCH160	SMLS,ASTM A106 GR.B	No.	11	187	2,057.00
IV	NIPPLE, PLN-THD IBR	3/4"	ASME B36.10	SCH160	SMLS,ASTM A106 GR.B	No.	11	209	2,299.00
V	NIPPLE, THD	3/4"	ASME B36.10	SCHXXS	SMLS,ASTM A106 GR.B,HOT DIP	No.	22	298	6,556.00
VI	NIPPLE, PLN-PLN	3/4"	ASME B36.19	SCH80S	SMLS,ASTM A312 TP304	No.	65	165	10,725.00
VII	NIPPLE, PLN-THD	3/4"	ASME B36.19	SCH80S	SMLS,ASTM A312 TP304	No.	65	165	10,725.00
VIII	NIPPLE, PE	3/4"	MF.STD/DIN 16965 PART 4	CALC	FRP DERAKANE 411 OR EQUV+ANTI	No.	26	408	10,608.00
IX	NIPPLE, PLN-THD	11/2"	ASME B36.19	SCH80S	SMLS,ASTM A312 TP304	No.	7	660	4,620.00
X	NIPPLE, PLN-THD IBR	1	ASME B36.10	SCH160	SMLS,ASTM A106 GR.B	No.	2	158	316.00
XI	NIPPLE, PLN-THD	1	ASME B36.19	SCH80S	SMLS,ASTM A312 TP304	No.	3	215	645.00
								SUB-TOTAL	**1,10,910.00**
13.0 BRANCH WELD WITH RP									
I	BRANCH WELD WITH RP	16"X4"	ASME B31.3	SCH10S X SCH10S	STAINLESS STEEL	No.	2	603	1,206.00
II	BRANCH WELD WITH RP	3"X3/4"	MF.STD/DIN 16965 PART 4	CALC X CALC	FRP DERAKANE 411 OR EQUV+ANTI	No.	7	292	2,044.00
III	BRANCH WELD WITH RP	6"X3/4"	MF.STD/DIN 16965 PART 4	CALC X CALC	FRP DERAKANE 411 OR EQUV+ANTI	No.	7	292	2,044.00
								SUB-TOTAL	**5,294.00**
14.0 HALF COUPLING									
I	HALF COUPLING, SOCW IBR	3/4	ASME B16.11	3000#	ASTM A105	No.	9	53	477.00
II	HALF COUPLING, THRD	3/4	ASME B16.11	3000#	ASTM A105 HOT DIP GALV.	No.	13	63	819.00

III	HALF COUPLING, THRD	11/2	ASME B16.11	3000#	ASTM A105 HOT DIP GALV.	No.	4	143	572.00
IV	HALF COUPLING, SOCW IBR	1	ASME B16.11	3000#	ASTM A105	No.	2	79	158.00
								SUB-TOTAL	**2,026.00**
15.0 COUPLING									
I	COUPLING, SOCW	1	ASME B16.11	3000#	ASTM A105	No.	22	66	1,452.00
II	COUPLING, SOCW	1	ASME B16.11	3000#	ASTM A182 F304	No.	9	158	1,422.00
III	COUPLING, BW	2	ASME B16.9		ASTM A234 WPB-SMLS,HOT DIP	No.	153	150	22,950.00
IV	COUPLING, BW	3	ASME B16.9		ASTM A234 WPB-SMLS,HOT DIP	No.	5	250	1,250.00
V	COUPLING, BW	4	ASME B16.9		ASTM A234 WPB-SMLS,HOT DIP	No.	3	322	966.00
VI	COUPLING, BW	6	ASME B16.9		ASTM A234 WPB-SMLS,HOT DIP	No.	87	423	36,801.00
VII	COUPLING, BW	8	ASME B16.9		ASTM A234 WPB-SMLS,HOT DIP	No.	3	500	1,500.00
VIII	COUPLING, SOCW	11/2	ASME B16.11	3000#	ASTM A105	No.	282	120	33,840.00
IX	COUPLING, SOCW	11/2	ASME B16.11	3000#	ASTM A182 F304	No.	78	303	23,634.00
X	COUPLING, THRD	11/2	ASME B16.11	3000#	ASTM A105 HOT DIP GALV.	No.	82	144	11,808.00
XI	COUPLING, SOCW IBR	3/4	ASME B16.11	3000#	ASTM A105	No.	14	138	1,932.00
								SUB-TOTAL	**1,37,555.00**
16.0 W.N.FLANGE									
I	W.N.FLANGE	1	ASME B16.5	150#, SCH40S,WN-RF 125 AARH	ASTM A182 F304	No.	3	424	1,272.00
II	W.N.FLANGE	2	ASME B16.5	150#, SCH XS,WN-RF 125 AARH	ASTM A105 HOT DIP GALV.	No.	4	471	1,884.00
III	W.N.FLANGE	3	ASME B16.5	150#, SCH 10S,WN-RF 125 AARH	ASTM A182 F304	No.	4	2112	8,448.00
IV	W.N.FLANGE	3	ASME B16.5	150#, SCH STD,WN-RF 125 AARH	ASTM A105 HOT DIP GALV.	No.	3	1069	3,207.00
V	W.N.FLANGE	4	ASME B16.5	150#, SCH 10S,WN-RF 125 AARH	ASTM A182 F304	No.	7	2904	20,328.00

VI	W.N.FLANGE	4	ASME B16.5	150#, SCH STD,WN-RF 125 AARH	ASTM A105 HOT DIP GALV.	No.	2	1426	2,852.00
VII	W.N.FLANGE	6	ASME B16.5	150#, SCH 10S,WN-RF 125 AARH	ASTM A182 F304	No.	4	4305	17,220.00
VIII	W.N.FLANGE	6	ASME B16.5	150#, SCH STD,WN-RF 125 AARH	ASTM A105 HOT DIP GALV.	No.	2	1905	3,810.00
IX	W.N.FLANGE	8	ASME B16.5	150#, SCH 10S,WN-RF 125 AARH	ASTM A182 F304	No.	8	6530	52,240.00
X	W.N.FLANGE	8	ASME B16.5	150#, SCH STD,WN-RF 125 AARH	ASTM A105 HOT DIP GALV.	No.	3	3036	9,108.00
XI	W.N.FLANGE	12	ASME B16.5	150#, SCH 10S,WN-RF 125 AARH	ASTM A182 F304	No.	2	15862	31,724.00
XII	W.N.FLANGE	14	ASME B16.5	600#,SCH 80,WN-RF 125 AARH	ASTM A105	No.	5	17582	87,910.00
XIII	W.N.FLANGE	16	ASME B16.5	150#, SCH 10S,WN-RF 125 AARH	ASTM A182 F304	No.	1	28600	28,600.00
XIV	W.N.FLANGE	11/2	ASME B16.5	150#, SCH 40S,WN-RF 125 AARH	ASTM A182 F304	No.	4	567	2,268.00
								SUB-TOTAL	**2,70,871.00**
17.0 WELDOLET									
I	WELDOLET BW	8X3	MSS SP 97	SCH20 X SCH40	ASTM A105	No.	4	1100	4,400.00
II	WELDOLET BW	12X6	MSS SP 97	SCH10 X SCH40	ASTM A105	No.	3	6435	19,305.00
III	WELDOLET BW	16X4	MSS SP 97	SCH10 X SCH40	ASTM A105	No.	1	1944	1,944.00
								SUB-TOTAL	**25,649.00**
18.0 STUB END									
I	STUD END	3	MF.STD/ASME B16.9	CALC	FRP DERAKANE 411 OR EQUV+ANTI	No.	3	4684	14,052.00
II	STUD END	6	MF.STD/ASME B16.10	CALC	FRP DERAKANE 411 OR EQUV+ANTI	No.	3	7674	23,022.00
								SUB-TOTAL	**37,074.00**
19.0 SPACER AND BLIND									
I	SPACER AND BLIND	14	ASME B16.48	600#,RF 125 AARH	ASTM A105	No.	2	25520	**51,040.00**
								SUB-TOTAL	**51,040.00**

TOTAL OF 3.0 = Rs.	**7,13,57,757.00**

4.a. FABRICATION & ERECTION OF ABOVE GROUND (A-G) PIPING

Transportation of all piping materials from storage point to work site/shop including from shop to work site, cleaning, stacking, surface preparation/shot blasting of piping, **supply & application of Cold tape type Wrapping & coating materials(Shall be paid seperatly as per Items nos 4.c), supply & application of paints and primers (including all coats-primer, intermediate & final coats)** for piping and equipments as per enclosed painting specification in NIT,prefabrication / fabrication at shop and/or site including marking, cutting, edge preparation, beveling, bending, etc., providing all branch connections, re-enforcement pads, threading etc., welding of all fitting and specials, erection including lifting, placing, installing of supports etc. at all levels and locations, leveling, aligning, jointing of flanges including insertion of gaskets, orifice plates, spectacle blinds etc., bolting, joining by threading or welding, ,connecting the system to the required other system, equipments, pumps, including hook up of new lines with existing lines, and welding of Tie-in points as per tie-in list, installation of all in line fittings / all type of valves / Instruments / strainers / filters / spray nozzles / traps, safety / control valves rapture disc, flow meters, flow orifice etc. as applicable including shifting to & collection from painting contractor's shop for erection, hydro testing, flushing and blowing, seal/leak testing and making ready for commissioning as per drawings, specification ,standards ,codes, instructions of Owner/Consultant and scope of work defined in Tender. Welding shall include all the examination and testing required such as but not limited to radiography, ultrasonic, magnaflux /dye check etc and pre and post heat treatment wherever required.
The cost towards radiography only shall be paid separately as per SOR Cl. 9.0 . Unit rates shall include the cost of supervision, labour, overheads/profits, consumables, and other associated arrangements required to execute all the related activities.
In case of IBR piping, material identification, drawing approval, hydro-test witness and final approval of fabricated **piping by IBR** authorities for taking the same in use, shall also be included in the quoted rate.The quoted rates shall include seal welding of thermocouples, Orifice flange plug, nipple, and hydro testing drain and vents caps.

SL NO	Description			UNIT	Approx Qty.	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
	NB	O.D.	SCH./THK				
A	**PIPE : SMLS, API 5L GR.B/ERW, API 5L GR.B**						
I	1"	33.4	SCH 80	Mtr.	110	800	88,000.00
II	1 1/2"	48.3	SCH 80	Mtr.	1500	800	12,00,000.00
III	2"	60.3	SCH 40	Mtr.	4700	1520	71,44,000.00
IV	3"	88.9	SCH 40	Mtr.	2900	2200	63,80,000.00
V	4"	114.3	SCH 40	Mtr.	1900	3000	57,00,000.00
VI	6"	168.3	SCH 40	Mtr.	1200	4120	49,44,000.00
VII	8"	219.1	SCH 20	Mtr.	2040	5520	1,12,60,800.00
VIII	10"	273	SCH 20	Mtr.	150	6811	10,21,650.00
IX	12"	323.9	SCH 20	Mtr.	15	8220	1,23,300.00
X	14"	355.6	SCH 10	Mtr.	45	10220	4,59,900.00
XI	14"	355.6	SCH 80	Mtr.	755	11050	83,42,750.00
XII	16"	406.4	SCH 10	Mtr.	45	11220	5,04,900.00
B	**EFW, STR.WELD, ASTM A312 TP304/SMLS, ASTM A312 TP304**						
I	1"	33.4	SCH40S	Mtr.	35	1100	38,500.00
II	1 1/2"	48.3	SCH40S	Mtr.	400	1100	4,40,000.00
III	3"	88.9	SCH10S	Mtr.	625	3200	20,00,000.00
IV	4"	114.3	SCH10S	Mtr.	1400	4250	59,50,000.00
V	6"	168.3	SCH10S	Mtr.	400	5995	23,98,000.00
VI	8"	219.1	SCH10S	Mtr.	856	7200	61,63,200.00

VII	12"	323.9	SCH10S	Mtr.	140	11220	15,70,800.00
VIII	16"	406.4	SCH10S	Mtr.	270	15690	42,36,300.00
C	**FRP DERAKANE 411 OR EQUV+ANTI CORROSION BARRIER**						
I	3"	88.9	CALC	Mtr.	610	2500	15,25,000.00
II	6"	168.3	CALC	Mtr.	609	4200	25,57,800.00
D	**SMLS, ASTM A106 GR.B (IBR)**						
I	3/4"	26.7	SCH 80	Mtr.	61	1582	96,502.00
II	4"	114.3	SCH 40	Mtr.	910	4450	40,49,500.00
III	8"	219.1	SCH 20	Mtr.	185	8200	15,17,000.00
E	**SMLS, ASTM A106 GR.B, HOT DIP GALV.**						
I	1 1/2"	48.3	SCH XS	Mtr.	410	1250	5,12,500.00
II	2"	60.3	SCH XS	Mtr.	840	1760	14,78,400.00
III	3"	88.9	SCHSTD	Mtr.	25	3390	84,750.00
IV	4"	114.3	SCHSTD	Mtr.	15	4360	65,400.00
V	6"	168.3	SCHSTD	Mtr.	490	6200	30,38,000.00
VI	8"	219.1	SCHSTD	Mtr.	15	7500	1,12,500.00
						SUB TOTAL OF 4.a. = Rs.	**8,50,03,452.00**

4.b. UNDER GROUND (U-G) PIPING WORKS:

A	EARTHWORK	UNIT	Approx Qty.	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
I	Excavation of trenches for pipelines in all kinds of soil including soft and hard rock mixed in nature both dry and wet conditions including dressing of sides and bottom getting out excavated material in the approved dump yard in all leads of 100 meter including spreding and leveling as per instruction of owner/Consultant.	M3	1500	2200	33,00,000.00
II	Same as above but lift from 1.5 Mtr.to 3.0 Mtr.	M3	500	3300	16,50,000.00
III	Providing and filling with fine river sand in trenches a layer of 150 mm from BOP(Bottom of pipe) and 200 mm top of pipes(In case of pipe size>24" NB) and for pipe<24" filling of sand in trenches shall be 150mm from BOP and 100 mm from top of pipe including watering, ramming, consolidating and complete dressing.	M3	500	3300	16,50,000.00

IV	Filling with available earth excavated without stones & unwanted materials in the treanches in layer other than Sr. No. III. In depth consolidation each deposited layer by ramming and watering all complete.			M3	500	700	3,50,000.00
V	Removal or excess excavated materials after back filling of trenchesfrom site of work to other area in factory premises, as directed by ownerand spreading and leveling the same.			M3	1000	1000	10,00,000.00
VI	Cutting and disposal of RCC, PCC and paved surface at all level other than I & II			M3	600	1700	10,20,000.00
B	**FABRICATION & ERECTION OF UNDER GROUND (U-G) PIPING-ERW,API 5L GR.B/SMLS,API 5L GR.B**						
I	4"	114.3	SCH 40	Mtr.	50	2950	1,47,500.00
II	6"	168.3	SCH 40	Mtr.	30	4400	1,32,000.00
III	8"	219.1	SCH 10	Mtr.	15	6200	93,000.00
IV	10"	273	SCH 10	Mtr.	75	6800	5,10,000.00
V	12"	323.9	SCH 10	Mtr.	1050	7200	75,60,000.00
VI	16"	406.4	SCH 10	Mtr.	660	12250	80,85,000.00
C	**COATING AND WRAPPING OF UNDERGROUND PIPING**						
	Procurement and supply of all Cold Tape type coating and wrapping materials, manpower, equipments, consumables and necessary arrangements for surface preparation and application shall be in the scope of Contractor. All oil, grease, rust, mill scale, soil, dust, previous paint if any or foreign matters shall be completely removed from pipe surface prior to priming. Surface cleaning and preparation shall consist of cleaning and degreasing by Grit / Shot blasting and or power scraping, using most suitable method or a combination therefore, both followed by carefully removal of the dust according to the specification ISO 8501-1: 1988 SA 2.5. The coating continuity shall be visually 100% checked by electric Holiday detector to detect and search of particles and other inclusion, pinholes, cavities, cracks and other ruptures. All defects visually detected or by Holiday detector shall be clearly marked and all defects in the coating shall be made good immediately after their inspection.						
	COATING AND WRAPPING OF UNDERGROUND PIPING: As per C&W-TS						
	Cold Tape Type (Two layer = Inner wrap and Outer wrap.)			Sq. M.	2050	6500	1,33,25,000.00
						SUB TOTAL OF 4.b. = Rs.	**3,88,22,500.00**
						TOTAL OF 4.0 = Rs.	**12,38,25,952.00**

5.0 PRE-FABRICATED PIPING

5. a. ERECTION OF PREFABRICATED PIPING

Transportation of prefabricated spools from Owner/ Consultant's storage point to work site/shop including from shop to work site, cleaning, stacking, collecting from painting Contractor's shop, erection by bolting/screwing, welding, supporting (Technical Specification Cl. 1.4.2), hydro-testing, flushing & blowing, seal/leak testing and ready for commissioning as per drawings, specifications, standards, codes, instructions of Owner/Consultant and scope of work defined in Tender.

Bidders shall quote the erection rate in Rupees per M.T.; include the cost of labour, supervision, overheads/profits, and temporary supports wherever required. Materials which are in Contractor's scope, consumables, conditions listed in preamble to Schedule of Rates and other associated arrangements required to execute all the related activities. For all field joints welding in piping > 2" NB, welding activity shall be paid as per SOR Cl. No.5. b. However, piping with flange joint connection payment shall be made on tonnage basis as per Cl. No. 5. a (A & B).

For IBR piping all necessary approval for material identification, drawing approval, hydro-test witness and final approval of fabricated piping by IBR authorities shall also be included in the quoted rate.

The prefabricated spools may be supplied in 100 mm extra at each field weld joints for adjustments. Cutting of extra length on prefabricated spools as per site requirement, beveling and edge preparation as per standard shall also be included as part of this activity.

SL NO		Description	UNIT	Approx Qty.	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
A. PIPING ≤ 2" SIZE						
1		Carbon Steel (Non-IBR)	MT.	0.8	75000	60,000.00
2		Carbon Steel (IBR)	MT.	0.8	75000	60,000.00
3		Alloy Steel (IBR)	MT.	0.1	75000	7,500.00
4		Stainless Steel	MT.	0.5	150000	75,000.00
B. PIPING > 2" SIZE						
1		Carbon Steel (Non-IBR)	MT.	0.8	65000	52,000.00
2		Carbon Steel (IBR)	MT.	0.8	65000	52,000.00
3		Alloy Steel (IBR)	MT.	0.2	65000	13,000.00
4		Stainless Steel	MT.	0.5	120000	60,000.00
					SUB TOTAL OF 5.a.= Rs.	**3,79,500.00**

5. b. FIELD WELDING OF PRE-FABRICATED PIPING JOINTS:

The field welds for piping shall be as indicated below and in the scope of this Contract shall be done as per markings on drawings. Welding shall include all examination and inspection required, such as but not limited to radiograph, ultrasonic, magnaflux/dye check etc. and pre and post weld heat treatment wherever required. The cost towards radiography & stress relieving shall be paid separately as per Schedule of Rates Cl.2.8 & 2.9 respectively.

Rates shall also include the cost of supervision, labour, overloads/profits, materials which are in the Contractor's scope. Consumables, conditions listed in preamble to Schedule of Rates and other associate arrangements required executing all the related activities. The rates quoted shall be per joint basis.

SL NO		Description NB	UNIT	Qty.	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
A) PIPE MATERIAL : CARBON STEEL (IBR/Non- IBR)						
1		2" Sch. 40	No. of joints	1	2900	2,900.00
2		3" Sch. 40	No. of joints	1	4350	4,350.00
3		6"Sch. 80	No. of joints	1	9564	9,564.00

4		8" Sch.80	No. of joints	1	14736	14,736.00
5		10" Sch.120	No. of joints	1	41450	41,450.00
6		12" Sch. 20	No. of joints	1	44150	44,150.00
7		12" Sch. 30	No. of joints	1	40050	40,050.00
8		14" Sch. STD	No. of joints	1	46050	46,050.00
9		16" Sch. 20	No. of joints	1	48000	48,000.00
10		16" Sch. 30	No. of joints	1	48000	48,000.00
B) PIPE MATERIAL : STAINLESS STEEL						
1		2" Sch.40s	No. of joints	1	5000	5,000.00
2		6" Sch.10s	No. of joints	1	15000	15,000.00
3		8" Sch.10s	No. of joints	1	20000	20,000.00
4		10" Sch.10s	No. of joints	1	25000	25,000.00
5		12" Sch.10s	No. of joints	1	30000	30,000.00
6		14" Sch.10s	No. of joints	1	35000	35,000.00
7		16" Sch.10S	No. of joints	1	40000	40,000.00
8		16" Sch.80S	No. of joints	1	42000	42,000.00
					SUB TOTAL OF 5.b.= Rs.	**5,11,250.00**
					TOTAL OF 5.0 = Rs.	**8,90,750.00**

6.0 TESTING OF HEAT EXCHANGERS

Heat exchangers erected by the Contractor and / or existing heat exchangers and existing equipment erected by other Contractors may have to be tested at site by the Contractor. Test rings, if available, shall be supplied to Contractor by Owner.

Contractor shall be required to withdraw the test rings from stores, storage yard or any other place (inside the project) initiated by Owner / Consultant, transport to place of testing, testing the heat exchangers and the same to be returned to Owner's stores after completion of test, as per instructions of Owner/Consultant. The quoted rates shall also include tightening of gland packing of valves, bonnet of flanged valves, existing flanges and providing hydro testing blanks by welding, Blinding & deblinding if required during hydro testing.Reintallation of piping & assoceries related to heat exchangers.

The rates shall include the cost of labour, testing materials such as pump, pressure gauges, piping, valves etc; consumables and all other associated arrangements & activities required completion of testing.

SL NO		DESCRIPTION	UNIT	Qty	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
1		Testing of New Heat Exchangers / Existing Exchangers / Equipments	MT	1	30000	30,000.00
					TOTAL OF 6.0 = Rs.	**30,000.00**

NOTES: -

1. Weight indicated in 'Total Qty.' in MT of total heat exchangers/ Equipments.
2. The testing shall be done both for shell & tube side, if required, by Owner /Consultant.

7.0 ERECTION OF VALVES

Transportation from storage points to shop/site, (including testing and setting of safety valves but excluding testing of control valves which shall be issued from Owner/ Consultant's stores or instrument contractor's shop/stores), installation in position by threading, bolting or welding as per drawings, specifications, standards / codes, instructions of Owner/Consultant and scope of work defined in NIT. Welding shall include all the examination and inspection required such as but not limited to radiography, ultrasonic, magnaflux, dye check etc, pre and post heat-treatment wherever required.

The cost towards radiography shall be paid separately as per Cl 9 of Schedule of Rates, whereas the cost of all other tests is included in the rates quoted as per Cl. 2.4 Of Schedule of Rates. Rates shall also include the cost of supervision, labour, Overhead / profits, consumables, statutory approval and conditions listed in preamble to Schedule of Rates and other associated arrangements required to execute all the related activities.

The quoted rates shall also include tightening of gland packing and bonnet flange of valves if required during hydro-testing of piping.

SL NO		Description	UNIT	Approx Qty.	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
A) FLANGED/SCREWED VALVES						
1		2" to 4"	No	17	1500	25,500.00
2		6" to 8"	No	18	3000	54,000.00
3		10" to 12"	No	2	4000	8,000.00
4		14" to 16"	No	1	5200	5,200.00
B) SW/BW VALVES						
1		Up to 3/4"	No	240	5200	12,48,000.00
2		1" TO 1 1/2"	No	11	8200	90,200.00
					TOTAL OF 7.0 = Rs.	**14,30,900.00**

NOTES:
1. WAFER TYPE VALVES shall be treated as flanged valves
2. Above includes valves of all materials, rating, IBR/Non IBR.
3. Above includes all types of valves.

8.0 PIPE SUPPORTS

8. a. SUPPLY & FABRICATION OF PIPE SUPPORTS

Supply & Fabrication of pipe supports as per drawings, standards, Specifications, NIT conditions & instructions of Owner/Consultant. The rate shall include the cost of materials , consumables, surface preparation & application of primer, labour overheads/profits etc.

CATEGORY	MATERIAL OF CONSTRUCTION
PS 1	Means carbon steel supports.
PS 2	Means alloy steel supports (Alloy steel parts of supports only)
PS 3	Means stainless steel supports (SS parts of Support only)
PS 4	PUF supports
PS 5	Means Turn buckles (Forged)
PS 6	Means Spring support (Free Issue)

SL NO		Category of Supports	UNIT		Qty.	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
1		PS 1	MT.		10	140110	14,01,100.00
2		PS 2	MT.		1	200000	2,00,000.00
3		PS 3	MT.		1	160000	1,60,000.00
4		PS 4	MT.		0.2	245000	49,000.00

5		PS 5	MT.		0.1	285000	28,500.00
						TOTAL OF 8.a. = Rs.	**18,38,600.00**

8. b. ERECTION OF PIPE SUPPORTS

Erection of supports fabricated by Contractor and/or supplied by vendors. The rate shall include cost of erection as part of piping, welding (including dissimilar welding), labour, consumables, application of finish paint, overheads/profits etc to complete all related activities as per ITB and instruction of Owner/ Consultant.

SL NO		Category of Supports	UNIT		Qty.	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
1		PS 1	MT.		10	16000	1,60,000.00
2		PS 2	MT.		1	16000	16,000.00
3		PS 3	MT.		1	17500	17,500.00
4		PS 4	MT.		0.2	6000	1,200.00
5		PS 5	MT.		0.1	85000	8,500.00
6		PS6 (spring Supports)	MT.		1.5	60000	90,000.00
						TOTAL OF 8.b.= Rs.	**2,93,200.00**

Notes for 8.a. & 8.b. :

1. Irrespective of whether pipe supports and/or pipe support materials are supplied by Contractor or Vendor, all fasteners such as bolts, studs, nuts, washers etc., are to be supplied by Contractor at his cost.

2. Preference shall be given to PUF support

3. Welding for supports shall include preheating and all tests (excluding radiography & stress relieving, which shall be paid separately) such as dye- penetrent test, hardness test etc. as required by standards, codes, specifications and instructions of Owner/Consultant.

4. Turn buckles shall be as per Engineering Standard

5. For PUF Supports, density shall be 250 Kg/M3 and dimensions shall be as per support sketch. Both the inner and outer diameter surfaces shall have Aluminum facing.

8.c. STRUCTURAL STEEL WORKS

All structural work under this enquiry has been divided in to two categories:

CATEGORY-A : Equipment platforms , valve operating platforms, ladders and hand railing (but excluding gratings) and any other additional equipment supports, if required , to be fabricated at site.

CATEGORY-B : Galvanized Gratings (35 mm)

The rates for above items shall be quoted for supply, fabrication and Erection as per the format below.

8.c.1 Supply, Fabrication & Erection of Steel Structure

Structural steel is also to be arranged and supplied by CONTACTOR.

The rate shall include cost of preparation, submission and obtaining approval of fabrication drawings from CONSULTANT, labour, materials, consumables, surface preparation & application of primer, tools & tackles and other associated arrangement required to execute all the related activities. The cost shall also include cost of bolts, nuts, washers and anchor bolts. The rate shall include cost of withdrawal and transportation from OWNER/CONSULTANT'S stores /storage yard (if prefabricated structurals issued by OWNER/CONSULTANT) or from his own stores/ shop to place of erection, grouting

SL NO		Description	UNIT		Qty.	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
1		CATEGORY-A	MT		2	174462	3,48,924.00

2		CATEGORY-B	MT		0.5	165480	82,740.00
						TOTAL OF 8.c.1. = Rs.	**4,31,664.00**
						SUB TOTAL OF 8.0 = Rs.	**25,63,464.00**

Note:

1. Prior approval shall have to be obtained from OWNER/CONSULTANT, in writing for making a change in sections due to non-availability of certain sections or using built-up section, compound sections, for fabrication of built-up compound sections either recommended by CONSULTANT or CONTRACTOR, no extra payment shall be made.

2. For hand railing under clause 8.c.1 pipes shall also be supplied by CONTRACTOR.

3. During execution of piping etc. gratings may have to be cut and the same shall be repaired by cold galvanization (Zinc spray) of thickness 80 microns after proper surface preparation. This activity shall be deemed covered within the unit rate of erection of grating and nothing extra shall be paid for this.

9.0 RADIOGRAPHY (GAMMA RAY)

The unit rate shall include cost of radiograph viewer and films, consumables, scaffolding, manpower, overheads/profits etc. Payment shall be made only for those films after examination for joints found acceptable as per codes, standards & NIT. Films for defective joints shall not be paid. Overlapping Length of radiography film is not payable.

SL NO		Description	UNIT	Approx Quantity	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
A.0	**At outside, the place of erection using film size**					
a)		3" wide film	Inches	1350	110	1,48,500.00
b)		4" wide film	Inches	7850	140	10,99,000.00
B.0	**In-situ (Erected position) using**					
a)		3" wide film	Inches	1050	140	1,47,000.00
b)		4" wide film	Inches	6050	190	11,49,500.00
					SUB TOTAL OF 9.0 = Rs.	**25,44,000.00**

NOTES:

1. Length and width of film to be used which shall be decided by Owner before execution of radiography.
2. As a guide line the radiography film shall be used as below: -
   - i) 3" wide film shall be used up to 4" dia pipes
   - ii) 4" wide film shall be used above 4" dia pipes
3. Payment shall be made on the basis of weld length radiographed & for those joints which are found acceptable.
4. Length of radiographed film shall be calculated (O.D. x 3.14) in inch.

10.0 MODIFICATION/EXTRA WORKS (IF ANY): -

MODIFICATION/EXTRA WORKS (IF ANY) :- Cutting, bevelling, fitup, welding of different sizes of CS(IBR / NON IBR) /AS/SS piping of all types and thicknessess in shop, in position, on ground/overhead on rack and at all elevations; transportation of pipes, fittings, flanges etc from owner's storage point to work site/ work shop, making necessary scaffoldings, consumables, machinery, tools, tackles, labour and supervision including attending repairs for completing the work as per the instruction of Engineer-in-charge.

SL NO		Description / Material	UNIT	Qty.	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
1		FLAME CUTTING C.S PIPING IBR/NON IBR	Inch dia	500	350	1,75,000.00
2		HACKSAW CUTTING C.S PIPING IBR/NON IBR	Inch dia	30	450	13,500.00

3		BEVELLING C.S PIPING IBR/NON IBR	Inch dia	500	600		3,00,000.00
4		Fit up & Welding C.S	Inch dia	500	2900		14,50,000.00
5		FLAME CUTTING S.S PIPING	Inch dia	100	600		60,000.00
6		HACKSAW CUTTING S.S PIPING	Inch dia	30	350		10,500.00
7		BEVELLING S.S PIPING	Inch dia	100	350		35,000.00
8		Fit up & Welding OF SS	Inch dia	100	3250		3,25,000.00
9		Plate Cutting Up to 10 mm (CS, CSLT & AS)	Inch dia	25	450		11,250.00
10		Plate Cutting Up to 10 mm (SS)	Inch dia	25	550		13,750.00
11		Plate Welding Up to 10 mm (CS, CSLT & AS)	Inch dia	25	3560		89,000.00
12		Plate Welding Up to 10 mm (SS)	Inch dia	25	4250		1,06,250.00
					SUB TOTAL OF 10.0= Rs.		**25,89,250.00**

NOTE:

1. Rates shall include for IBR and Non IBR
2. CS shall include GI also.
3. For other thickness, the rates shall be increased by direct proportion.
4. Rates for cutting shall include the cost of consumables labour and other necessary arrangement related with & for this activity.

11.0 HANDLING CHARGES FOR MODIFICATION & ERECTION

1. This rate is applicable for all materials, i.e. carbon steel, alloy steel, and stainless steel.
2. Handling charges shall be paid for piping, required to be removed and reinstalled for modifications called for, after erection is done by Contractor. Payment shall be made only if the modification is required for no fault of Contractor.
3. This item rate shall be applicable only for those items which are not covered elsewhere in the contract.

SL NO		Description /Thk. (mm) Material	UNIT	Qty.	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
1		**REMOVAL & REINSTALLATION** After modification (cutting & welding to be paid as per 10.0 as the case may be)	MT	1	250000	2,50,000.00
					SUB TOTAL OF 11.0 = Rs.	**2,50,000.00**

12.0 ASSISTANCE DURING PRE COMMISSIONING/COMMISSIONING

The rate below shall be inclusive of Contractor's supervision, hand tools, all equipments & machinery, consumables, contractor's supervision, over-head and profits.

SL NO		Category of Personnel	UNIT	Approx Qty	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
a		Skilled (with hand tools, equipment/machinery, consumables): Welder, Millwright Fitter	MANDAY	30	3050	91,500.00
b		Semi Skilled (with hand tools): Pipe Fitter, Gas Cutter, Rigger, Electrician (for welding m/c).	MANDAY	30	1900	57,000.00
c		Unskilled: Helper, Khalasi.	MANDAY	30	1400	42,000.00
					SUB TOTAL OF 12.0 = Rs.	**1,90,500.00**

13.0 LETTER STENCILLING

SL NO		Description	UNIT	Approx Qty	UNIT RATE (Rs.)	TOTAL AMOUNT (Rs.)
1		**LETTER STENCILLING** Surface preparation,supply and application of primer and paint on uninsulated equipment, for lettering, stenciling on Pumps, Piping for the purposes of identification (Equipment Name, Equipment Number & Service Description) as per applicable painting specification enclosed elsewhere in the tender document, providing scaffolding for all heights, labour, materials, tools, tackles, supervision etc. to complete the work as per specifications and instructions of Engineer-in-Charge.	Per Letter	1000	130	1,30,000.00
					SUB TOTAL OF 13.0 = Rs.	**1,30,000.00**
					GRAND TOTAL OF SUPPLY & ERECTION (Rs.)	**21,15,92,573.00**

SECTION-5.2

SUB-SECTION-5.2.2

SOR FOR SUPPLY & APPLICATION OF INSULATION FOR PIPING & EQUIPMENTS

SCHEDULE OF RATES

FOR

SUPPLY & APPLICATION OF INSULATION FOR PIPING & EQUIPMENTS

FOR

COMPOSITE MECHANICAL ERECTION WORKS AT HURL GORAKHPUR

(OSBL)

1.0 HOT INSULATION

1.1 EQUIPMENT: -

1.1.1 EQUIPMENTS WITH OPERATING TEMPERATURE UP TO 500^0 C - Supply and application, inspection, testing and guarantee are using **Rock Wool Mattress / Slabs** as per drawings, documents, codes, standards and technical specification and as per instructions of Owner / Consultant.

Sl. No.	Insulation Thick. (mm)	Unit	APPROX QTY	Unit Rate (Rs.)	Total Amount (Rs)
1	100	M^2	150	2450	3,67,500.00
2	130	M^2	150	3000	4,50,000.00

SUB-TOTAL OF ITEM (1.0) = Rs. 8,17,500.00

2.0 PIPING: -

PIPING WITH OPERATING TEMPERATURE UP TO 400^0C & NOMINAL PIPE SIZE UP TO 14" NB Supply and application, inspection, testing and guarantee are using **Rock Wool Mattress / Slabs** (in 2 halves) as per drawings, documents, codes, standards and technical specification and as per instructions of Owner / Consultant.

Sl. No.	Insulation Thick (mm)	Pipe size NB (Inch)	UNIT	APPROX. QTY.	UNIT RATE (Rs.)	Total Amount (Rs.)
1.	50	¾	MTR	120	735	88,200.00
2.	50	1	MTR	10	840	8,400.00
3.	75	4	MTR	1100	1550	17,05,000.00
4.	75	8	MTR	265	2000	5,30,000.00

SUB-TOTAL OF ITEM (2.0) = Rs. 23,31,600.00

3.0 ALUMINUM FOIL WRAPPING ON S.S. SURFACE BEFORE INSULATION OF EQUIPMENT & PIPING: - Supply and application, inspection and certification by Owner / Consultant's site engineer.

Sl. No.	Description of Item	UNIT	APPROX. QTY.	Unit Rate (Rs.)	Total Amount (Rs.)
1.	For Equipment	M^2	160	150	24,000.00
2.	For Piping	M^2	300	110	33,000.00

SUB-TOTAL OF ITEM (3.0) = Rs. 57,000.00

4.0 INSPECTION POCKETS

Inspection pockets of sizes 4" X 4" to be made as instructions of Owner / Consultant at site.

Sl. No.	Inspection Pockets	UNIT	APPROX. QTY.	Unit Rate (Rs.)	Total Amount (Rs.)
1.	Size 4" X 4"	Nos.	05	100	500.00

SUB-TOTAL OF ITEM (4.0) = Rs. 500.00

GRAND TOTAL OF ITEMS (1.0+2.0+3.0+4.0) = Rs.32,06,600.00

SECTION-5.2

SUB-SECTION-5.2.3

SOR FOR PERMANENT CATHODIC PROTECTION FOR U/G PIPELINE NETWORK

SCHEDULE OF RATES
FOR
PCP OF U/G PIPELINE NETWORK
AMMONIA UREA FERTILIZER PLANT
OSBL HURL, GORAKHPUR

General Instruction to Bidder

1.0	The schedule of rates is to be read in conjunction with Technical Specification : Technical Specification of Permanent Cathodic Protection System U/g Cooling Water Pipeline Network and other relevant sections / sub sections.(Doc no. EM250-PNEL-TS-802)
2.0	The rates shall be applicable for all floors, heights and depths.
3.0	This being an item rate contract, the unit rate shall prevail, does any discrepancy arises between unit rate and total price, unit rate shall be considered for evaluation and arriving at the Contract Value.Further in case of any discrepancy arises between unit rate (in Figure) and unit rate (in words), unit rate indicated in words shall be considered for evaluation and arriving at contact value.
4.0	Owner/Consultant reserves the right to interpolate or extrapolate the rate for any item from the rates available for similar work in the Schedule of Rates.
5.0	Whenever it is mentioned in the specifications that the bidder shall perform certain work or provide certain facilities/materials or certain item or activity is in bidder's scope of services it is understood that the bidder shall do so at his cost within the item rates unless expressly stated otherwise.
6.0	Quoted rates shall include the cost of labour, supervision, and consumables, cost towards providing necessary tools and tackles, and providing all the required facilities for execution and inspection, testing, guarantees etc. as per Scope of work and Technical Specification of Permanent Cathodic Protection System of U/g steel pipeline network etc. listed in ITB. Minor repair and touch painting work towards providing all required facilities for execution shall be in bidder's scope.
7.0	Quoted rates shall also cover the cost towards fabrication of steel structure,its painting with two coats of epoxy paint, after surface preparation, at welded joints and surface of steel structure and providing one coat of zinc oxide primer.
8.0	All GI materials shall have zinc coating of 610 gm/Sq.mm at any point on its surface unless indicated otherwise in the schedule of rates.
9.0	All supply items shall be of superior quality. These shall conform to relevant IS and shall be of approved make.
10.0	The portion, which is under "HOLD" shown in the approved drawing (if any) or the portion, which would be brought under "HOLD" during execution on account of co-ordinating different activities of other working agencies (if any) shall be taken up by the Bidder to execute only after the said "HOLD" is withdrawn. The bidder on this account shall not be entitled to claim for any extra charge.
11.0	Any item specifically not indicated but considered necessary for completion of job shall also be quoted by the Bidder under separate sheet.Work shall also include any other item of work required to complete the work in all respect as per the specifications,drwaings and instructions of the Engineer-in- charge whether specifically mentioned or not in the tender document.
12.0	Bidder shall indicate the prices of all items/components as per attached documents.The items/quantity indicated in SOR are tentative/indicative and may vary considerably during detail engineering, depending upon site condition,methodology adopted as per site requirement with due approval of owner/consultant . Successful bidder shall supply the actual quantities as per approved design & as per site requirements,Payment shall be made as per quantities executed.Some items may even be added/deleted at the time of order,Successful bidder shall supply the equipments at the same rate as per these change quantities.Un-priced price schedule shall be attached with bid documents for conformity that all the items have been quoted.
13.0	Quoted rates shall remain firm till completion of work including all extensions granted for any reasons whatsoever.
14.0	All heavy machinery including Cranes, Hydra, etc for the job of CP works (if required) shall be in the bidder's scope.
15.0	Bidders are required to undertake all the safety precautions as deemed fit and necessary by statutory authorities and/or CONSULTANT/OWNER and cost towards such safety precautions /measures must be included in the quoted prices.
16.0	All items/ equipments to be supplied with required cable glands,cable lugs, foundation bolts,mounting accessories, spares etc.
17.0	All civil works associated with PCP are included in the scope of bidder,This shall include but not limited to making of cable trenchs wherever required,foundation for all equipement, test station etc.

Sr. No.	DESCRIPTION	UNIT	QTY	TOTAL LUMP SUM AMOUNT (in Rs.)
1.0	**Schedule of Rates For Permanent Cathodic Protection System**			
	Basic surveys, Design,Detailed Engineering, Supply,testing at works, transportation on FOT Project site in well packed condition,Storage at site,transpotation to work place,Physical verification/ inspection at site, Installation, testing ,commissioning of PCP system for underground steel pipeline network of 8",10", 12"& 16" dia, Piplines with Cold Tape Type coating system (Polyethylene backed tape with butyl rubber based adhesive system) which shall includes but not limited to MMO anodes, Cables, Semi Deep well anode ground beds, Long line linear anode, TR units, AJB, CJB, Zn ribbon anodes for casing protection,Test Stations, Cu/CuSO4 reference electrode, Zinc Grounding Anodes & Thermit Weld Kit along with all accessories for cable sizes indicated in Technical Specification to pipe connection including all work labour, materials, hardwares, civil masonary & structural materials. Scope shall also include Supply of tools and equipments for Erection, Pre commissioning & Commissioning activities, Supply of Mandatory Spares etc. Further scope shall also includes post commissioning survey like ON/OFF survey and the location of test station and polarization coupon in order to achieve adequate level of protection as per NACE criteria. Monitoring of complete PCP for 3 month from date of commissioning, complete with all work, labour, materials, hardware, civil masonry & structural materials. Above activities shall be as per specification of Permanent cathodic protection system (EM250-PNEL-TS-802), and instruction of Engineer in-charge.			
a)	for 8" dia, SCH 10	meter	13.315	35,00,000.00
b)	for 10" dia, SCH 10	meter	69.371	
c)	for 12" dia, SCH 10	meter	999.507	
d)	for 16" dia, SCH 10	meter	643.315	
	NOTE : For pipeline details, also refer mechanical input/SOR attached elsewhere in NIT.			
	TOTAL OF 1.0 = Rs.			**35,00,000.00**

SECTION-5.3

SUMMARY OF SCHEDULE OF RATES

[BIDDER TO QUOTE IN THIS SOR]

NIT NO.	:	PNPM/EM250/E/G-601
NIT DESCRIPTION	:	TENDER DOCUMENT FOR COMPOSITE MECHANICAL ERECTION WORKS FOR OFFSITE & UTILITIES OF AMMONIA-UREA FERTILIZER COMPLEX AT GORAKHPUR, UTTAR PRADESH

SUMMARY OF SCHEDULE OF RATES

S.NO.	ITEM DESCRIPTION	UNIT	ESTIMATED AMOUNT
1.	**SECTION-5.2.1 :** SOR FOR MECHANICAL WORKS (SUPPLY & ERECTION)	INR	21,15,92,573.00
2.	**SECTION-5.2.2 :** SOR FOR SUPPLY & APPLICATION OF INSULATION FOR PIPING & EQUIPMENTS	INR	32,06,600.00
3.	**SECTION-5.2.3 :** SOR FOR PERMANENT CATHODIC PROTECTION FOR U/G PIPELINE NETWORK	INR	35,00,000.00
4.	**TOTAL ESTIMATED VALUE (1+2+3)**	**INR**	**21,82,99,173.00**
5.	BIDDER TO QUOTE IN PERCENTAGE ABOVE OR BELOW APPLICABLE FOR TOTAL ESTIMATED VALUE MENTIONED AT S.NO.-4 ABOVE	In %	***Bidder to quote either Above or Below else bid will be rejected*** **(in fig.) Above :** ____ % **OR** **(in fig.) Below :** ____ % **(in words) : _____%** Note: The Percentage indicated above shall be applicable for all the Sections i.e. 5.2.1, 5.2.2 & 5.2.3.
6.	TOTAL QUOTED PRICE *[By considering Percentage Above Or Below (as mentioned at S.No.-5) on Estimated Value at S.No.-4]*	INR	
7.	**Goods & Service Tax (GST)**	**In %**	**18.00%**
8.	TOTAL GST Amount *(By considering GST Rate mentioned at S.No.-7)*	INR	
9.	**GRAND TOTAL (6 + 8)**	**INR**	

NIT NO.	:	PNPM/EM250/E/G-601
NIT DESCRIPTION	:	TENDER DOCUMENT FOR COMPOSITE MECHANICAL ERECTION WORKS FOR OFFSITE & UTILITIES OF AMMONIA-UREA FERTILIZER COMPLEX AT GORAKHPUR, UTTAR PRADESH

Note :

1.) **Bidder to quote either Above or Below above, else their bid will be liable to be rejected.**

2.) If the bidder has indicated “Not Applicable/Not Quoted” at S.No.-7 above, their bid will liable to be rejected and will not considered for price evaluation. However, if the bidder has indicated “Nil / Blank”, it will be consider as “Nil Percentage” and the Estimated Amount will be considered for evaluation and award, in case the bidder becomes successful.

3.) The Evaluation shall be done on Overall Lowest basis as per Clause no. 29.0 of the ITB, considering the rates quoted above plus GST.

4.) Bidder to quote the Percentage (Either Above or Below) within 2 Decimal places. Digits beyond 2 decimal places will be ignored.

5.) If two or more bidders emerge as the Lowest evaluated bidders after evaluation, in such an event, Revised Percentage (which should be lower than Original Quoted Percentage) will be sought from those bidders and Re-evaluation will be carried out for selection of Lowest (L-1) Bidder.

Name of Tenderer	:
Signature & Seal of Tenderer	:
Place	:
Date	: