

FORWARDING LETTER

M/s

Sub: IFB No. CPI8239P19 for Engineering, Fabrication and Supply of Modular Packages Contract (MPC) for OCS, Nadua and GGS, East Khagorijan in Dibrugarh, Assam

Dear Sirs,

1. OIL INDIA LIMITED (OIL), a “Navaratna” Category, Government of India Enterprise, [here in after referred also as ‘Company’] is a premier oil Company engaged in exploration, production and transportation of crude oil & natural gas with its Headquarters at Duliajan, Assam. Duliajan is well connected by Air with nearest Airport being at Dibrugarh, 45 km away.
2. OIL INDIA LIMITED proposes to construct an Oil Collecting Station (OCS) at Nadua and a Group Gathering Station (GGS) at East Khagorijan in upper Assam. The installations are to be constructed on Modular basis with standard sizes of modules as per Design Basis, Scope of Work and Functional specifications.
3. In this connection, OIL invites National Competitive Bids (NCB) from competent and experienced Bidders through OIL’s e-procurement site for Engineering, Procurement, Fabrication and Supply of Modular Air and Nitrogen Packages for OCS, Nadua and GGS East Khagorijan in Dibrugarh district, Assam. One complete set of Bid Document covering OIL’s IFB for Engineering, Procurement, Fabrication and Supply of Modular Air and Nitrogen Packages for OCS, Nadua and GGS East Khagorijan is uploaded in OIL’s e-procurement portal. You are invited to submit your most competitive bid on or before the scheduled bid closing date and time through OIL’s e-procurement portal. For your ready reference, few salient points of the IFB (covered in detail in the Bid Document) are highlighted below:

1.	IFB No./E-Tender No.	:	CPI8239P19
2.	Type of Bidding	:	National Competitive Bidding (NCB) under Single Stage 2-Bid System
3.	Tender Fee	:	INR 2,000.00
4.	Period of Tender Sale	:	14/06/2018 to 11/07/2018
5.	Bid Submission/Closing Date & Time	:	18/07/2018 at 11.00 Hours (IST)
6.	Technical Bid Opening Date & Time	:	18/07/2018 at 14.00 Hours (IST)
7.	Priced Bid Opening Date & Time	:	To be intimated to the Technically & Commercially acceptable bidders at a later date.
8.	Bid Submission Mode	:	E-tendering through OIL's e- tender Portal.
9.	Bid Opening Place	:	<u>Office of CGM-Projects</u> <u>Projects Department,</u> <u>Oil India Limited, Duliajan -786602,</u> <u>Assam, India.</u>
10.	Bid Validity	:	120 days from the Bid Closing date
11.	Delivery Period	:	Seven Months (7) from the Date of Letter of Award (LOA).
12.	Bid Security Value	:	INR 21,00,000.00
13.	Bid Security Validity	:	150 days from the Bid Closing date
14.	Original Bid Security to be submitted	:	GM(Projects-C&P), PROJECTS DEPARTMENT, OIL INDIA LIMITED, DULIAJAN, ASSAM-786 602, INDIA
15.	Amount of Performance Security	:	10% of Contract Value
16.	Validity of Performance Security	:	Up to 3 months from date of completion of Contract plus defect liability period
17.	Integrity Pact	:	Must be digitally signed & uploaded along with the Techno-commercial Un-priced Bid.
18.	Bids to be addressed to	:	GM(Projects-C&P), PROJECTS DEPARTMENT, OIL INDIA LIMITED, DULIAJAN, ASSAM-786 602, INDIA

4. Integrity Pact:

The Integrity Pact must be uploaded in OIL's E-procurement portal along with the Technical Bid digitally signed by the same signatory who signed the Bid i.e. who is duly authorized to sign the Bid. If any bidder refuses to sign Integrity Pact or declines to submit the Integrity Pact, their bid shall be rejected straightway. Uploading the Integrity Pact with digital signature will be construed that all pages of the Integrity Pact has been signed by the bidder's authorized signatory who signs the Bid. (Enclosed in Annexure- B)

5. GUIDELINES FOR PARTICIPATING IN OIL'S E-PROCUREMENT

- 5.1 To participate in OIL's E-procurement tender, bidders should have a legally valid digital certificate of Class 3 with Organization's Name and Encryption Certificate as per Indian IT Act from the licensed Certifying Authorities operating under the Root Certifying Authority of India (RCAI), Controller of Certifying Authorities (CCA) of India (<http://www.cca.gov.in>). Digital Signature Certificates having "Organization Name" field as "Personal" are not acceptable.
- 5.2 Digital Certificate comes in a pair of Signing/verification and Encryption/Decryption certificate. Bidder should have both the Signing/verification and Encryption/Decryption certificate for signing and encryption, decryption purpose respectively. The driver needs to be installed once, without which the DSC will not be recognized. While participating on e-Tendering the DSC token should be connected to your system.
- 5.3 Bidders must have a valid User ID to access OIL's e-Procurement site for submission of bid. Vendors having User ID & password can purchase bid documents on-line through OIL's electronic Payment Gateway. New vendor shall obtain User ID & password through online vendor registration system in e-portal and can purchase bid documents subsequently in the similar manner.
- 5.4 Parties, who do not have a User ID, can click on Guest login button in the E-portal to view and download the available open tenders. The detailed guidelines are available in OIL's e-procurement site (Help Documentation). For any clarification in this regard, bidders may contact E-Tender Support Cell at Duliajan at erp_mm@oilindia.in, Ph.: 0374-2807178/4903.
- 5.5 EXEMPTION OF TENDER FEE
 - 5.5.1 If the bidder is a Micro or Small Enterprise [MSE] under the Micro, Small and Medium Enterprises Development Act, 2006 and is registered with District Industries Centres 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 Udyog Aadhaar Memorandum or any other body specified by Ministry of Micro, Small and Medium Enterprises, then they are exempted from payment of tender fees for the items/services for which they are registered. Copy of valid Registration Certificate, must be enclosed along with the application for issuing tender documents and the Registration Certificate should clearly indicate the items/services for which the

bidders are registered [or they intend to quote against OIL tenders] with any of the aforesaid agencies.

6. The Central Govt. Departments and Central Public Sector Undertakings will also be exempted from the payment of tender fee.

7. CONSULTANT

OIL has appointed M/s. Kavin Engineering and Services Private Limited, Coimbatore (KAVIN) as their EPCM Consultant for implementation of the project. OIL has also authorized the Consultant to enter into correspondence with bidders and obtain clarification/confirmation, if any, with respect to this Tender. Communications to Consultant shall be addressed to e-mail: satish.madhavan@kavinengg.com

8. PRE BID QUERIES/CLARIFICATIONS ON THE TENDER

The prospective bidders shall submit their pre-bid queries/clarifications against the tender through **e-mail** addressed to satish.madhavan@kavinengg.com with a copy to Oil India Limited, Duliajan, Assam-786602 (shantanukr_gogoi@oilindia.in) on or before 25.06.2018 (15.30 Hrs. IST)

9. IMPORTANT NOTES

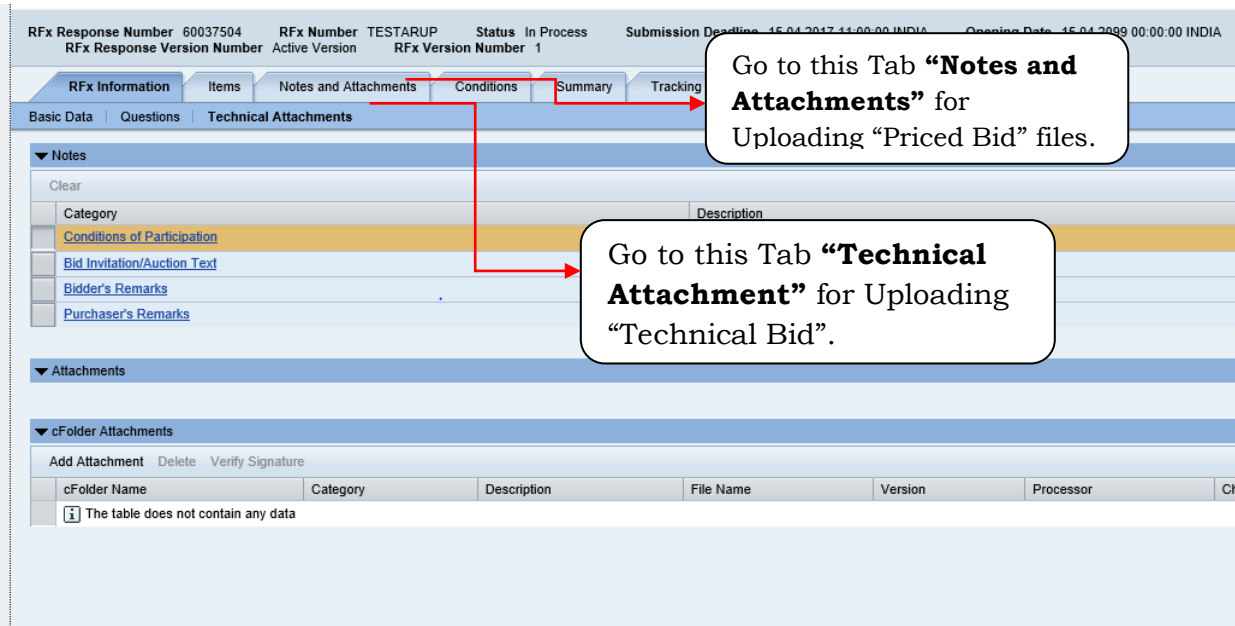
Bidders shall take note of the following important points while participating in OIL's e-procurement tender:

- i) **BIDDERS ON HOLIDAY LIST:** The bidders who are on Holiday list of OIL on due date of submission of bid/during the process of evaluation of the bids, the offers of such bidders shall not be considered for bid opening/ evaluation/award. If the bidding documents were issued inadvertently/ downloaded from website, the offers submitted by such bidders shall also not be considered for Bid Opening/Evaluation/Award of Work.
- ii) **BACKING OUT BY BIDDER:** In case any bidder withdraws their bid within the bid validity period, Bid Security will be forfeited and the party will be put on Holiday list as per the Banning Policy (available in OIL's website) of Company.
- iii) **BACKING OUT BY L-1 BIDDER AFTER ISSUE OF LOA:** In case LOA issued is not accepted by the L1 bidder or the Performance Security is not submitted as per the terms of the contract within the time specified in the Bid Document, the Bid Security shall be forfeited and the bidder shall be dealt as per the Banning Policy (available in OIL's website) of Company.
- iv) **FURNISHING FRAUDULENT INFORMATION/DOCUMENT:** The information and documents furnished by the Bidder/Contractor in respect of the subject tender/contract are accepted to be true and genuine. However, if it is detected

during technical scrutiny or after award of the contract or after expiry of the contract, that the bidder had submitted any fake/fraudulent document or furnished false statement, the offer/contract shall be rejected/cancelled, as the case may be and the bidder (if fake document/false statement pertains to such bidder) shall be dealt as per the Banning Policy (available in OIL's website) of Company.

- v) **ERRING/DEFAULTING AGENCIES:** Erring and defaulting agencies like bidder, contractor, supplier, vendor, service provider will be dealt as per OIL's Banning Policy dated 6th January, 2017 available in OIL's website: www.oil-india.com.
- vi) Bid should be submitted online in OIL's e-Procurement site up to 11.00 Hrs. (IST) (Server Time) on the date as mentioned and will be opened on the same day at 14.00 Hrs. (IST) (Server Time) at the Office of the CGM-Projects, Duliajan in presence of the authorized representatives of the bidders.
- vii) The authenticity of digital signature shall be verified through authorized CA after bid opening. The digital signature used for signing the bid shall be of "Class -3" with Organizations name, failing which the bid will be rejected.
- viii) The tender is invited under **SINGLE STAGE-TWO BID SYSTEM**. The bidders shall submit both the "TECHNICAL" and "PRICED" bids through electronic form in the OIL's e-Procurement portal within the Bid Closing Date and Time stipulated in the e-Tender portal. The Technical Bid should be submitted as per Terms of Reference & Technical Specifications along with all technical documents related to the tender and uploaded in **"Technical Attachments" Tab only**.
- Bidders to note that no price details should be uploaded in "Technical Attachments" Tab Page. Details of prices as per Price Bid format/Priced bid to be uploaded under "Notes & Attachments" tab. A screen shot in this regard is shown below. Offer not complying with above submission procedure will be rejected as per Bid Evaluation Criteria.**
- ix) The bid along with all supporting documents must be submitted through OIL's e-Procurement site only except the following documents which shall be submitted manually by the bidder in duplicate in a sealed envelope super scribed with OIL's IFB No./E-Tender No., Bid Closing Date and marked as "Original Bid Security/Catalogue and Literature/ Power of Attorney" etc. as the case may be and addressed to GM(C&P)-Projects Department, Oil India Limited, Duliajan, Assam-786602, India.
- Original Bid Security
 - Power of Attorney for signing the bid.
 - Any other document required to be submitted in original as per tender requirement.

The above documents including the Original bid security, must be received at GM(C&P)-Projects Office, Projects Department, Oil India Limited, Duliajan, Assam-786602, India on or before 13.00 Hrs.(IST) on the technical bid closing date failing which the bid shall be rejected. A scanned copy of the Bid Security shall also be uploaded by the bidder along with their Technical Bid in OIL's E-procurement site.



RFx Response Number 60037504 RFx Number TESTARUP Status In Process Submission Deadline 15-04-2017 11:00:00 INDIA Opening Date 15-04-2019 00:00:00 INDIA

RFx Response Version Number Active Version RFx Version Number 1

Go to this Tab **"Notes and Attachments"** for Uploading "Priced Bid" files.

Go to this Tab **"Technical Attachment"** for Uploading "Technical Bid".

▼ Notes

Clear

Category

Conditions of Participation

Bid Invitation/Auction Text

Bidder's Remarks

Purchaser's Remarks

▼ Attachments

▼ cFolder Attachments

Add Attachment Delete Verify Signature

cFolder Name	Category	Description	File Name	Version	Processor	Che
The table does not contain any data						

On "EDIT" Mode, Bidders are advised to upload "Technical Bid" and "Priced Bid" in the respective places as indicated above:

Note:

- * The "Technical Bid" shall contain all techno-commercial details **except the prices**.
- ** The "Priced bid" must contain the price schedule only. For uploading Priced Bid, click on Add Attachment, a browser window will open, select the file from the PC and name the file under Description, Assigned to General Data and click on OK to digitally sign and upload the File. Please click on Save Button of the Response to Save the uploaded files.

OIL now looks forward to your active participation in the IFB.

Thanking you,
 Yours faithfully,
OIL INDIA LIMITED

Sd/-
For CHIEF GENERAL MANAGER(PROJECTS)
For RESIDENT CHIEF EXECUTIVE

	MODULAR PACKAGE CONTRACT (MPC-4) Engineering, Procurement, Fabrication and Supply of Modular Air and Nitrogen Package for OCS, Nadua and GGS, East Khagorijan IFB No. CPI8239P19	

MPC TENDER PACKAGE 4
IFB No.:CPI8239P19

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VOLUME I: COMMERCIAL
PART I

INSTRUCTIONS TO BIDDERS (ITB) AND GENERAL TERMS & CONDITIONS

M/s. Kavin Engineering and Services Private Limited (KAVIN) hereinafter “the Consultant” on behalf of Oil India Limited (OIL) hereinafter “the Company/Owner” wishes to receive bids as described in the Bidding Documents.

1. SCOPE OF BID

- 1.1 The scope of Bid shall be as defined in the Terms of Reference and Specifications issued as part of Bidding Document.
- 1.2 The successful bidder shall be expected to fulfill the requirements of Scope of Bid within the contractual period stated in bidding document
- 1.3 Throughout this Bidding Documents, the term “Bid” and “Tender” and their derivatives (“Bidder/Tenderer”, “Bid/Tendered/Tender”, “Bidding/Tendering”, etc.) are synonymous, and day means calendar day. Singular shall also mean plural and vice versa.

2. ELIGIBILITY TO BID

- 2.1 Eligible bidder means, a bidder meeting the BQC criteria as per the bidding document.
 - 2.1.1 Pursuant to qualification criteria specified in Bidding Document, the bidder, along with his bid, shall furnish all necessary supporting documentary evidence to establish the Bidder claim of meeting qualification criteria.
 - 2.1.2 The documentary evidence of the bidder’s qualifications to perform the contract if their bid are accepted, shall establish to the Owner’s/Consultant’s satisfaction that, the bidder has the financial and technical capacity necessary to perform the contract.
- 2.2 Consortium, Un-incorporated JVs etc. can not bid
- 2.3 A bidder shall not be affiliated with a firm or entity:
 - 2.3.1 that has provided consulting services related to the project during the preparatory stages of the works or of the project of which the works form a part, or
 - 2.3.2 that has been hired by the Owner as Engineer/Consultant for the contract.
- 2.4 Bidder should not be under Liquidation, Court Receivership or similar proceedings. In case bidder is under Liquidation, court receivership or similar proceedings, the offer submitted by such bidder shall be rejected. Bidder shall submit a self-declaration on their letter head in this regard.
- 2.5 The bidder should not be on Holiday/Negative list of OWNER on due date of submission of bid. If the documents were issued inadvertently/downloaded from website, offers submitted by such bidders shall not be considered for opening/evaluation/award.
- 2.6 If the Bidder is placed on Holiday/Negative list of OWNER after opening of unpriced bids but before opening of price bids, further evaluation of bid of such bidders shall be stopped and the corresponding price bid will not be opened.

3. MULTIPLE/ALTERNATIVE BIDS

3.1. A bidder (i.e., the bidding entity) shall, on no account submit more than one bid either directly (as a single bidder) or indirectly (as a sub-contractor) failing which following actions shall be initiated:

3.1.1. All bids submitted by such bidder (say 'A') as a single bidder or as a consortium, shall stand rejected and BID SECURITY, if any, in case of all such bids submitted by bidder 'A' shall be forfeited.

3.1.2. If another bidder (say 'B') has proposed bidder 'A' as a sub-contractor then bidder 'B's bid shall also be rejected. However, in case the bidder 'B' has also proposed an alternative sub-contractor who is other than the bidder 'A', then bidder 'B's bid shall be evaluated with the proposed alternative sub-contractor only. Hence, every bidder shall ensure in his own interest that his proposed sub-contractor is not submitting alternative/multiple bids.

Note: However, in case KAVIN has proposed a list of sub-contractors/sub-vendors in the bidding document itself which shall be common for all the bidders, the provision at (b) above shall not be applicable as long as only the sub-contractors/ sub-vendors are common in case of various bidders.

3.2. Alternative priced bids are not acceptable. A bidder who submits alternative bids will cause all alternative bids to be disqualified.

4. TRANSFERABILITY OF BID DOCUMENTS

4.1 Bid Documents are non-transferable. Bid can be submitted only in the name of the bidder in whose name the Bid Document has been issued.

4.2 Unsolicited bids will not be considered and will be rejected straightway

5. AMENDMENT OF BID DOCUMENTS

5.1 At any time prior to the deadline for submission of bids, the Company may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bid Documents through issuance of an Addendum.

5.2 The Addendum will be uploaded in OIL's E-Tender Portal in the Tab "Technical Rfx" and under External Area-"Amendments" folder. The Company may, at its discretion, extend the deadline for bid submission. Bidders are expected to take the Addendum into account in preparation and submission of their bid. Bidders are to check from time to time the E-Tender portal ["Technical RFX" Tab and under the folder "Amendments"] for any amendments to the bid documents before submission of their bids. No separate intimation shall be sent to the Bidders.

6. LANGUAGE OF BID

6.1 The Bid prepared by the bidder, all correspondence/drawings and documents relating to the bid exchanged by the bidder with the Owner/Consultant shall be in English language only. If the supporting documents are not in English language, then the English translation copy of the same shall also be furnished duly certified from any one of the following :

- a) Official of Indian Embassy/High Commission/Consulate General situated in the country where language has been translated.
- b) Official of Embassy/High Commission/Consulate General of the country where language has been translated, in India.

6.2 In case any printed literature furnished by the bidder in another language and is accompanied by an English translation, in which case, for the purpose of interpretation of the bid, the English translation shall govern.

7. INTENTION TO BID

Within 5 days of downloading bidding document, bidder shall confirm his intention to bid by mail

8. BIDFORM

The bidder shall complete the Bid Form as per Proforma B.

9. BID PRICES

- 9.1. Prices must be quoted by the Bidders online as per the price bid format available in OIL's e-tender portal under "Notes & Attachment" Tab. Prices must be quoted by the bidders as per the Pricing schedule SOR/P.
- 9.2. Prices shall be furnished strictly in the appropriate Price Schedule format(s) enclosed with the Bidding Document. Quoted prices shall be net of discount, if any. Conditional discounts, if offered by a bidder, shall not be considered for evaluation.
- 9.3. Price quoted by the bidder, shall remain firm & fixed until completion of the contract and will not be subject to any variation, except as otherwise specifically provided in the Bidding Documents. Bidder's prices shall also remain firm and fixed on account of foreign exchange variation unless otherwise any specific provision is indicated in bidding document.
- 9.4. The bidder shall quote the prices after careful analysis of cost involved for the performance of complete work considering all parts of the Bidding Documents. In case, any activity though specifically not covered but is required to complete the work as per scope of work, scope of supply, specifications, standards, drawings, bidding document including its commercial section, SCC or any other part of Bidding Document, the prices quoted shall be deemed to be inclusive of cost incurred for such activity.
- 9.5. Bidders shall indicate the following in their offer:
 - 9.5.1. Ex Works price of packages including packing, forwarding and insurance; such price to include engineering, fabrication / manufacturing of package, all costs as well as duties and taxes paid or payable on components and raw materials incorporated or to be incorporated in the goods, inspection testing etc
 - 9.5.2. The quoted price shall be deemed to be inclusive of all taxes and duties except "Goods and Services Tax" (hereinafter called GST) (i.e. IGST or CGST and SGST/UTGST applicable in case of interstate supply or intra state supply respectively and GST compensation Cess if applicable)
 - 9.5.3. Item wise/Lumpsum Transportation Charges (as per Price Schedule) up to respective project site exclusive of GST (Goods & Service Tax)
 - 9.5.4. Bidder shall indicate the following separately:

9.5.4.1. Built in CIF value of import for raw material and components incorporated or to be incorporated in the goods and included in quoted price. The bidder shall provide description of such material, quantity, rate, value etc.

9.5.5. Site work Prices, if applicable as per Bid Documents for the scope of work mentioned in Bidding Documents inclusive of all taxes & duties but exclusive of GST (Goods & Service Tax). All necessary registration, if required for carrying out the site activities shall be done by the bidder and cost towards the same shall be included in quoted site work prices.

10. BID SECURITY

10.1. The Bid Security is required to protect the Company against the risk of Bidder's conduct, which would warrant forfeiture of the Bid Security, pursuant to sub-clause 10.9.

10.2. All the bids must be accompanied by Bid Security in Original for the amount as mentioned in the "Forwarding Letter" or an equivalent amount in other freely convertible currency and shall be in the OIL's prescribed format as Bank Guarantee (BG) enclosed with the NIT vide Proforma-E from any of the following Banks –

a) Any schedule Indian Bank or Any Branch of an International Bank situated in India and registered with Reserve Bank of India as scheduled foreign Bank

Note: Bank Guarantee issued by a Scheduled Bank in India at the request of some other Non-scheduled Bank of India shall not be acceptable.

The bank Guarantee issued by the Bank must be routed through SFMS Platform as per following details:

- (i) MT 760/MT 760 COV for issuance of Bank Guarantee
- (ii) MT 760/MT 767 COV for amendment of Bank Guarantee

The above Message/Intimation shall be sent through SFMS by the BG issuing Bank Branch to Axis Bank, Duliajan Branch, IFS Code- UTIB0001129.

Branch Address: Axis Bank Ltd., Duliajan Branch, Daily Bazar, Jyotinagar, Duliajan, District: Dibrugarh, PIN: 786602"

Bidders are to submit the copy of SFMS Message as sent by the issuing Bank Branch along with the original Bank Guarantee.

The Bank Guarantee shall be valid for the time as asked for in the Bid Document. Bank Guarantees issued by Banks in India should be on non-judicial stamp paper of requisite value, as per Indian Stamp Act, purchased in the name of the Banker.

10.3. Bidders can submit Bid Security on-line through OIL's electronic Payment Gateway.

10.4. The bidders shall extend the validity of the Bid Security suitably, if and when specifically advised by OIL, at the bidder's cost.

10.5. Unsuccessful Bidder's Bid Security will be discharged and/or returned within 30 days after finalization of IFB.

10.6. Successful Bidder's Bid Security will be discharged and/or returned upon Bidder's furnishing the Performance Security and signing of the contract. Successful bidder will however ensure validity of the Bid Security till such time the Performance Security in conformity with Clause 41 below is furnished.

10.7. Bid Security shall not accrue any interest during its period of validity or extended validity.

10.8. The Bid Security may be forfeited:

- i) If the bidder withdraws the bid within its original/extended validity.
- ii) If the bidder modifies/revise their bid suo-moto.
- iii) If the bidder does not accept the order/contract.
- iv) If the bidder does not furnish Performance Security Deposit within the stipulated time as per tender/order/contract.
- v) If it is established that the bidder has submitted fraudulent documents or has indulged into corrupt and fraudulent practice, the bid security shall be forfeited after due process in addition to other action against the bidder. In case any bidder withdraws their bid during the period of bid validity, Bid Security will be forfeited and the party shall be debarred for a period of 2(two) years.

10.9. The scanned copy of the original Bid Security in the form of either Bank Guarantee or LC must be uploaded by bidder along with the Technical bid in the "Technical Attachment" tab of OIL's e-portal. The original Bid Security shall be submitted by bidder to the office of GM(Projects-C&P), Oil India Ltd., Duliajan-786602(Assam), India in a sealed envelope which must reach GM(Projects-C&P)'s office on or before 12.45 Hrs (IST) on the Bid Closing date.

10.10. A bid shall be rejected straightway if Original Bid Security is not received within the stipulated date & time mentioned in the Tender and/or if the Bid Security validity is shorter than the validity indicated in Tender and/or if the Bid Security amount is lesser than the amount indicated in the Tender.

11. EXEMPTION FROM SUBMISSION OF BID SECURITY

11.1. Central Govt. offices and Central Public Sector undertakings are exempted from submitting Bid Security.

11.2. If the bidder is a Micro or Small Enterprises (MSE) registered with District Industry 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 Udyog Aadhaar Memorandum any other body specified by Ministry of MSME, then they are also exempted from submitting Bid Security. Bidding MSEs shall have to submit a Copy of valid Registration Certificate clearly indicating the monetary limit, if any and the items/Services for which bidder are registered with any of the aforesaid agencies.

In case bidding MSE is owned by Schedule Caste or Schedule Tribe entrepreneur, valid documentary evidence issued by the agency who has registered the bidder as MSE owned by SC/ST entrepreneur should also be enclosed.

12. PERIOD OF VALIDITY OF BIDS

12.1 Bids shall remain valid for 120 days from the date of closing of bid prescribed by the Company. Bids of shorter validity will be rejected as being non-responsive. If nothing is mentioned by the bidder in their bid about the bid validity, it will be presumed that the bid is valid for 120 days from Bid Closing Date.

12.2 In exceptional circumstances, the Company may solicit the Bidder's consent to an extension of the period of validity. The request and the response thereto shall be made in

writing through Fax or e-mail. The Bid Security provided under Para 11.0 above shall also be suitably extended. A Bidder may refuse the request without forfeiting its Bid Security. A Bidder granting the request will neither be required nor permitted to modify their Bid.

13. SIGNING OF BIDS

13.1 Bids are to be submitted online through OIL's e-tender portal with digital signature. The bid and all attached documents should be digitally signed by the bidder using "Class 3" digital certificates with Organization's Name [e-commerce application (Certificate with personal verification and Organisation Name)] and Encryption Certificate as per Indian IT Act 2000 obtained from the licensed Certifying Authorities operating under the Root Certifying Authority of India (RCAI), Controller of Certifying Authorities (CCA) of India before bid is uploaded. Digital Signature Certificates having "Organization Name" field other than Bidder's Name are not acceptable. Digital Signature Certificates having Bidder's Name in the "Organization Name" field are only acceptable.

The bid including all uploaded documents shall be digitally signed by duly authorized representative of the bidder holding a Power of Attorney to bind the Bidder to the contract.

If any modifications are made to a document after attaching digital signature, the digital signature shall again be attached to such documents before uploading the same. The Power of Attorney in original shall be submitted by bidder as mentioned in Para 13.2 below.

In case the digital signature is not of "Class-3" with organization name, the bid will be rejected. Bidder is responsible for ensuring the validity of digital signature and its proper usage by their employees.

13.2 The original and all copies of the bid shall be typed or written in indelible inks. Since bids are to be submitted ONLINE with digital signature, manual signature is NOT relevant. The letter of authorisation (as per Proforma-H) shall be indicated by written Power of Attorney accompanying the Bid.

13.3 Any physical documents submitted by bidders shall contain no interlineations, white fluid erasures or overwriting except as necessary to correct errors made by the Bidder, in which case such correction shall be initialled by the person or persons who has/have digitally signed the Bid.

13.4 Any Bid, which is incomplete, ambiguous, or not in compliance with the Bidding process will be rejected.

14. SUBMISSION OF BIDS

The tender is processed under single stage - Two bid system. Bidder shall submit the Technical bid and Priced bid along with all the Annexures and Proforma (wherever applicable) and copies of documents in electronic form through OIL's e-tender portal within the Bid Closing Date & Time stipulated in the e-tender. For submission of Bids online at OIL's e-Tender Portal, detailed instructions under Heading **HELP DOCUMENTATION** are available in OIL's e-Tender Portal. Guidelines for bid submission are also provided in the "Forwarding

Letter". The Technical Bid is to be submitted as per Terms of Reference/Technical Specifications of the bid document and Priced Bid as per the Price Schedule. The Technical Bid should be uploaded in the **"Technical Attachment Tab"** Page only. Prices to be quoted as per **Proforma-B** and should be uploaded as Attachment just in the attachment link under "Notes & Attachments" Tab under General Data in the e-portal. No price should be given in the "Technical Attachment", otherwise bid shall be rejected. The priced bid should not be submitted in physical form which shall not be considered.

15. DOCUMENTS COMPRISING THE BID

Bids are invited under Single Stage Two Bid System. The bid to be uploaded by the Bidder in OIL's e-Tender portal shall comprise the following documents:

15.1 PART - I : TECHNO-COMMERCIAL/ UNPRICED BID(to be uploaded in "Technical Attachments" tab)

- a) Offer Covering letter (in bidder's letter head)
- b) Power of Attorney in favour of Authorized signatory of the bid, as per Form G
- c) Bid Security as per Form D
- d) Documentation against Bidder's Qualification Criteria
- e) Integrity Pact as in Annexure B
- f) General Information of the bidder as per Form – I
- g) Techno-commercial compliance to the TOR terms & Conditions (Form-B).
- h) Bank Certified Mandate Form as per Form-J, duly signed and stamped with the Banker's certification along with cancelled cheque.
- i) Self-Declaration as per Form – S
- j) Undertaking for applicability of Purchase Preference Policy
- k) Undertaking by the bidder for PP-LC, if applicable as per SCC required
- l) Statutory Auditor's Certificate for PP-LC, if applicable as per SCC.
- m) Calculation of Local Content(LC), if applicable as per FORM – A1.
- n) Exact Unpriced copy of Price Bid in price schedule format issued with the bidding document duly indicating 'Q' (Quoted) in place of "price" and 'NQ' (Not Quoted) where against each item where price to be quoted.
- o) Cover sheet of Addendum/Amendment (if any).
- p) Documentary evidence in case bidder is MSE bidder.
- q) Technical Compliance/data sheets/documents, required as per Material Requisition. Terms of Reference (TOR)
- r) Compliance to requirement of PAN No., Tax Residency Certificate and Form P as per relevant forms provided in Bidding Forms
- s) Any other document required as per, Technical Specifications; and

Please note that, price should not be mentioned in the "Technical Attachments" tab. The Priced Bid shall contain the prices along with the currency quoted and any other commercial information pertaining to the service offered.

Documents sent through E-mail/Fax/Telephonic method will not be considered.

15.2 PART-II : PRICED BID(to be uploaded in "Notes and Attachments" tab)

Priced Bid containing only prices filled in the prescribed price schedule excel format and other formats provided in the Bidding Document, consisting of the following:

a) Prices in Price Schedule formats issued with bidding document shall be uploaded at the designated place of the e-tender portal of OIL

Notes:

1. Part-II (Priced Bid) shall be uploaded in Notes and Attachments” tab of e-tender portal as mentioned in above
 2. Deviation to terms & conditions, presumptions etc. shall not be stipulated in Priced part of bid. In case of any conditions stipulated in price bid, the bids of such bidders shall be summarily rejected and shall not be considered for further evaluation. Evaluation shall be carried out excluding such bidder(s).
- 15.3 No Physical Bids/Offeres shall be permitted. The offers/bids submitted online on e-tender portal of OIL shall only be considered for evaluation and ordering.
- 15.4 Bidders are required to submit the following documents in original also as per the manner prescribed in the bid document in sealed envelope titled “Original Documents for respective IFB. No” and the same shall be sent to OIL Office at Duliajan. Kind Attention: (Name mentioned in BID document) General Manager (C&P) within the final bid due date, besides uploading the scanned copies of the same on E-tender portal along with the e-bid:
- i) Original EMD/Bid Security along with 2(two) copies) (if applicable).
 - ii) Power of Attorney (POA) in favour of the bid signatory for signing the bid digitally (if applicable).
 - iii) Any other document required to be submitted in original as per bid document requirement.
- 15.5 Timely delivery of the documents in physical form as stated in Para above is the responsibility of the bidder. Bidders should send the same through Registered Post or by Courier Services or by hand delivery to the Officer in Charge of the particular tender before the Bid Closing Date and Time. Company shall not be responsible for any postal delay/transit loss.
- 15.6 Bids received through the e-procurement portal shall only be accepted. Bids received in any other form shall not be accepted.

16. DEADLINE FOR SUBMISSION OF BIDS

- 16.1. Bids should be submitted online as per the online tender submission deadline. Bidders will not be permitted by System to make any changes in their bid/quote after the bid submission deadline is reached. Bidders are requested to take note of this and arrange to submit their bids within the submission deadline to avoid last minute rush/network problems.
- 16.2. No bid can be submitted after the submission dead line is reached. The system time displayed on the e-procurement web page shall decide the submission dead line.
- 16.3. The documents in physical form as stated in Para 15.4 must be received by Company at the address specified in the “Forwarding Letter” on or before 12.45 Hrs(IST) on the Bid Closing Date mentioned in the "Forwarding Letter". Timely delivery of the same at the address mentioned in the Forwarding Letter is the responsibility of the Bidders.

17. LATE BIDS

Bidders are advised in their own interest to ensure that their bids are uploaded in system before the closing date and time of the bid. The documents in physical form if received by the Company after the deadline for submission prescribed by the Company shall be rejected and shall be returned to the Bidders in unopened condition immediately.

18. MODIFICATION AND WITHDRAWAL OF BIDS

- 18.1. The Bidder after submission of Bid may modify or withdraw its Bid prior to Bid Closing Date & Time.
- 18.2. No Bid can be modified or withdrawn subsequent to the deadline for submission of Bids.
- 18.3. No Bid can be withdrawn in the interval between the deadline for submission of Bids and the expiry of the period of Bid Validity specified by the Bidder on the Bid Form. Withdrawal of a Bid during this interval shall result in the Bidder's forfeiture of its Bid Security and bidder shall also be debarred from participation in future tenders of OIL.

19. EXTENSION OF BID SUBMISSION DATE

Normally no request for extension of Bid Closing Date & Time will be entertained. However, OIL at its discretion, may extend the Bid Closing Date and/or Time due to any reasons. In such a case, all rights and obligations of the Owner/Consultant and bidders, previously subject to the original deadline will thereafter be subject to deadline as extended.

20. COMPLIANCE WITH TENDER

- 20.1. Enquiry has been issued on ZERO DEVIATION BIDDING basis, wherein bids with deviations shall not be acceptable. In view of the same, Bidder in his own interest is advised not to submit any deviation. Owner/Consultant reserves right to carry out bid evaluation with available information in the bid without any post-bid correspondence. Accordingly, bidder shall submit Techno-commercial compliance format duly signed as token of his acceptance.
- 20.2. Bidder shall furnish quotations only for those items / parts:
 - a) For which bidder is enlisted with OIL (Limited enquiries); or
 - b) For which Bidder can supply strictly as per Technical specifications including fulfilment of Bidder Qualification Criteria (BQC) wherever applicable (Press enquiries).

21. CLARIFICATION ON BIDDING DOCUMENTS

- 21.1. A bidder may seek clarification regarding the Bidding Document provisions, bidding process and/or rejection of his bid. Consultant/Owner shall respond to such requests within a reasonable time. However, such information relating to the evaluation of bids and recommendation of award shall not be disclosed to any other persons not officially concerned with the bidding process.
- 21.2. A prospective bidder requiring any information or clarification of the Bidding Documents, may notify the Consultant in writing by e-mail/post at Consultant's mailing address indicated in the Bidding Document. All question/ queries should be referred to KAVIN not later than three (3) days before scheduled date of receipt of pre-bid queries and OWNER/KAVIN reserves the right not to entertain any pre-bid query after cut-off

date. Pre-bid meeting shall be attended by competent representative(s) of the bidder. Reply to Pre-Bid Queries shall be hosted on Tender portal.

- 21.3. Any modifications of the Bidding/RFQ Document, which may become necessary as a result of pre-bid queries/pre-bid discussion, shall be intimated to all the bidders through issue of an Addendum/Amendment.

22. OFFER WITHOUT ANY DEVIATION

- 22.1. Owner/KAVIN will appreciate submission of offer based on the Terms and Conditions in the bid document, Scope of Work, and Technical Specification enclosed with Material Requisition etc. to avoid wastage of time and money in seeking clarifications on technical/commercial aspect of the offer. Bids having any deviation to the bid document Terms & Conditions shall lead to the offer liable for rejection.

- 22.2. If a bidder has not quoted any part/component, Freight, the same shall be considered inclusive. Supervision, Hazop, Training etc. which needs to be quoted on per diem basis, the same shall also be considered inclusive for the number of days specified in the enquiry document.

However, per diem rates of supervision rates included in the quoted prices shall be obtained from the bidder before award of work which shall be used for making payment based on actual number of days of working at site.

- 22.3. Non-compliance shall result in rejection of the corresponding item/group/block.

- 22.4. Error/non submission of Taxes & Duties

The evaluation and ordering shall be carried out considering the rates of Taxes & Duties as quoted in the bid. In case quoted Taxes are more than the applicable rate, the evaluation shall be carried out based on the quoted rate but applicable rate of tax shall be clarified before placement of order.

- 22.5. Taxes & Duties, if not quoted:

- a) Composite bidding – Bids shall be rejected.
- b) Other than Composite bidding: Bidder shall be given chance to absorb the same, failing which the bid shall be rejected.

23. PRICE CHANGES/IMPLICATIONS AFTER OPENING OF TECHNICAL BIDS

- 23.1. In the event of any unsolicited price increase sought by any bidder, subsequent to the bid due date, the bid of such a bidder shall be rejected, in case the bidder does not agree to withdraw the price increase. Wherever, decision is taken to reject a bid, Bid Security, if submitted by the Bidder, shall also be forfeited and case shall be referred to arbitrator for appropriate action as per procedure.

- 23.2. In the event of any suo-moto decrease in price sought by a Bidder subsequent to the bid due date and which is not as a result of any change in scope of supply or terms and conditions specified in the bid document, the reduction in price shall not be considered for evaluation, however, the same shall be considered for ordering in case the Bidder happens to be the lowest techno-commercially acceptable.

24. BID EVALUATION CRITERIA

If there is correction/wrong entry or a difference between the values entered in figures and in words, the following procedure shall be adopted for evaluation:

- i) When there is a difference between the rate in figures and in words for an item, the rate which corresponds to the amount worked out by the Bidder for the item based on the quantity specified, shall be taken as correct.
- ii) When the rate quoted by the Bidder in figures and words tallies but the amount is incorrect, the rate quoted by the Bidder shall be taken as correct.
- iii) When it is not possible to ascertain the correct rate as detailed above, the rate quoted for the item in words shall be adopted as the quoted rate.
- iv) If the total amount written against an item does not correspond to the rate written in figures and if the rate in words is not written by the bidder, then the higher of the rates, i.e. higher of the rate worked out by dividing the amount by the quantity and the rate quoted shall be considered for evaluation. In the event that such a bid is determined as the lowest bid, the lower of the rates shall be considered for ordering.

25. BID REJECTION CRITERIA

- 25.1. Bids are invited under Zero Deviation bidding basis. Bids with deviations shall be rejected.
- 25.2. Owner/Consultant reserves the right to verify the authenticity of Digital Signature. In case Digital Signature is not authorized, the bid shall be rejected.
- 25.3. If a bidder submits prices in un-priced part of bid, the bid shall be rejected. Prices uploaded at the designated priced folder of the e-tendering website shall only be considered.
- 25.4. Mere acceptance of above mentioned points will not make bidder automatically qualify for this tender. Bidder to refer **Part II, Volume – I** for detailed Bid Evaluation Criteria.

26. BID OPENING

- 26.1. Company will open the Technical Bids, including submission made pursuant to clause 15.0, in presence of Bidder's representatives who choose to attend at the date, time and place mentioned in the Forwarding Letter. However, an authorisation letter (as per Proforma-H) from the Bidder must be produced by the Bidder's representative at the time of Bid Opening. Unless this Letter is presented, the representative will not be allowed to attend the Bid Opening. The Bidder's representatives who are allowed to attend the Bid Opening shall sign a register evidencing their attendance. Only one representative against each Bid will be allowed to attend. In technical bid opening, only "Technical Attachment" will be opened. Bidders therefore should ensure that technical bid is uploaded in the "Technical Attachment" Tab Page only in the e-portal.
- 26.2. In case of any unscheduled holiday or Bandh on the Bid Opening Date, the Bids will be opened on the next full working day. Accordingly, Bid Closing date/time will get extended up to the next working day and time.
- 26.3. Bids which have been withdrawn pursuant to clause 18.0 shall not be opened. Company will examine bids to determine whether they are complete, whether requisite Bid Securities have been furnished, whether documents have been digitally signed and whether the bids are generally in order.

26.4. At bid opening, Company will announce the Bidder's names, written notifications of bid modifications or withdrawal, if any, the presence of requisite Bid Security and such other details as the Company may consider appropriate.

27. EVALUATION AND COMPARISON OF BIDS

- 27.1. The Company will evaluate and compare the bids as per BID EVALUATION CRITERIA (BEC), PART-II of the Bid Documents.
- 27.2. DISCOUNTS/REBATES: Unconditional discounts/rebates, if any, given in the bid will be considered for evaluation.
- 27.3. Post bid or conditional discounts/rebates offered by any bidder shall not be considered for evaluation of bids. However, if the lowest bidder happens to be the final acceptable bidder for award of contract, and if they have offered any discounts/rebates, the contract shall be awarded after taking into account such discounts/rebates.
- 27.4. Normally no clarifications shall be sought from the Bidders. However, for assisting in the evaluation of the bids especially on the issues where the Bidder confirms compliance in the evaluation and contradiction exists on the same issues due to lack of required supporting documents in the Bid (i.e. document is deficient or missing), or due to some statement at other place of the Bid (i.e. reconfirmation of confirmation) or vice versa, clarifications may be sought by OIL. In all the above situations, the Bidder will not be allowed to change the basic structure of the Bid already submitted by them and no change in the price or substance of the Bid shall be sought, offered or permitted.
- 27.5. Prior to the detailed evaluation, Company will determine the substantial responsiveness of each bid to the requirement of the Bid Documents. For purpose of these paragraphs, a substantially responsive bid is one, which conforms to all the terms and conditions of the Bid Document without material deviations or reservation. A material deviation or reservation is one which affects in any substantial way the scope, quality, or performance of work, or which limits in any substantial way, in-consistent way with the Bid Documents, the Company's right or the bidder's obligations under the contract, and the rectification of which deviation or reservation would affect unfairly the competitive position of other bidders presenting substantial responsive bids. The Company's determination of Bid's responsiveness is to be based on the contents of the Bid itself without recourse to extrinsic evidence.
- 27.6. A Bid determined as not substantially responsive will be rejected by the Company and may not subsequently be made responsive by the Bidder by correction of the non-conformity.
- 27.7. The Company may waive minor informality or nonconformity or irregularity in a Bid, which does not constitute a material deviation, provided such waiver, does not prejudice or affect the relative ranking of any Bidder.

28. COMPARISON OF OFFERS

- 28.1. The lowest evaluated bid shall be considered for award of order on the basis of landed cost at site for the respective grouped items as per Material Requisition including Supply, Site work, Training. The evaluated price shall be calculated based on the prices quoted by the bidder after considering the following:

a) **Bidder:**

- i. FOR dispatch point price quoted by the bidder including packing and forwarding.
- ii. All inspection and Testing charges, if quoted extra.
- iii. Cost of Mandatory spares, Special Tools & Tackles, Commissioning spares, etc., if quoted extra.
- iv. GST (Goods & Service Tax) will be cost loaded as quoted and in line with provisions of bidding document.
- v. Road Freight charges.
- vi. Site Work/Supervision/Training charges wherever applicable as per Bid Documents.
- vii. Technical loading, if any, as defined in the Bidding document.

28.2. Cost (including taxes & duties) of Mandatory/Insurance spares if identified in the Material Requisition, commissioning spares and special tools and tackles will be included for price evaluation of bids, but costs of Specific Spares for two years normal operation shall be excluded.

28.3. Cost of loading towards Technical Parameters (Utilities etc.) wherever applicable shall be considered for evaluation.

28.4. Wherever supervision, site works, AMC, training etc. are required as per Bid Documents/RFQ; the same shall be considered for evaluation for no. of man days specified elsewhere in RFQ document alongwith the respective GST (Goods & Service Tax) at applicable rates.

28.5. Item shall be awarded on individual/group wise/bottom line basis as per Bid Documents/RFQ to the Bidder(s) whose evaluated price for the individual item/group items/ bottom line is the lowest.

28.6. Transit Insurance shall not be added for evaluation.

28.7. Other Conditions Related to Bid Evaluation:

i. Input Tax Credit on GST (Goods & Service Tax) is available to Owner & the same shall be considered for the Purpose of evaluation.

ii. Prices quoted in PRICE BID as per the requirement of the bidding document shall only be considered for evaluation.

iii. Offer evaluation and ordering shall be on lowest bottom line group price basis in case of Group Bid Documents or on individual item wise lowest basis or on bottom line basis as mentioned in Price schedule.

iv. In case, price increase is sought by the L1 bidder after priced bid opening and the bidder does not agree to withdraw the price increase, the order shall not be placed with price increase and the tender enquiry shall be refloated. Wherever, decision is taken to reject a bid, EMD/Bid Security, if submitted, by the Bidder, shall also be forfeited and appropriate penal action shall be initiated, as per Company Policy.

v. Purchase Preference to MSE bidders: Refer Clause No.8 of BEC of the Part II of this bidding document.

vi. Shifting: OWNER also reserves the right to consolidate the quantities of PO where it is commercially prudent to place single order. In the case of shifting of order as above, the following shall govern:

MODULAR PACKAGE CONTRACT (MPC-4)
Engineering, Procurement, Fabrication and Supply of Modular
Air and Nitrogen Package
for OCS, Nadua and GGS, East Khagorijan
 IFB No. CPI8239P19

a) In order to avoid splitting of order on number of bidders, particularly when order value is small, shifting shall be resorted to so that time and effort on ordering, expediting, inspection etc. is saved in dealing with extra suppliers.

For the purpose of shifting, cost of order management per order is considered as INR. 1,00,000/-.

b) Based on the lowest evaluated item wise prices the shifting shall be carried out provided the following conditions are met:

Shifting shall be done only if shifting cost of each order is upto INR. 1, 00,000/-

Shifting shall not be resorted to if the value of the order is more than 25% of the total order value of the recommendation. However, this ceiling will not be applicable where total order value of recommendation is upto INR. 4, 00,000/-

In case the order value on L1 bidder is more than INR 2,00,000/- then shifting shall not be resorted.

With above shifting the selected bidder for award will be deemed to be the L1 bidder.

c) In case **MSE bidder** is the L1 bidder, shifting shall not be resorted to.

vii. OIL/Consultant shall allow Purchase Preference Policy - linked with Local Content (PP - LC) notified vide letter no. O-27011/44/2015-ONG-II/FP dated 25.04.2017 of MoP&NG in this tender. Bidders seeking benefits, under this Policy (linked with Local Content) (PP-LC) shall have to comply with all the relevant provisions and shall submit relevant undertakings/documents applicable for this policy as specified below:

1. In case a bidder is eligible to seek benefits under PP-LC policy as well as Public Procurement Policy for MSEs-Order 2012, then the bidders should categorically seek benefits against only one of the two policies i.e. either PP-LC or MSE policy. If a bidder seeks free of cost tender document under the MSE policy, then it shall be considered that the bidder has sought benefit against the MSE policy and this option once exercised cannot be modified subsequently. Tenders involving eligible/qualified MSME Vendors as well as LC Vendors, preference regarding placement of order shall be accorded to MSME Vendors in line with Public Procurement Policy over PP-LC Policy.
2. Bidders seeking Purchase Preference (linked with Local Content) (PP-LC) shall be required to meet/exceed the target of Local Content (LC) which in this case is 20%.

2.1. Such bidders shall furnish following undertaking from the manufacturer on manufacturer's letter head along with their techno-commercial bid. The undertaking shall become a part of the contract.

"We _____ (Name of Manufacturer) undertake that we meet the mandatory minimum Local Content (LC) requirement i.e. 20% for claiming purchase preference linked with Local Contents under the Govt. Policy against under tender no. _____."

2.2. Above undertaking shall be supported by the following certificate from Statutory Auditor engaged by the bidder, on the letter head of such Statutory Auditor.

"We _____ the statutory auditor of M/s. _____ (name of the bidder) hereby certify that M/s. _____ (name of manufacturer) meet the mandatory Local Content requirements of the Goods and/or Services i.e. 20% quoted vide offer No. _____ dated _____ against OIL's tender No. _____ by M/s. _____ (Name of the bidder)."

Notes:

- a. In case of bidder(s) for whom Statutory Auditor is not required as per law required certificates shall be provided by a practicing Chartered Accountant.
 - b. In case the manufacturer himself is bidding then the certificate shall be submitted by the Statutory Auditors of the manufacturer who shall provide the break-up of the cost component as per FORM – H of Bidding forms.
 - c. In case of bidder is a supplier quoting on behalf of manufacturer then the certificate shall be submitted by the Statutory Auditors of the supplier who shall provide the break-up of the cost component of the manufacturer as per FORM-H of bidding forms. The responsibility for the certificate provided by the statutory auditor of the supplier shall be that of the supplier.
 - d. In case the tender scope covers testing, installation and commissioning and any other services in respect of the supplied goods/equipments then such costs shall also be considered in LC for which the bidder shall provide certificate from the Statutory Auditors or the Chartered Accountant as the case may be.
- 2.3. At the bidding stage the bidder shall provide Break-up of “Local Component” and “Imported Component” in the prescribed format and submit/ uploaded (in the e-procurement portal in case of e-tender) along with their price.
3. Eligible (techno-commercially qualified) LC bidder shall be granted a purchase preference of 10% i.e. where the evaluated price is within 10% of the evaluated lowest price of Non Local Content (NLC) bidder, other things being equal. Accordingly, purchase preference shall be granted to the eligible (techno-commercially qualified) LC bidder concerned, at the lowest valid i.e. NLC price bid.
- 3.1. Only those LC bidders whose bids are within 10% of the NLC L1 bid would be allowed an opportunity to match L1 bid. All the eligible LC bidders shall be asked to submit their confirmation to match their prices in sealed envelopes. Envelopes of the bidders shall be opened and award shall be made to the lowest evaluated Technically Acceptable-Commercially Acceptable (TA/CA) bidder among the eligible LC bidders. In case the lowest eligible LC bidder fails to match L1 price, the next eligible LC bidder will be awarded the prescribed quantity and so on. In case none of the eligible LC bidders matches the L1 bid, the actual bidder holding L1 price will secure the order.
4. Order for supply of 50% of the tendered quantity would be awarded to the lowest techno-commercially qualified LC bidder, subject to matching with valid NLC L1 price. The remaining quantity will be awarded to L1 (i.e. NLC bidder). Prescribed 50% tendered quantity for LC bidders shall not be further sub-divided among eligible LC bidders.
- 4.1. However, if L1 bidder happens to be a LC bidder, the entire procurement value shall be awarded to such bidder.
- 4.2. When the tendered goods/services cannot be divided in the exact ratio of 50%/50% then OIL reserves the right to award on lowest eligible PP-LC bidder for quantity not less than 50% as may be dividable.
- For example in case tendered quantity is 3 (not divisible in the ratio of 50:50), PP-LC bidder shall get order for 2 nos. only and the rest will go to L-1 (NLC bidder). OR
- (Alternate clause applicable for cases where tendered quantity cannot be divided).
- 5. The tendered quantity is not splittable/non-dividable cannot be procured from multiple sources. Hence, the entire procurement value shall be awarded to the**

lowest techno-commercially qualified LC bidder subject to matching with valid NLC L1 rates.

6. For the purpose of this policy, all terms used vide aforesaid policy shall be governed by the definitions specified at para 2 of the policy document notified by MoPNG vide letter No. O-27011/44/2015-ONG/II/FP dated 25.04.2017.

The successful bidder shall be obliged to fulfill the requirements of quality and delivery time in accordance with the provisions of the Purchase order/contract. OIL shall have the right to satisfy itself of the production capability and product quality of the manufacturer.

7. Determination of LC :

7.1. LC shall be computed on the basis of the cost of domestic components in goods compared to the whole cost of product. The whole cost of product shall be constituted of the cost spent for the production of goods, covering direct component (material) cost, direct manpower cost, factory overhead cost and shall exclude profit, company overhead cost and taxes for the delivery of goods.

7.2. The criteria for determination of the Local Content cost shall be as follows:

- a) In the case of direct component (material), based on country of origin.
- b) In the case of manpower based on INR component and
- c) In the case of working equipment/facility, based on the country of origin.

7.3. The calculation of LC of the combination of several kinds of goods shall be based on the ratio of the sum of the multiplication of LC of each of the goods with the acquisition price of each goods to the acquisition price of the combination of goods.

8. Calculation of LC and Reporting

8.1. LC shall be calculated on the basis of verifiable data. In the case of data used in the calculation of LC being not verifiable, the value of LC of the said component shall be treated as NIL.

8.2. Formats for the calculation of LC of goods is given in this document.

9. Certification and Verification

9.1. Bidder seeking Purchase Preference under the policy shall be obliged to verify the LC of goods as follows:

9.1.1. At bidding stage:

a) Price Break-up:

(i) The bidder shall provide break-up of "Local Component" and "Imported Component" along with the price bid as per provisions under clause 2.3.

(ii) Bidder must have LC in excess of the specified requirement.

b) Undertaking by the bidder:

(i) The bidder shall submit undertaking along with the techno-commercial bid as per clause no. 2.1, such undertaking shall become a part of the contract.

(ii) Bidder shall also submit the list of items / services to be procured from Indian manufacturers / service providers.

c) Statutory Auditor's Certificate:

(i) The Undertaking submitted by the bidder shall be support by a certificate from Statutory Auditor as per clause 2.2.

9.1.2. After Contract Award:

a) In the case of procurement cases with the value less than INR. 500,00,000 (Rupees Five Crore), the LC content may be calculated (self-assessment) by the supplier of goods and/or the provider of services and certified by the Director/Authorized Representative of the Company.

b) The verification of the procurement cases with the value Rupees Five Crore and above shall be carried out by a Statutory Auditor engaged by the bidder.

9.2. Each supplier shall provide the necessary Local Content documentation to the statutory auditor, which shall review and determine the local content requirements have been met and issue of local content certificate to that effect on behalf of OIL, stating the percentage of local content in the good or service measured. The Auditor shall keep all necessary information obtained from suppliers for measurement of Local Content confidential.

9.3. The Local Content certificate shall be submitted along with each invoice raised. However, the % of local content may vary with invoice while maintaining the overall % of local content for the total purchase of the prorated local content requirement. In case, it is not satisfied cumulatively in the invoices raised up to that stage, the supplier shall indicate how the local content requirement would be met in the subsequent stages.

9.4. Where currency quoted by the bidder is other than Indian Rupee then the bidder claiming benefits under PP-LC shall consider exchange rate prevailing on the date of notice inviting tender (NIT) for the calculation of Local Content.

9.5. OIL shall have the authority to audit as well as witness production processes to certify the achievement of the requisite local content.

10. Sanctions:

10.1. OIL shall impose sanction on bidder/manufacturers/service providers for not fulfilling LC of goods/services in accordance with the value mentioned in certificate of LC.

10.2. The sanctions may be in the form of written warning, financial penalty and blacklisting.

10.3. If the bidder does not fulfill his obligation after the expiration of the period specified in such warning. OIL shall initiate action for blacklisting such bidder/successful bidder.

10.4. A bidder who has been awarded the contract after availing Purchase Preference is found to have violated the LC provision, in the execution of the procurement contract of goods and/or services shall be subject to financial penalty over and above the PBG value prescribed in the contract and shall not be more than an amount equal to 10% of the Contract Price.

10.5. In pursuance of the clause No.7 above, towards fulfillment of conditions pertaining to Local Contents in accordance with the value mentioned in the certificate of LC, the bidder shall have to submit additional Bank Guarantee

(as per FORM – I of Bidding forms) equivalent to the amount of PBG.

11. Bidders should note that PP – LC shall not be applicable in case of procurement of goods/services falling under the list of items reserved for exclusive purchase from Micro and Small Enterprise (MSEs)

29. ADVANCE PAYMENT :

• Request for advance payment shall not be normally considered. However, depending on merit and at the sole discretion of OIL, advance payment may be agreed at an interest rate of 1% above the prevailing Bank rate (CC rate) of State Bank of India compounding on quarterly basis from the date of payment of the advance till recovery / refund.

29.1. Advance payment if agreed to by the Company shall be paid only against submission of an acceptable Bank Guarantee whose value should be equivalent to the amount of advance plus the amount of interest estimated by OIL on the basis of contractual delivery period without further reference.

29.2. Bank Guarantee shall be valid for 3 months beyond the delivery period incorporated in the order and same shall be invoked in the event of Seller's failure to execute the order within the stipulated delivery period.

29.3. In the event of any extension to the delivery date, seller shall enhance the value of the bank guarantee to cover the interest for the extended period and also shall extend the validity of bank guarantee accordingly.

30. OPENING OF PRICED BIDS:

30.1. Company will open the Priced Bids of the techno-commercially qualified Bidders on a specific date in presence of representatives of the qualified bidders. The techno-commercially qualified bidders will be intimated about the Priced Bid Opening Date & Time in advance. In case of any unscheduled holiday or Bandh on the Priced Bid Opening Date, the Bids will be opened on the next working day.

30.2. The Company will examine the Price quoted by Bidders to determine whether they are complete, any computational errors have been made, the documents have been properly signed, and the bids are generally in order.

30.3. Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price (that is obtained by multiplying the unit price and quantity) the unit price shall prevail and the total price shall be corrected accordingly. If there is a discrepancy between words, and figures, the amount in words will prevail. If any Bidder does not accept the correction of the errors, their Bid will be rejected.

31. NOTIFICATION OF AWARD OF CONTRACT/ORDER :

31.1. The Company will award the Contract to the successful bidder whose bid has been determined to be substantially responsive and has been determined as the lowest evaluated bid, provided further that the bidder is determined to be qualified to perform the Contract satisfactorily.

31.2. Prior to the expiration of period of bid validity, the Company/Owner will notify the successful bidder by e-mail to be confirmed in writing, that his bid has been accepted. The notification of Award/Letter of Acceptance will constitute the formation of the Order.

- 31.3. The Delivery Schedule shall commence from the date of issue of notification of award/Letter of Acceptance (LOA).
- 31.4. Award of Contract/Order will be by way of issuing a Letter of Acceptance (LOA). LOA will contain price, delivery and other salient terms of bid and bid document. Bidder will be required to confirm receipt of the same by returning "Copy of the LOA" duly signed and stamped by the bidder as a token of acknowledgement to the Company/Owner and the Consultant. Subsequently, detailed Purchase Order/Contract will be issued. Alternatively direct detailed Purchase Order may be issued without issuing LOA.
- 31.5. Upon the successful bidder's furnishing of Performance Security pursuant to Clause 34.0 below, the Company/Owner will promptly notify each un-successful bidder and will discharge their Bid Security as per relevant Clause herein in ITB.

32. CONTACTING THE COMPANY AFTER BID OPENING :

- 32.1. Except as otherwise provided elsewhere in the bid, no bidder shall contact Company on any matter relating to its bid, from the time of the bid opening to the time the Contract is awarded.
- 32.2. An effort by a Bidder to influence the Company in the Company's bid evaluation, bid comparison or Contract award decisions may result in the rejection of their bid.

33. COMPANY'S RIGHT TO ACCEPT OR REJECT ANY BID:

Company reserves the right to accept or reject any or all bids and to annul the bidding process and reject all bids, at any time prior to award of contract, without there by incurring any liability to the affected bidder, or bidders or any obligation to inform the affected bidder of the grounds for Company's action.

34. PERFORMANCE SECURITY:

- 34.1. On receipt of notification of award from the Company, the successful Bidder (including MSEs, Public Sector undertakings and other Government bodies) shall furnish to the Company the Performance Security for an amount specified in the Forwarding Letter and Letter of Award (LOA) issued by the Company to the Bidder as per Proforma-F or in any other format acceptable to the Company and must be in the form of a Bank Guarantee
 Any schedule Indian Bank or Any Branch of an International bank situated in India and registered with Reserve Bank of India as scheduled foreign
- 34.2. Bank Guarantee issued by a Bank, amongst others, must contain the following particulars of such bank:
- Full address.
 - Branch Code.
 - Code Nos. of the authorized signatory with full name and designation.
 - Phone Nos., Fax Nos., E-mail address.
- 34.3. Bidders will have to submit the Bank Guarantee from any of the scheduled banks and on non-judicial stamp paper of requisite value as per the Indian Stamp Act, purchased in the name of the issuing banker.

Note : Bank Guarantee issued by a Scheduled Bank in India at the request of some other Non-scheduled Bank of India shall not be acceptable.

34.4. The bank Guarantee issued by the Bank must be routed through SFMS Platform as per following details :

- a.(i) “MT 760/MT 760 COV for issuance of Bank Guarantee
- (ii) MT 760/MT 767 COV for amendment of Bank Guarantee

The above Message/Intimation shall be sent through SFMS by the BG issuing Bank Branch to Axis Bank, Duliajan Branch, IFS Code- UTIB0001129. Branch Address : Axis Bank Ltd., Duliajan Branch, Daily Bazar, Jyotinagar, Duliajan, District : Dibrugarh, PIN : 786602”

b.Bidders are to submit the copy of SFMS Message as sent by the issuing Bank Branch along with the original Bank Guarantee.

The Performance Security shall be denominated in the currency of the contract.

34.5. The Performance Security specified above must be valid for three(3)months beyond the contract period. The Performance Security will be discharged by Company not later than 30 days following its expiry. In the event of any extension of the Contract period, Bank Guarantee should be extended by Contractor by the period equivalent to the extended period.

34.6. The Performance Security shall be payable to Company as compensation for any loss resulting from Contractor’s failure to fulfil its obligations under the Contract.

34.7. The Performance Security will not accrue any interest during its period of validity or extended validity.

34.8. Failure of the successful Bidder to comply with the requirements of clause 10.8 and shall constitute sufficient grounds for annulment of the award and forfeiture of the Bid Security or Performance Security. In such an eventuality, the party shall be debarred for a period of two (2) years from the date of default.

35. INTEGRITY PACT:

35.1. The bidder confirms that all declarations made in this Integrity Pact are true and correct. In case of any declaration turning out to be false, the bidder shall not be allowed to take the defence that the correct declaration is given elsewhere in the offer. For example, any and all cases of transgression as defined in the Integrity Pact must be reflected in the Integrity Pact itself or attached as an appendix to the Integrity Pact with a corresponding reference marked in the transgression provision in the Integrity Pact so that Integrity Pact remains a single and unified document with regard to the objective of Integrity Pact.

35.2. This Integrity Pact proforma has been duly signed by OIL’s competent signatory. The proforma has to be uploaded by the bidder (along with the technical bid) duly signed (digitally) by the same signatory who signed the bid, i.e., who is duly authorized to sign the bid. Uploading the Integrity Pact with digital signature will be construed that all pages of the Integrity Pact has been signed by the bidder’s authorized signatory who signs the Bid. The names of the OIL’s Independent External Monitors (IEMs) at present are as under:

SHRI SATYANANDA MISHRA, IAS (Retd.), former Chief Information Commissioner of India & Ex-Secretary, DOPT, Govt. of India,
E-mail ID : satyanandamishra@hotmail.com

SHRI RAJIV MATHUR, IPS (Retd.) Former Director, IB, Govt. of India,
E-mail ID : rajivmathur23@gmail.com and

SHRI JAGMOHAN GARG, Ex-Vigilance Commissioner, CVC,
E-mail ID : jagmohangarg@gmail.com

35.3. Bidder (s) not complying with the requirements of Integrity Pact shall be rejected.

36. PACKING :

Packing of goods must be sufficiently robust to withstand multiple handling during transit for delivery to their final destination so that contents do not get damaged. Protection of the plant and equipment against corrosion or deterioration must be given special attention.

Machined steel and iron parts are to be heavily greased/varnished as prevention against rust.

1. In the case of internal combustion engines, compressors and similar equipment, internal parts are to be sprayed with an inhibitor or water splitting preservative and all openings covered with tape to prevent ingress of water.
2. Boxes/Packing cases containing electrical/electronic equipment are to be waterproof lined.
3. All items must have their respective identification marks painted /embossed on them.
4. Crates or boxes should have a list of items contained therein secured to the exterior by means of an enveloping piece of tin sheet nailed to the wood. A duplicate list should also be included inside the crate with the contents.
5. The Seller shall be responsible for damage of goods either in full or in part and for corrosion and/or deterioration of the plant and equipment during transit due to inadequate/insufficient packing or due to non-compliance with the above Para Nos. 1 to 4 depending upon the nature of items and as such shall be obligated to repair or replace the damaged goods or plant or equipment in full or in parts thereof, at free of cost to OIL.

37. INSPECTION AND TEST :

- 37.1. The Consultant shall provide all requisite inspection services for all indigenous equipment/bulk material procured for the project and no additional charges shall be payable to seller on account of the same. In the case Indian bidder sourcing materials from abroad, the inspection shall be arranged through Third Party Inspection agency (i.e. LRIS/BV/DNV/TUV/CEIL) in the country of origin & charges of the same shall be included in quoted prices.
- 37.2. The Inspection Agencies mentioned at any other place in bid document shall stand modified with agencies indicated above.
- 37.3. Also,
 - i) QAP will be approved by Inspection agency incorporating requirements of Inspection and Test Plan, Technical specifications provided with Purchase Order/Contract document.

- ii) The Inspection release note issued by the Third Party Inspection agency shall clearly stipulate that materials/equipment have been inspected as per Code-1 approved drawings and approved QAP.
- iii) Certification of final documents, wherever applicable, for release of final payment, shall be carried out by Inspection Authority issuing the final inspection certificate.

38. WARRANTY / GUARANTEE & DEFECT LIABILITY:

Contractor also guarantees the design, workmanship and the freedom from defects of the Goods and/or Services for a period of one (1) Gregorian year from the installation, commissioning and PGTR or eighteen (18) Gregorian months from the date of receipt of the Goods and/or Services by Company, whichever occurs later.

Notwithstanding anything else to the contrary, If, within these specified periods, Contractor receives notice from COMPANY of any alleged defect in or non conformance of any product or repair and if in the Contractor's sole judgment the product or repair does not conform or is found to be defective in material or workmanship then the COMPANY shall at Contractor's request, return the part or product on F.O.R Duliajan (Despatching Station) to Contractor's designated plant or service location. Any repair work performed by Contractor is warranted for one year from completion of such repairs and applies only to work performed.

If the Contractor feels that any variation in work or in quality of materials or proportions would be beneficial or necessary to fulfil the guarantees called for, he shall bring this to the notice of the Consultant/OIL in writing.

Defective goods / materials or parts notified by OIL to the Seller shall be replaced immediately by the Seller on F.O.R destination basis including payment of all taxes and duties at Seller's expense. Also, an additional Contractual Performance Guarantee shall be furnished separately for the extended period of liability for that portion of work/equipment only.

Contractor, at Contractor's option and expense, shall repair or replace the defective part or product, or repay to COMPANY the full price paid by COMPANY for such defective part, repair or product. Any repayment of the purchase price shall be without interest. Contractor's warranty liability, including for defects caused by Contractor's negligence, shall be limited to such repair, replacement or refund, and shall not include claims for labor costs, heavy lifting, rig stand-by time, expenses of COMPANY resulting from defects, recovery under general tort law or strict liability or for damages resulting from delays, loss of use, or other direct, indirect, incidental or consequential damages of any kind.

However, Guarantee for the Basic Engineering & FEED of PLANTS in respect of suitable, appropriate & fault-free design, and system adaptability, process philosophy, etc. without defects/faults that affect operation of the plant will be provided by the Consultant (KAVIN).

Any Liability arising due to failure to obtain required mandatory statutory approval for the Plant and the installed instrument/facility as stipulated vide provisions of Oil Mines Regulations, DGMS, Indian Explosives Act, Indian Electricity Rules, Petroleum Rules, Indian Boiler Regulations etc. in force or byelaws / directives promulgated by Govt.

Circulars/ Regulatory Boards/Panels, Enforcement Directorates etc will be borne by the Consultant.

Any liability due to wrong/improper framing of commissioning & testing procedures and Safe Operating Procedures (SOPs) for all field equipments, system, etc. will be borne by Consultant.

Contractor will not be responsible for failures of products which have been in any way tampered with or altered by anyone other than Contractor's authorized representative, failures due to lack of compliance with recommended maintenance procedures or products which have been repaired or altered in such a way (in Contractor's judgment) as to affect the products adversely.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, STATUTORY OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE WHICH EXCEED THE FOREGOING WARRANTY.

39. APPLICABLE LAW :

The Contract shall be deemed to be a Contract made under, governed by and construed in accordance with the laws of India and shall be subject to the exclusive jurisdiction of Courtssituated in Guwahati.

40. INSURANCE :

The Seller shall arrange Comprehensive Marine Cum Transit (MCT) insurance policy for the goods being dispatched to Project site.However, storage of goods at site and erection of allthe material and equipment's to be incorporated in permanent works shall be covered underabove MCT insurance policy by Owner. The insurance required under prevailing Indian laws for bidder's personnel, equipmentas well as Third Party Insurance shall be arranged by the Seller.

41. TERMS OF PAYMENT :

41.1. Payment Terms are enclosed as Annexureto Special Conditions of Contract

41.2. Advance payment as specified in the payment terms shall be payable.

42. SHIPMENT DOCUMENTATION :

42.1. Following despatch documents are required to be submitted by the Supplier immediately aftershipment is made.

42.1.1. Invoice

42.1.2. Inspection Release Note by Third Party Inspection Agency / Purchaser / Consultant.

42.1.3. Clean Bill of Lading/Clean Airway Bill

42.1.4. Packing List identify contents of each package

42.1.5. Test Certificates (NDT reports, MTC, etc. as per Bid Documents)

42.1.6. Certificate of Measurement and Weight

42.1.7. List of documents as specified in Vendor Data Requirement in Material Requisition/PurchaseRequisition&counter stamped by TPIA /KAVIN

42.1.8. Estimated Time of Arrival (ETA) of Vessel at port of entry

42.1.9. Documents pertaining to ocean freight

- 42.1.10. Country of origin certificate issued by relevant Chambers of Commerce
- 42.1.11. Documents in support of Customs duty exemption or waiver or reduced rate, as applicable under CEPA, FTA, Multi-lateral, Bi-lateral trade agreement between India and bidder's country, if exemption is claimed in the bid.

43. TAXES & DUTIES:

43.1. GOODS AND SERVICES TAX:

In view of GST Implementation from 1st July 2017, all taxes and duties including Excise Duty, CST/VAT, Service tax, Entry Tax and other indirect taxes and duties have been submerged in GST. Accordingly reference of Excise Duty, Service Tax, VAT, Sales Tax, Entry Tax or any other form of indirect tax except of GST mentioned in the bidding document shall be ignored.

- 43.2. Bidders are required to submit copy of the GST Registration Certificate while submitting the bids wherever GST (CGST & SGST/UTGST or IGST) is applicable.

- 43.3. "GST" shall mean Goods and Services Tax charged on the supply of material(s) and services. The term "GST" shall be construed to include the Integrated Goods and Services Tax (hereinafter referred to as "IGST") or Central Goods and Services Tax (hereinafter referred to as "CGST") or State Goods and Services Tax (hereinafter referred to as "SGST") or Union Territory Goods and Services Tax (hereinafter referred to as "UTGST") depending upon the import/interstate or intrastate supplies, as the case may be. It shall also mean GST compensation Cess, if applicable.

- 43.4. Quoted prices should be inclusive of all taxes and duties, except GST (i.e. IGST or CGST and SGST/UTGST applicable in case of interstate supply or intra state supply respectively and GST compensation Cess if applicable). Please note that the responsibility of payment of GST (CGST & SGST or IGST or UTGST) lies with the Supplier of Goods /Services (Service Provider) only. Supplier of Goods /Services (Service Provider) providing taxable service shall issue an Invoice/ Bill, as the case may be as per rules/ regulation of GST. Further, returns and details required to be filled under GST laws & rules should be timely filed by Supplier of Goods/Services (Service Provider) with requisite details.

- 43.5. Where the OIL is entitled to avail the input tax credit of GST:

OIL will reimburse the GST to the Supplier of Goods/Services (Service Provider) at actual against submission of Invoices as per format specified in rules/ regulation of GST to enable OIL to claim input tax credit of GST paid. In case of any variation in the executed quantities, the amount on which the GST is applicable shall be modified in same proportion. Returns and details required to be filled under GST laws & rules should be timely filed by supplier with requisite details.

- 43.6. The input tax credit of GST quoted shall be considered for evaluation of bids, as per evaluation criteria of tender document.

- 43.7. Where the OIL is not entitled to avail/take the full input tax credit of GST:

OIL will reimburse GST to the Supplier of Goods/Services (Service Provider) at actual against submission of Invoices as per format specified in rules/ regulation of GST subject to the ceiling amount of GST as quoted by the bidder, subject to any statutory variations, except variations arising due to change in turnover. In case of any variation in the executed quantities (If directed and/or certified by the In-Charge) the ceiling amount on which GST is applicable will be modified on pro-rata basis.

- 43.8. The bids will be evaluated based on total price including applicable GST.
- 43.9. Payments to Service Provider for claiming GST amount will be made provided the above formalities are fulfilled. Further, OIL may seek copies of challan and certificate from Chartered Accountant for deposit of GST collected from OIL.
- 43.10. Contractor/vendor shall be required to issue tax invoice in accordance with GST Act and/or Rules so that input credit can be availed by OIL. In the event that the contractor / vendor fails to provide the invoice in the form and manner prescribed under the GST Act read with GST Invoicing Rules thereunder, OIL shall not be liable to make any payment on account of GST against such invoice.
- 43.11. GST shall be paid against receipt of tax invoice and proof of payment of GST to government. In case of non-receipt of tax invoice or non-payment of GST by the contractor/vendor, OIL shall withhold the payment of GST.
- 43.12. GST payable under reverse charge for specified services or goods under GST act or rules, if any, shall not be paid to the contractor/vendor but will be directly deposited to the government by OIL.
- 43.13. Where OIL has the obligation to discharge GST liability under reverse charge mechanism and OIL has paid or/and 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 OIL or ITC with respect to such payments is not available to OIL for any reason which is not attributable to OIL, then OIL shall be entitled to deduct/setoff/recover such amounts against any amounts paid or payable by OIL to Contractor/Supplier.
- 43.14. Notwithstanding anything contained anywhere in the Agreement, in the event that the input tax credit of the GST charged by the Contractor/Vendor is denied by the tax authorities to OIL for reasons attributable to Contractor/Vendor, OIL shall be entitled to recover such amount from the Contractor/Vendor by way of adjustment from the next invoice. In addition to the amount of GST, OIL shall also be entitled to recover interest at the rate prescribed under GST Act and penalty, in case any penalty is imposed by the tax authorities on OIL.
- 43.15. TDS under GST, if applicable, shall be deducted from contractor's/vendor's bill at applicable rate and a certificate as per rules for tax so deducted shall be provided to the contractor/vendor.
- 43.16. The Contractor will be under obligation for charging correct rate of tax as prescribed under the respective tax laws. Further the Contractor shall avail and pass on benefits of all exemptions/concessions available under tax laws.
- 43.17. GST liability, if any on account of supply of free samples against any tender shall be to bidder's account.
- 43.18. In case of statutory variation in GST, other than due to change in turnover, payable on the contract value during contract period, the Supplier of Goods/Services (Service Provider) 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. Beyond the contract period, in case OIL is not entitled for input tax credit of GST, then any increase in the rate of GST beyond the contractual delivery period shall be to Service provider's account whereas any decrease in the rate GST shall be passed on to the OIL. Beyond the contract period, in case OIL is entitled for input tax credit of GST, then statutory

variation in applicable GST on supply and on incidental services, shall be to OIL's account.

43.19. Claim for payment of GST/Statutory variation, 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 Opening Date.

43.20. The contractor will be liable to ensure to have registered with the respective tax authorities and to submit self-attested copy of such registration certificate(s) and the Contractor will be responsible for procurement of material in its own registration (GSTIN) and also to issue its own Road Permit/E-way Bill, if applicable etc.

43.21. In case the bidder is covered under Composition Scheme under GST laws, then bidder should quote the price inclusive of the GST (CGST & SGST/UTGST or IGST). Further, such bidder should mention "Cover under composition system" in column for GST (CGST & SGST/UTGST or IGST) of price schedule.

43.22. OIL will prefer to deal with registered supplier of goods/services under GST. Therefore, bidders are requested to get themselves registered under GST, if not registered yet. However, in case any unregistered bidder is submitting their bid, their prices will be loaded with applicable GST while evaluation of bid. Where OIL is entitled for input credit of GST, the same will be considered for evaluation of bid as per evaluation methodology of tender document.

43.23. Documentation requirement for GST :

The vendor will be under the obligation for invoicing correct tax rate of tax/duties as prescribed under the GST law to OIL, and pass on the benefits, if any, after availing input tax credit.

Any invoice issued shall contain the following particulars -

- a) Name, address and GSTIN of the supplier;
- b) Serial number of the invoice;
- c) Date of issue;
- d) Name, address and GSTIN or UIN, if registered of the recipient;
- e) Name and address of the recipient and the address of the delivery, along with the State and its code,
- f) HSN code of goods or Accounting Code of services[SAC];
- g) Description of goods or services;
- h) Quantity in case of goods and unit or Unique Quantity Code thereof;
- i) Total value of supply of goods or services or both;
- j) Taxable value of supply of goods or services or both taking into discount or abatement if any;
- k) Rate of tax (IGST, CGST, SGST/UTGST, cess);
- l) Amount of tax charged in respect of taxable goods or services (IGST, CGST, SGST/UTGST, cess);
- m) Place of supply along with the name of State, in case of supply in the course of interstate trade or commerce;
- n) Address of the delivery where the same is different from the place of supply
- o) Signature or digital signature of the supplier or his authorised representative.

GST invoice shall be prepared in triplicate, in case of supply of goods, in the following manner:

- a) The original copy being marked as ORIGINAL FOR RECIPIENT;
- b) The duplicate copy being marked as DUPLICATE FOR TRANSPORTER and
- c) The triplicate copy being marked as TRIPPLICATE FOR SUPPLIER.

In case of any advance given against any supplies contract, the supplier of the goods shall issue Receipt Voucher containing the details of advance taken along with particulars as mentioned in Clause nos. (a), (b), (c), (d), (g), (k), (l), (m) & (o) above.

43.24. Anti-profiteering clause -

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

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

44. INCOME TAX:

Income Tax as applicable shall included in the price and will be deducted at source as TDS by OIL. Owner shall issue a Tax deduction or withholding certificate to the MPC Contractor evidencing the Taxdeducted or withheld and deposited by Owner on payments made to the MPC Contractor to enable him to claim the credit of the Tax deducted or withheld by Owner.

45. STATUTORY VARIATIONS :

- 45.1.** No variation on account of taxes and duties, statutory or otherwise, shall be payable by OIL/Consultant to contractor/vendor except for GST. Any statutory variation for GST shall be payable up to contractual date of completion against documentary evidence. In case, input tax credit of GST is available to OIL/Consultant beyond Contractual completion date, the same may be reimbursed by OIL/Consultant. Any reduction in taxes and duties included in the price shall be passed on to OIL/Consultant.
- 45.2.** For the purpose of applicability of statutory variations on GST (Goods & Service Tax) as above (including imposition of any new taxes/duties/levies, etc.) under above terms, each staggered delivery of lots (due in a specific month as per delivery schedule for bulk items) shall be considered as delivery date for the respective lot(s).
- 45.3.** Statutory Variation in GST (Goods & Service Tax), within the contractual completion period shall be on Owner's account against submission of documentary evidence. However, in case of delay in completion beyond the contractual date, for reasons attributable to Seller, any increase in GST(Goods & Service Tax) shall be borne by Seller, whereas any decrease shall be passed on to OIL.
- 45.4.** If the statutory variation entitles the employer to recover the amount (irrespective of contractual delivery) such amount will be recovered from any bill of the Supplier

immediately on enforcement of such variation under intimation to the Supplier.

45.5. NEW TAXES & DUTIES

All new Indian taxes/duties/cess/levies notified after the date of unpriced bid opening/submission of any subsequent price implication/revised prices, but within Time for Completion/extended Timefor Completion (due to reasonattributable to OIL), shall be to Owner's account. These shall be reimbursed against documentary evidence.However, wherever any new taxes & duties are imposed and previous taxes & duties are abolished/discontinued, the same shall be considered on case to case basis.Further, in case of delay attributable to supplier, any new or additional taxes and duties imposedafter Time for Completion, as above, shall be to supplier's account.

Note: wherever any price implication/revised prices is obtained from bidders after un-priced bid opening, bidder to consider any new taxes/duties/cess/ levies notified after un-priced bid openingin this price implication/revised prices.

45.6. **GENERAL :**

- a) Any error of interpretation of applicability of taxes/duties by the contractor shall be to bidder's account.
- b) The classification of goods as per GST (Goods & Service Tax) Act should be correctly done by the contractor to ensure that input tax credit on GST (Goods & Service Tax) is not lost to theOwner on account of any error on the part of the SUPPLIER.
- c) Notwithstanding anything mentioned elsewhere in the Bidding Document the aggregate liability of Owner towards Payment of Taxes & Duties shall be limited to applicable GST except for the statutory variation in taxes & duties & Clause 50.3 above.

46. **LIMITATION OF LIABILITY**

Notwithstanding any other provisions herein to the contrary, except only in cases of wilful misconduct and/or criminal acts,

(a) Neither the Contractor nor the Company shall be liable to the other, whether in Contract, tort, or otherwise, for any consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs.

(b) Notwithstanding any other provisions incorporated elsewhere in the contract, the aggregate liability of the Contractor in respect of this contract, whether under the Contract, in tort or otherwise, shall not exceed 50% of the Contract Price, provided however that this limitation shall not apply to the cost of repairing or replacing defective equipment by the Contractor, or to any obligation of the Contractor to indemnify the Company with respect to Intellectual Property Rights.

The Company shall indemnify and keep indemnified the Contractor harmless from and against any and all claims, costs, losses and liabilities in excess of the aggregate liability amount in terms of clause (b) above.

47. **CARTEL FORMATION**

In case any bidder is found to be involved in cartel formation, his bid will not be considered for evaluation/placement of order. EMD/Bid Security submitted by such bidder shall be forfeited and such bidder will also be put on Holiday/Negative list of OWNER barring them from bidding in future.

48. ORDER OF PRECEDENCE

The documents forming the Contract are to be taken as mutually explanatory of one another. If there is an ambiguity or discrepancy in the Term & Conditions defined in the various documents, the order of Precedence shall be as follows:

- Bidding Document and its enclosures along with bidding document Amendment to Bidding Document, if any
- Bidding Document/IFB along with Bid Data Sheet
- Job Specifications
- Drawings
- Technical specifications
- Instructions to Bidders (ITB)

A variation or amendment issued after the execution of the formal contract shall take precedence over respective clauses of the formal contract and its Annexure.

49. FORCE MAJEURE :

- 49.1. In the event of either party being rendered unable by 'Force Majeure' to perform any obligation required to be performed by them under the contract, the relative obligation of the party affected by such 'Force Majeure' will stand suspended for the period during which such cause lasts. The word 'Force Majeure' as employed herein shall mean acts of God, war, revolt, agitation, strikes, riot, fire, flood, sabotage, civil commotion, road barricade, acts of government of the two parties which makes performance impossible or impracticable and any other cause whether of kind herein enumerated or otherwise which are not within the control of the party to the contract and which renders performance of the contract by the said party impossible.
- 49.2. Upon occurrence of such cause and upon its termination, the party alleging that it has been rendered unable as aforesaid thereby, shall notify the other party in writing within seventy two (72) hours of the alleged beginning and ending thereof, giving full particulars and satisfactory evidence in support of its claim.
- 49.3. Should 'force majeure' condition as stated above occurs and should the same be notified within seventy two (72) hours after its occurrence the 'force majeure' rate shall apply for the first fifteen days. Parties will have the right to terminate the Contract if such 'force majeure' conditions continue beyond fifteen (15) days with prior written notice. Should either party decide not to terminate the Contract even under such condition, no payment would apply after expiry of fifteen (15) days force majeure period unless otherwise agreed to.

50. SETTLEMENT OF DISPUTES AND ARBITRATION:

Arbitration (Applicable for Suppliers/Contractors other than PSU):

Except as otherwise provided elsewhere in the contract, if any dispute, difference, question or disagreement arises between the parties hereto or their respective representatives or assignees, in connection with construction, meaning, operation, effect, interpretation of the

contract or breach thereof which parties are unable to settle mutually, the same shall be referred to Arbitration as provided hereunder:

1. A party wishing to commence arbitration proceeding shall invoke Arbitration Clause by giving 30 days notice to the other party. The notice invoking arbitration shall specify all the points of dispute with details of the amount claimed to be referred to arbitration at the time of invocation of arbitration and not thereafter. If the claim is in foreign currency, the claimant shall indicate its value in Indian Rupee for the purpose of constitution of the arbitral tribunal.

2. The number of arbitrators and the appointing authority will be as under:

Claim amount (excluding claim for interest and counter claim, if any)	Number of Arbitrator	Appointing Authority
UptoRs. 5 Crore	Sole Arbitrator	OIL
Above Rs. 5 Crore	3 Arbitrators	One Arbitrator by each party and the 3rd Arbitrator, who shall be the presiding Arbitrator, by the two Arbitrators.

3. The parties agree that they shall appoint only those persons as arbitrators who accept the conditions of the arbitration clause. No person shall be appointed as Arbitrator or Presiding Arbitrator who does not accept the conditions of the arbitration clause.
4. Parties agree that there will be no objection if the Arbitrator appointed holds equity shares of OIL and/or is a retired officer of OIL/any PSU. However, neither party shall appoint its serving employees as arbitrator.
5. If any of the Arbitrators so appointed dies, resigns, becomes incapacitated or withdraws for any reason from the proceedings, it shall be lawful for the concerned party/arbitrators to appoint another person in his place in the same manner as aforesaid. Such person shall proceed with the reference from the stage where his predecessor had left if both parties consent for the same; otherwise, he shall proceed de novo.
6. Parties agree that neither shall be entitled for any pre-reference or pendente-lite interest on its claims. Parties agree that any claim for such interest made by any party shall be void.
7. The arbitral tribunal shall make and publish the award within time stipulated as under:

Amount of Claims and counter claims(excluding interest)	Period for making and publishing of the award(counted from the date of first meeting of the Arbitrators)
UptoRs. 5 Crore	Within 8 months
Above Rs. 5 Crore	Within 12 months

The above time limit can be extended by Arbitrator, for reasons to be recorded in writing, with the consent of the other parties.

8. If after commencement of the arbitration proceedings, the parties agree to settle the dispute mutually or refer the dispute to conciliation, the arbitrators shall put the proceedings in abeyance until such period as requested by the parties.
 9. Each party shall be responsible to make arrangements for the travel and stay etc. of the arbitrator pointed by it. Claimant shall also be responsible for making arrangements for travel/stay arrangements of the Presiding Arbitrator and the expenses incurred shall be shared equally by the parties.
In case of sole arbitrator, OIL shall make all necessary arrangements for his travel, stay and the expenses incurred shall be shared equally by the parties.
 10. The Arbitration shall be held at the place from where the contract has been awarded. However, parties to the contract can agree for a different place for the convenience of all concerned.
 11. The Arbitrator(s) shall give reasoned and speaking award and it shall be final and binding on the parties.
 12. Subject to aforesaid, provisions of the Arbitration and Conciliation Act, 1996 and any statutory modifications or re-enactment thereof shall apply to the arbitration proceedings under this clause.
- The venue of all arbitrations will be at Duliajan, Assam. The award made in pursuance thereof shall be binding on the parties.

51. NOTICES:

- 51.1. Any notice given by one party to other, pursuant to this Purchase Contract shall be sent in writing or by telex or Fax and confirmed in writing to the applicable address specified below:

Company

CGM (Projects)
Projects Department
OIL INDIA LIMITED
PO DULIAJAN - 786602
ASSAM, INDIA
Email: prodproj@oilindia.

c) Contractor

E-mail id:

- 51.2. A notice shall be effective when delivered or on the notice's effective date, whichever is later.

52. ROYALTY AND PATENTS:

Each party shall hold harmless and indemnify the other from and against all claim and proceedings for or on account of any patent rights, design, trade mark or other protected rights arising from any use of materials, equipment, processes, inventions and methods which have not been imposed on the attending party by the terms of the contract or the specifications or drawings forming part thereof.

53. WAIVER:

Any delay in exercising and any omission to exercise any right, power or remedy exercisable by the Company under this contract shall not impair such right, power or remedy nor shall any waiver by the Company of any breach by the Contractor of any provision of this contract prevent the subsequent enforcement of that provision by the Company or be deemed a waiver by the Company of any subsequent breach by the Contractor.

54. CONSEQUENTIAL DAMAGE:

Except as otherwise expressly provided, neither party shall be liable to the other for special, indirect or consequential damages resulting from or arising out of the contract, including but without limitation, to loss or profit or business interruptions, howsoever caused and regardless of whether such loss or damage was caused by the negligence (either sole or concurrent) of either party, its employees, agents or sub-contractors.

55. LIQUIDATED DAMAGE

55.1 The duration for supplying all the contractual package materials/items as per TOR and specification shall be 7 months from the date of issue of Letter of Award (LOA). In the event of delay on the part of the Contractor to deliver package material/items, within the stipulated period of 8 months, Liquidated damage 0.5 % of per unit package cost per week or part therefore of subject to maximum of 7.5 % will be applicable. Should there be default on the part of the Seller for more than 26 Weeks from the scheduled date to complete the delivery or to complete the installation/commissioning & Training (wherever applicable) successfully, OIL shall have the right, in addition to the provisions as above to invoke the Performance Security without causing any notice to the Seller to this effect.

55.2 The parties agree that the sum specified above is not a penalty but a genuine pre-estimate of the loss/damage which will be suffered by OIL on account of delay/breach on the part of the Contractor and the said amount will be payable without proof of actual loss or damage caused by such delay/breach and without any demur and shall not be open for any dispute whatsoever. It is agreed that the payment of such liquidated damages shall represent the sole remedy available to the Company in respect of delay under Contract or otherwise at law.

56. TERMINATION

- 56.1. **TERMINATION ON EXPIRY OF THE TERMS (DURATION):** This contract shall be deemed to have been automatically terminated on the expiry of duration of the contractor the extension period, if exercised by Company under the provision of the Contract.
- 56.2. **TERMINATION ON ACCOUNT OF FORCE MAJEURE:** Either party shall have the right to terminate this Contract on account of Force Majeure as set forth in Article 57.0 above.
- 56.3. **TERMINATION ON ACCOUNT OF INSOLVENCY:** In the event that the Contractor or its collaborator at any time during the term of the Contract, becomes insolvent or makes a voluntary assignment of its assets for the benefit of creditors or is adjudged bankrupt, then the Company shall, by a notice in writing have the right to terminate the Contract and all the Contractor's rights and privileges hereunder, shall stand terminated forthwith.
- 56.4. **TERMINATION FOR UNSATISFACTORY PERFORMANCE:** If the Company considers that, the performance of the Contractor is unsatisfactory, or not upto the expected standard, the Company shall notify the Contractor in writing and specify in details the

cause of the dissatisfaction. The Company shall have the option to terminate the Contract by giving 15 days notice in writing to the Contractor, if Contractor fails to comply with the requisitions contained in the said written notice issued by the Company.

56.5. **TERMINATION DUE TO CHANGE OF OWNERSHIP & ASSIGNMENT:** In case the Contractor's rights and/or obligations under this Contract and/or the Contractor's rights, title and interest to the equipment/material, are transferred or assigned without the Company's consent, the Company may at its absolute discretion, terminate this Contract.

56.6. **CONSEQUENCES OF TERMINATION:** In all cases of termination herein set forth, the relative obligations of the parties to the Contract shall be limited to the period up to the date of termination. Notwithstanding the termination of this Contract, the parties shall continue to be bound by the provisions of this Contract that reasonably require some action or forbearance after such termination.

END OF VOLUME I: COMMERCIAL PART I

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VOLUME I: COMMERCIAL
PART II

BID EVALUATION CRITERIA (BEC)

PREAMBLE:

The bid shall conform generally to the specifications and terms and conditions given in this bid document. Bids shall be rejected in case the services offered do not conform to therequired parameters stipulated in the technical specifications. Notwithstanding the general conformity of the bids to the stipulated specifications, the following mandatory requirements will have to be particularly met by the Bidders without which the same will be considered as non-responsive and rejected. All the documents related to BEC must be submitted along with the Techno-Commercial Bid.

1.0 TECHNICAL CRITERIA :

- 1.1 Bidder should have executed one integrated contract for a hydrocarbon industry consisting of Instrument/Utility air system with a minimum design capacity of 800 Nm³/hr, Nitrogen Generation system with a minimum design capacity of 100 Nm³/hr.
- 1.2 Bidder should have carried out Engineering, Procurement, Fabrication and Supply on their own as stated above in Para 1.1 above.
- 1.3 Bidder should have In-House design & engineering capability.
- 1.4 Bidder / packager shall provide performance certificate from the end user for a minimum period of two years satisfactory operation at site as on bid due date for at least one of the supplied Air & Nitrogen Package .
- 1.5 Experience of having successfully executed one similar job as mentioned above in Para 1.1 of value not less than INR. 6.335 Crore by the bidders in the last five years (05) to be reckoned from the original Bid Closing date.
- 1.6 Documentary evidence in support of the above jobs in the form of job completion certificates from the clients are to be submitted failing which the offers will be rejected. The bidder shall give information on each individual work executed during the past five years (05), ending original bid closing date, indicating the following details.
 - Brief Description of Work
 - Value of Contract
 - Completion time as stated in Contract (months)
 - Actual Completion time (months)
 - Month/Year of completion
 - Reasons for delay, if any
 - Name & postal address of client
 - Contact person
- 1.7 **BIDS FROM CONSORTIUMS ARE NOT ACCEPTED. BIDS FROM JOINT VENTURES NOT ACCEPTED.**

2.0 FINANCIAL CRITERIA:

- a) Annual Turnover of Bidder:** The Annual Financial turnover of the Bidder in any of the 3 preceeding Financial / Accounting Years from the original bid closing date (BCD) must be equal or more than INR 6.335 Crore as per Audited Annual Financial Reports.
- b) Net Worth:** The financial Net Worth of the Bidder must be **Positive** net worth for the preceding Financial/Accounting year from the original bid closing date.
- c) Working Capital Requirement:** The Working Capital of the Bidder must be minimum INR 1.267 Crore in the preceding Financial/Accounting year from the original bid closing date.

Note1: Considering the time required for preparation of Financial Statements, if the last date of preceding financial/accounting year falls within the preceding six months reckoned from the original bid closing date and the Financial Statements of the preceding financial/accounting year are not available with the bidder, then the financial turnover of the previous three financial/accounting years excluding the preceding financial/accounting year will be considered. In such cases, the Net Worth of the previous financial/accounting year excluding the preceding financial/accounting year will be considered. However, the bidder has to submit an affidavit/ undertaking certifying that the balance sheet/Financial Statements for the financial year (as the case may be) have not been audited so far.

Note2: For proof of Annual Turnover & Net Worth the following document must be submitted along with the bid:-

- i) A certificate issued by a practicing Chartered/Cost Accountant (with Membership Number and Firm Registration Number-FRN), certifying the Annual turnover & Net worth.

AND

- i) Audited Balance Sheet along with Profit & Loss account.

Note3: In case the bidder is a Central Govt. Organization/PSU/State Govt. Organization/Semi-State Govt. Organization or any other Central/State Govt. Undertaking, where the auditor is appointed only after the approval of Comptroller and Auditor General (CAG) of India and the Central Government, their certificates may be accepted even though FRN is not available. However, the bidder to provide documentary evidence for the same.

3.0 DOCUMENTARY EVIDENCES TO BE SUBMITTED BY THE BIDDERS IN SUPPORT OF THEIR BIDS:

Bidders must furnish documentary evidences in support of fulfilling the entire above requirement as under:

- (a) P.O/Work Order and job Completion Certificate or any other documents from their clients which can substantiate their claim towards experience.
- (b) Company Profile, address, concerned person and his/her contact details, organizational set up with details of professional technical and financial capabilities, qualification and experience certificates for TDC engineers.
- (c) Documents in the form of copies of relevant pages of Contract and Completion Certificate or final bill payment documents etc. or any other documents issued by their clients in support of executing the job as mentioned in the Scope of Work/Terms of Reference/Technical Specification (Section-II) of the bidding document, during last 5 years prior to the bid closing date of the tender.
- (d) ISO certification of the bidder.

All documents submitted with bid must be self-certified by the bidder's authorized person signing the bid and duly authenticated as mentioned elsewhere in the bidding document.

NOTE:

In case Bidder has executed and completed a Composite work in a single contract which includes the qualifying work(s) stated under Clause No. 1.1 to 1.3 above, then value of such qualifying work(s) out of total value of composite work shall be considered for the purpose of evaluation.

For qualification based on composite works, in the event the value of the qualifying work(s) cannot be ascertained from the Work Order/Completion Certificate submitted by bidder, Copy of Schedule of Rates/Prices (SOR/P), Copy of relevant pages of contract, Copy of relevant pages of final bill certified by their OWNER for establishing requirement of BQC or written letter from their Owner specifying the nature of work with quantities and values shall be submitted for qualification.

4.0 COMMERCIAL – BID SUBMISSION

- 4.1 Bids shall be submitted under single stage two Bid systems i.e. Technical Bid and Priced Bid separately in the OIL's e-Tender portal. The Technical Bid is to be uploaded as per Scope of Work & Technical Specification of the tender in "Technical RFx Response" Tab and Priced Bid uploaded in the "Notes & Attachments" Tab. Bids shall be rejected outright if the prices are indicated in the technical bids. Bids not conforming to this two bid system shall be rejected outright.
- 4.2 Except for the provisions of escalation provided elsewhere in the bidding document, bidder shall offer firm prices. Price quoted by the successful bidder must remain firm during the execution of the contract and not subject to variation on any account unless mentioned otherwise in the bidding document.
- 4.3 Validity of bids shall be minimum 4 months (120 days). Bids with lesser validity will be rejected as being non-responsive.
- 4.4 Bid without original Bid Security and confirmation regarding submission of bid security as per para 10 of Volume I - Commercial -Part I - ITB shall be rejected.

- 4.5 The amount of Bid Security shall be as specified in the Forwarding Letter of the Bid Document. Bid without proper & valid Bid Security will be rejected.
- 4.6 The authenticity of digital signature shall be verified through authorised CA after bid opening and in case if the digital signature is not authorised, the bid will be rejected.
- 4.7 Bids received through the e-procurement portal shall only be accepted. Bid not submitted in compliance with special methods of submitting system mentioned in 4.1 above (wherever applicable) will be rejected. Bids received in any other form shall not be accepted.
- 4.8 The Integrity Pact must be uploaded in OIL's E-Procurement portal along with the Technical Bid digitally signed by the same signatory who digitally signed the Bid i.e. who is duly authorized to sign the Bid. If any bidder refuses to sign Integrity Pact or declines to submit the Integrity Pact, their bid will be rejected.
- 4.9 Physical Bids, if any received from the bidders, shall not be considered and will be rejected.
- 4.10 Bids submitted after the Bid Closing Date and Time will be rejected.
- 4.11 The bid documents are non-transferable. Bid can only be submitted in the name of the bidder in whose name the User ID and Password have been issued. Unsolicited bids will not be considered and will be straightway rejected.
- 4.12 Bids shall be typed or written in indelible ink and shall be digitally signed by the bidder or his authorised representative.
- 4.13 Any physical documents wherever called for, submitted by bidders shall contain no interlineations, white fluid erasures or overwriting except as necessary to correct errors made by the Bidder, in which case such correction shall be initialled by the person or persons who has/have digitally signed the Bid.
- 4.14 Any Bid containing false/incorrect statement will be rejected.
- 4.15 Bidders must quote clearly and strictly in accordance with the price schedule outlined in "Price Bid Format" of Bid Document, otherwise the Bid will be summarily rejected.
- 4.16 Bidders shall quote directly and not through their Agent/Representative/Retainer/Associate in India.
- 4.17 Bidder must accept and comply with the following clauses as given in the Bid Document in toto failing which bid will be rejected –
- i) Performance Guarantee Clause
 - ii) Force Majeure Clause
 - iii) Tax Liabilities Clause
 - iv) Arbitration Clause
 - v) Acceptance of Jurisdiction and Applicable Law
 - vi) Liquidated damage and penalty clause
 - vii) Safety, Environment & Labour Law
 - viii) Termination Clause
 - ix) Integrity Pact

5.0 PRICE BID EVALUATION (Part of BEC) :

The bids conforming to the technical specifications, terms and conditions stipulated in the bidding document and considered to be responsive after subjecting to Bid Rejection Criteria will be considered for further evaluation as given below:

- 5.1 If there is any discrepancy between the unit price and the total price, the unit price will prevail and the total price shall be corrected. Similarly, if there

is any discrepancy between words and figure, the amounts in words shall prevail and will be adopted for evaluation.

5.2 The bidders must quote their charges/rates in the manner as called for vide Schedule of Rates/Price (Form SOR/P) as per Volume I- Commercial Part III, Section 2, Annexure II.

5.3 The MPC Contract will be signed with successful bidder for Engineering, Procurement and Supply of Modular Air Package with or without Nitrogen Packages and successful PGTR till end of warranty period.

5.4 The MPC Contract Price shall be calculated as follows:-

- a) Lump sum Price indicated in the Schedule of Rates/Prices (Form SOR/P) comprising the price of **Supplies**
- b) **Goods and Service Tax (GST)**
- c) **Total Lump sum MPC Price = a) + b) shall form the Total Contract Value (Price).**

6.0 GENERAL:

6.1 In case bidder takes exception to any clause of bid document not covered under BEC, then the Company (OIL) has the discretion to load or reject the offer on account of such exception if the bidder does not withdraw/modify the deviation when/as advised by the Company (OIL). The loading so done by the Company (OIL) will be final and binding on the bidders. To ascertain the inter se ranking, the comparison of the responsive bids will be made subject to loading for any deviation. The Commercial Bids shall be evaluated taking into account the rates quoted in the Price Bid Format.

6.2 To ascertain the substantial responsiveness of the Bid, the Company (OIL) reserves the right to ask the bidder for clarification in respect of clauses covered under BEC also and such clarifications fulfilling the BEC clauses in totomust be received on or before the dead line given by the Company (OIL) failing which the offer will be summarily rejected.

6.3 If any of the clauses in the BEC contradicts with other clauses of the Bid Document elsewhere, then the clauses in the BEC shall prevail.

7.0 CUSTOMS DUTY :

The supplies under this Contract shall be carried out in PEL/ML areas of the Company (OIL) which have been issued or renewed after 01/04/1999 and therefore, Customs Duty on the imports under this Contract presently shall be Nil. Bidders should take note of the same while quoting. No Customs Duty is therefore considered for evaluation of bids.

8.0 PURCHASE PREFERENCE CLAUSE:

8.1 Purchase Preference to Micro and Small Enterprises:

8.1.1 Purchase Preference to Micro and Small Enterprises registered with District Industry Centres 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 Udyog Aadhaar Memorandum or any other body specified by Ministry of MSME.

- 8.1.2 In case participating MSEs quote price within price band of L1+15%, such MSE shall be considered for award of contract by bringing down their price to L1 price in a situation where L1 price is from someone other than a MSE.
- 8.1.3 In case of more than one such MSE qualifying for 15% purchase preference, the contract shall be awarded to lowest eligible MSE amongst the MSEs qualifying for 15% purchase preference.
- 8.1.4 In case any part of the work is sub-contracted to a Micro or Small Enterprise as per contract conditions then the contractor shall provide complete details (i.e. name of the subcontractor, value of sub-contacted work, copy of valid registration certificate etc.) of the sub-contractor to OIL.
- 8.1.5 **DOCUMENTATION REQUIRED TO BE SUBMITTED BY MSEs:**
Copy of valid Registration Certificate to be submitted, if bidder is a Micro or Small Enterprises (MSE) registered with District Industry Centres 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 Udyog Aadhaar Memorandum (UAM) or any other body specified by Ministry of MSME. The Registration Certificate should clearly indicate the monetary limit, if any and the items for which bidder are registered with any of the aforesaid agencies. In case bidding MSE is owned by Schedule Caste or Schedule Tribe entrepreneur, valid documentary evidence issued by the agency who has registered the bidder as MSE owned by SC/ST entrepreneur should also be enclosed.

9.0 PURCHASE PREFERENCE LINKED WITH LOCAL CONTENT :

Purchase preference policy (linked with Local Content) (PP-LC) notified vide Letter No:O-27011/44/2015-ONG/II/FP dated 25.04.2017 of MoPNG.

Refer Instruction to Bidders Volume I - Commercial -Part I - ITB for details of the PP-LC

VOLUME-I Part-III
SECTION-1

TERMS OF REFERENCE & TECHNICAL SPECIFICATIONS

VOLUME-I Part-III

SECTION: 1

TERMS OF REFERENCE & TECHNICAL SPECIFICATIONS

1.0 INTRODUCTION:

OIL INDIA LIMITED (OIL) a Government of India Enterprise, proposes to construct two number of Surface Production facilities primarily for separation of Oil, Gas & Water and processing of non-associated & associated gas in its producing field at Nadua and East Khagorijan. The installation will be constructed on Modular design concept with emphasis on skid mounted prefabricated facilities minimizing civil construction work at site to the extent possible as per functional specifications of various process/utility packages. Instead of permanent civil buildings, containerized offices/structures will be preferred.

KAVIN ENGINEERING AND SERVICES PRIVATE LIMITED(Consultant) has been appointed as Engineering Procurement Construction Management Consultant for construction of surface production facilities Oil Collection Station (OCS) at Nadua and Group Gathering Station (GGS) at East Khagorijan, in upper Assam.

The NADUA (OCS) oil field is located near Dibrugarh town in Assam. The field is presently producing from 04 Nos. of wells through a QPS (Quick Production Setup). Considering the potential of the field, it is envisaged that Oil production is expected to rise to a level of 1200 KLPD from 15 HP wells and 15 LP wells. Associated Gas is expected to be around 0.2 MMSCMD. Oil India Limited proposes to construct an Oil Collecting Station (OCS) at NADUA to cater to the production in that area. It is also expected that the field will produce about 800 KLPD of water along with the 1200 KLPD of crude, so the plant will be designed for handling 2000 KLPD of total well fluid.

The East Khagorijan (GGS) field is located near Dibrugarh town in Assam at a location approximately 200m south (aerial distance) of Loc# TAI at 27°32'N 95°09'E approx. Elevation 121 m MSL. The field is presently producing from 02 Nos. of wells through a QPS (Quick Production Setup). Considering the potential of the field it is envisaged that Oil production is expected to rise to a level of 1000 KLPD from 06 HP wells, 06 LP wells and 06 Non Associated Gas wells. Associated Gas is expected to be around 0.1 MMSCMD. The East Khagorijan gas field is expected to produce about 1 MMSCMD of non-associated natural gas from this area. It is also expected that the field will produce about 800 KLPD of water along with the 1000 KLPD of crude, so the plant design will be for handling 1800 KLPD of total well fluid. Oil India Limited proposes to construct a Group Gathering Station (OCS + FGS) at East Khagorijan to cater to the production in that area.

Pipelines carrying well fluids to the proposed surface production facilities and pipelines transporting dry crude, separated gas, treated water from the facilities are not in the project scope.

1.1 SUBJECT:

OIL is in the process of development of surface production facility in Nadua and East Khagorijan. As a part of this development scheme, OIL desires to procure **Modular Air and Nitrogen Package** providing Instrument air, Utility air & Nitrogen for Oil Collection Station(OCS) at Nadua and Group Gathering Station (GGS) at East Khagorijan in Upper Assam, India.

1.2 SITE DETAIL: Nadua & East Khagorijan

Location:

Nadua is a village in Panitola Tehsil in Dibrugarh District of Assam State, India. It is located 20 KM towards East from District headquarters Dibrugarh and 426 KM from State capital Dispur. East Khagorijan is close to Chauba town, located 11km from Chabua Railway station.

Dibrugarh Town Rail Way Station is major railway station 23 KM near to Nadua

Airport: Nearest airport Dibrugarh

1.3 FIELD DETAILS

Nadua and East Khagorijan are Oil producing fields with associated gas. East Khagorijan produces non-associated gas also. Nadua production facility will be connected to 15 LP well and 15 HP wells and will produce 2000 KLPD fluid, out of which 1200 KLPD will be crude. East Khagorijan will be connected with 6 LP wells, 6 HP wells, 6 Non-Associated Gas wells. East Khagorijan will produce 1000 KLPD crude and 1 MMSCMD of non-associated gas.

2.0 OBJECTIVE:

This document specifies the scope and schedule of work to be performed by the MPC contractor for the supply of Plant air system package and one Nitrogen generation system package for each field (Nadua & East Khagorijan). Modular Package Construction (MPC) Contractor shall supply in accordance with the given Terms of Reference, guidelines, instructions etc.

The equipment's which are to be supplied for this facility, Nadua and East Khagorijan shall be latest, suitable, appropriate & proven technology. The proposed installation is designed to meet all the latest and relevant standards for QHSE-ISO and ISRS (International Safety Rating System), OMR (Oil Mines Regulations) 2017, IE Rules, OISD (Oil Industry Safety Directorate), DGMS guidelines (Director General of Mines and Safety), Ministry of Environment and Forest (MOEF), Central & Assam Pollution Control Board and any other relevant laws, by-laws, or Acts in force, etc.

3.0 SCOPE OF SUPPLY FOR FACILITIES IN NADUA AND EAST KHAGORIJAN

The Scope of supply involves package engineering, procurement, fabrication of plant air system package required for OCS Nadua and GGS East khagorijan including transportation and delivery of complete package/skid to respective site. The Scope of supply is not limited to the below mentioned items, MPC Contractor shall supply all required items for the satisfactory operation of the unit.

The scope of work described below is for one facility, the second facility follows the typical arrangement.

Plant air package consists of following system,

- Instrument air / Utility air system
- Nitrogen generation system

3.1 INSTRUMENT AIR / UTILITY AIR SYSTEM

Instrument air / utility air compressor shall be designed for the total capacity of 800 Nm³/hr at 8.8 kg/sq.cm (g) pressure at the outlet of package. The Quality of the Instrument Air shall be in accordance with the 'ISA 7.0.01 Quality Standard for Instrument Air'.

- a) Three (3) nos. of Rotary screw compressor, oil free, air cooled type driven by AC electric motor (2W+1S) of capacity 400 Nm³/hr each. PLC based control panel with associated piping and instrumentation shall be provided for the Compressor.
- b) Compressor skid shall be complete with Lube oil circuit with pumps & oil cooler, Inter cooler, after cooler, Air inlet silencer & filter etc.
- c) Two (2) nos. of Air Dryer Heatless type 2 x 100% (1W+1S) with pre-filter and After-filter for each air drier. Local control panel for each dryer.
- d) Two (2) nos. of Instrument air receiver and each vessel shall be sized for 5 minutes residence time between normal and minimum supply pressure for instrument air capacity of 300 Nm³/hr.
- e) One (1) no. of Utility air receiver sized for 5 minutes residence time between normal and minimum supply pressure for utility air capacity of 100 Nm³/hr.
- f) Complete interconnecting piping, valves, instruments etc. from Compressor outlet to Air dryer and Utility air receiver and Dryer outlet to Instrument air receiver. Piping battery limit shall be Instrument air receiver outlet piping to skid edge, Utility air receiver outlet piping to skid edge and Air drier outlet piping to skid edge for Nitrogen generation package.
- g) Fire fighting system including fire extinguisher as per OISD-STD-189 requirements and shall be of standard capacity as per IS 15683, IS 2878 & IS 10658.

The complete system including equipments, pipes, instruments etc. shall be pre-fabricated and assembled at shop as a single skid and transported in modular skids / container. If skid size exceeds the transport regulations, then the same shall be split suitable for road conditions of Assam. The skid fabrication at the site shall be

avoided. The overall skid dimension shall not exceed the dimension specified in Plot plan attached in Volume-II.

3.2 NITROGEN GENERATION SYSTEM

Nitrogen Generation system shall be designed for the capacity of 100 Nm³/hr (at outlet). Nitrogen generation package receives compressed dry air inlet from Instrument Air Dryer outlet. The system shall consist of the following equipment as minimum,

- a) Two (2) nos. of Particle Filter (1W+1S),
- b) Two (2) nos. of Membrane type Nitrogen generator (1W+1S), Nitrogen purity at the outlet of generator shall be 98% minimum.
- c) One (1) no. of Nitrogen receiver, material shall be SA516 Gr.70 sized for 5 minutes residence time between normal and minimum supply pressure for Nitrogen capacity of 100 Nm³/hr.
- d) Complete interconnecting piping, valves, instruments including gas analyzers etc. within the package.
- e) PLC based control panel for the package.
- f) Fire fighting system including fire extinguisher as per OISD-STD-189 requirements and shall be of standard capacity as per IS 15683, IS 2878 & IS 10658.

The complete system including equipments, pipes, instruments etc. shall be pre-fabricated and assembled at shop as a single skid and transported in container. If skid size exceeds the transport regulations, then the same shall be split suitable for road conditions of Assam. The skid fabrication at the site shall be avoided. The overall skid dimension shall not exceed the dimension specified in Plot plan attached in Volume-II.

3.3 GENERAL FOR INSTRUMENT AIR / UTILITY AIR SYSTEM AND NITROGEN GENERATION SYSTEM

- a) Complete equipment, piping, fittings, valves, instruments and controls, supports, structures etc.
- b) Complete electrical system required for satisfactory operation of the unit including earthing design, preparation of detailed drawings, manufacture, testing.
 - Power and control cabling, cable trays and tray supports
 - Local control station (as applicable)
 - Lighting & small power sockets and distribution boards
 - Earthing protection system
 - Junction boxes (Where required)
 - Cable glands

- Local AC UPS distribution
- Local DC UPS distribution
- c) Surface preparation and painting
- d) Shop inspection and testing, Factory Acceptance Tests (FAT), Site Acceptance Test (SAT)
- e) Packing, marking and forwarding
- f) Spares and Special tools
 - Supply of Start-up spares as required during start-up and commissioning
 - Supply of Maintenance tools and tackles including special tools
- g) Price list of recommended spares for smooth operation of the system / equipment for a minimum period of 2 years.
- h) Noise level of the equipments shall be 75 dBA @ 1m distance from periphery of the equipment / Enclosure. If required, Acoustic enclosure shall be provided to meet the desired Noise level.
- i) Process / Performance Guarantee
- j) Access platforms, ladders, stairways, handrails etc as required
- k) List of consumables and First fill of Lubricants for the complete package. Additional top-up quantity as required during commissioning period and PGTR of 1 month shall also be supplied.
- l) Process / Performance Guarantee
- m) Commissioning Assistance at Site
- n) Guarantee to Meet all HAZOP, SIL and Safety Operational Requirements

3.4 PACKAGE RESPONSIBILITY

The Package responsibility shall rest with the MPC Contractor, who shall be responsible for the complete Package including Compressor, Air dryer, Receiver, Nitrogen generation package, associated auxiliary system etc.

3.5 SPARE PARTS PHILOSOPHY:

MPC contractor shall provide Spares necessary for Start-up and Commissioning, Special tools as part of the offer.

Price list for 2 years operation and maintenance spares shall be submitted along with the offer. Prices for these spares shall not be taken into consideration for evaluation of Contractor's offer. This price list will be utilized during the award of O&M Contract at later stage.

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4.0 MPC BATTERY LIMIT

- a) All the package equipment described in the scope of supply shall be in the scope of the MPC contractor. The design, procurement and fabrication within the package shall be under the scope of MPC contractor. All piping, cable tray, etc., Tie-in shall be terminated at the package edge.
- b) Refer “P&ID of Air & Nitrogen system” attached in Volume-II, Section-III for detailed scope of battery limit of the MPC contractor.
- c) MPC contractor’s scope of supply for electrical cable tray shall be terminated at package tie-in. Power cables for motors and incomers for distribution boards inside package shall be sized and directly terminated by others.
- d) Providing UPS power supply for Instrumentation & Control, Control Panel at one tie-in-point specified by the MPC contractor will be provided by others.
- e) Providing lighting power supply to the designated connection point of the lighting DB as specified by the MPC contractor will be provided by others.
- f) Utility water (If required) connections will be provided at one single tie-in point location at the package edge, further internal piping distribution within the package shall be under the scope of the MPC contractor.
- g) All interconnecting pipe, cable tray tie-in co-ordinates location shall be mutually agreed between the MPC contractor and EPCM consultant. The same shall be provided in the tie-in register by the MPC contractor.
- h) The plant air system package shall be installed on the concrete pedestal / foundation. The inputs required for design, construction of civil foundation shall be provided by the MPC contractor in a timely manner. The civil design & construction scope will be by others.

5.0 MODULAR PACKAGE DESIGN CONCEPT:

- a) The plant air system facilities involved in the Nadua and East Khagorijan plant to be pre-fabricated and transported as Modular skid / Container. The dimension of skid shall be selected in such a way to be transported as a standard size of the container. If any package needs to be designed higher than the recommended container size, the package shall be split and flanged to erect as one package at site
- b) The plant air system facilities should involve designing the systems into portable skids. These skids should be self-contained units which can be stacked or rearranged in different formations to add or to form entire plants.
- c) The modular package shall be transportable via roads of Assam and to the plant locations. The regulation of road safety shall be met by the package supplier.
- d) The skid fabrication at site shall be avoided by the package supplier.
- e) Civil work shall be done by others based on the inputs given by the package supplier.

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6.0 PACKAGE ENGINEERING:

MPC Contractor shall carry out the package engineering as detailed below:

- a) The design life of the complete package shall be minimum 20 years.
- b) MPC Contractor shall develop package engineering based on the design basis, specifications, drawings, etc. attached in Volume-II. Basic engineering documents provided are for guidance and are minimum / indicative only. It is the responsibility of the MPC contractor to develop any missing information based on good engineering practices for completing the project in all respect meeting quality requirement and desired level of operational efficiency. The successful MPC Contractor shall carry out package engineering over and above of that mentioned in the tender, required to deliver the package with no extra cost. All such activities shall be vetted by EPCM consultant /OIL.
- c) MPC Contractor shall carry out design and fabrication of plant air system as per latest codes & standards.
- d) Equipment engineering shall include but not limited to the Preparation of drawings as per Basic Engineering provided, defining major equipment, giving the layout of equipment with sections and elevations, wherever necessary for equipment engineering as per the statutory guidelines. The proposed facilities shall be designed and executed on modular concept by MPC contractor.
- e) MPC contractor shall attend the overall plant HAZOP/SIL study workshop, which will be conducted by other process package MPC Contractor. MPC-4 contractor shall implement the HAZOP/SIL study recommendation for their part of scope without any additional cost and time impact.
- f) Package engineering phase shall include submission of HSE plan and Quality assurance plan, procurement plan, fabrication drawings, steel frame, drawings & datasheet for Equipment, instruments, piping, etc.
- g) MPC contractor has to prepare and submit documents, drawings, fabrication drawings, As-built drawings, calculations and information as requested in the tender document for review / approval and information. Manufacturing process shall only be carried out based on the drawings / documents approved by the EPCM.
- h) MPC contractor to ensure that the plant air packages are sized and located in accordance with the overall plot plan attached in the Volume-II. The design of the modular package shall not exceed the package size specified in the overall plot plan.
- i) MPC contractor shall design the modular package considering the approaches for maintenance, emergency evacuation, fire fighting etc.

7.0 TECHNICAL REQUIREMENTS:

7.1 GENERAL

- a) All possible efforts have been made to establish a link between the Basic Engineering, Scope of work, Design basis, Standard Specifications, Standards and Drawings so that the MPC contractor has clear cut frame work of guidelines within

which the package engineering would be performed. Despite this, it may still be required to apply judgment and reason to certain areas based on experience and sound engineering practice to achieve desired results.

- b) MPC contractor must understand and undertake clearly that it is the sole responsibility of the MPC contractor to complete all works in all respect leading to mechanical completion and make the plant ready for commercial operation. Codes and standards included shall be followed and considered as the minimum requirement.
- c) In case of any conflicting requirement of various chapters, which are part of this document following order of priority shall govern in general.
- Basic Engineering Design Package
 - Local regulation
 - Codes & standards

However, in case of conflict, it shall be referred to EPCM for clarifications and the decision of EPCM consultant shall be final and binding on the MPC contractor without any cost and time implications.

- d) The requirement of any statutory body like Chief Controller of Explosive (CCE), Nagpur, India, Environmental Clearances, Factory Inspector, and Director General of Civil Aviation Authority (DGCA) etc. shall govern where these are more stringent than the requirement specified above.
- e) Although the scope of work has been defined package wise, the MPC contractor would be required to interact with other agencies working in the adjoining areas. It is essential to coordinate the interface directly or through EPCM consultant as and when required to attain unhindered and smooth completion.
- f) The coordinates at the battery limits will be provided later, same shall be accommodated without any cost/time implication by the MPC contractor.
- g) MPC contractor shall submit the progress report every month or mutually agreed intervals.
- h) The technical evaluation of the bid shall be based on review of deviations, scope of work and selection of efficient equipment. Critical and long delivery items may however be reviewed to ensure pre-selection of vendors before award of work.
- i) After award of Contract, the MPC contractor shall furnish discipline wise detailed index of all drawings and documents, indicating schedule dates of submission.
- j) MPC contractor shall submit updated discipline-wise drawing index fortnightly, so that the error in Manufacturing on previous revision could be avoided. Manufacturing shall not be carried out with advance revision, not reviewed by EPCM Consultant.
- k) The fire protection and fire fighting facilities shall conform to OISD 189, OMR, NFPA, IS standards.

7.2 PROCESS

The process design condition shall be in accordance with the requirements specified in “Process Design Basis” and P&IDs

7.3 PIPING

- a) Piping design shall be in accordance with project piping design basis
- b) MPC Contractor shall prepare the Equipment Layout, within the specified area for Air Compressor and Nitrogen generator in the Overall Plot plan attached in Volume-II Technical.
- c) The piping layout shall be prepared for the complete system supplied by the MPC Contractor taking consideration of operability, safety of installations, ease of maintenance and construction etc. MPC Contractor shall provide inputs and drawings in native file format required for 3D Modeling preparation.
- d) 3D model ‘STEP file’ for Critical equipments such as Compressor, Nitrogen generator, etc. shall be provided to EPCM by MPC Contractor. The 3D model file shall match with the dimensions of the specific Equipment Model supplied for the project. EPCM shall prepare the 3D Modeling based on the provided documents.
- e) Model review will be conducted stage by stage which is from 30%, 60% and 90% review during package engineering phase at EPCM consultant location. MPC Contractor shall attend the review and provide required clarification as necessary. MPC-4 Contractor shall implement any correction/change in pipe routing if required, at the outcome of the review.

7.4 MECHANICAL

- a) The mechanical equipment shall be designed and fabricated in accordance with the requirements specified in ‘Specification for Compressor’ and relevant codes & standards.
- b) Design of pressure vessel shall be performed based on ASME SEC VIII Div.1 and specification for unfired pressure vessel.

7.5 INSTRUMENTATION

The selection of instrumentation and control equipment shall be in accordance with the requirements specified in “Functional Specification for Package Instruments”.

7.6 ELECTRICAL

The selection of electrical equipment shall be in accordance with the requirements specified in “Specification for electrical requirements for MPC-4 Package”.

7.7 STRUCTURAL

MPC contractor shall provide frame arrangements and details, foundation loading for access platforms, pump, ladders, stairways, handrails etc. within the package as required. MPC contractor shall refer the “Package specification for Structural works” for Structural design. MPC contractor shall provide the input required to design foundation for the package in early stage to start up the civil activity.

8.0 MINIMUM DELIVERABLES

List of documents to be submitted by MPC contractor during MPC Contract phase for review / approval by EPCM consultant / OIL [after award of contract] is listed below.

Documents specified below are minimum requirements. MPC Contractor shall submit any other documents / drawings required for the completion of the project as per EPCM instruction.

Sl No	DOCUMENT DESCRIPTION
PROJECT MANAGEMENT	
1	Master Document schedule (MDS) / Document Control Index (DCI) for all disciplines
2	Organization Chart
3	Vendor document register for each packages
4	Technical query Register
5	Planning Schedule
6	Procurement Plan
7	Manufacturing/Fabrication Plan and Procedure
8	Progress Report (Weekly and Monthly)
9	List of Sub-Vendors
10	Unpriced purchase order along with specification
MECHANICAL	
1	Equipment Specifications
2	Technical data sheet for Compressor, Receiver, Air dryer, Particulate filter, Nitrogen generator etc.
3	General Arrangement Drawings with dimensions, BOM, material of construction, instruments, weight, handling item details etc. for all equipment within the package
4	Vessel Design calculation
5	Equipment list
6	Manual Valves and Piping Speciality MTO
7	Purchase Specification for Equipment
8	Material Handling procedure and Material Handling Study & Report
9	Manufacturing / Fabrication Drawings

10	Equipment Performance Curves and Data
11	Lifting Equipment Test Certificates and other Test Certificates
PROCESS	
1	Line List
2	Alarm & Trip Schedule
3	Utility Consumption Schedule
4	Line sizing calculations
5	PSV sizing calculations
6	Process Utility Flow Diagram – Instrument air/Utility air system
7	Process Utility Flow Diagram – Nitrogen Generation system
8	Piping & Instrumentation Diagram – Instrument air/Utility air system
9	Piping & Instrumentation Diagram – Nitrogen Generation system
PIPING	
1	Equipment Layout Plan & Elevation
2	Tie-In Register
3	MTO for Piping and Appurtenances
4	Piping GA plan & Elevation
5	30% Model Review Close out Report
6	60% Model Review Close out Report
7	90% Model Review Close out Report
8	Fabrication Isometrics
ELECTRICAL	
1	Electrical load list
2	Electrical material take-off
3	Electrical equipment list
4	Tie-in point schedule
5	Electrical cable schedule
6	Lux calculation
7	Data sheet for distribution boards

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	8	Data sheet for motor
	9	Data sheet for local control station
	10	Lighting and small power layout
	11	Lighting and power panel distribution diagram
	12	Earthing layout
	13	Cable tray / trench routing layout with cable fill report
	INSTRUMENTATION	
	1	Instrument Data Sheets
	2	Instrument Index
	3	I/O List
	4	Instrument Cable Schedule
	5	Instrument and Junction Box Location Layout
	6	Instrument Process Hook ups Detail
	7	Instrument Cable Tray Layout
	8	Junction Box Construction Diagram
	9	Junction Box Wiring Diagram
	10	Level Sketches
	11	Instrument Earthing Layout
	12	Instrument Cable Block Diagram
	13	Instrument Bulk MTO
	14	Interconnection Diagram
	15	Loop Diagram
	16	Logic Diagram
	STRUCTURAL	
	1	Design Report for Module Package
	2	Structural Beam Layout and Details
	3	Equipment Support Layout and Details
	4	Secondary details (ladder, staircase, handrails etc.,)
	5	Module Lifting Layout and details

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6	Transportation beam Layout and Details
7	Weight Control Report
8	Foundation loading Diagram
QUALITY CONTROL	
1	Inspection, Testing & Quality plan and Procedure
2	Material Certificates for Supplier's/Contractor's Materials & Mill Certificates
3	WPS & PQR, Welder Qualification Records
4	NDT requirements/procedure & record
5	Painting/Coating Procedure & Result
6	Test Procedure & Report (Including FAT / SAT)
7	Dimensional Control Reports/Dimension Inspection Reports & Weighing Reports
8	Shop & Fabrication Inspection Plan
9	Notice of Inspection
10	Inspection & Test Report and Non Conformance Report / Register
11	Manufacturer Inspection Final Books
12	Scope of TPI authority
13	Material Traceability Reports
MDR (MANUFACTURER DATA RECORD)	
1	Operating & Maintenance manuals and catalogues
2	Lubrication schedule
3	Priced spare parts list with part no. and Interchange ability record
4	Spare parts list & Special tools list
5	Packing, Transportation, Storage and Installation procedure
6	As-built document, drawings & manuals

MPC Contractor shall maintain an up to date drawing & document register and monitor drawing & document issued. This register shall list all drawings & documents used in the design and construction. The drawing register shall be a controlled document and shall be kept updated / revised and shall be issued on A3 / A4 size sheets.

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9.0 DOCUMENTATION

MPC contractor shall follow the documentation procedure as mentioned below for the drawings / documents submitted for EPCM consultant approval and records.

- MPC contractor shall follow the drawing / document template as per the format provided by the EPCM.
- Drawing and documentation are only accepted by the EPCM when signed by the MPC contractor as checked and approved in the coversheet.
- All the drawings (package engineering) & documents have to be prepared by the MPC contractor in a presentable manner with all texts in the English language.
- Drawings shall show all necessary dimensions and details required for interface information and installation.
- Required clearance for maintenance and weight / dimension of heaviest single piece item to be handled shall be indicated in the drawing.
- MPC contractor shall submit major documents and drawings containing interface information for the EPCM consultant approval according to the minimum document requirement list but in any case prior to start of manufacturing.
- All revised drawings and documents shall clearly show revision cloud, revisions with the issue date and the MPC contractor's checked and approval signature.
- Drawings shall be in AUTOCAD format, other documentation shall be in Microsoft Office format (Excel / Word / Power Point / Access).
- Drawings, documentation and certification requiring an independent certifying authority to approve shall be done at the vendor's initiation, direction and expense.
- All final drawings, manuals and computer based training information for the MPC contractor's equipment (i.e.: operation and maintenance manuals) shall be provided. Further details are specified within the minimum document requirement list.
- MPC contractor shall provide six (6) sets of final approved documents and laminated drawings and 3 sets of soft copies (2 copies in CD-ROM and 1 copy in Flash Drive) of all the Final/As-Built documents listed in the minimum document requirement list.
- The Supplier, and his sub-supplier, shall operate a quality system satisfying the applicable provisions of BS5750/ISO 9000 (series). A detailed quality plan shall be provided with the bid.
- The EPCM consultant reserves the right to carry out quality and technical review at both supplier's and sub-supplier's works.

10.0 STATUTORY APPROVALS

It is the responsibility of MPC Contractor to meet all the requirements of Statutory approvals, within the quoted rates. Documents, drawings, forms, affidavits etc required for the Statutory approval shall be prepared and submitted by the MPC contractor.

11.0 PROCUREMENT

The scope of work of MPC Contractor is composite in nature which contains broadly:

- a) All Major bought-out items shall be sourced from reputed manufacturer, before placing order necessary PTR of the Sub-vendor shall be submitted for EPCM review and approval.
- b) Factory Acceptance Tests (FAT) shall be as per approved QAPs.
- c) The MPC Contractor shall carry out Inspection and expediting services for all the bought-out items for the package and submit the inspection reports to EPCM review.

12.0 MATERIAL CODING:

MPC contractor shall provide unique asset code for every individual equipment / item in their scope of supply.

13.0 QUALITY CONTROL:

Owner/EPCM reserves the right to appoint independent Third Party Agency for quality control/quality surveillance of materials and fabrication activity.

14.0 INSPECTION AND TESTING

- a) Detailed quality control Plan (Inspection Test Plan) shall be submitted to EPCM consultant for approval before starting the fabrication work. All inspections / tests / Certificates shall have approval of EPCM consultant.
- b) MPC contractor shall provide the certification of material compliance in accordance with EN 10204, Type 3.1 for all materials used in pressure parts and EN 10204, Type 2.2 for non-pressure parts.
- c) The testing and inspection shall be in strict accordance with the design code requirements and OIL/EPCM approved ITP.
- d) The right to witness all inspection and Non-Destructive Test from raw material certification till final stage of inspection is reserved by EPCM /OIL and their TPI agency.
- e) All test procedures shall be forwarded to the EPCM for review / approval.
- f) EPCM / OIL will inspect the various equipment and machinery during the various stages of construction and tests at the manufacturer's works.
- g) MPC contractor shall intimate EPCM consultant / OIL, the location and date of inspection before fifteen (15) days.

h) The inspector may at his discretion examine the following

- Materials of construction of standard parts prior to start of work
- Quality of casting or machined parts
- Complete or part assembled units
- Functional testing and simulation of control system including local control panel.

15.0 PAINTING

- a) Painting covers the general requirements like surface preparation, painting, application sequence, colour codes etc.
- b) Paint selected shall be such that they should be able to withstand all weather conditions as well as atmospheric conditions of the plant area.
- c) Painting of entire installation including, equipment, piping, structure, and all other facilities in the Modular package.
- d) The Paint Material, colour coding, Procedure of application, Selection etc. shall be as per specification for surface preparation and painting.

16.0 MARKING

In case the package is necessary to separate into different parts for the transportation all components and subassemblies shall be carefully identified and match marked to prevent any error in assembly.

All loose components such as studs, nuts, washer, gasket etc., shall be packed in crates and shall be marked for the project, consignee, consigner, job number, item number, order number, gross and net weight, dimensions etc. A copy of loose component list shall be enclosed in a water tight envelope.

Additional indications such as North / East / South / West along with (COG) centre of gravity shall be clearly marked with white paints.

Equipment / piping which have been post weld heat treated or have an applied lining, e.g. lead glass, rubber etc., shall have a suitable warning printed on the visible portion on the outside of equipment / pipe.

17.0 TRANSPORTATION

MPC Contractor shall arrange to transport the skid mounted package equipment to site location at Nadua and East Khagorijan (Dibrugarh district) of Assam. The MPC Contractor shall consider the limitation of transportation dimension to site as follows.

- The dimensions of any skid shall not exceed the standard ISO container size (for any mode of transportation):
- The total weight of any skid shall not exceed the weight limitation of the “Ministry of road transport and highways and transportation mode.

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MPC contractor to undertake route survey, arrange and provide all loading/unloading facilities, transportation of entire skid to Contractor's premises including all roll on, roll off facilities, crane(s), labour etc.

18.0 INSTALLATION AND COMMISSIONING SUPERVISION

MPC Contractor shall supervise the site execution work i.e. hook-up of skids, erection, installation, commissioning and PGTR of the complete system at each site, to ensure soundness of erection and installation by providing adequate qualified experienced engineers.

The duration of PGTR will be one (1) month.

19.0 TRAINING

MPC Contractor has to provide training for operation and maintenance for the modular packages they are supplying to Owner's personnel. Prices for Training and for clause no. 18 shall be included in item no.1 of SOR/P in Annexure to SCC.

20.0 TECHNICAL COMPLIANCE

MPC Contractor must furnish answers/clarifications/confirmations of all the following queries and submit along with offer. MPC Contractor shall indicate the reply in the space provided in the Technical Questionnaire. In case space provided is not adequate, the reply may be furnished separately under suitably numbered annexure /attachments duly referred against the comment/query.

The Compliance Statements/Queries are required to be categorically confirmed /answered by the bidder and the completely filled in Tech Questionnaire shall be submitted together with the Bid.

Sl. No.	COMPLIANCE STATEMENT/ QUERY	MPC CONTRACTOR'S CONFIRMATION/ ANSWER
1	MPC contractor to note that the scope of supply / work consists of 2 (Two) units, which are located at different locations at Nadua and East Khagorijan, Assam. Confirm that all requirements for each location are taken care without any deviations.	

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Sl. No.	COMPLIANCE STATEMENT/ QUERY	MPC CONTRACTOR'S CONFIRMATION/ ANSWER
2	Confirm that all requirements as per tender documents including Terms of Reference, Design basis, Volume-II - technical documents and Codes & Standards shall be complied without any technical deviation. Deviations, if any against the above mentioned documents shall be duly consolidated under deviation list and submitted for EPCM approval. In case no deviations are furnished, it shall be construed that MPC contractor's proposal is in total compliance to tender document requirements.	
3	Any deviations/deletions/corrections made elsewhere in the body of the bid (on specs etc.) other than deviation list will not be taken cognizance of and all such deviations shall be deemed to have been withdrawn by the MPC contractor. Confirm compliance.	
4	MPC contractor to confirm compliance to Piping Material Specifications and Valve Material Specifications given in the tender document.	
5	Equipment data sheets, performance data for the selected vendor/ equipment model shall be subject to OIL/EPCM approval, during package engineering. Confirm compliance.	
6	Compliance of MOC for equipment / components as per Volume-II specifications or superior MOC if required for the package shall be offered.	
7	Compliance to supply the equipments in skids pre-fabricated at shop and transport in container size. No site work is allowed.	
8	Location and no. of skids shall be complied in accordance with the Overall plot plan attached in Volume-II. Any changes in the size and no. of skids shall be submitted for EPCM approval before order finalisation. Any changes in post order shall not be accepted. MPC contractor to confirm.	
9	Confirm that technical particulars of each LV motor of the package have been furnished on LV Motor Data sheet.	
10	Confirm to furnish filled up electrical load data sheet.	

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Sl. No.	COMPLIANCE STATEMENT/ QUERY	MPC CONTRACTOR'S CONFIRMATION/ ANSWER
11	Confirm that all electrical equipment shall be provided with valid type test certification from agency such as CMRI / BASEEFA / UL / FM / PTB / LCIE or equivalent.	
12	All FLP / WP cable glands shall be provided for each electrical equipment.	
13	Confirm inclusion of Structural platforms, ladders / stairs, handrails, support as required for the package etc.	
14	Confirm inclusion of anchor bolts & Steel foundation template for anchor bolt fixation.	
15	MPC contractor confirm to furnish the schedule of submission of drawings, documents during kick-off meeting after order placement. Drawing / documents schedule shall be in compliance with clause no.8 of Terms of reference.	
16	Confirm that MPC Contractor and Sub-vendor are meeting the equipment qualification criteria Requirements. Confirm Compliance.	
17	Confirm that all requirements as per Performance Guarantee shall be complied	
18	Confirm that guarantee / warranty of each equipment are included in MPC contractor's scope of work.	
19	All fire extinguishers shall be I.S.I marked / UL listed.	
20	MPC contractor to confirm that the requirement of surface preparation, primer and finish paint shall be as per painting specification. Normal corrosive environment shall be considered while referring to painting specification.	
21	Confirm that all Inspection & Tests as required for each equipment, as per Volume-II, Site acceptance test and Codes & standards referred to have been included by the MPC contractor in their proposal. Inspection and testing shall be carried out as per OIL/EPCM approved QAP / ITP.	

 ऑयल इंडिया लिमिटेड Oil India Limited	MODULAR PACKAGE CONTRACT (MPC-4) Engineering, Procurement, Fabrication and Supply of Modular Air and Nitrogen Package for OCS, Nadua and GGS, East Khagorijan IFB No. CPI8239P19	

Sl. No.	COMPLIANCE STATEMENT/ QUERY	MPC CONTRACTOR'S CONFIRMATION/ ANSWER
22	Confirm that all consumables, chemicals, first fill of lubricants etc. for initial charge including commissioning & PGTR period have been included in the MPC contractor's proposal.	
23	Confirm that Erection & Commissioning Spares as required for each equipment have been included by the MPC contractor in their proposal. Further, in case any spare is consumed over and above the quoted commissioning spares during start-up/ commissioning, the same shall be supplied free of cost.	
24	MPC contractor shall obtain and submit the priced list of operation and Maintenance spares required for Two Year Normal Operation as recommended by the equipment manufacturer. Confirm Compliance.	
25	Confirm that Special Tools & Tackles, as required for each equipment have been included.	

Bidder's Signatures, with Stamp and Date

END OF VOLUME-I Part-III SECTION-1

&&&&&&

VOLUME I: COMMERCIAL
PART III
SECTION - 2

SPECIAL CONDITIONS OF CONTRACT

VOLUME I: COMMERICAL
PART III

SECTION - 2
SPECIAL CONDITIONS OF CONTRACT

1.0 GENERAL:

Special Conditions of Contract shall be read in Conjunction with the General Conditions of Contract, specification of work, Drawings and any other documents forming part of this Contract wherever the context so requires.

Notwithstanding the sub-division of the documents into these separate sections and volumes, every part of each shall be deemed to be supplementary to and complementary of every other part and shall be read with and into the Contract so far as it may be practicable to do so.

Where any portion of the General Condition of Contract is repugnant to or at variance with any provisions of the Special Conditions of Contract (SCC), unless a different intention appears, the provisions of the Special Conditions of Contract shall be deemed to over-ride the provisions of the General Conditions of Contract and shall to the extent of such repugnancy, or variations, prevail.

Wherever it is mentioned in the specifications that the Contractor shall perform certain work or provide certain facilities, it is understood that the Contractor shall do so at his cost and the value of the Contract shall be deemed to have included cost of such performance and provisions, so mentioned.

The materials, design, and workmanship shall satisfy the relevant Indian Standards, the Job Specifications contained herein and Codes referred to. Where the job specification stipulates requirements in addition to those contained in the standard codes and specifications, these additional requirements shall also be satisfied.

In case of an irreconcilable conflict between Indian or other applicable standards, General Conditions of Contract, Special Conditions of Contract, Specifications, Drawings or Schedule of Rates, the following shall prevail to the extent of such irreconcilable conflict in order of precedence:

- Contract Agreement
- Letter of Award
- Schedule of Rates
- Terms of Reference and Technical Specifications.
- Drawings
- Technical/Material Specifications.
- Special Conditions of Contract.
- Instruction to Bidders
- General Conditions of Contract.
- Indian Standards

- Other applicable Standards

It will be the MPC Contractor's responsibility to bring to the notice of Consultant any irreconcilable conflict in the contract documents before starting the work (s) or making the supply with reference which the conflict exists.

In the absence of any Specifications covering any material, design of work (s) the same shall be performed / supplies / executed in accordance with Standard Engineering Practice as per the instructions / directions of the Consultant, which will be binding on the Contractor.

2.0 SCOPE OF WORK:

The scope of work in general includes scope of work specified in Technical Documents enclosed and Schedule of Rates enclosed in Commercial Section of the Bidding Document. Further, it includes any other work not specifically mentioned but required to complete the work as per specifications, drawings and instructions of Consultant.

Scope of work shall be read in conjunction with item description of Schedule of Rates and the Contractor's scope shall include all activities of work specified in the item description of Schedule of Rates.

Rates shall include all costs for the performance of the item considering all parts of the Bidding Document. In case any activity though specifically not covered in description of item under 'Schedule of Rates' but is required to complete the work which could be reasonably implied/informed from the content of Bidding Document, the cost for carrying out such activity of work shall be deemed to be included in the item rate.

3.0 SCOPE OF SUPPLY:

The Contractor shall supply modular Plant Air package which includes Instrument / Utility Air and Nitrogen Generation System including all the materials, instruments, equipments, tools and tackles required for delivery of Air & Nitrogen packages in all respects as per the requirement enumerated in Technical Section of Bidding Document, at their sole cost and expense.

4.0 TIME SCHEDULE:

The Work shall be executed strictly as per time schedule given in Annexure- I to SCC. The period of completion given includes the time required for delivery of packages in all respects to the satisfaction of the Consultant.

Project Execution Plan shall be prepared by the Contractor and approved by the Consultant. This programme will take into account the time schedule as mentioned above.

Weekly execution progress shall be reported to Consultant.

5.0 DRAWINGS AND DOCUMENTS:

The drawings accompanying the bid document (if any) are of indicative nature and issued for bidding purpose only. Purpose of these drawing is to enable the bidder to make an offer in line with the requirements of the Company. However no extra claim whatsoever, shall be entertained for variation in the "Approved for Construction" and "Bid document drawings" regarding any changes/units.

The drawings and documents to be submitted by the Contractor to the Company after award of the work as per agreed DCI (Document Control Index)/MDS(Master Document Schedule) shall be for the Company/Consultant's approval, review, information and record. The Contractor shall ensure that drawings and documents submitted to the Company/Consultant's are accompanied by relevant calculations, data as required and essential for review of the document/drawings. The Company shall review the drawings/documents within two weeks from the date of submission provided the same are accompanied by relevant calculations, data as required and essential for review.

All documents and drawings including those of the Contractor, sub-vendors manufacturer etc. shall be submitted to the Consultant/ Company after having been fully vetted in detail, approved and co-opted by the Contractor & shall bear Contractor's seal/certifications to this effect. All documents/drawings & submissions made to the Company without compliance to this requirement will not be acceptable and the delay & liability owing to this shall be to the Contractor's account.

The review of documents and drawings by the Company shall not absolve the Contractor from his responsibility to meet the requirements of specifications, drawings etc. and liabilities for mistakes and deviations. Upon receiving the comments on the drawings/documents reviewed by the Consultant/Company, the Contractor shall incorporate the comments as required and ensure their compliance.

Copies of all detailed working drawing relating to the works shall be kept at the Contractor's Office and shall be made available to the Consultant/Company at any time during execution of the Contract. However, no extra claim whatsoever shall be entertained for any variation in the "approved/issued for construction drawings" and "tender drawings" regarding any changes/units unless otherwise agreed.

The Contractor shall rectify any inaccuracies, errors and non-compliance to contractual requirements. Any delay occurring on this shall not construe a reason for delay/ extension.

6.0 FIRM PRICES:

The quoted price shall remain firm and fixed till the completion of work except for the statutory variations of GST.

7.0 GOVERNMENT OF INDIA NOT LIABLE:

It is expressly understood and agreed by and between the Contractor and the Company that the Company 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 there under. It is expressly understood and agreed that the Company is an independent legal entity with power and authority to enter into contract, solely in its own behalf under the applicable laws of India and General Principles of Contract Law. The Contractor expressly agrees, acknowledges and understands that the Company is not an agent, representative or delegate of Govt. of India. It is further understood and agreed that the Govt. 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 hereby expressly waives, releases and foregoes any and all actions or claims, including cross claims, impleader claims or counter claims against the Govt. of India arising out of this Contract and covenants not to sue to Govt. of India as to any manner, claim, cause of action or thing whatsoever arising of or under this agreement

8.0 INTELLECTUAL PROPERTY:

Neither the Company nor the Contractor nor their personnel, agents nor any sub-contractor shall divulge to any one (other than persons designated by the party disclosing the information) any information designated in writing as confidential and obtained from the disclosing party during the course of execution of the works so long as and to the extent that the information has not become part of the public domain. This obligation does not apply to information furnished or made known to the recipient of the information without restriction as to its use by third parties or which was in recipient's possession at the time of disclosure by the disclosing party. Upon completion of the works or in the event of termination pursuant to the provisions of the Contract, the Contractor shall immediately return to the Company all drawings, plans, specifications and other documents supplied to the Contractor by or on behalf of the Company or prepared by the Contractor solely for the purpose of the performance of the works, including all copies made thereof by the Contractor.

9.0 PROVIDENT FUND ACT:

The MPC Contractor shall comply with the provisions of Employees Provident Fund Act and register them with RPFC as applicable

10.0 ALTERATIONS IN DESIGNS, PLANS, DRAWINGS, SPECIFICATIONS ORDERS AND INSTRUCTIONS:

- a.** The Consultant/ The Company shall have the power, by written notice to the Contractor at any time prior to or in the course of the execution of works or any part thereof, to alter or amend the specifications, orders and/or instructions or any of them by addition, omission, substitution or otherwise howsoever with or without altering or amending the plans, drawings and/or design and the Contractor shall carry out the related work in accordance with such altered specifications, orders, instructions, plans, drawings and/or designs as the case may be, on mutually agreed terms and conditions in all respects.
- b. ALTERATION IN THE SCOPE OF WORK :**
The Company may, at any time(s) before or after the commencement of the work, by notice in writing issued to the Contractor, alter the scope of work by increasing or reducing the works or the jobs required to be done by the Contractor or by adding thereto or omitting there from any specific works or jobs or operations or by substituting any existing works or jobs or operations with other works or jobs and/or operations or by requiring the Contractor to perform any additional works in or about the job site, and upon receipt of such notice the Contractor shall execute the job(s) as required within the altered scope of work.
- c.** Notwithstanding anything else to the contrary If any change increases or decreases the cost or time required for Contractor's performance, then as soon as practicable, the Parties shall agree to an equitable adjustment to the agreed price and performance schedule as applicable. In no event may Contractor delay initial Work or the Work proposed by the Company initiated change while the parties settle issues of price or performance schedule, unless the value of all disputed change orders equals or exceed 5% of the original Purchase Order value, in which case Contractor shall be entitled to cease its performance until all unresolved change orders have been resolved. Notwithstanding anything else to the contrary Contractor shall not, without Company's prior written authorization, alter, substitute, or add to the Goods.

11.0 TERMS OF PAYMENT:

Basis and terms of payment for making "On Account Payment" shall be as set out in Annexure-II to SCC.

12.0 TESTS AND INSPECTION:

Materials to be supplied by the Contractor under the scope of work shall be inspected as per the detailed scope provided in the Technical Part of Bidding

Document, by the Third Party Inspection Agencies (TPIA), from Company approved TPIA like SGS/TUV/BV/DNV/LR/IRS/RITES. The Inspection Charges/Fees shall be excluded from the Contract price

The Contractor shall carry out the various tests as enumerated in the technical specifications of this bid document and the technical documents that will be furnished to him during the performance of the work.

All the tests either on the field or at outside laboratories concerning the execution of the work and supply of materials by the Contractor shall be carried out by the Contractor at his own cost.

The work is subject to inspection at all times by the Consultant/Company. The Contractor shall carry out all instructions given during inspection and shall ensure that the work is being carried out according to the technical specifications of this bid document, the technical documents and the relevant codes of practice will be furnished to him during the performance of the work.

Any work not conforming to execution drawings, specifications or codes shall be rejected forthwith and the Contractor shall carryout the rectifications at his own cost.

All results of inspection and tests will be recorded in the inspection reports, proforma of which will be approved by the Consultant. These reports shall form part of the completion documents.

Inspection and acceptance of work shall not relieve the Contractor from any of his responsibilities under this Contract.

13.0 QUALITY MANAGEMENT SYSTEM:

Bidder shall include in his offer the Quality Assurance Programme containing the overall quality management and procedures, which is required to be adhered to during the execution of contract. After the award of the Contract detailed quality assurance programme shall be prepared by the contractor for the execution of the Contract for various works, which will be mutually discussed and agreed to.

The Contractor shall establish document and maintain an effective quality assurance system outlined in recognised codes.

Quality Assurance System plans/procedures of the Contractor shall be furnished in the form of a QA manual. This document should cover details of the personnel responsible for the Quality Assurance, plans or procedures to be followed for quality control in respect of Engineering, Procurement, Fabrication, Testing, Preservation, Packing, Transportaiton and Supply to site. The quality assurance system should indicate organizational approach for quality control and quality assurance at all stages of work including at manufacture's works and dispatch of materials.

The Company/Consultant or its representative shall reserve the right to

inspect/witness, review any or all stages of work at shop/site as deemed necessary for quality assurance.

The Contractor has to ensure the deployment of Quality Assurance and Quality Control Engineer(s) depending upon the quantum of work. This QA/QC group shall be fully responsible to carryout the work as per standards and all code requirements. In case Consultant feels that the Contractor's QA/QC Engineer(s) are incompetent or insufficient, the Contractor has to deploy other experienced Engineer(s) as per requirement and to the complete satisfaction of the Consultant.

In case the Contractor fails to follow the instructions of the Consultant with respect to above clauses, next payment due to him shall not be released unless until he complies with the instructions to the complete satisfaction of the Consultant.

The Contractor shall adhere to the quality of work as per laid down Specification elsewhere in the Bidding Document.

14.0 HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT:

The Contractor, during entire duration of the Contract, shall adhere to agreed HSE plan.

15.0 COMPLETION DOCUMENTS:

The following documents shall be submitted in hard binder by the Contractor/Sub-Contractor in 6 (Six) sets, as a part of completion documents. These will be in addition to those mentioned in General Conditions of the Contract.

- (i) Material Inspection/Test Report for supply of all materials
- (ii) TPI release notes and dispatch release notes by Consultant
- (iii) As built drawings
- (iv) Operation & Maintenance Manual of each package
- (v) Commissioning Manual
- (vi) Any other drawing/document/report specified elsewhere in the bidding document.

16.0 COORDINATION WITH OTHER AGENCIES:

Proper coordination with other agencies will be the Contractor's responsibility. In case of any dispute, the decision of Consultant shall be final and binding on the Contractor

17.0 RESPONSIBILITY OF MPC CONTRACTOR:

It shall be the responsibility of the Contractor to obtain the approval for any revision and/or modifications decided by the Contractor from the Company/the Consultant before implementation. Also such revisions and/or modifications if accepted/ approved by the Company/the Consultant shall be carried out at no extra cost to the Company. Any changes required during and/or after approval for detailed construction drawings due to functional requirements or for efficient running of system keeping the basic parameters unchanged and which has not been indicated by the Contractor in the data/drawings furnished along with the offer will be carried out by the Contractor at no extra cost to the Company.

The procurement and supply in sequence and at the appropriate time of all materials and consumables shall be entirely the Contractor's responsibility and his rates for execution of work will be inclusive of supply of all these items.

18.0 SINGLE POINT RESPONSIBILITY:

The entire work as per Scope of Work covered under this contract shall be awarded on single point responsibility basis.

19.0 COORDINATION WITH CONSULTANT:

The Contractor shall coordinate with the Consultant, for his day-to-day activities and provide free access and assistance during the inspections and other activities to be carried out by the Consultant.

20.0 DELAYS BY THE COMPANY OR ITS AUTHORISED AGENTS:

No adjustment in Contract Price shall be allowed for reasons of any delays and extensions granted except as provided in Tender Document, where the Company reserves the right to seek indulgence of the Contractor to maintain the agreed Time Schedule of Completion.

21.0 FAILURE BY THE CONTRACTOR TO COMPLY WITH THE PROVISIONS OF THE CONTRACT

If the Contractor refuses or fails to execute the work or any separate part thereof with such diligence as will ensure its completion within the time specified in the Contract or extension thereof or fails to perform any of his obligation under the Contract or in any manner commits a breach of any of the provisions of the Contract it shall be open to the Company at its option by written notice to the Contractor:

- a. To determine the Contract in which event the Contract shall stand terminated and shall cease to be in force and effect on and from the date appointed by the Company on that behalf, whereupon the Contractor shall stop forthwith any of the Contractor's work then in progress, except such work as the Company may, in writing, require to be done to

safeguard any property or work, or installations from damage, and the Company, for its part, may take over the work remaining unfinished by the Contractor and complete the same through a fresh contractor or by other means, at the risk and cost of the Contractor, and any of his sureties if any, shall be liable to the Company for any excess cost occasioned by such work having to be so taken over and completed by the Company over and above the cost at the rates specified in the schedule of quantities and rate/prices.

- b. Without determining the Contract to take over the work of the Contractor or any part thereof and complete the same through a fresh contractor or by other means at the risk and cost of the Contractor. The Contractor and any of his sureties are liable to the Company for any excess cost over and above the cost at the rates specified in the Schedule of Quantities/Rates, occasioned by such works having been taken over and completed by the Company.
- c. The whole or part of the Contract Performance Security furnished by the Contractor is liable to be forfeited without prejudice to the right of the Company to recover from the Contractor the excess cost referred to in the sub-clause aforesaid, the Company shall also have the right of taking possession and utilising in completing the works or any part thereof, such as materials equipment and plants available at work site belonging to the Contractor as may be necessary and the Contractor shall not be entitled for any compensation for use or damage to such materials, equipment and plant.
- d. The amount that may have become due to the Contractor on account of work already executed by him shall not be payable to him until after the expiry of Six (6) calendar months reckoned from the date of termination of Contract or from the taking over of the work or part thereof by the Company as the case may be, during which period the responsibility for faulty materials or workmanship in respect of such work shall, under the Contract, rest exclusively with the Contractor. This amount shall be subject to deduction of any amounts due from the Contractor to the Company under the terms of the Contract authorised or required to be reserved or retained by the Company.

Before determining the Contract as per above clauses, provided in the judgement of the Company, the default or defaults committed by the Contractor is/are curable and can be cured by the Contractor if an opportunity given to him, then the Company may issue Notice in writing calling the Contractor to cure the default within such time specified in the Notice.

The Company shall also have the right to proceed or take action as per above, in the event that the Contractor becomes bankrupt, insolvent, compounds with his creditors, assigns the Contract in favour of his creditors or any other person or persons, or being a company or a corporation goes into voluntary

liquidation, provided that in the said events it shall not be necessary for the Company to give any prior notice to the Contractor.

Termination of the Contract as provided for in the clauses above shall not prejudice or affect their rights of the Company which may have accrued upto the date of such termination.

22.0 COMPLETION OF WORK:

The Final Report of Completion of Work shall be issued by the Company against the written application of the Contractor after completion of successful PGTR. The issue of Completion Certificate/Report shall be considered as the completion of all the obligations of the Contractor under the Contract.

23.0 WARRANTY /GUARANTEE:

Refer to clause 38 of ITB and General Terms and Conditions (Volume-I Part-I)

24.0 DEFECT LIABILITY PERIOD:

Refer to clause 38 of ITB and General Terms and Conditions (Volume-I Part-I)

25.0 PAYMENT & INVOICING PROCEDURE:

The Company shall pay to the Contractor, during the term of the Contract, the amount due calculated according to the rates of payment set and in accordance with other provisions hereof. No other payments shall be due from the Company unless specifically provided for in this Contract. All payments will be made in accordance with the terms hereinafter described.

Payments due by the Company to the Contractor shall be made at the Contractor's designated bank account. All bank charges will be to their account.

Payment of any invoices shall not prejudice the right of the Company to question the validity of any charges therein, provided the Company within one year after the date of payment shall make and deliver to the Contractor written notice of objection to any item or items the validity of which the Company questions.

The Contractor will require to submit all bills/invoices, other negotiating documents etc as applicable and as set out in Annexure II Schedule of Payments.

The Company shall within 10 days of receipt of the invoice notify the Contractor of any item under dispute, specifying the reasons thereof, in which event, payment of the disputed amount may be withheld until settlement of the dispute, but payment shall be made of any undisputed portion within 30 days

subject to necessary approval. This will not prejudice the Company's right to question the validity of the payment at a later date.

The acceptance by the Contractor of part payment on any billing not paid on or before the due date shall not be deemed a waiver of the Contractor's rights in respect of any other billing, the payment of which may then or thereafter be due.

The Contractor shall maintain complete and correct records of all information on which the Contractor's invoices are based up to two years(2) from the date of last invoice. Such records shall be required for making appropriate adjustments or payments by either party in case of subsequent audit query / objection. Any audit conducted by the Company of the Contractor's records, as provided herein, shall be limited to the Company's verification (i) of the accuracy of all charges made by the Contractor to the Company and (ii) that the Contractor is otherwise in compliance with the terms and conditions of this Agreement.

26.0 NIL Customs Duty and Concessional GST Applicable for Projects in ML/PEL Area

1.0 Consequent upon implementation of GST w.e.f. 01.07.2017, various Office Ordered /Circulars and clarifications thereof have been notified by Govt. of India regarding applicability of exemption / concession on the Customs Duty as well as on GST for procurement of goods & services by OIL & ONGCL in connection with use in PEL/ML Areas for exploration purpose. The items eligible for NIL rate of Customs Duty and Concessional GST @5% are appended in the list as appended below.

2.0 In this regard, the following Govt. Notifications may also be referred:

- (a) Notification No. 3/2017-Integrated Tax (Rate) dated 28.06.2017 for IGST @5% (five percent) on procurement from Domestic / Indigenous Suppliers having interstate movement.
- (b) Notification No. 3/2017-Central Tax (Rate) dated 28.06.2017 for GST @5% (CGST+SGST) on procurement from Domestic / Indigenous Suppliers having intrastate movement.
- (c) Sl. No 404 and Chapter 84 of Notification No. 50/2017-Customs dated 30.06.2017 for NIL Rate of Customs Duty and IGST@5% on procurement from Overseas Suppliers (Imported Goods).

3.0 To avail benefit under above Government Notification, OIL needs to put up application for obtaining Essentiality Certificate (EC) from DGH. While applying for EC, following information are required to be furnished to DGH:

- Technical Justification of the ordered items regarding use of the item.
- Nature of operation under which the ordered items fall out of the following categories:

- Production, Drilling, Logging, Seismic acquisition, Chemical, Reservoir, Geophysics, Geology, IT and Software
- Area(specific ML / PEL area) where the item will be used as in the list, as furnished vide Annexure A, under which the ordered item falls.

27.0 PACKAGING

1. Packing of goods must be sufficiently robust to withstand multiple handling during transit for delivery to their final destination so that contents do not get damaged. Protection of the plant and equipment against corrosion or deterioration must be given special attention. Machined steel and iron parts are to be heavily greased /varnished as prevention against rust.
2. In the case of internal combustion engines, compressors and similar equipment, internal parts are to be sprayed with an inhibitor or water splitting preservative and all openings covered with tape to prevent ingress of water.
3. Boxes / Packing cases containing electrical / electronic equipment are to be waterproof lined.
4. All items must have their respective identification marks painted /embossed on them. MM-LOCAL-E-01-2005 – FHQ (Rev Jan.2018)
<http://oilindia.com/pdf/tenders/limited/General Terms and Condition Indigenious E-Tenders-MM-LOCAL-E-01-2005FHQ.pdf>
5. Crates or boxes should have a list of items contained therein secured to the exterior by means of an enveloping piece of tin sheet nailed to the wood. A duplicate list should also be included inside the crate with the contents.
6. The Seller shall be responsible for damage of goods either in full or in part and for corrosion and/or deterioration of the plant and equipment during transit due to inadequate/insufficient packing or due to non-compliance with the above Para Nos. 1 to 4 depending upon the nature of items and as such shall be obligated to repair or replace the damaged goods or plant or equipment in full or in parts thereof, at free of cost to OIL within a time period stipulated by OIL.

28.0 DESPATCH

29.1 Road Despatch

- a) In the event of an order other than FOR Destination terms, the material will be required to despatch through OIL's approved transporters (which will be specified in the order) on "Door Delivery" basis.
- b) For orders placed on FOR Destination basis, the material will be required to despatch through reputed Bank approved transporters only on Door Delivery basis. In case OIL is required to collect the material from transporters godown, extra expenditure incurred thereof will be recovered from the Bidder/seller.

29.2 Rail Despatch:

- a) In case of Rail despatch, the Bidder will be fully responsible for arranging required railway wagons/rake. Tubular consignment will be despatched on open type wagons only. Height of the wagons should not exceed 4.6 metres.

29.0 INSURANCE

- a) Transit insurance will be arranged and paid for by OIL for all orders other than FOR Destination orders. The Bidder/seller will be required to intimate the insurance agency (which will be specified in the Purchase Order) regarding the despatch details immediately after despatch. The Sellers have to arrange the transit insurance at their cost in case of orders placed on FOR Destination basis.

ANNEXURE- I TO SPECIAL CONDITIONS OF CONTRACT

TIME SCHEDULE

NAME OF WORK	TIME OF DELIVERY TO SITES
SUPPLY OF MODULAR AIR PACKAGE AT OCS, NADUA AND AT GGS, EAST KHAGORIJA	SEVEN MONTHS (7)
SUPPLY OF NITROGEN PACKAGE AT OCS, NADUA AND AT GGS, EAST KHAGORIJA	SEVEN MONTHS (7)

Note:

1. The Time of delivery of modular pricess package at sites (Nadua and East Khagorijan), shall be reckoned from date of award of contract, which shall be the date of issue of Letter of Award (LOA).
2. The Time indicated is for delivery of Air & Nitrogen packages in all respects as per specifications, codes, drawings and instructions of Consultant.
3. Any delay in completion shall be subject to Liquidated Damages as defined in the bidding document, which shall be applicable.
4. All demurrage on account of non readiness of contractor like non arrangement of requisite vehicles, all requisite permissions including the one from port authorities etc. shall be borne by the contractor

(SIGNATURE OF BIDDER)

ANNEXURE- II TO SPECIAL CONDITIONS OF CONTRACT

PREAMBLE TO SCHEDULE OF RATES/PRICE (SOR/P)

- 1.** Bidder's quoted prices shall be strictly as per various FORMS included under Schedule of Prices. Bidder shall quote prices against each item mentioned in SOR/P. GRAND TOTAL PRICE may be referred as Engineering, Procurement, Modular Package Construction (MPC) price and other charges to effect safe delivery of MPC packages at site and the associated service/works. MPC Contract Price quoted shall be inclusive **of all taxes, duties, except Goods and Service Tax (GST).**
- 2.** The price quoted shall be on contract basis. Payments to contractor shall be made limited to Contract price indicated, irrespective of the progressive payments made during execution.
Obligation of the Contractor is not limited to the quantities that the Contractor may either indicate in the Schedule of Break up of Package Material Prices along with his bid or in further detailed break of lump sum prices furnished after award of work. Contractor shall carry out entire scope of work/supplies as detailed in various sections/volumes of the Bidding Document within the quoted MPC Price (Contract Price).
- 3.** Contract prices quoted by the Bidder shall include cost of any other supplies/work(s) not specifically mentioned in the Bidding Document but necessary for the efficient, trouble free operation of the package items and to make this package complete in every respect.
- 4.** Bidder to note that the Price as stated in Schedule of Rates/Price (Form SOR/P) shall be considered and shall form the Total Price payable under the Contract as the MPC Price before Goods & Service Tax. The GST as computed as per Para 5.5 of VOLUME I: COMMERCIAL PART II BEC.
- 5.** Price Bid Evaluation of BEC shall be added to the quoted MPC Price to ascertain the Total Contract Value (Price). The Spares for start-up/commissioning and mandatory spares required are in CONTRACTOR's scope and are included in their above quoted MPC Prices. In addition, for information the bidder shall furnish mandatory spares for two years operation & maintenance(not for evaluation).
- 6.** Bidder shall also furnish the Cost Break up of Schedule of Rates/Price as per Annexure II-A.
- 7.** Bidder shall indicate foreign currency considered by them for overseas components.
- 8.** Bidder shall ensure that prices quoted include the complete scope of supply in totality as below :

- i) Engineering including but not limited to -
 - a) Detailed engineering including preparation of PFD/UFD, plot plan, simulation, heat & mass balance, hazardous area identification, equipment & piping layout diagram, stress analysis, mechanical design, piping design, civil engg. design, electrical & instrumentation engg. design, Engineering drawings for all items, based on Design Basis, Scope of work & Functional Specifications, Detailed fabrication drawings, MTO etc, for all Equipments/ Vessels and package systems.
 - b) Preparation of 3D Computer modelling with the Air & Nitrogen package at OCS&GGS
 - c) Provision of necessary supports for obtaining statutory approvals for individual equipment / instrument.
 - d) Submission of list of BOM (Bill of materials) in soft and hard form against all materials & equipments supplied at OCS&GGS along with quantities, manufacturer details, technical specifications etc.
 - e) Submission of as built live 3D computer model of Air & Nitrogen packages at OCS &GGS
 - f) Submission of Quality assurance, Quality Control, Quality Plan and Inspection plan.
 - g) Submission of HSE Plan
- ii) Procurement and Supply including but not limited to -
 - a) Procurement of all materials whatsoever required for the fabrication, supply of equipment along with associated piping, instrumentation. Structural platforms, ladders/stairs, support etc. within the specified battery limits and delivery of the complete system at site
 - b) Procurement and supply of package systems
 - c) Procurement and supply of Mandatory spares
 - d) Fabrication of all items covered in Bid Package including Surface Preparation and Painting.
 - e) Packing, Transportation and supply of all items to site.
 - f) Inspection and expediting for procurement
 - g) Supply of all special tools and tackles as required.
 - h) Unloading of all materials at site.
 - i) Supervision during Commissioning.

9. Title of Air & Nitrogen packages shall not be transferred by Contractor to OIL at the time of supply and brought to site, and shall be transferred by Contractor upon obtaining acceptance certificate from Consultant/Company.

SCHEDULE OF RATES/PRICES (SOR/P) FOR MODULAR AIR & NITROGEN PACKAGES AS DETAILED IN TERMS OF REFERENCE (TOR)

DESCRIPTION	PRICE IN INDIAN RUPEES(INR)
1.	
a. Package Material Price covering Engineering, Construction of Modular Air Packages including packing/forwarding on Ex Work's basis.	
b. Freight, Insurance Charges for delivery & Unloading at site	
TOTAL for Air Package Supply	
2.	
a. Package Material Price covering Engineering, Construction of Modular Nitrogen Packages including packing/forwarding on Ex Work's basis.	
b. Freight, Insurance Charges for delivery & Unloading at site	
TOTAL for Nitrogen Package Supply	

Note: Price quoted 1 and 2 above is exclusive of GST, which is extra as applicable

SCHEDULE OF PAYMENTS

FOR SUPPLY OF PACKAGES

1. 10% of Package Material Price (SOR/P Item No. 1) against approval of documents and drawings identified in Contract at least in Code-2 and against placement of sub-order for specified major raw material (to be identified during kick off meeting, if not specified in bidding documents) and against submission of Advance Bank Guarantee (ABG) of equivalent amount.
2. 10% of Package Material Price (SOR/P Item No. 1) against identification of raw materials at Contractor's works (to be identified during kick off meeting, if not specified in bidding documents) and against submission of advance Bank Guarantee of equivalent amount.
3. 55% of Package Material Price (SOR/P Item No. 1) against submission of despatch documents (along with copy of LR/GR and IRN) together with full taxes, duties and transportation charges.
4. 2% of Package Material Price (SOR/P Item No. 1) on receipt of Final/As built Drawings/Documents/Data/Manual in requisite number of copies/sets/CDs as per VDR specified in bidding documents (to be identified during kick off meeting, if not specified in bidding documents)
5. 20% of Package Material Price (SOR/P Item No. 1) on successful completion of Commissioning and PGTR of the project works (by others)
6. Payment for item No. 2 in SOR/P shall be limited to quoted price against submission of relevant documents.

Note: If the payment is not claimed as per item No.1 & 2 above on account of non submission of Advance Bank Guarantee (ABG), the payment can be claimed for item no 1, 2 & 3 together against despatch documents. ABG submitted for payment of item No. 1 & 2 the same shall be returned after completion of activities in item No.5 above.

FOR ASSOCIATED SERVICES/WORKS

1. Supplier's Services/Works: Supervision of Erection, Testing & Commissioning/ assistance during erection, Testing & Commissioning: 2% of Package Material Price (SOR/P Item No. 1) will be paid after PGTR.
2. Training: 1% of Package Material Price (SOR/P Item No. 1) on successful completion of Training as per bidding documents, duly certified by Consultant/Owner

GENERAL NOTES:

- (i) 1ST Milestone payment shall be released only after receipt of Performance Bank Guarantee (PBG)
- (ii) Pro rata payments shall be applicable on dispatch of equipment. In case of equipment, prorate shall not be on part of equipment.
- (iii) In case of Indigenous SUPPLIER's, wherever taxes/duties are separately indicated, the order value shall be exclusive of taxes/duties. 100% payment of taxes/duties shall be paid along with the payment released against dispatch documents on receipt of GST tax invoice.
- (iv) Payment to Indigenous SUPPLIER's shall be released through Electronic Clearing System (ECS).
- (v) All bank charges of respective bankers shall be to respective account.
- (vi) Supplier shall submit Billing Schedule, wherever applicable, within three weeks of award for OIL/Consultant approval. Suppliers requiring multiple despatches will restrict the number of despatches to maximum three, unless agreed otherwise by Project Manager.
- (vii) Bidders to arrange for necessary/applicable road permits/e-way bill for every dispatch.
- (viii) In case site is not available up to Six (6) months (wherever site work is applicable), after receipt of all supplies at site, the payment against the same shall be released on submission of additional Bank Guarantee of equivalent amount valid for One year (1) or such extended period as may be required.

ANNEXURE II- A: BREAK UP OF SCHEDULE OF RATES/PRICES.

(Not to be considered for Evaluation of Bid).

S No.	System / Descriptions	Estimated Quantity	Ex -Works Price In INR	FOR Destination In INR
1	2	3	4	5
A.1	INSTRUMENT AIR COMPRESSOR			
A.3	AIR RECEIVER			
A.3	NITROGEN GENERATOR			

[ANNEXURE - III TO SPECIAL CONDITIONS OF CONTRACT]

APPROVAL OF CONSTRUCTION SUB-CONTRACTOR

NOT APPLICABLE

[ANNEXURE - IV TO SPECIAL CONDITIONS OF CONTRACT]

QUALIFICATION & EXPERIENCE OF KEY SUPERVISORY PERSONNEL

1. Project Director/ Project Manager: Engineering Graduate with 15 years experience in engineering or fabrication or construction experience in Upstream Oil and Gas Industry. Should have been having atleast two years project management experience previous
2. Lead Engineers (Process, Mechanical, Electrical, Instrumentation, Piping, and Structural): Engineering Graduate in respective branch and having at least 10 years engineering experience.
3. Procurement Manager: Engineering Graduate with atleast 10 years of procurement experience.
4. Fabrication Manager: Engineering Graduate with atleast 10 years of module fabrication experience.
5. HSE Officer: Graduate with 03 years experience in HSE job/Diploma in HSE having experience of minimum 07 years working as Safety Officer in engineering construction job.
6. QA/QC Manager: Engineering Graduate with 10 years experience on QA/QC job/Diploma in engineering with 15 years of QA/QC job.

[ANNEXURE - V TO SPECIAL CONDITIONS OF CONTRACT]

QUALITY MANAGEMENT SYSTEM

**MPC CONTRACTOR TO SUBMIT THEIR QUALITY MANAGEMENT POLICY AND QUALITY
MANUAL WITH QMS CERTIFICATE**

[ANNEXURE - VI TO SPECIAL CONDITIONS OF CONTRACT]

HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT

**MPC CONTRACTOR TO SUBMIT THEIR HSE MANAGEMENT POLICY AND HSE MANUAL
WITH HSE CERTIFICATE**

ANNEXURES TO BID PACKAGE

 ऑयल इंडिया लिमिटेड Oil India Limited	MODULAR PACKAGE CONSTRUCTION (MPC-4) WATER PACKAGE ENGINEERING FABRICATION AND SUPPLY For OCS, Nadua and GGS, East Khagorijan IFB No. CPI8239P19	

ANNEXURE –A: LIST OF ITEMS

(Related To NIL Customs Duty and Concessional GST Applicable for Projects in ML/PEL Area)

1. Land Seismic Survey Equipment and accessories, requisite vehicles including those for carrying the equipment, seismic survey vessels, global positioning system and accessories, and other materials required for seismic work or other types of Geophysical and Geochemical surveys for onshore and offshore activities.

2. All types of drilling rigs, jack up rigs, submersible rigs, semi-submersible rigs, drill ships, drilling barges, shot-hole drilling rigs, mobile rigs, work over rigs consisting of various equipment and other drilling equipment required for drilling operations, snubbing units, hydraulic work over units, self-elevating work over platforms, Remote Operated Vessel (ROV)

3. Helicopters including assemblies / parts

4. All types of marine vessels to support petroleum operations including work boats, barges, crew boats, tugs, anchor handling vessels, lay barges and supply boats, marine ship equipment including water maker, DP system and Driving system.

5. All types of equipment/ units for specialised services like diving, cementing, logging, casing repair, production testing, simulation and mud services, oil field related lab equipment, reservoir engineering, geological equipment, directional drilling, stimulation, Coil Tubing units, Drill Stem Testing (DST), Data acquisition and processing, solids control, fishing (as related to down hole retrieval in oil field operations or coal bed methane operations), well control, blowout prevention (BOP), pipe inspection including Non Destructive Testing, coring, gravel pack, well completion and work over for oil/gas/ CBM wells including wireline and down hole equipment.

6. All types of casing pipes, drill pipes, production tubing, pup joints, connections, coupling, Kelly, cross overs and swages, Drive Pipes.

7. All types of drilling bits, including nozzles, breakers and related tools

8 All types of oil field chemicals or coal bed methane operations, oil well cement and cement additives, required for drilling, production and transportation of oil or gas.

9. Process, production and well platforms/ installation for oil, gas or CBM and water injection including items forming part of the platforms/ installation and equipment required like process equipment, turbines, pumps, generators, compressors, prime movers, water makers, filters and filtering equipment, telemetry, telecommunication, tele-control and other material required for platforms/ installations

 ऑयल इंडिया लिमिटेड Oil India Limited	MODULAR PACKAGE CONSTRUCTION (MPC-4) WATER PACKAGE ENGINEERING FABRICATION AND SUPPLY For OCS, Nadua and GGS, East Khagorijan IFB No. CPI8239P19	

10. Line pipes for flow lines and trunk pipelines including weight-coating and wrapping.
11. Derrick barges, Mobile and stationary cranes, trenchers, pipe lay barges, cargo barges and the like required in the construction / installation of platforms and laying of pipelines.
12. Single buoy mooring systems, mooring ropes, fitting like chains, shackles, couplings marine hoses and oil tankers to be used for oil storage and connected equipment, Tanks used for storage of oil, condensate, coal bed methane, water, mud, chemicals and related materials.
13. All types of fully equipped vessels and other units/equipment required for pollution control, fire prevention, fire fighting, safety items like Survival Craft, Life Raft, fire and gas detection equipment, including H2S monitoring equipment.
14. Mobile and skid mounted pipe laying, pipe testing and pipe inspection equipment.
15. All types of valves including high pressure valves
16. Communication equipment required for petroleum or coal bed methane operations including synthesized VHF Aero and VHF multi channel sets/ VHF marine multi channel sets.
17. Non-directional radio beacons, intrinsically safe walkie-talkies, directional finders, EPIRV, electronic individual security devices including electronic access control system.
18. Specialized antenna system, simplex telex over radio terminals, channel micro wave systems, test and measurement equipment,
19. X-band radar transponders, area surveillance system.
20. Common depth point (CDP) cable, logging cable, connectors, geo-phone strings, perforation equipment and explosives
21. Wellhead and Christmas trees, including valves, chokes, heads spools, hangers and actuators, flexible connections like chocks and high pressure hoses, shut down panels
22. Cathodic Protection Systems including anodes

 ऑयल इंडिया लिमिटेड Oil India Limited	MODULAR PACKAGE CONSTRUCTION (MPC-4) WATER PACKAGE ENGINEERING FABRICATION AND SUPPLY For OCS, Nadua and GGS, East Khagorijan IFB No. CPI8239P19	

23. Technical drawings, maps, literature, data tapes, Operational and Maintenance Manuals required for petroleum or coal bed methane operations

24. Sub-assemblies, tools accessories, stores, spares, materials, supplies, consumables for running, repairing or maintenance of the goods.

ANNEXURE –B: INTEGRITY PACT

INTEGRITY PACT

Between

Oil India Limited (OIL) hereinafter referred to as "The Principal"

And

(Name of the bidder).....hereinafter referred to as
 "The Bidder/Contractor"

Preamble :

The Principal intends to award, under laid down organizational procedures, contract/s for The Principal values full compliance with all relevant laws and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder/s and Contractor/s.

In order to achieve these goals, the Principal co-operates with the renowned international Non-Governmental Organisation "Transparency International" (TI). Following TI's national and international experience, the Principal will appoint an External Independent Monitor who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1 - Commitments of the Principal

(1) The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:-

1. No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for him/herself or third person, any material or immaterial benefit which he/she is not legally entitled to.
2. The Principal will, during the tender process treat all Bidders with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidders the same information and will not provide to any Bidder confidential/additional information through which the Bidder could obtain an advantage in relation to the tender process or the contract execution.
3. The Principal will exclude from the process all known prejudiced persons.

(2) If the Principal obtains information on the conduct of any of its employees which is a criminal offence under the relevant Anti-Corruption Laws of India, or if

there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 - Commitments of the Bidder/Contractor

(1) The Bidder/Contractor commits itself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

1. The Bidder/Contractor will not, directly or through any other person or firm, offer, promise or give to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material or immaterial benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2. The Bidder/Contractor will not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, Subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelisation in the bidding process.

3. The Bidder/Contractor will not commit any offence under the relevant Anti-corruption Laws of India; further the Bidder/Contractor will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

4. The Bidder/Contractor will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

(2) The Bidder/Contractor will not instigate third persons to commit offences outlined above or be an accessory to such offences.

(3) The Bidder/Contractor signing Integrity Pact shall not approach the Courts while representing the matters to IEMs and he/she will await their decision in the matter.

Section 3- Disqualification from tender process and exclusion from future Contracts

If the Bidder, before contract award has committed a transgression through a violation of Section 2 or in any other form such as to put his reliability or risibility as Bidder into question, the Principal is entitled to disqualify the Bidder from the tender process or to terminate the contract, if already signed, for such reason.

1. If the Bidder/Contractor has committed a transgression through a violation of Section 2 such as to put his reliability or credibility into question, the Principal is entitled also to exclude the Bidder/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of the transgression. The severity will be determined by the circumstances of the case, in particular the number of transgressions, the position of the transgressions within the company hierarchy of the Bidder and the amount of the damage. The exclusion will be imposed for a minimum of 6 months and maximum of 3 years.

2. The Bidder accepts and undertakes to respect and uphold the Principal's Absolute right to resort to and impose such exclusion and further accepts and undertakes not to challenge or question such exclusion on any ground, including the lack of any hearing before the decision to resort to such exclusion is taken. This undertaking is given freely and after obtaining independent legal advice.

3. If the Bidder/Contractor can prove that he has restored/recouped the Damage caused by him and has installed a suitable corruption prevention system, the Principal may revoke the exclusion prematurely.

4. A transgression is considered to have occurred if in light of available evidence no reasonable doubt is possible.

5. Integrity Pact, in respect of a particular contract, shall be operative from the date Integrity Pact is signed by both the parties till the final completion of the contract **or as mentioned in Section 9 – Pact Duration whichever is later**. Any violation of the same would entail disqualification of the bidders and exclusion from future business dealings.

Section 4 - Compensation for Damages

1. If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover from the Bidder liquidated damages equivalent to Earnest Money Deposit/Bid Security.

2. If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal

shall be entitled to demand and recover from the Contractor liquidated damages equivalent to Security Deposit/Performance Bank Guarantee.

3. The bidder agrees and undertakes to pay the said amounts without protest or demur subject only to condition that if the Bidder/Contractor can prove and establish that the exclusion of the Bidder from the tender process or the termination of the contract after the contract award has caused no damage or less damage than the amount or the liquidated damages, the Bidder/Contractor shall compensate the Principal only to the extent of the damage in the amount proved.

Section 5 - Previous transgression

1. The Bidder declares that no previous transgression occurred in the last 3 years with any other Company in any country conforming to the TI approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

2. If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 - Equal treatment of all Bidders/Contractor/Subcontractors

1. The Principal will enter into Pacts on identical terms with all bidders and contractors.

2. The Bidder/Contractor undertakes to demand from all subcontractors a commitment in conformity with this Integrity Pact. The bidder/contractor shall be responsible for any violation(s) of the provisions laid down in this Agreement/Pact by any of its sub-contractors/sub-vendors.

3. The Principal will disqualify from the tender process all bidders who do not sign this Pact or violate its provisions.

Section 7 - Criminal charges against violating Bidders/Contractors/Sub-contractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Sub-contractor, or of an employee or a representative or an associate of a Bidder, Contractor or Sub-contractor, which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 - External Independent Monitor/Monitors

- 1.** The Principal appoints competent and credible External Independent Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.
- 2.** The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the Chairperson of the Board of the Principal.
- 3.** The Contractor accepts that the Monitor has the right to access without restriction to all Project documentation of the Principal including that provided by the Contractor. The Contractor will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The same is applicable to Sub-contractors. The Monitor is under contractual obligation to treat the information and documents of the Bidder/Contractor/Subcontractor with confidentiality.
- 4.** The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.
- 5.** As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or heal the violation, or to take other relevant action. The monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.
- 6.** The Monitor will submit a written report to the Chairperson of the Board of the Principal within 8 to 10 weeks from the date of reference or intimation to him by the 'Principal' and, should the occasion arise, submit proposals for correcting problematic situations.
- 7.** If the Monitor has reported to the Chairperson of the Board a substantiated suspicion of an offence under relevant Anti-Corruption Laws of India, and the Chairperson has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.
- 8.** The word 'Monitor' would include both singular and plural.

Section 9 - Pact Duration

This Pact begins when both parties have legally signed it. It expires for the Contractor 12 months after the last payment under the respective contract, and for all other Bidders 6 months after the contract has been awarded.

If any claim is made/lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/determined by Chairperson of the Principal.

Section 10 - Other provisions

1. This agreement is subject to Indian Law. Place of performance and jurisdiction is the Registered Office of the Principal, i.e. New Delhi. The Arbitration clauses provided in the main Tender document/contract shall not be applicable for any issue/dispute arising under Integrity Pact.

2. Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

3. If the Contractor is a partnership or a consortium, this agreement must be, signed by all partners or consortium members.

4. Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

 For the Principal

 For the Bidder/Contractor

Place: Duliajan.
 Date : .

Witness 1 :

Witness 2 :

ANNEXURE -C
PROFORMA OF CONSORTIUM AGREEMENT

NOT APPLICABLE.

ANNEXURE-D

VENDOR SELECTION CRITERIA

1.0 GENERAL:

- (i) The Package / Equipment / system (with all its sub-systems) as being offered / supplied should have been installed and operating satisfactorily in similar application for at least the period as mentioned in the individual package / equipment / system / sub-system (as collaborated by user certificate).
- (ii) The Package / Equipment / system should be supplied, engineered & tested from a factory from where the Package / Equipment / system / sub-systems as offered / supplied, engineered & tested/ have already been supplied and meet the criteria 1(i) above.
- (iii) All the activities including engineering should be carried out by the engineering firm which has carried out the similar activity in the past and meets the criteria 1(i) above.
- (iv) The system should be supplied by the manufacturer/authorized dealer in the fully engineered condition or should be supplied by the manufacturer's representative/ subsidiary (except basic engineering- refer responsibility chart and explanation given above) who have proper infrastructural facilities and meets the criteria 1(i) above.
- (v) The design life of the Package / Equipment / system shall be as mentioned in individual package.
- (vi) Vendor List for Package / Equipment / system is NOT provided elsewhere in the Bid package. For any Package / Equipment / system, the offered items for the same must meet the tender specifications and proven track record (PTR) requirement. The responsibility of ensuring the performance of these items as per tender specification is EPC responsibility. Any vendor who meets the vendor selection criteria such as EQC and PTR requirement shall be considered for this project and also for the items where selection criteria (like EQC, PTR) is not provided, in such cases vendor has to arrange for procurement by strictly complying to the tender specifications and the responsibility of ensuring the quality of these items as per tender specification is EPC responsibility.
- (vii) Vendors on Owner holiday list shall not be considered for ordering. Names of such vendors who are put on Owner "Holiday List" subsequent to vendor approval at bidding stage shall be informed to the EPC CONTRACTOR at any stage of the project. CONTRACTOR shall comply with this requirement without any time or cost implication to the OWNER.
- (viii) No obsolete equipment / package / system will be acceptable.
- (ix) The equipment selected shall be rugged in design and must be field proven. Prototype design or equipment of experimental nature or design undergoing testing etc. shall not be selected and supplied.
- (x) Any equipment/ package / systems offered by the vendor for this project

has to ensure that continued support services such as technical support, availability of spares etc. are provided for a period of at least 10 (ten) years from the date of commissioning.

2.0 MECHANICAL PACKAGE/ EQUIPMENTS

2.1 IA/UA COMPRESSOR PACKAGE

2.1.1 EQUIPMENT QUALIFICATION CRITERIA (EQC)

The vendor for the complete unit shall be an OEM/ authorised packagers/authorised dealers of oil free type screw compressor (electric motor driven). The manufacturer/ packagers/dealers of the proposed compressors shall have the adequate engineering, manufacturing & testing facilities for the same.

The compressor model offered shall be from regular manufacturing range of the manufacturer and shall meet the following minimum service and manufacturing experience requirements.

Compressors shall be identical in frame designation and type i.e. dry and validly similar in terms of Frame number, Rotational Speed, Discharge pressures, Inlet temperatures, Actual Inlet flow, Process Gas, Mechanical Design, Type of Rotor, Rotor Dynamics, Materials, Type of shaft seals etc. as compared to at least TWO UNITS designed, manufactured, tested and supplied from the proposed manufacturing plant and at least ONE of these units shall have successfully operated in an onshore installation in India for at least 5 Years intermittently or 8000 hrs continuously (including normal maintenance shutdowns /replacement etc.) without any major problems as on the date of bidding.

2.1.2 PROVEN TRACK RECORD (PTR)

Compressor vendor shall complete the Experience Record Performance to amply prove that the Equipment offered meets the EQC for technical acceptance. Compressor vendor may furnish additional information to justify that the EQC is being met. In addition, manufacturer's catalogue and general reference list for all the above equipment shall also be furnished along with the bid/proposal

2.2 IA DRYER PACKAGE

2.2.1 EQUIPMENT QUALIFICATION CRITERIA (EQC)

The vendor for the complete unit shall be an OEM/ authorised packagers/authorised dealers of IA dryer package. The manufacturer/ packagers/dealers of the proposed IA dryer package shall have the adequate engineering, manufacturing & testing facilities for the same.

2.2.2 PROVEN TRACK RECORD (PTR)

Vendor shall complete the Experience Record Performance to amply prove that the Equipment offered meets the EQC for technical acceptance. Vendor may furnish additional information to justify that

the EQC is being met. In addition, manufacturer's catalogue and general reference list for all the above equipment shall also be furnished along with the bid/proposal.

2.2.3 OTHER REQUIREMENTS

The Vendor shall have total responsibility for the Dryer Package being designed, fabricated, and tested at the Vendor's facility in accordance with the requirements of this specification, referenced codes, regulations, and standards.

2.3 NITROGEN GENERATION PACKAGE

2.3.1 EQUIPMENT QUALIFICATION CRITERIA (EQC)

The vendor for the complete unit shall be an OEM/ authorised packagers/authorised dealers of Nitrogen generation package. The manufacturer/ packagers/dealers of the proposed Nitrogen generation package shall have the adequate engineering, manufacturing & testing facilities for the same.

The Nitrogen Generator model offered shall be from regular manufacturing range of the manufacturer and shall meet the following minimum service and manufacturing experience requirements as per standard.

Nitrogen Generator shall be identical in type i.e. Rating, Operation method, Electrical Design etc. as compared to at least TWO UNITS designed, manufactured, tested and supplied from the proposed manufacturing plant and at least ONE of these units shall have successfully operated in an onshore installation for at least 5 years of past operation with an additional clause of 25 years future design service life as on the date of bidding.

2.3.2 PROVEN TRACK RECORD (PTR)

Vendor shall complete the Experience Record Performance to amply prove that the Equipment offered meets the EQC for technical acceptance. Vendor may furnish additional information to justify that the EQC is being met. In addition, manufacturer's catalogue and general reference list for all the above equipment shall also be furnished along with the bid/proposal.

2.3.3 OTHER REQUIREMENTS

The Vendor shall have total responsibility for the Nitrogen generation Package being designed, fabricated, and tested at the Vendor's facility in accordance with the requirements of this specification, reference codes, regulations and standards.

2.4 PUMP PACKAGE

2.4.1 EQUIPMENT QUALIFICATION CRITERIA (EQC)

The vendor shall be an established pump manufacturer/ authorized packagers/ authorized dealer. The manufacturer/ authorized packagers/ authorized dealer of the proposed pump shall have the adequate engineering, manufacturing & testing facilities for pumps.

The pump model offered shall be from the regular manufacturing range of the manufacturer. The mechanical as well as the hydraulic performance (including NPSHR) for the complete range of operation of the offered model shall have been established in the shop test. The offered pump model shall meet the following minimum service and manufacturing experience requirements.

Pumps shall be identical or validly similar in terms of Power rating, Hydraulic Performance (including NPSHR), Inlet flow, Differential Head, Operating Pressure & Temperature, Pumping Liquid, Speed, Number & Type of Impellers, Mechanical Design, Materials, Bearing span (applicable for between bearing pumps), Column Length (applicable for vertically suspended pumps) etc. as compared to and at least TWO UNITS of the proposed model designed, manufactured, tested and supplied from the proposed manufacturing plant in the last ten years and at least ONE of these units in similar application and shall have successfully operated in the field in India for at least 8000 hours continuously individually without any major problem as on the date of bidding.

2.4.2 PROVEN TRACK RECORD (PTR)

The vendor shall complete the Experience Record Proforma to amply prove that the offered pumps meet the EQC for technical acceptance. Special attention is drawn to applications involving high suction pressure, high/low operating temperature and low NPSHR. Vendor shall also identify the imported components against each specific reference in the PTR. Vendor may furnish additional information to justify that the EQC is being met. In addition, manufacturer's catalogue and general reference list for Pumps shall also be furnished along with the proposal.

2.5 PRESSURE VESSELS/ HEAT EXCHANGERS/ PUMPS/ MANUAL VALVES

2.5.1 EQUIPMENT QUALIFICATION CRITERIA (EQC)

The vendor for the complete unit/items shall be an OEM/ authorised packagers/authorised dealers of pressure vessels/heat exchangers/manual valves. The manufacturer/ packagers / dealers of the proposed items shall have adequate engineering, manufacturing & testing facilities for the same.

The pressure vessels/heat exchangers/manual valves model offered shall be from regular manufacturing range of the manufacturer and

shall meet the following minimum service and manufacturing experience requirements.

The Offered equipment shall be identical in type i.e. Rating, Operation method, etc. as compared to at least TWO UNITS designed, manufactured, tested and supplied from the proposed manufacturing plant and at least ONE of these units shall have successfully operated in an onshore installation for at least 5 years of past operation.

For each category of valves, vendor to ensure that at least 2 units/category which is identical in type, rating, operating methodology etc., should have been designed, manufactured, tested and supplied from the proposed manufacturing plant. At least one unit/category should have been successfully operated for at least 5yrs of plant operation.

2.5.2 PROVEN TRACK RECORD (PTR)

Pressure vessels/heat exchangers/pumps/ manual valves manufacturer shall complete the Experience Record Performance to amply prove that the Equipment offered meets the EQC for technical acceptance. Pressure vessels/heat exchangers/pumps vendor may furnish additional information to justify that the EQC is being met. In addition, manufacturer's catalogue and general reference list for all the above equipment shall also be furnished along with the bid/proposal.

2.5.3 OTHER REQUIREMENTS

The vendor shall have total responsibility for the pressure vessels/heat exchangers/pumps being designed, fabricated and tested at the vendor's facility in accordance with the requirements of this specification, referenced codes, regulations, standards.

2.6 PLATES / PIPES / FLANGES / FITTINGS / GASKETS / FASTENERS

For these items vendor has to arrange for procurement by strictly complying with the tender specifications and the responsibility of ensuring the quality of these items as per tender specification is EPC responsibility. Vendors who has supplied similar materials matching to this tender specification and as per codes & standards shall be accepted.

3.0 INSTRUMENTATION SYSTEM / SUB-SYSTEM

3.1 REQUIREMENT FOR FIELD PROVEN QUALITY OF ITEMS

3.1.1 The system/sub-system/bought out items and services as offered should have been supplied and working satisfactorily for a period of minimum 8000 hrs. in a similar application.

3.1.2 The instrumentation selected shall be rugged in design and must be field proven. Prototype design or equipment of experimental nature or design undergoing testing etc. shall not be selected and supplied.

3.1.3 Following criteria must be applied before selecting a particular instrument item:

a) For Instrument Items (Other than Systems)

The instruments as being offered / supplied should have been operating satisfactorily in similar process conditions for at least 8000 hrs. in the last seven years.

b) For System Oriented Item

The system (with all its sub-systems) as being offered / supplied should have been installed and operating satisfactorily in similar application for at least 8000 hrs. (as collaborated by user certificate).

3.1.4 Contractor is responsible to comply with the total scope of work indicated in the package regarding the Plant Control, Monitoring and Interlock system and meeting all the functional requirements specified in this package for the same, through hardware and software, during detail engineering. Accordingly the Bill of Material (BOM) is contractor's responsibility. Any Change, modification or addition necessary in the proposed BOM or scope of work necessary to achieve the functional requirements during detail engineering shall be carried out by contractor within the project schedule and without any implications.

3.1.5 Contractor shall be fully responsible for proper engineering, integration, installation, performance and operation of all equipments including I/O and marshalling racks, and bought-out items supplied by them (when integrated with the main system) as per the requirements.

3.1.6 Further the following are Contractor's scope/responsibility:

- a) 230 V AC UPS/230VAC Non UPS/24 V DC Power Distribution shall be prepared by contractor.
- b) Spares as specified in the package are included.
- c) BOM shall be finalized during detail engineering.
- d) Contractor shall be bound to incorporate owner's comments in line with package requirements without any implication.
- e) Contractor shall be responsible to engineer the system based on the inputs provided by owner. In case of any conflict or interpretational understanding owner decision shall be final.
- f) Functional Schematics and logic diagrams prepared by contractor to be furnished of Owner review before development of application software.
- g) Contractor shall be responsible to incorporate owner comments during engineering and demonstrate the same during integrated FAT.
- h) Contractor shall be responsible to incorporate all pre-commissioning and commissioning comments of owner.
- i) Contractor shall be responsible to involve sub-vendors for all engineering, engineering reviews, system definition and software definition meeting, drawing/document review meeting without any

exception as per responsibility chart.

- j) It is contractor's responsibility to furnish instrument installation standards based on the base drawing furnished with this bid package.
- k) Contractor shall provide detailed System Architecture diagram in line with this package and indicating major hardware models and software loaded in each machine to meet the functional requirements of this package.
- l) Contractor shall provide all system related documentation and loop drawing complete with terminal numbers and locations before the system integrated factory acceptance.

4.0 ELECTRICAL SYSTEM / SUB-SYSTEM

4.1 4.1 REQUIREMENT FOR FIELD PROVEN QUALITY OF ITEMS

- 4.1.1** The system/sub-system/bought out items and services as offered should have been supplied from a vendor who has been supplying electrical items and services for last 5(five) years to any Govt./Semi-Govt./PSU/Public Limited Company and the model/item offered in the bid should have been working satisfactorily for a period of minimum 8000 hours in a single similar application.
- 4.1.2** The electrical item/ system/sub-system selected shall be rugged in design and must be field proven. Prototype design or equipment of experimental nature or design undergoing testing etc. shall not be selected and supplied.
- 4.1.3** Following criteria must be applied before selecting a particular electrical item:
 - a) For electrical Items (Other than Systems)
The electrical items being offered / supplied should have been operating satisfactorily in similar process conditions for at least 8000 hrs. in a single application in last seven years.
 - b) For System Oriented Item
The system (with all its sub-systems) as being offered / supplied should have been installed and operating satisfactorily in similar application for at least 8000 hrs. (as collaborated by user certificate).
- 4.1.4** Contractor is responsible to comply with the total scope of work indicated in the package regarding the Plant Control, Monitoring and Safety Interlock system and meeting all the functional requirements specified in this package for the same, through hardware and software, during detail engineering. Accordingly the Bill of Material (BOM) is contractor's responsibility. Any Change, modification or addition necessary in the proposed BOM or scope of work necessary to achieve the functional requirements during detail engineering shall be carried out by contractor within the project schedule and without any cost/time implications.

4.1.5 Contractor shall be fully responsible for proper design, engineering, integration, installation, performance and operation of all electrical equipment including switch gear panels/racks and bought-out items supplied by them (when integrated with the main system) as per the requirements.

4.1.6 Further the following are Contractor's scope/responsibility:

- a) 230 V AC UPS/230VAC Non UPS/24 V DC Power Distribution shall be prepared by contractor.
- b) Spares as specified in the package are included.
- c) BOM shall be finalized during detail engineering.
- d) Contractor shall be bound to incorporate owner's comments in line with package requirements without any implication.
- e) Contractor shall be responsible to engineer the system based on the inputs provided by owner. In case of any conflict or interpretational understanding owner decision shall be final.
- f) Functional Schematics and diagrams prepared by contractor are to be furnished for Owner's review before development of application software.
- g) Contractor shall be responsible for incorporation of owner's comments during engineering and demonstrate the same during integrated FAT.
- h) Contractor shall be responsible for incorporation of all pre-commissioning and commissioning comments of owner.
- i) Contractor shall be responsible for involvement of sub-vendors for all engineering, engineering reviews, system definition and software definition meeting, drawing/document review meeting without any exception as per responsibility chart.
- j) It is contractor's responsibility to furnish instrument installation standards based on the base drawing furnished with this bid package.
- k) Contractor shall provide detailed Single Line diagram in line with this package and indicating major hardware models and software loaded in each machine to meet the functional requirements of this package.
- l) Contractor shall provide all system related documentation and loop drawing complete with terminal numbers and locations before the system integrated factory acceptance.

4.1.7 In addition to the above, the Contractor shall also ensure the electrical equipment/accessories/bought out items to be supplied conform to the statutory safety norms as detailed in (Indian) Central Electricity Authority Regulations (Measures relating to Safety and Electric Supply)- 2010 and (Indian) Oil Mines Regulations-2014, with latest amendments.

4.1.8 As per present statutory norms and CEA regulations, the following minimum electrical safety issues are required to be addressed in Hazardous areas of Oil and Gas Mines.

- a) Valid DGMS approval for all Electrical Equipments to be used in Hazardous Zones 1 & 2. Suitable Earth leakage protection devices to

be used in every motor starter or supply feeder so as to trip the incomer to that motor starter or supply feeder instantly on the occurrence of earth fault or earth leakage current. ELCB shall be used for all power feeders up to 63A rating and motor feeders upto 7.5kW rating. For rating higher than these CBCT, earth leakage relay and timer along with indication lamps shall be provided.

- b) Resistance Grounding system for generator neutral to limit the ground fault current to 750 mA in installations of voltages exceeding 250 V up to 1100 V [CEA Regulation # 100]. Since generator neutral will be resistance grounded, neutral will not be used throughout the system. In case the neutral is required, it shall be generated through the employment of a separate unity isolation transformer (415/415, Dyn11).
- c) Voltage shall not exceed 240V between phases used for lighting purpose. This has to be done by employing 415/240 V phase-to-phase lighting transformer. [CEA Regulation # 102 (ii) (b)]
- d) Remote Push Button Station for starting of motors shall be intrinsically safe and remote starter control supply voltage shall not exceed 30 Volts. [CEA Regulation # 102 (iv) & 110 (4) (i)].

4.2 AREA CLASSIFICATION AND EQUIPMENT SELECTION

- a) For Hazardous Area locations, i.e., Zone 1 and Zone 2, electrical equipment (motors, light fittings, pushbutton stations, junction boxes etc.) shall comply with the requirement of IS: 5572/ IS/IEC 60079. No electrical equipment shall be installed in Zone 0.
- b) Irrespective of the extent of hazardous areas, electrical equipment used in these areas shall invariably be of FLP type-‘d’ (Flameproof/Explosion-proof only). For flameproof enclosure located in hazardous areas, Gas group classification i.e. IIA and IIB will be as per IS: 2148.

5.0 CEMENT AND STRUCTURAL STEEL : NOT APPLICABLE

END OF VOLUME 1 PART-3 SECTION-III
 &&&&&&&&

PROFORMAS

PROFORMA-A LIST OF ITEMS

(Equipment, Tools, Accessories, Spares & Consumables)

**TO BE IMPORTED IN CONNECTION WITH EXECUTION
OF THE CONTRACT SHOWING CIF VALUE**

PROFORMA-A1

FORMAT FOR CALCULATION OF LOCAL CONTENT- GOODS

VALUES IN INR

Name of Manufacturer	Calculation by manufacturer Cost per one unit of product			
Cost Component	Cost (Domestic Component) a	Cost (Imported Component) b	CostTotal c = a+b	%Domestic Component d= a/c
I. Direct material cost				
II. Direct labour cost				
III. Factory overhead				
IV. Total Production Cost				

$$\% \text{ LC Goods} = \frac{\text{Total cost (IV.c)} - \text{Total Imported Component Cost (IV.b)}}{\text{Total Cost (IV.c)}} \times 100$$

$$\% \text{ LC Goods} = \frac{\text{Total Domestic Component Cost (IV.a)}}{\text{Total Cost (IV.c)}} \times 100$$

As regards cases where currency quoted by the bidder is other than Indian Rupee, exchange rate prevailing on the date of **Notice Inviting Tender (NIT)** shall be considered for the calculation of Local Content (LC)

Above Calculation is based on Purchase preference policy (linked with Local Content) (PP-LC) notified vide letter no.O-27011/44/2015-ONG/II/FP dated 25.04.2017 of MoPNG.

PROFORMA-B
BIDFORM

To
M/s. Oil India Limited,
P.O. Duliajan, Assam, India

Sub: IFB No. CPI8239P19

Gentlemen,

Having examined the General and Special Conditions of Contract and the Terms of Reference including all attachments thereto, the receipt of which is hereby duly acknowledged, we the undersigned offer to perform the services in conformity with the said conditions of Contract and Terms of Reference for the sum of _____ (Total Bid Amount in words and figures) or such other sums as may be ascertained in accordance with the Schedule of Prices attached herewith and made part of this Bid.

We undertake, if our Bid is accepted, to commence the work within (_____) days calculated from the date both parties have signed the Contract.

If our Bid is accepted, we will obtain the guarantee of a bank in a sum not exceeding _____ for the due performance of the Contract.

We agree to abide by this Bid for a period of 120 days from the date fixed for Bid closing and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

Until a formal Contract is prepared and executed, this Bid, together with your written acceptance thereof in your notification of award shall constitute a binding Contract between us.

We understand that you are not bound to accept the lowest or any Bid you may receive.

Dated this _____ day of _____ 2018.

Authorised Person's Signature: _____

Name: _____

Designation: _____

Seal of the Bidder:

PROFORMA-C

STATEMENT OF NON-COMPLIANCE
(Only exceptions/deviations to be rendered)

1.0 The Bidder shall furnish detailed statement of exceptions/deviations, if any, to the tender stipulations, terms and conditions in respect of each Section of Bid Document in the following format:

Section No.	Clause No. (Page No.)	Non-Compliance	Remarks

Authorised Person's Signature: _____

Name: _____

Designation: _____

Seal of the Bidder:

NOTE: OIL INDIA LIMITED expects the bidders to fully accept the terms and conditions of the bid document. However, should the bidders still envisage some exceptions/deviations to the terms and conditions of the bid document, the same should be indicated as per above format and submit along with their bids. If the "Statement of Compliance" in the above Proforma is left blank (or not submitted along with the technical bid), then it would be construed that the bidder has not taken any exception/deviation to the tender requirements.

PROFORMA-D**FORM OF BID SECURITY (BANK GUARANTEE)**

To:
M/s. OIL INDIA LIMITED,
GM (Projects - C&P),
Projects Department,
Oil India Ltd.,
P.O. Duliajan - 786 602
Assam, India

WHEREAS, (Name of Bidder) _____ (hereinafter called "the Bidder") has submitted their offer Dated _____ for the provision of certain oil field services (hereinafter called "the Bid") against OIL INDIA LIMITED, Duliajan, Assam, India (hereinafter called the Company)'s IFB No. KNOW ALL MEN BY these presents that we (Name of Bank) _____ of (Name of Country) _____ having our registered office at _____ (hereinafter called "Bank") are bound unto the Company in the sum of (*) for which payment well and truly to be made to Company, the Bank binds itself, its successors and assignees by these presents. SEALED with the common seal of the said Bank this ___ day of ___ 2018.

THE CONDITIONS of these obligations are:

- (1) If the Bidder withdraws their Bid during the period of Bid validity specified by the Bidder; or
- (2) If the Bidder, having been notified of acceptance of their Bid by the Company during the period of Bid validity:
 - (a) Fails or refuses to execute the form of agreement in accordance with the Instructions to Bidders; or
 - (b) Fails or refuses to furnish the Performance Security in accordance with the Instructions to Bidders;

We undertake to pay to Company up to the above amount upon receipt of its first written demand (by way of letter/fax/cable), without Company having to substantiate its demand provided that in its demand Company will note that the amount claimed by it is due to it owing to the occurrence of one or both of the two conditions, specifying the occurred condition or conditions.

This guarantee will remain in force up to and including the date(**) and any demand in respect thereof should reach the Bank not later than the above date.

SIGNATURE AND SEAL OF THE GUARANTORS _____

Name of Bank & Address _____

Witness _____

Address _____

(Signature, Name and Address)

Date: _____

Place: _____

* The Bidder should insert the amount of the guarantee in words and figures.

** Date of expiry of Bank Guarantee should be as specified in the tender document.

Note: The bank Guarantee issued by the Bank must be routed through SFMS Platform as per following details:

- a. (i) “MT 760/MT 760 COV for issuance of Bank Guarantee
(ii) MT 760/MT 767 COV for amendment of Bank Guarantee

The above Message/Intimation shall be sent through SFMS by the BG issuing Bank Branch to Axis Bank, Duliajan Branch, IFS Code- UTIB0001129.
Branch Address: Axis Bank Ltd., Duliajan Branch, Daily Bazar, Jyotinagar, Duliajan, District: Dibrugarh, PIN: 786602”

- b. Bidders should submit the copy of SFMS Message as sent by the issuing Bank Branch along with the original Bank Guarantee.

PROFORMA –E**FORM OF PERFORMANCE BANK GUARANTEE**

To:
M/s. OIL INDIA LIMITED,
GM (Projects - C&P),
Projects Department,
Oil India Ltd.,
P.O. Duliajan - 786 602
Assam, India

WHEREAS _____ (Name and address of Contractor) (hereinafter called "Contractor") had undertaken, in pursuance of Contract No. _____ to execute (Name of Contract and Brief Description of the Work) _____ (hereinafter called "the Contract").

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee as security for compliance with Contractor's obligations in accordance with the Contract.

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee; NOW THEREFORE we hereby affirm that we are Guarantors on behalf of the Contractor, up to a total of (Amount of Guarantee in figures) _____ (in words _____), such amount being payable in the types and proportions of currencies in which the Contract price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of guarantee sum as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein. We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or the work to be performed thereunder or of any of the Contract documents which may be made between you and the Contractor shall in any way cease us from any liability under this guarantee, and we hereby waive notice of such change, addition or modification.

This guarantee is valid until the date _____ (calculated at 3 months after Contract completion date).

SIGNATURE AND SEAL OF THE GUARANTORS _____

Designation _____

Name of Bank _____

Address _____

Witness _____

Address _____

Date

Place _____

Note :Note: The bank Guarantee issued by the Bank must be routed through SFMS Platform as per following details:

- a. (i) “MT 760/MT 760 COV for issuance of Bank Guarantee
(ii) MT 760/MT 767 COV for amendment of Bank Guarantee

The above Message/Intimation shall be sent through SFMS by the BG issuing Bank Branch to Axis Bank, Duliajan Branch, IFS Code- UTIB0001129.
Branch Address: Axis Bank Ltd., Duliajan Branch, Daily Bazar, Jyotinagar, Duliajan, District: Dibrugarh, PIN: 786602”

- b. The Contractor/Supplier should submit the copy of SFMS Message as sent by the issuing Bank Branch along with the original Bank Guarantee.

PROFORMA-F**AGREEMENT FORM**

This Agreement is made on ____ day of _____ between Oil India Limited, a Government of India Enterprise, incorporated under the Companies Act 1956, having its registered office at Duliajan in the State of Assam, hereinafter called the "Company" which expression unless repugnant to the context shall include executors, administrators and assignees on the one part, and M/s _____ (Name and address of Contractor) hereinafter called the "Contractor" which expression unless repugnant to the context shall include executors, administrators and assignees on the other part,

WHEREAS the Company desires that Supply of _____ (brief description of supplies) should be provided by the Contractor as detailed hereinafter or as Company may requires;

WHEREAS, Contractor engaged themselves in the business of offering such supplies represents that they have adequate resources and equipment, material etc. in good working order and fully trained personnel capable of efficiently undertaking the operations and is ready, willing and able to carry out the said supplies for the Company as per Section-II attached herewith for this purpose and

WHEREAS, Company accepted the bid submitted by the Contractor and had issued a firm Letter of Award No. _____ dated _____ based on Offer No. _____ dated _____ submitted by the Contractor against Company's IFB No. _____. All these aforesaid documents shall be deemed to form and be read and construed as part of this agreement/contract. However, should there be any dispute arising out of interpretation of this contract in regard to the terms and conditions with those mentioned in Company's tender document and subsequent letters including the Letter of Intent and Contractor's offer and their subsequent letters, the terms and conditions attached hereto shall prevail. Changes, additions or deletions to the terms of the contract shall be authorized solely by an amendment to the contract executed in the same manner as this contract.

NOW WHEREAS, in consideration of the mutual covenants and agreements hereinafter contained, it is hereby agreed as follows -

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.

2. In addition to documents herein above, the following Sections and Annexures attached herewith shall be deemed to form and be read and construed as part of this agreement viz.:

- (a) Part I indicating the General Conditions of this Contract;
- (b) Part III Section-1 indicating the Terms of Reference;
- (c) Part III Section-2 indicating the Special Terms & Condition;
- (d) Part III Section- 2 indicating the Schedule of Rates

3. In consideration of the payments to be made by the Company to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Company to provide the Services and to remedy defects therein in conformity in all respect with the provisions of this Contract.

4. The Company hereby covenants to pay the Contractor in consideration of the provision of the Services and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of this Contract at the times and in the manner prescribed by this Contract.

IN WITNESS thereof, each party has executed this contract at Duliajan, Assam as of the date shown above.

Signed, Sealed and Delivered,

For and on behalf of
Company (Oil India Limited)

for and on behalf of Contractor
(M/s. _____)

Name:

Name:

Status:

Status:

In presence of

In presence of

1.

1.

2.

2.

PROFORMA-G**PROFORMA OF LETTER OF AUTHORITY**

TO
GM (Projects - C&P),
Projects Department,
Oil India Ltd.,
P.O. Duliajan - 786 602
Assam, India

Sir,

Sub: OIL's IFB No. -----

We _____ confirm that Mr. _____ (Name and address) as authorised to represent us to Bid, negotiate and conclude the agreement on our behalf with you against Tender Invitation No. _____ for hiring of services for the supply of _____.

We confirm that we shall be bound by all and whatsoever our said representative shall commit.

Yours Faithfully,

Authorised Person's Signature: _____

Name: _____

Designation: _____

Seal of the Bidder:

Note: This letter of authority shall be on printed letter head of the Bidder and shall be signed by a person competent and having the power of attorney (power of attorney shall be annexed) to bind such Bidder.

PROFORMA-H

AUTHORISATION FOR ATTENDING BID OPENING

TO
GM (Projects - C&P),
Projects Department,
Oil India Ltd.,
P.O. Duliajan - 786 602
Assam, India

Date: _____

Sir,

Sub : OIL's IFB No. -----

We authorise Mr. /Mrs. _____ (Name and address) to be present at the time of opening of the above IFB due on _____ at Duliajan on our behalf.

Yours Faithfully,

Authorised Person's Signature: _____

Name: _____

Designation: _____

Seal of the Bidder:

Note: This letter of authority shall be on printed letter head of the Bidder and shall be signed by a person who signs the bid.

PROFORMA-I

BIDDER'S GENERAL INFORMATION

To
OIL INDIA LTD.

1-1 Bidder Name: _____

1-2 Number of Years in Operation: _____

1-3 Address of Registered Office: _____

City _____ District _____

State _____ PIN/ZIP _____

Country _____

1-4 Operation Address
if different from above:

City _____ District _____

State _____ PIN/ZIP _____

Country _____

1-5 Telephone Number: _____

(Country Code) (Area Code) (Telephone No.)

1-6 E-mail address: _____

1-7 Website: _____

1-8 Fax Number: _____

(Country Code) (Area Code) (Telephone No.)

1-9 ISO Certification, if any {If yes, please furnish details}

1-10 Banker's Name : _____

 ऑयल इंडिया लिमिटेड Oil India Limited	MODULAR PACKAGE CONSTRUCTION (MPC-4) Engineering, Procurement, Fabrication and Supply of Modular Air and Nitrogen Package for OCS, Nadua and GGS, East Khagorijan IFB No. CPI8239P19	

1-11 Branch : _____

1-12 Branch Code : _____

1-13 Bank account number : _____

1-14 GST Registration number : _____

1-15 GST Range : _____

1-16 GST Division : _____

1-17 PAN/Tax Identification No. : _____

 ऑयल इंडिया लिमिटेड Oil India Limited	MODULAR PACKAGE CONSTRUCTION (MPC-4) Engineering, Procurement, Fabrication and Supply of Modular Air and Nitrogen Package for OCS, Nadua and GGS, East Khagorijan IFB No. CPI8239P19	

PROFORMA-J

SUB PROFORMA J1

PROFORMA FOR SUBMISSION OF DETAILS OF SPECIFIC EXPERIENCE
AND ANNUAL TURNOVER DETAILS AS CALLED IN “QUALIFICATION
CRITERIA” OF INVITATION FOR BID

S.No.	Description	Details

1. Name of the Bidder :

2. Bidder to specify the details of work(s) executed
by the Bidder complying the requirement of IFB
Experience details as below

SNo	Name& Description of Work	WO No & Date	WO Value	Completion Certificate & Date	Completion Date	Executed Value (excluding tax)

3. Submission of Documentary Evidence:

i) Copy of Work Order Submitted/ Not Submitted

ii) Copy of Completion Certificate Submitted/ Not Submitted

Bidder must ensure that all details filled at Sr. No.2 above are covered in work order/ completion certificate. In case certain detailed are not covered, bidder may submit additional authenticated document/ certificate in respect of the same.

4. Annual turnover for the last three financial years :

i) Year 1 :

ii) Year 2 :

iii) Year 3 :

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5. Submission of Documentary Proof :

(i)	Audited Balance Sheet including Profit Loss Accounts Statement for the last three years of the Bidder	Yes/No

NOTE:

- i) Bidder shall furnish the experience details as above only of those projects which they consider suitable for meeting the Qualification Criteria. OIL reserve the right not to evaluate any other project details. Details of more projects may be furnished in the same format, if desired.
- ii) Bidder to note that non-submission of relevant supporting documents may lead to rejection of their bid. It shall be ensured that all relevant supporting documents are submitted alongwith their bid in the first instance itself. Evaluation may be completed based on the details so furnished without seeking any subsequent additional information.

SIGNATURE OF THE BIDDER : _____

NAME OF THE BIDDER : _____

COMPANY SEAL : _____

 ऑयल इंडिया लिमिटेड Oil India Limited	MODULAR PACKAGE CONSTRUCTION (MPC-4) Engineering, Procurement, Fabrication and Supply of Modular Air and Nitrogen Package for OCS, Nadua and GGS, East Khagorijan IFB No. CPI8239P19	

SUB PROFORMA J2

ANNUAL TURNOVER STATEMENT

The bidder shall indicate herein his Annual Turnover during preceding 3 years based on the audited balance sheet/profit & loss account statement.

FINANCIAL YEAR	ANNUAL TURNOVER (INR.)
Year 1	
Year 2	
Year 3	

NOTE:

1. Copies of audited balance sheets with Profit & Loss account statement for last 3 years are enclosed along with the bid.
2. A brief note should be appended describing thereby details of turnover as per audited results..
3. In case of tenders having the bid closing date up to 30th September of the relevant financial year and audited financial results of immediate 3 preceding financial year being not available, the bidder has an option to submit the audited financial results of three years immediately prior to relevant financial year. Wherever, the bid closing date is after 30th September of the relevant financial year, bidder has to compulsorily submit the audited financial results of immediate preceding three financial years

SIGNATURE OF BIDDER : _____

NAME OF BIDDER : _____

 ऑयल इंडिया लिमिटेड Oil India Limited	MODULAR PACKAGE CONSTRUCTION (MPC-4) Engineering, Procurement, Fabrication and Supply of Modular Air and Nitrogen Package for OCS, Nadua and GGS, East Khagorijan IFB No. CPI8239P19	

SUB PROFORMA J3

FORMAT FOR CHARTERED ACCOUNTANT / STATUTORY AUDITOR 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 (Currency)
Year 1:	
Year 2:	
Year 3:	

B. FINANCIAL DATA FOR LAST AUDITED FINANCIAL YEAR :

Description	Year ____
	Amount (Currency)
1. Current Assets	
2. Current Liabilities	
3. Working Capital (Current Assets-Current liabilities)	
4. Net Worth (Paid up share capital and Free Reserves & Surplus)	

Name of Audit Firm: [Signature of Authorized Signatory]
Chartered Accountant Name:
Date: Designation:
Seal:

Membership no.

Instructions:

- The financial year would be the same as one normally followed by the bidder for its Annual Report.
- 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.
- For the purpose of this Tender document, (i) Annual Turnover shall be "Sale value/ Operating Income" (ii) Working Capital shall be "Current Assets less

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Current liabilities” and (iii) Net Worth shall be “Paid up share capital and Free Reserves & Surplus”

This certificate is to be submitted on the letter head of Chartered Accountant.

 ऑयल इंडिया लिमिटेड Oil India Limited	MODULAR PACKAGE CONSTRUCTION (MPC-4) Engineering, Procurement, Fabrication and Supply of Modular Air and Nitrogen Package for OCS, Nadua and GGS, East Khagorijan IFB No. CPI8239P19	

PROFORMA-K

CONTRACT EXECUTION PLAN

The execution of the contract includes Engineering, Procurement, Fabrication/Construction of Air & Nitrogen packages and Transportaiton of Air & Nitrogen packages to site.

OIL/Consultant will receive the Air & Nitrogen packages at site (in presence of package supplier representative).

Others will install/erect the Air & Nitrogen packages at site. Necessary documentation for installation of packages shall be provided by MPC contractor.

Further MPC contractor/ package supplier has to guarantee Performance Guarantee Test Run SAT of the Air & Nitrogen packages he is supplying.

The technical specification and details for constructing/ fabricating Air & Nitrogen packages are enclosed in the Vol-II of the tender document.

MPC contractor has to provide a detailed level 4 schedule in MS Projects / Prime Vera, detailing all the activities of the contract. This shall be part of the bid.

PROFORMA-L

DETAILS OF SIMILAR WORK COMPLETED DURING LAST SEVEN YEARS.

- i. Bidder should be in the modular packaging business and should have done atleast one project which consists of Separation, Gas compression, Crude Dehydration in Hydrocarbon sector. Such modular packager should have carried out Engineering, Procurement, Fabrication and supply on their own.
- ii. The Bidder should have executed and completed one similar work of minimum value INR 6.335 Crores in previous Five years(5) reckoned from the date for submission of bid.

Provide details of similar works done in the last Five years, satisfying the above conditions.

SN o	Name& Description of Work	WO No & Date	WO Value	Completion Certificate & Date	Completi on Date	Executed Value (excluding tax)

PROFORMA-M**PROJECT SCHEDULE FOR COMPLETION OF MAJOR ACTIVITIES**

The scheduled timeframe for delivery of Air & Nitrogen package at OCS Nadua and GGS East Khagorijan is Seven months(7) from the date of issue of LOA.

MPC Contractor shall provide a detailed schedule (prepared in MS Projects / Prime Vera) highlighting major activities involved from engineering till delivery of packages at sites.

PROFORMA N**1. DETAILS OF P.F. & ESI REGISTRATION(As Applicable)**

Bidder to furnish details of Provident Fund Registration and ESI Number:

PF REGISTRATION NO. :

DISTRICT & STATE :

ESI NO. :

We hereby confirm that the above PF Account is under operation presently and shall be used for all PF related activities for the labour engaged by us in the present work (if awarded to us).

SIGNATURE OF BIDDER : _____

NAME OF BIDDER : _____

COMPANY SEAL : _____

 ऑयल इंडिया लिमिटेड Oil India Limited	MODULAR PACKAGE CONSTRUCTION (MPC-4) Engineering, Procurement, Fabrication and Supply of Modular Air and Nitrogen Package for OCS, Nadua and GGS, East Khagorijan IFB No. CPI8239P19	

PROFORMA-O

REPLY TO COMMERCIAL QUESTIONNAIRE

COMMERCIAL QUESTIONNAIRE

Sr. No.	Commercial Query	Bidder's Reply / Confirmation
1	Please confirm that Main Index Document along with Amendment, if any, duly signed and stamped on each page has been submitted along with the Bid.	
2	Confirm that all pages of the Bid have been numbered in sequential manner	
3	Confirm that Bid has been submitted to OIL's E-Procurement website as specified in Instructions to Bidders.	
4	Confirm that you have studied complete Bidding document including technical and commercial part and your Bid is in accordance with the requirements of the Bidding documents.	
5	Confirm that the price part does not include any terms and conditions. In case any terms and conditions are mentioned in the price part, the same shall be treated as null and void.	
6	Confirm your compliance to total scope of work mentioned in the Bidding document.	
7	Confirm your acceptance for "SCOPE OF SUPPLY" mentioned in the Bidding Document. Please note that scope of supply mentioned in the Bidding document is not limitative and shall include supply of all materials required for completion of Work irrespective of whether such materials are mentioned in the Bidding document or not.	

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Sr. No.	Commercial Query	Bidder's Reply / Confirmation
8	Confirm your acceptance for time schedule as per Bidding Document.	
9	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.	
10	DELETED	
11	Confirm that proposed fabrication facility is having qualified managerial and supervisory personnel having sufficient experience. .	
12	Confirm that all costs resulting from safe execution of work, such as safety induction, use of protective clothing, safety glasses and helmet etc. have been considered, including any special safety measures required to be taken or any other safety measures to be undertaken for the execution of Work are included in the quoted price.	
13	Please confirm that all safety rules & regulations as mentioned in Bidding Document shall be adhered by bidder within quoted price.	
14	DELETED	
15	Confirm the following : "The planning schedule, S-curves, manpower estimates, construction equipment deployment schedule etc; submitted by the bidder with his bid, are	

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Sr. No.	Commercial Query	Bidder's Reply / Confirmation
	indicative and shall not be basis for extra compensation in case actual needs are higher. Detailed planning schedule developed by MPC CONTRACTOR after Contract award may be subject to fluctuations depending upon actual progress of the project. 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.	
16	Please furnish the biodata of key personnel including nominated Project Director/Project Manager, Engineering Manager, Engineering Co-ordinator, Purchase Manager, QA / QC Manager, etc. These will be reviewed and approved by CONSULTANT	
17	Please confirm that all chemicals, consumables etc. required for initial charge as per provision of Bidding document shall be supplied by the MPC CONTRACTOR.	
18	DELETED	
19	Please confirm, you shall submit PACKING LIST, conforming bid requirement.	
20	Please confirm that your bid is valid for 120 days from the date of closing of bid.	

STAMP AND SIGNATURE OF BIDDER

PROFORMA-P

INCOME TAX PAN NUMBER PF REGISTRATION NUMBER (AS APPLICABLE)
TO BE PROVIDED BY THE BIDDER

PROFORMA-Q

CHECKLIST FOR SUBMISSION OF BID

Bidder is requested to fill this check list and ensure that all details/documents have been furnished as called for in the Bidding Document along with duly filled in, signed & stamped checklist with each copy of the “Techno-Commercial bid”.

Please tick the box and ensure compliance:

(1.0) Pro-Forma of Acknowledgement Letter & Intention to Bid

Submitted

☐

(2.0) Pro-Forma of Declaration of blacklisting / holiday listing

Submitted

☐

(3.0) Power of Attorney in Favour of the person who has signed the bid on stamp paper of Appropriate value

Submitted

☐

Not Applicable

☐

(4.0) Submission of documents to establish conformity with Bidder's Qualification Criteria as per Instruction to bidder (ITB)

Submitted

☐

Not Applicable

☐

(5.0) Partnership Deed in case of partnership firm and Article of Association (AOA) / Memorandum of Association (MOA) in case of limited company

Submitted

☐

Not Applicable

☐

(6.0) Present/ Concurrent Commitments as per ITB

Submitted

☐

(7.0) Schedule of Deviations to General & Commercial conditions as per ITB

Submitted

☐

(8.0) Schedule of Deviations to technical specifications as per ITB

Submitted

☐

(9.0) Overall schedule for completion of work in the form of Bar Chart

Submitted ☐

(10.0) Commercial Details/ Documents specified in part – I: Commercial

Submitted ☐

Not Applicable ☐

(11.0) Technical Details/ Documents specified in part – II: Technical

Submitted ☐

Not Applicable ☐

(12.0) Blank copy (without price) of schedule of Price indicating “Quoted” duly signed and stamped on each page

Submitted ☐

(13.0) Schedule Bar chart, proposed site organization chart

Submitted ☐

(14.0) PAN Details EPF, ESI, GST registration certificate, income tax clearance certificate, solvency certificate

Submitted ☐

(15.0) Relevant Registration certificate for claiming benefit under MSME

Submitted ☐

Not Applicable ☐

(16.0) Financial balance sheet, profit and loss account, Assets / Liability sheet as per ITB

Submitted ☐

Not Applicable ☐

(17.0) Complete tender document duly signed and stamped by the Bidder in token of having received and read all the parts of the Bidding documents and having accepted and considered the same in preparing and submitting the Bid and submission of an undertaking that no pages have been altered / changed with respect to the tender documents and all subsequent amendments.

Submitted ☐

(18.0) Earnest Money Deposit (EMD) as per ITB section

Submitted

☐

Not Applicable

☐

(19.0) Integrity pact duly signed and stamped

Submitted

☐

(20.0) Quality manual, sample audit report as per QMS section and safety assurance plan

Submitted

☐

(21.0) Information about Tenderer and details of similar work done

Submitted

☐

(22.0) Details of tool, tackles & equipment available with tenderer for use in this work

Submitted

☐

(23.0) Manpower estimation for job, deployment chart with bio-data / Experience / qualification of all supervisory staff

Submitted

☐

(24.0) Certificate of approval for compliance to ISO:9001 standard submitted by contractor

Submitted

☐

CONFIRM THE FOLLOWING:

(1.0) All pages of the bid have been page numbered in sequential manner.

YES

☐

(2.0) Bidding Document marked “ORIGINAL” along with Original offer, Compliance Letter for Addendum/ Amendment, if any, has been submitted duly signed and stamped on each page.

YES

☐

(3.0) Declaration By Bidder Regarding Directors Of The Company

YES

☐

CONFIRM & ENSURE COMPLIANCE:

DESCRIPTION	YES / NO
Cover Envelope containing submission of Physical documents	
a. Original Bid Security b. Printed catalogue and Literature, if any c. Power of Attorney for signing the bid. d. Any other document required to be submitted in original as per tender.	

SIGNATURE OF BIDDER : _____

NAME OF BIDDER : _____

COMPANY SEAL : _____

PROFORMA-R
DECLARATION BY BIDDER
NOT APPLICABLE

PROFORMA-S

DECLARATION OF BIDDER REGARDING BLACK LISTING/ HOLIDAY LISTING

MPC BIDDER SHALL PROVIDE SELF DECLARATION

END OF VOLUME I PART III
SECTION-2



**CREATION OF SURFACE PRODUCTION FACILITIES
(OCS & GGS) AT NADUA & EAST KHAGORIJA**

**MPC4 – AIR & NITROGEN PACKAGE
ENGINEERING FABRICATION AND SUPPLY**



**VOLUME-II TECHNICAL
FOR EAST KHAGORIJA & NADUA**

 ऑयल इंडिया लिमिटेड Oil India Limited	MODULAR PACKAGE CONTRACT (MPC-4) Engineering, Procurement, Fabrication and Supply of Modular Air and Nitrogen Package for OCS, Nadua and GGS, East Khagorijan	

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	Section – I: General
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2.0	Scope of Supply
3.0	Site conditions and Utilities
	Section – II: Specifications
4.0	Specification for Instrument Air Compressor / Utility Air Compressor
5.0	Specification for Unfired Pressure Vessel
6.0	Specification for Surface Preparation and Painting
7.0	Functional Specification for Package Instruments
8.0	Specification for Electrical requirements
9.0	Package specification for Structural works
10.0	Piping design basis
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11.0	PFD - Instrument Air and Utility System
12.0	PFD - Nitrogen Generation System
13.0	P&ID - Instrument Air and Utility Air Compressor Package
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15.0	P&ID - Particulate Filter
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Section-I

VOLUME-II

1.0 INTRODUCTION:

OIL INDIA LIMITED (OIL) a Government of India Enterprise, proposes to construct two number of Surface Production facilities primarily for separation of Oil, Gas & Water and processing of non-associated & associated gas in its producing field at Nadua and East Khagorijan. The installation will be constructed on Modular design concept with emphasis on skid mounted prefabricated facilities minimizing civil construction work at site to the extent possible as per functional specifications of various process/utility packages. Instead of permanent civil buildings, containerized offices/structures will be preferred.

The NADUA (OCS) oil field is located near Dibrugarh town in Assam. The field is presently producing from 04 Nos. of wells through a QPS (Quick Production Setup). Considering the potential of the field, it is envisaged that Oil production is expected to rise to a level of 1200 KLPD from 15 HP wells and 15 LP wells. Associated Gas is expected to be around 0.2 MMSCMD. Oil India Limited proposes to construct an Oil Collecting Station (OCS) at NADUA to cater to the production in that area. It is also expected that the field will produce about 800 KLPD of water along with the 1200 KLPD of crude, so the plant will be designed for handling 2000KLPD of total well fluid.

The East Khagorijan (GGS) field is located near Dibrugarh town in Assam at a location approximately 200m south (aerial distance) of Loc# TAI at 27°32'N 95°09'E approx. Elevation 121mMSL. The field is presently producing from 02 Nos. of wells through a QPS (Quick Production Setup). Considering the potential of the field it is envisaged that Oil production is expected to rise to a level of 1000 KLPD from 06 HP wells, 06 LP wells and 06 Non Associated Gas wells. Associated Gas is expected to be around 0.1 MMSCMD. The East Khagorijan gas field is expected to produce about 1 MMSCMD of non-associated natural gas from this area. It is also expected that the field will produce about 800 KLPD of water along with the 1000 KLPD of crude, so the plant design will be for handling 1800KLPD of total well fluid. Oil India Limited proposes to construct a Group Gathering Station (OCS + FGS) at East Khagorijan to cater to the production in that area.

Pipelines carrying well fluids to the proposed surface production facilities and pipelines transporting dry crude, separated gas, treated water from the facilities are not in the project scope.

1.1. SUBJECT:

As a part of this development scheme, OIL desires to procure **Modular Air and Nitrogen Package** for providing Instrument air, Utility air & Nitrogen for Oil Collection Station(OCS) at Nadua and Group Gathering Station (GGS) at East Khagorijan in Upper Assam, India.

1.2. SITE DATA

Site information shall specify the environmental condition of the Project site. All information specified herein shall be used for reference for the MPC Contractor's sound Engineering and Design.

All equipment shall be suitable for mounting and operation in the ambient conditions specified below.

Ambient Temperature: 41°C (Max) and 2°C (Min)

Relative Humidity: 98% (Max) and 36% (Min)

Maximum Rainfall for 24 hr. period: 1600mm

For detailed information, please refer to the document "Site conditions & Available utilities".

1.3. SITE LOCATION: Nadua & East Khagorijan

Nadua is a village in Panitola Tehsil in Dibrugarh District of Assam State, India. It is located 20 KM towards East from District headquarters Dibrugarh and 426 KM from State capital Dispur. East Khagorijan is close to Chauba town, located 11km from Chabua Railway station.

Dibrugarh Town Rail Way Station is major railway station 23 KM near to Nadua

Airport: Nearest airport Dibrugarh

1.4. ABBREVIATION

ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
CPCB	Central Pollution Control Board
EK	East Khagorijan
EPCM	Engineering Procurement Construction Management
GGs	Group Gathering Station
MPC	Modular Package Construction
NB	Nominal Bore
ND	Nadua
NFPA	National Fire Protection Association
OCS	Oil Collecting Station
OISD	Oil Industry Safety Directorate
OMR	Oil Mines Regulations

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1.5. DEFINITIONS

COMPANY / OWNER	Oil India Limited
EPCM	Kavin Engineering and Services Private Limited
MPC CONTRACTOR	MPC Contractor executing the package

1.6. DESIGN LIFE

The design life of complete package shall be 20 years.

1.7. CODES AND STANDARDS

CODES / STANDARDS	DESCRIPTION
API STD 619	Rotary Type Positive Displacement Compressors for Petroleum, Chemical and Gas Industry Services.
IS 6206	Guide for Selection, Installation and Maintenance of Air compressor plants with operating pressures upto 10bar.
ASME Sec. VIII Div.1	ASME Boiler and Pressure Vessel Code – Rules for Construction of Pressure Vessels.
IS 2825	Code for Unfired Pressure vessels.
IS 7938	Air receivers for Compressed air installation.
IS 11989	Specification for Compressed Air Dryers.
API 661	Air Cooled Heat Exchangers for General Refinery Service.
IS 5456	Testing of Positive Displacement Type Air Compressors and Exhausters- Code of Practice.
ISA - 7.0.01	Quality Standard for Instrument Air.
ISO 1940	Mechanical vibration -Balance quality requirements for rotors in a constant (rigid) state -Part 1: Specification and verification of balance tolerances.
ISO 2954	Mechanical vibration of rotating and reciprocating machinery -Requirements for instruments for measuring vibration severity.
ASME Sec. II	ASME Boiler and Pressure Vessel Code – Materials.
ASME Sec. V	ASME Boiler and Pressure Vessel Code – Non destructive Examination.
ASME Sec. IX	ASME Boiler and Pressure Vessel Code – Welding, Brazing and Fusing Qualifications.
ASME B16.5	Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.

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CODES / STANDARDS	DESCRIPTION
ASME B16.47	Large Diameter Steel Flanges NPS 26 through NPS 60.
AWS D 1.1	American Welding Society – Structural Welding Code.
WRC Bulletin No 107	Local stresses in spherical and cylindrical shell due to external loading.
WRC Bulletin No 297	Local stresses in cylindrical shell due to external loading.
API RP 520	Sizing Selection and installation of Pressure Relieving devices in refineries (Part 1 and 2)
API RP 521	Guide for pressure relieving and de-pressuring device.
API RP 540	Electrical installation in petroleum processing plant.
BS EN 10204	Materials Testing Certificates.
IS - 875 (Part - 3)	Codes of practice for design loads (other than earthquake) for buildings and structures.
IS-325	Three Phase Induction Motors Specification.
IS -1893	Codes of practice for Earthquake Design.
IS-13920	Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces.
ASTM A193	Standard specification of alloy-steel and stainless steel bolting materials for high temperature or high pressure service and other Special purpose applications.
ASTM A194	Standard specification for carbon and alloy steel nuts for bolt for high pressure or high temperature service or both
API 510	Pressure Vessel Inspection Code- Maintenance, Inspection, Rating, Repair & Alteration

1.8. UNITS OF MEASUREMENT

Dimension	Units	Symbol
Area	Square Metre	m ²
Concentration	Mole	%
Density	Kilogram per cubic metre	kg/m ³
Energy	Kilowatt	kW

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Dimension	Units	Symbol
Flow rate (Liquid)	Kilo Litres Per Day	KLPD
Flow rate (gas)	Million Metric Standard Cubic Metre per day / Million Metric Standard Cubic feet per day	MMSCMD/MMSCFD
Flow rate (Air/Nitrogen)	Normal Cubic metre per hour	Nm ³ /hr
Length	Meter	m
Mass	Kilogram	kg
Momentum	Kilogram per metre square second	kg/ms ²
Power	Kilowatt	kW
Pressure	Kilogram per square centimetre	kg/cm ²
Specific Heat Capacity	Kilo joule per kilogram Celsius	kJ/kg °C
Thermal Conductivity	Watt per metre Kelvin	W/ m K
Temperature	Celsius	° C
Time	Second	sec
Velocity	Metre per second	m/s
Viscosity	Centipoise	cP
Volume	Cubic Metre	m ³

2.0 SCOPE OF SUPPLY

The Scope of supply together with the attachments defines and covers the guidelines for design, engineering, selection of equipment, procurement, fabrication, assembly and testing of Air and Nitrogen generation system required for East Khagorijan & Nadua including transportation and delivery of complete package at site.

The Scope of supply is not limited to the below mentioned items, MPC Contractor shall supply all required items for the satisfactory operation of the unit.

The Complete Air and Nitrogen package will be located in Outdoor location without any shelter. MPC Contractor to supply equipment suitable for extreme weather condition prevalent in the plant.

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The scope of work described below is for one facility, the second facility follows the typical arrangement.

Plant air package consists of following system,

- Instrument air / Utility air system
- Nitrogen generation system

2.1. INSTRUMENT AIR / UTILITY AIR SYSTEM

Instrument air / utility air compressor shall be designed for the total capacity of 800 Nm³/hr at 8.8 kg/sq.cm (g) pressure at the outlet of package. The Quality of the Instrument Air shall be in accordance with the 'ISA 7.0.01 Quality Standard for Instrument Air'.

- a) Three (3) nos. of Rotary screw compressor, oil free, air cooled type driven by AC electric motor (2W+1S) of capacity 400 Nm³/hr each. PLC based control panel with associated piping and instrumentation shall be provided for the Compressor.
- b) Compressor skid shall be complete with Lube oil circuit with pumps & oil cooler, Inter cooler, after cooler, Air inlet silencer & filter etc.
- c) Two (2) nos. of Air Dryer Heatless type 2 x 100% (1W+1S) with pre-filter and After-filter for each air drier. Local control panel for each dryer.
- d) Two (2) nos. of Instrument air receiver and each vessel shall be sized for 5 minutes residence time between normal and minimum supply pressure for instrument air capacity of 300 Nm³/hr.
- e) One (1) no. of Utility air receiver sized for 5 minutes residence time between normal and minimum supply pressure for utility air capacity of 100 Nm³/hr.
- f) Complete interconnecting piping, valves, instruments etc. from Compressor outlet to Air dryer and Utility air receiver and Dryer outlet to Instrument air receiver. Piping battery limit shall be Instrument air receiver outlet piping to skid edge, Utility air receiver outlet piping to skid edge and Air drier outlet piping to skid edge for Nitrogen generation package.
- g) Fire fighting system including fire extinguisher as per OISD-STD-189 requirements and shall be of standard capacity as per IS 15683, IS 2878 & IS 10658.

The complete system including equipments, pipes, instruments etc. shall be pre-fabricated and assembled at shop as a single skid and transported in modular skids / container. If skid size exceeds the transport regulations, then the same shall be split suitable for road conditions of Assam. The skid fabrication at the site shall be avoided. The overall skid dimension shall not exceed the dimension specified in Plot plan attached in Volume-II.

2.2. NITROGEN GENERATION SYSTEM

Nitrogen Generation system shall be designed for the capacity of 100 Nm³/hr (at outlet). Nitrogen generation package receives compressed dry air inlet from

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Instrument Air Dryer outlet. The system shall consist of the following equipment as minimum,

- a) Two (2) nos. of Particle Filter (1W+1S),
- b) Two (2) nos. of Membrane type Nitrogen generator (1W+1S), Nitrogen purity at the outlet of generator shall be 98% minimum.
- c) One (1) no. of Nitrogen receiver, material shall be SA516 Gr.70 sized for 5 minutes residence time between normal and minimum supply pressure for Nitrogen capacity of 100 Nm³/hr.
- d) Complete interconnecting piping, valves, instruments including gas analyzers etc. within the package.
- e) PLC based control panel for the package.
- f) Fire fighting system including fire extinguisher as per OISD-STD-189 requirements and shall be of standard capacity as per IS 15683, IS 2878 & IS 10658.

The complete system including equipments, pipes, instruments etc. shall be pre-fabricated and assembled at shop as a single skid and transported in container. If skid size exceeds the transport regulations, then the same shall be split suitable for road conditions of Assam. The skid fabrication at the site shall be avoided. The overall skid dimension shall not exceed the dimension specified in Plot plan attached in Volume-II.

2.3. GENERAL FOR INSTRUMENT AIR / UTILITY AIR SYSTEM AND NITROGEN GENERATION SYSTEM

- a) Complete equipment, piping, fittings, valves, instruments and controls, supports, structures etc.
- b) Complete electrical system required for satisfactory operation of the unit including earthing design, preparation of detailed drawings, manufacture, testing.
 - Power and control cabling, cable trays and tray supports
 - Local control station (as applicable)
 - Lighting & small power sockets and distribution boards
 - Earthing protection system
 - Junction boxes (Where required)
 - Cable glands
 - Local AC UPS distribution
 - Local DC UPS distribution
- c) Surface preparation and painting

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- d) Shop inspection and testing, Factory Acceptance Tests (FAT), Site Acceptance Test (SAT)
- e) Packing, marking and forwarding
- f) Spares and Special tools
 - Supply of Start-up spares as required during start-up and commissioning
 - Supply of Maintenance tools and tackles including special tools
- g) Price list of recommended spares for smooth operation of the system / equipment for a minimum period of 2 years.
- h) Noise level of the equipments shall be 75 dBA @ 1m distance from periphery of the equipment / Enclosure. If required, Acoustic enclosure shall be provided to meet the desired Noise level.
- i) Process / Performance Guarantee
- j) Access platforms, ladders, stairways, handrails etc as required
- k) List of consumables and First fill of Lubricants for the complete package. Additional top-up quantity as required during commissioning period and PGTR of 1 month shall also be supplied.
- l) Process / Performance Guarantee
- m) Commissioning Assistance at Site
- n) Guarantee to Meet all HAZOP, SIL and Safety Operational Requirements

MPC Contractor shall carry out the design and engineering of the Air & Nitrogen package in accordance with International codes & standards, local legislation, Specification & Design basis attached in the subsequent sections.

3.0 SITE CONDITIONS & AVAILABLE UTILITIES

SITE CONDITIONS

Site Location: East Khagorijan & Nadua Elevation above MSL: Note-4 m Barometer: 1.0335 kg/cm²

Air Temperature: Design: 80 °C Maximum: 41 °C Normal: * °C Minimum: 2 °C

Atmosphere: ☐ Noncorrosive ☐ Corrosive ☒ Dust ☐ Fumes

Wind Speed: Avg: 14.4 m/s Max: * m/s Max. Speed: 50 m/s

Prevailing Direction: North East

Relative Humidity: Mean: * % High: 98 % Low: 36 %

Precipitation: Annual Max: 19450 mm Monthly Max: * mm Monthly Min: * mm 24 Hour Max: 1600 mm

(Rain fall) Ice/Snow Burden: * mm

Installation: ☐ Offshore ☐ Coastal ☒ Inland ☐ Enclosure by Supplier

☐ Indoor ☒ Outdoor ☒ Winterization ☐ Tropicalization

Seismic Loads: ☐ None ☒ Seismic Zone: V Load: *

Water Properties: ☐ Fresh ☐ Salt Temp: Max Surface: N/A °C Max Seabed: N/A °C

Min Surface: N/A °C Min Seabed: N/A °C

UTILITIES

Area Classification: Zone: T Class: Group: NOTE-3 ☐ Nonclassified

Available Power: ☒ 415V AC, 3 Ph, 50 Hz ☐ 120 V, 1 Ph, 50 Hz ☐ 120 V, 1 Ph, 60 Hz

☐ 110V AC, 1Ph, 50Hz ☐ 11 kV, 3 Ph, 50 Hz ☐ 6.6 KV AC, 3 Ph, 50 Hz

☒ 240V AC, 1 Ph, 50 Hz ☐ 24V DC ☒ 110V DC

NITROGEN	☒	☒ Design	☐ Press: <u>12.5</u> kg/cm ²	☒ Temp: <u>85.0</u> °C
		☒ Operating	☒ Press: <u>6.3-8.3</u> kg/cm ²	☒ Temp: <u>51.0</u> °C
INSTRUMENT AIR	☒	☒ Design	☒ Press: <u>12.5</u> kg/cm ²	☒ Temp: <u>85.0</u> °C
		☒ Operating	☒ Press: <u>6.5-8.5</u> kg/cm ²	☒ Temp: <u>51.0</u> °C
HP FUEL GAS	☐ None	☐ Design	☐ Press: <u>-</u> kg/cm ²	☐ Temp: <u>-</u> °C
		☐ Operating	☐ Press: <u>-</u> kg/cm ²	☐ Temp: <u>-</u> °C
FUEL GAS:	☒	☒ Design	☒ Press: <u>11.0</u> kg/cm ²	☒ Temp: <u>85.0</u> °C
		☒ Operating	☒ Press: <u>6.0</u> kg/cm ²	☒ Temp: <u>46-52</u> °C
COOLING MEDIUM	☐ None	☐ Design	☐ Press: <u>-</u> kg/cm ²	☐ Temp: <u>-</u> °C
		☐ Operating	☐ Press: <u>-</u> kg/cm ²	☐ Temp: <u>-</u> °C
HEATING MEDIUM	☒ (NOTE-1)	☒ Design	☒ Press: <u>12.0</u> kg/cm ²	☒ Temp: <u>250.0</u> °C
		☒ Operating	☒ Press: <u>5.0</u> kg/cm ²	☒ Supply Temp: <u>200.0</u> °C
				☒ Return Temp: <u>100.0</u> °C
UTILITY AIR	☒	☒ Design	☒ Press: <u>12.5</u> kg/cm ²	☒ Temp: <u>85.0</u> °C
		☒ Operating	☒ Press: <u>6.8-8.8</u> kg/cm ²	☒ Temp: <u>51.0</u> °C
SEA WATER	☐ None	☐ Design	☐ Press: <u>-</u> kg/cm ²	☐ Temp: <u>-</u> °C
		☐ Operating	☐ Press: <u>-</u> kg/cm ²	☐ Temp: <u>-</u> °C
FIRE WATER	☒	☒ Design	☒ Press: <u>15.0</u> kg/cm ²	☒ Temp: <u>80.0</u> °C
		☒ Operating	☒ Press: <u>10.0</u> kg/cm ²	☒ Temp: <u>AMB</u> °C
SERVICE WATER	☒	☒ Design	☒ Press: <u>5.0</u> kg/cm ²	☒ Temp: <u>80.0</u> °C
		☒ Operating	☒ Press: <u>ATM</u> kg/cm ²	☒ Temp: <u>AMB</u> °C
FOAM	☒	☒ Design	☒ Press: <u>15.0</u> kg/cm ²	☒ Temp: <u>80.0</u> °C
		☒ Operating	☒ Press: <u>12.0</u> kg/cm ²	☒ Temp: <u>AMB</u> °C
POTABLE WATER	☒	☒ Design	☒ Press: <u>5.0</u> kg/cm ²	☒ Temp: <u>80.0</u> °C
		☒ Operating	☒ Press: <u>ATM</u> kg/cm ²	☒ Temp: <u>AMB</u> °C
GROUND FLARE	☒	☒ Design	☒ Press: <u>3.5/FV</u> kg/cm ²	☒ Temp: <u>200.0</u> °C
		☒ Operating	☒ Press: <u>0.2-0.7</u> kg/cm ²	☒ Temp: <u>AMB</u> °C
CLOSED DRAIN	☒	☒ Design	☒ Press: <u>3.5/FV</u> kg/cm ²	☒ Temp: <u>80.0</u> °C
		☒ Operating	☒ Press: <u>0.7</u> kg/cm ²	☒ Temp: <u>AMB</u> °C

SKID CONSTRUCTION

Skid Type	Onshore-Grouted
Lifting Devices	Lugs
Main Beams	TBA
Other Beams	TBA
Skid Level Screws	TBA
Equipment Mounting	TBA

NOTE:

- Hot oil (Therminol-55) is used as a heating medium.
- FOW - Full of water
- Area Classification as per OISD Guidelines.
- Site elevation above MSL shall be 121m for East Khagorijan and 116m for Nadua.
- * OIL to provide information.

Section-II

**Specification for Instrument Air / Utility
Air Compressor Package**

1 INTRODUCTION

1.1 Objective

This specification defines the minimum requirements for the design, material procurement, fabrication, inspection, testing, painting, and shipment of Instrument air / utility air compressor & dryer system.

The requirements of this specification are to be considered as minimum requirements and MPC Contractor may submit to the EPCM Consultant for agreement, any possible solutions, with supporting calculation notes that could give technical and economic improvement.

Any omission in this requirement shall not relieve the MPC Contractor of his responsibility to deliver the equipment along with other associated items, which are complete, of proven design, and conforms to the Performance Requirements.

2 SCOPE

The scope of supply for Air compressor package shall include, but not necessarily be limited to the following:

2.1 Air Compressor package

- a) Oil free type screw compressor
- b) Electric motor drive
- c) Coupling with spacers and non-sparkling guard
- d) Inter cooler and After cooler shall be Air cooled
- e) Lube oil system with transfer pump and cooler
- f) Control panel for Compressor skid
- g) Inter connecting piping, valves, instrumentation etc. within the skid
- h) Air receiver for Instrument air and Utility air service

2.2 Air Dryer

- a) Heatless adsorption type air dryer
- b) Pre-filter and After-filter
- c) Control panel and Purge optimizer
- d) Inter connecting piping, valves, instrumentation etc. within the skid

2.3 Piping

- a) Complete interconnecting piping within the skid
- b) Drain & vent piping within the skid up to Vendor's Battery limit.
- c) All pipe supports, guides, anchors etc. along with structural members for the piping within the Battery limit

3 DESIGN REQUIREMENTS

3.1 General

- a) The compressor unit and auxiliary shall be designed and constructed for continuous full load duty.

- b) Inter cooler, after cooler drain and Air dryer filter drains shall be routed to skid edge / nearest drain trench and waste oil drains shall be routed to skid edge for closed drain system.
- c) All piping tie-in points shall be terminated with ASME B16.5 flanged connections at the package edge.
- d) Local package mounted PLC based control panel to monitor and control the compressors and the entire package shall be supplied.
- e) Unless specified otherwise, the entire package will be installed in an outdoor non-hazardous area.
- f) All couplings and gears shall be provided with adequate non-sparking guards.
- g) Compressor main motor shall have power ratings atleast equal to 110 percent of the compressor rated power at the relief valve set pressure (including gear and coupling losses). Electric motor drivers shall be rated with a 1.0 service factor.
- h) Compressors and other components within the package shall be designed for rapid, economical maintenance. The arrangement shall provide adequate clearance areas and safe access for operation and maintenance.
- i) Access ladders and platforms as required for maintenance and inspection purpose shall be provided.
- j) Noise level of the rotating equipments shall not exceed 75dBA @ 1m distance from the periphery of the equipment.
- k) The Compressor assembly shall be mounted inside Canopy. Canopy shall have suitable facility for ventilation and access door as required for maintenance.

3.2 Compressor

- a) Air Compressor shall be Screw type, Oil-free, Air-cooled compressor.
- b) Air inlet connection shall be provided with suction air filter, silencer, etc. and the air filter shall have differential pressure indicator.
- c) The inlet air control regulating system shall be automatic and of the modulating type. Compressors shall constantly modulate inlet air flow by means of a positioning control valve at the compressor inlet. The control valve shall throttle inlet air in order to maintain a constant pressure at the compressor discharge.
- d) Pressure relief valve shall be provided at the discharge of each compressor for full compressor rated capacity.
- e) The hoop stress values used in the design of the compressor casing shall not exceed the maximum allowable stress values in tension as specified in the ASME Code Section VIII. Division 1, at the maximum operating temperature of the material used.
- f) Shafts shall be forged steel unless otherwise approved by COMPANY.

- g) Rotors shall be forged steel precision ground pairs (one male, one female). All male-female rotor pairs shall be dynamically balanced and inspected to assure a perfect fit. Nodular iron castings may be used in place of forged steel if approved by EPCM Consultant and shall be produced in accordance with ASTM A395.
- h) Rolling element bearings shall have a minimum ABMA L-10 rating of 25,000 hours in continuous operation at rated conditions.
- i) Lubrication shall be provided integral with the compressor unit and the same shall be forced lubrication system.
- j) Lube oil pump shall be provided for transfer of oil through filters into the bearing and return to sump by gravity. The lube oil sump shall be adequate to drain all the lube oil in the system. Lube oil shall be cooled using air-fin type Lube oil cooler.
- k) The lube oil sump shall be adequate to drain all the lube oil in the system.
- l) Necessary arrangement for circulation of the oil prior to the operation of the compressor and cooling of the compressor after operation shall be provided.

3.3 Inter Cooler and After Cooler

- a) Air Cooled type, Coolers shall be of air-fin fan coolers, forced draft type complete with integrally mounted electric motor-driven fans.
- b) The cooling system shall be designed for full load and minimum load operation under the most adverse site conditions of maximum ambient air temperature.
- c) Discharged air lines from each of the cooler shall be provided complete with moisture separator with Automatic Drain Traps (ADT). All ADT's shall be provided with bypass arrangement with valves.
- d) After-coolers shall be sized to cool discharged air from the compressors to a temperature of not more than Ambient + 10°C.

3.4 Air Dryer Package

- a) Air dryer shall be twin tower heatless type. The unit shall consist of two identical drying vessels, arranged for automatic changeover such that one tower is always under drying and the other under regeneration. Visual indication on local panel to indicate state of each vessel (drying / regeneration) shall be provided.
- b) The dryer unit shall be provided with pressure relief valves, pressure gauges, purge flow indicator (visual type) and an exhaust muffler.
- c) The design code for air dryers shall be as per IS: 11989.
- d) Dryer vessel shall be designed and fabricated in accordance with ASME Code Section VIII Div.1 or IS 2825. In addition to the ASME Code, requirements specified in "Specification for Unfired Pressure vessel" to be followed.
- e) The desiccant used shall be activated alumina / silica gel.

- f) Dryer unit operation shall be fully automatic equipped with automatically timed switching valves, with provision of manual operation in case of switching failure.
- g) Air dryer unit shall be provided with Local Control Panel with necessary instruments for monitoring the operation of the dryer.
- h) The dryer unit shall be provided with isolation and bypass valves.
- i) An online dew point analyzer shall be provided on the outlet of the dryer unit to monitor the required purity and high moisture content alarm signal shall be generated in the local control panel for EPCM Consultant's interface.
- j) Suitable purge optimizer shall be provided for reducing air loss during desiccant regeneration.

3.5 Pre-Filters and After-Filters

- a) Pre-filter for protection against contaminated air and After filter to trap the carryover of desiccant to instrument air receiver shall be provided at the upstream and downstream of Air Dryer.
- b) Each filter unit shall be provided with Auto Drain Traps, Vent, Pressure Differential Indicator and isolation valves at inlet and outlet.
- c) Pre-filters shall be provided to prevent rust particles and oil to enter the air driers. They shall be able to remove 99.9% of all particle sizes greater than 1 micron, and shall remove 99.99% of entrained oil, oil aerosols and water entrainment.
- d) After-filters shall be capable of removing all entrained desiccant larger than 1.0 micron.
- e) Pre-filters and after-filters shall be of heavy duty and cartridge type.

3.6 Air receiver

- a) Air receivers shall be designed and fabricated in accordance with ASME Section-VIII, Division-1 or IS: 2825.
- b) Air receiver shall be sized considering 5 minutes residence time between normal and minimum air supply pressure.
- c) The Air receiver shall have automatic draining facilities with manual bypass. Corrosion allowance of minimum 3mm shall be considered and the vessel shall be provided internally with a protective coating.
- d) All the nozzle flanges shall be as per ASME B16.5 / B16.47- Series 'B' of respective class, unless otherwise specified. No threaded connections shall be screwed directly into any part of the equipment.
- e) Air receiver design shall also comply with the requirements of "Specification for unfired pressure vessel".

3.7 Electrical Requirements

- a) All electrical components and accessories shall be in accordance with the "Specification for Electrical requirements".

- b) MPC Contractor shall make provision to derive any other voltages / power supplies other than those specified in Specification for Electrical requirements for MPC4 Package as required within the package battery limits.
- c) Complete earthing system inside the battery limit shall be done by MPC contractor. Two earthing terminal shall be provided at diagonally opposite ends of the skid base frame to enable EPCM consultant to connect the compressor package to plant earthing system.
- d) Equipment selection shall be suitable for unclassified area.
- e) Supply and installation of Lighting Fixtures, ACDB, LDB, Convenient Receptacles, all Power and Control Cabling, Cabling Accessories, Cable Trays, Earthing materials, Tray Supports and Equipment Supports.
- f) Complete earthing system inside the battery limit shall be done by MPC Contractor. Two earthing terminals shall be provided at diagonally opposite ends of the skid base frame to enable EPCM Consultant to connect the compressor package to plant earthing system.
- g) Motor shall be capable of satisfactory operation on full load at a supply voltage of 85% of the rated voltage and shall be energy efficient-IE2 type.
- h) Local Start/Stop Lockable Push Button with Local/Remote Selector Switch shall be provided for all motors. Ammeter shall be provided in Local Control Station for motors rated 30kW and above.
- i) All cable glands and adaptors used shall be made up of nickel plated brass and are fitted with nylon washer. Fiber washers are not to be used. Cable glands shall be double compression type.
- j) Lighting and small power equipment shall be suitable for 240V, Phase to Phase supply.

3.8 Instruments and Controls

- a) All instruments and controls shall be suitable and protected for continuous operation in the environment specified and in accordance with “Functional Specification for Package Instruments”.
- b) Each compressor shall have facilities for manual and automatic starting in the case of failure of the other compressor. In addition each compressor shall be equipped with own local control panel.
- c) Automatic starting of the stand-by compressor shall be as fast as possible. Initiators shall be provided on the piping downstream of the air drier / air receiver to start the stand-by compressor.
- d) MPC Contractor shall provide all necessary pressure, temperature, Vibration, level monitoring instruments, etc. for alarms and indications as required for the Compressors and Dryer for safe and control operation of the entire package.
- e) Local control panel shall be provided for the compressors and dryer. The unit shall contain all local controls, indicators, terminals, and annunciators, as well as dry contacts wired to terminals for EPCM Consultant’s DCS and remote control of EPCM Consultant’s motor starters.

3.9 Nameplate

The equipment / package shall be provided with a Stainless Steel Nameplate.

The nameplate for Compressor package, as a minimum, shall have the following details

- a) Project Name
- b) Client's Name
- c) Manufacturer's Name, Serial No and Year of built
- d) Item no & type
- e) Design capacity / FAD
- f) Discharge pressure
- g) Rotational shaft speed
- h) Motor rating
- i) Design Pressure and Temperature
- j) Air receiver capacity

The nameplate for Air Dryer shall have the following details as minimum

- a) Project Name
- b) Client's Name
- c) Manufacturer's Name, Serial No and Year of built
- d) Item no & type
- e) Air dryer capacity
- f) Dryer outlet pressure
- g) Purge air quantity
- h) Weight – Dry / Operating

3.10 Base plate

- a) All the compressor equipment and the connected intercooler and after coolers shall be mounted on a common base plate provided with vibration absorbers between the rotating equipment and base plate.
- b) The Air Dryer may be integral with Compressor Package or a separate skid as per manufacturer's standard.
- c) Skid shall be designed for single point lift at hook and preferably a four point lift at skid. The Supplier shall provide all lifting slings, shackles, pins and spreader bars (if required).

4 INSPECTION AND TESTING

4.1 General

- a) Inspection and testing shall be followed as per COMPANY / EPCM consultant approved ITP and specification requirements.
- b) COMPANY / EPCM consultant shall be informed fifteen (15) working days prior to the shop testing of the components.
- c) After inspection, Procedures and records of factory test shall be available for review by EPCM.
- d) The right to witness all inspection and Non-Destructive Test from raw material certification till final stage of inspection is reserved by EPCM / COMPANY and their TPI agency.
- e) All testing shall be done using certified test equipment, which have been calibrated / checked prior to the test. The calibration records shall be furnished for EPCM review.

4.2 Non-Destructive Testing

- a) The extent of radiography shall be in accordance with the most stringent requirements of relevant code. Spot radiography to be considered as a minimum requirement.
- b) Unless specified otherwise, the following inspection shall be carried out as a minimum;
 - (i) Visual inspection of all the weld joints
 - (ii) Dimensional check
- c) Highly stressed attachments such as lifting lugs etc. shall be ultrasonically tested after PWHT.
- d) UT may be substituted for RT where the RT is not practicable. The absence of suitable RT equipment shall not be the justification for such substitution.
- e) All internal and external attachment welds to pressure parts shall be examined by magnetic particle method or liquid penetrate inspection method, after PWHT.

4.3 Hydrostatic Tests

- a) The pressure containing parts of the compressor casing shall be tested hydrostatically with liquid at a minimum of 1½ times the maximum allowable working pressure
- b) The equipment shall be hydrostatically tested on completion of all other tests and PWHT.
- c) The equipment/component shall be subject to the hydrostatic test pressure for a period of minimum 30 minutes.
- d) Hydrostatic pressure tests shall, wherever possible, be carried out with the equipment in operating position.

4.4 Mechanical Running Tests

- a) The compressor packages shall be given the manufacturer's standard shop run test at manufacturer's works and as per the relevant design codes and standards, but which shall not be for less than four hours.
- b) Routine tests for motors shall be performed as per the design codes and manufacturer's standard at manufacturer's works.
- c) Test procedure shall be submitted to COMPANY / EPCM prior to testing for approval and the test results with charts, etc. shall be provided for PURCHASER's approval and in final dossier.
- d) After a successful mechanical running test, the completed system shall be soap bubble tested for leakage during the final inspection. The test medium shall be air.

4.5 Performance Tests

- a) Compressors shall be tested in the manufacturer's shop at their rated speed, capacity and pressure in accordance with the requirements of the applicable Codes and Standards. The performance tests shall be witnessed. Test procedure shall be submitted to EPCM, prior to testing, for approval.

4.6 Factory Acceptance Test (FAT)

- a) The entire package shall be tested functionally in the complete assembled configuration at manufacturer's shop before dispatch, where possible.
- b) Package system leak Test: Complete package piping shall be hydrostatically tested / leak tested before FAT.
- c) The FAT test shall include, as a minimum, all the tests described as follows.
 - i. Package system leak test
 - ii. Hydrostatic Test
 - iii. Pre Run Test
 - iv. No Load Test
 - v. Full Load Test
 - vi. Functional Test
 - vii. Vibration Level Checks
 - viii. Noise Level Checks

4.7 Site Acceptance Test (SAT)

- a) Site Acceptance Testing shall be carried out at site after installation and commissioning of the package to demonstrate that the guaranteed performance of the package.
- b) MPC contractor shall submit the site acceptance test procedures for approval by EPCM. Final acceptance of the package shall be subject to the satisfactory performance functional and operational tests at site.

5 SURFACE TREATMENT, PAINTING AND MARKING

All external surfaces of the Compressor package shall be cleaned, primed and finish painted in accordance with the "Specification for Surface Preparation & Painting".

6 SPARE PARTS AND SPECIAL TOOLS

- MPC Contractor shall include and supply the spare parts for start-up and commissioning as part of supply scope.
- Mandatory spares for operation.
- Priced two (2) year spare parts list shall be provided.
- Special tools and tackles, which are necessary to dismantle, service and assemble the unit shall be supplied, if required.

7 INSTRUMENT AIR / UTILITY AIR COMPRESSOR PACKAGE: DATA SHEET

S. No	Description	Parameters
1.0	Screw Compressor	
1.1	Type	Rotary Screw Compressor, Non lubricated (oil free)
1.2	Type of Drive	Electric Motor, IP55
1.3	Service	Instrument Air / Utility Air
1.4	Applicable Standard	API 619 / IS 6206
1.5	Number Required	3X50% (2 - operating, 1 - standby)
1.6	Location : Indoor / Outdoor	Outdoor
1.7	Operation : Continuous / Intermittent	Continuous
1.8	Capacity	400 Nm ³ /hr each
1.9	Suction Pressure & Temperature	Ambient
1.10	Discharge Pressure at compressor package outlet (after air receiver at battery limit)	8.8 kg/cm ² g
1.11	Design Pressure	12.5 kg/cm ² g
1.12	Design Temperature	85°C
1.13	Maximum Compressor Speed	1500 RPM
1.14	Cooling Medium for inter cooler, after cooler and oil cooler	Air
1.15	Compressor bearing lubrication	Pressurized
1.16	Method of capacity control at constant speed	Auto Dual control
1.17	Compressor Casing	IS 210 Gr. FG 300

S. No	Description	Parameters
1.18	Compressor Rotor	EN 8
1.19	Cooler material	Aluminium
2.0	Instrument Air Receiver	
2.1	Service	Instrument Air
2.2	Location	Outdoor
2.3	Quantity	2 Nos.
2.4	Capacity	Note-1
2.5	Type	Vertical
2.6	Operating Pressure	6.5 – 8.5 kg/cm ² g
2.7	Design Pressure	12.5 / FV kg/cm ² g
2.8	Applicable Code	ASME SEC VIII DIV-1
2.9	Corrosion Allowance	3mm (Internal protective coating shall be provided)
2.10	Shell and dish end material	IS 2002 Gr.2
3.0	Utility Air Receiver	
3.1	Service	Utility Air
3.2	Location	Outdoor
3.3	Quantity	1 No.
3.4	Capacity	Note-1
3.5	Type	Vertical
3.6	Operating Pressure	6.8 – 8.8 kg/cm ² g
3.7	Design Pressure	12.5 / FV kg/cm ² g
3.8	Applicable Code	ASME SEC VIII DIV-1
3.9	Corrosion Allowance	3mm (Internal Protective Coating shall be provided)
3.10	Shell and dish end material	IS 2002 Gr.2
4.0	Air dryer	
4.1	Service	Instrument air
4.2	Air dryer quantity	2 Nos. (1 working + 1 standby)
4.3	Pre-filter quantity	2 Nos. (1 working + 1 standby)
4.4	After-filter quantity	2 Nos. (1 working + 1 standby)
4.5	Operation	Continuous
4.6	Location	Outdoor
4.7	Outlet air quality	Oil and dust free compressed air

S. No	Description	Parameters
4.8	Type	Heatless adsorption type (Desiccant)
4.9	Type of desiccant	Activated alumina / Silica gel
4.10	Design capacity	800 Nm ³ /hr (@ Dryer inlet)
4.11	Operating pressure	6.8 – 8.8 kg/cm ² g
4.12	Design pressure	12.5/FV kg/cm ² g
4.13	Max. allowable pressure drop across air dryer	0.3 kg/cm ²
4.14	Outlet air dew point	(Minus) 40°C ADP
4.15	Operating cycle	5 + 5 minutes
4.16	Applicable Design code	IS 11989
4.17	Corrosion allowance	3mm
4.18	Desiccant chamber	IS:2002 Gr.2 / SA516 Gr. 70
4.19	Filter shell	SA 106 Gr.B / IS:2002 Gr.2
4.20	Moisture Separation Shell	SA 106 Gr.B / IS:2002 Gr.2

Notes:

- Air receiver shall be sized considering 5 minutes residence time between normal and minimum air supply pressure.
- The interconnecting piping material shall be SA106 Gr.B (Galvanized).

Specification for Unfired Pressure Vessel

1 SCOPE

The objective of this document is to present the construction details & specification for Pressure Vessels. All engineering, design, manufacturing, procurement, fabrication, testing, supply of pressure vessels are to be carried out as per Code & Standards as listed in this document.

2 DESIGN CONSIDERATIONS

2.1 Codes and Standards

Pressurized vessels must be complied with ASME code, section VIII Div.1 latest edition. All fabricated materials must comply with ASME section II, Part – A & B and components in contact with process fluids.

All welding shall be in accordance with ASME IX.

Pressurized vessels must be equipped with pressure release and safety valves, designed to release the produced volume due to different applicable over pressure scenarios.

Vessels shall be equipped with all attachments such as nozzles, manways, tray support rings, Insulation clips, as well as any platform clips, platforms or ladders as required.

Suitable supports shall be provided for internal parts to avoid damage during shipment.

2.2 Load Combinations

Loadings to be considered in designing a vessel shall be as per the ASME Code Section VIII, Div 1 and shall include cyclic conditions and erection loadings.

Vessels shall be designed to withstand the total loads resulting from the weight of all attachments plus the greater of operating weight or its original test weight.

All applicable loads shall be considered as acting simultaneously, including wind, during erection, start-up or operation.

Free-standing vertical vessels shall be designed to withstand overturning forces such as wind, plus thrust from connecting pipe work.

The following load combinations shall be considered:

- Operating, including operating dead weight, plus wind load (or earthquake).
- Hydro test, including hydro test dead weight plus pressure, plus 25% wind load.

Allowable tensile and compressive stress basis for vessels shall also apply to vessel Supporting skirts.

2.3 Material of Construction

Material of Construction of all parts of the equipment shall be compatible with the fluid in contact with that part and as per relevant Codes, Standards, Project Specifications.

The certification of material compliance shall be in accordance with EN 10204, Type 3.1 for all materials used in pressure parts and EN 10204, Type 2.2 for non-pressure parts.

2.4 Corrosion Allowance

If not specified, the corrosion allowance for each vessel shall be determined by its intended service, and shall be based on a service life of twenty (20) years or minimum 3mm corrosion allowance (whichever higher) to be considered.

Corrosion allowance shall be added to all pressure parts and non-removable internal parts and on all exposed surfaces.

Parts or surfaces that are fabricated of or protected with EPCM approved corrosion-resistant internal material may not require an added corrosion allowance.

Internally coated components shall include the corrosion allowance as indicated on the MPC's data sheet.

Corrosion allowance similar to the vessel shall be considered for the design of internals.

Unless otherwise stated, minimum corrosion allowance for carbon steel wetted parts shall be 3mm.

2.5 Minimum Thickness

The minimum thickness of pressure containing components shall be 6mm (¼-inch) excluding corrosion allowance unless otherwise noted.

Vertical vessel skirts shall be 6mm (¼-Inch) minimum wall thickness excluding external corrosion allowance, unless otherwise noted.

Internal rings, supports, baffles, vortex breakers, miscellaneous plates and structural shapes, Piping supports, etc., shall have a minimum thickness of 6mm (¼- inch) exclusive of corrosion Allowance unless otherwise noted.

Horizontal drums on saddle supports shall be investigated for buckling, local circumferential bending and shear stresses. The method of L. P. Zick may be used for this investigation.

2.6 Dimensions

All vessel connections, internals, etc, shall be located from datum or references line (bottom/left tan line). SI units shall be used.

2.7 Nozzles

All nozzles shall be welded and flanged. Threaded connections shall not be permitted on vessels.

The minimum connection size welded into a vessel shall be DN50 (2"NB) with a flanged connection.

Vessel nozzles of non-standard sizes DN65 (2 ½"), DN90 (3 ½"), DN125 (5") and DN180 (7") shall not be used.

Nozzles necks made of pipe shall be of seamless material. All Nozzles shall be set into the vessel. Full penetration welds shall be used for all body flange, nozzle and Manhole attachments.

Set on type nozzle shall only be used with prior agreement from the EPCM & provided that 100% ultrasonic examination of shell plate is carried out adjacent to opening.

Weld neck flanges shall be used on all nozzles with the hub bore to match that of the nozzle neck. Long welding neck flanges may be provided as an alternative. Flanges shall be in accordance with ASME B16.5 with bolt holes straddling main vessel centerlines unless otherwise noted. Slips on flanges are not acceptable, with the exception that flanges for internal non-pressure piping may be slip on.

Nozzle projection shall be minimum of 200 mm for sizes less than or equal to 12" and 250 mm for sizes greater than 12", from outer most layer of shell or insulation whichever is applicable. Nozzle projection should have enough clearance for bolt removal without damaging the shell / insulation.

Nozzle for drains, vents and relief valve shall be flush with inside surface of the vessel.

For sizes 300mm and larger fabricated nozzles neck shall be acceptable with full radiography of longitudinal weld.

The mill tolerance on pipe thickness shall be deducted while calculating the required nozzle neck thickness or opening reinforcement.

Flanges for external nozzles and manholes shall be in accordance with ASME B 16.5 for DN50 (2") to DN600 (24") except for DN 550 (22"), ASME B16.47 Series A standard for flange size between DN650 (26") to DN900 (36") and with ASME B16.47 Series B for flanges DN 950 (38") and larger and they shall be raised face (upto 600#) unless otherwise shown on the MPC's individual vessel data sheet and/or drawings. Non-standard size flanges shall be designed in accordance with ASME Code Rules. Liquid outlet nozzles shall be fitted with vortex breaker. All internals not welded to the shell shall be removable and designed to pass through the vessel manways.

Nozzle load calculation according to WRC 107 & WRC 297 shall be submitted along with design calculation for EPCM's approval during detailed engineering. Alternative calculation methods are subjected to EPCM approval. Nozzles excluded from these requirements are Manways, Instrument nozzles & drain nozzles.

2.8 Manholes

Manholes shall have at least DN600(24") nozzles with 475mm clear inside diameters unless otherwise specified in EPCM approved Data Sheets and are to be complete with blind flanges, bolting, gaskets, and davits or hinges. Bolting as per ASME B 16.5 shall be used.

The material used for any manhole shall be the same material as the shell or head in which the manhole is installed.

Davits and hinges shall be provided for each manhole or inspection opening where the blind flange, bolting and gasket weight more than 25 kg.

All manholes and inspection holes shall be flush with inside vessel wall. Inside edges of manholes shall be rounded off smooth with a minimum radius of curvature of 3mm.

2.9 Reinforcement of nozzles

Reinforcement of nozzles and manholes shall be designed to provide 100% compensation for the as built thickness of the shell or head in accordance with the specified design code. The reinforcement for openings shall be provided by either

self reinforcing nozzles or built up seamless pipe and WN flange with pad reinforcement as necessary.

Reinforcing pads shall have a minimum width of 50mm or three times the pad thickness, whichever is greater. Reinforcing pads shall be made in one piece if possible. Large reinforcing pads may be made from two pieces provided that written approval is obtained from the EPCM.

All rectangular reinforcing pads when used for external or internal attachments shall have 25mm minimum radius of curvature at corners.

Each pad shall contain at least one 1/4" NPT tapped tell tale hole.

2.10 Head/Dished Ends

Dished ends shall preferably be of seamless construction.

Heads shall be one-piece semi ellipsoidal (ratio 2:1) unless otherwise stated.

Heads produced from more than one plate shall have the welds 100% radiography after forming.

In the case of vessels having removable internals such as filtering elements, demisters, etc, vessel shall be designed with a body flange along with the davit arm to permit a full access.

2.11 Supports and Brackets

Ladders, access platforms, etc., shall be supplied such that all instruments, valves, etc., are readily accessible.

Where ladders, access platforms, etc., are supported by the vessel, the brackets and supports for these attachments shall be included in the original design of the vessel and detailed clearly on the vessel drawings.

Ladder clips, platform supports, and piping supports shall be furnished and installed by the MPC Contractor prior to pressure testing and certification.

Vessel supports shall be adequate for wind load in accordance with the latest edition of ASCE-7, unless specified otherwise on MPC Contractor equipment data sheets.

Vessels & other mechanical equipments shall be designed for the loads induced during shipment.

The vessel shall be self-supporting and designed to withstand wind loading based on the projected area of curved surfaces. The area of ladders, platforms and pipe work shall be assumed as equivalent to one and one half times the wind loading of the insulated vessel.

2.12 Horizontal vessel support

No more than two steel saddles shall be used for horizontal vessels. They shall be clear of vessel seams. Saddle pads shall have rounded corners. Saddles shall provide support at least 120 degree arc at the circumference of the vessel shell. Each saddle shall be attached to the shell with a wrapper plate. The wrapper plate shall have two 1/4" NPT tapped telltale holes at outer extremities. The saddle base plate shall be a minimum of 10mm thick.

An earthing boss shall be fitted to each saddle.

Calculations shall be provided for the effect of support saddles on the vessel shell and heads.

Vessel supports shall accommodate thermal expansion by preferably using a non-corroding “slotted hole” sliding arrangement.

Vessel supports shall incorporate pads for hold down bolts. The pads shall be designed to facilitate welding directly to the deck or structure.

2.13 Vertical vessel support

Vertical vessels shall be supported on steel skirts. Small vertical vessels less than 1200mm inside diameter may be supported on structural legs or lugs whichever is advantageous to plant layout or as specified. Lugs or legs, whichever applicable, must be designed to accommodate lateral loads resulting from wind, seismic and sea (or) road transportation forces.

Vessel skirts shall be of the height required to provide a clearance not less than 480mm between the bottom of the head and the deck. The mean diameter of the skirts shall be the same as the mean diameter of the bottom shell course.

All vessels provided with skirts shall have reinforced access openings of at least 400mm diameter, with the exception that skirts for vessels smaller than 920mm diameter shall be provided with at least one 200mm diameter access opening.

Vessel skirts shall be provided with 80mm diameter reinforced vent holes at approximately 920mm intervals on the circumference, located as near the vessel head as permitted by insulation or other attachments. No skirts shall have less than two such vent holes.

The following joints factors should be applied to vessel skirts

- Circumferential seams - 0.7
- Skirt to shell joint - 0.55
- Skirt to base ring joint - 1.0

2.14 Internal Attachments

All removable internals shall be fabricated so as to pass through the vessel manholes, major internal piping shall be flanged for ease of removal through the vessel manholes. All bolted internals shall be capable of being installed or removed through the vessel manways; all internal bolting shall be secured with lock nuts.

Internals shall be retained and supported by 316 SS bolts and double 316 SS nuts with Teflon inserts.

All attachment welds for vessel internal to pressure retaining parts shall be continuous. Multi pass welds shall be used and single pass welding is not acceptable. Seal welds shall have a throat thickness greater than the vessel shell corrosion allowance.

Mist eliminator elements shall be installed in gas scrubbers, separators, absorbers and any other vessels where off gas is produced. Unless otherwise stated elements shall be manufactured of 316L stainless steel or Monel wire mesh elements. Elements shall be supported above and below by carbon steel grids, except where corrosion allowance exceeds 3mm the grid shall be stainless steel wire.

The internal structure will be free of moving parts to avoid detachment and affect efficiency, operation and equipment integrity.

All vessel liquid outlets shall be equipped with vortex breakers. MPC Contractor shall design and supply vortex breakers to not restrict the flow capacity of the liquid outlets.

2.15 Sacrificial Anodes

Internally glass flake lined vessel and other vessel where indicated, should be provided with fitting for installation of sacrificial anodes.

The Supply of cathodic protection for the vessel wherever it is appropriate to meet the vessel design life. Anode material and calculation report should be submitted to EPCM for approval.

2.16 External Attachments

The vessel fabricator shall furnish and attach all insulation support rings, external pressure Stiffeners, lifting lugs, ladder, platform lugs, and pipe supports unless otherwise specified. Reinforcing pads shall be continuously welded to the vessel beneath all attachments where the welding of such attachments would cause excessive concentration of stress of vessel at those points. Each pad shall contain at least one ¼" NPT tapped tell-tale hole.

All attachments shall be continuously welded.

Piping within skirts on vertical vessels shall be fully butt welded. The first flanged joint on any such pipe shall be just outside the skirt.

Platforms & ladders for maintenance shall be provided as necessary for safe access to manholes, relief valves, control valves, controller's etc. Sample Connections, thermometers, thermo wells, gauges & control instruments shall be accessible from the platform or a ladder.

Insulation supports on vessels operating above 80°C may be stitch welded.

2.17 Earthing

The vessel shall be provided with Two SS 316L Earthing Bosses (30 mm dia, 50 mm long with 25 mm tapped hole and complete with SS 316 M10 Stud and two nuts, lock and spring washers) located diametrically opposite each other on the vessel support.

2.18 Lifting lugs / trunnions

All vessels, vertical or horizontal, shall be furnished with a minimum of two lifting lugs/trunnions, which shall be designed for a load equal to two times the shipping weight, where specified, vessels shall be provided with temporary fasteners.

2.19 Bolting

Bolts and nuts shall be furnished for all cover plates, manways, handholes, blind flanges and bolted attachment supplied with vessel.

External bolting shall be suitably treated for atmospheric corrosion protection as specified.

All stud bolts shall be threaded full length to UNC series upto 1" (M24) diameter and 8 UN series for bolts greater than 1" (M24). Nuts shall be of heavy series.

Bolts shall extend at least two clear threads from the nut.

The use of austenitic stainless steel bolting for external flanges should be avoided due to the risk of stress corrosion cracking.

Internal bolting shall be compatible with the contacting fluid and the materials being bolted.

Materials shall be as stated on the respective MPC Contractor data sheets. Internal bolting used for attachment of internals shall be fitted with double nuts or an equivalent form of locking device.

2.20 Gaskets

Gaskets shall be furnished for all cover plates, manways, handholes, blind flanges and bolted attachment supplied with vessel.

Gasket Material shall be as specified on the respective MPC Contractor data sheets.

Spiral wound and Ring joint gaskets for ASME B16.5 and ASME B16.47 Series A/ Series B flanges shall comply with the requirements and dimensions of ASME B16.20 unless specified otherwise. Colour coding of spiral wound gaskets shall be in accordance with ASME B16.20 unless otherwise specified.

The use of CAF type gasket is prohibited.

Gasket manufactured by welding shall not be used.

2.21 Welding

All pressure bearing butt welds shall be full penetration, double welded joints. For all Single side weld joints, root weld deposit shall be welded by GTAW process to ensure complete penetration.

Nozzles and manways and their reinforcement pads shall be attached to vessel with full penetration weld.

All main weld seams shall be clear of nozzles, reinforcement pads, internals, trays support rings, cleats and stiffening ring by 50 mm minimum (Weld to weld Edge). In case of unavoidable MPC Contractor shall propose suitable testing to ensure the joint strength and get approval to the EPCM before proceeding.

MPC Contractor shall submit Welding procedure Specification and qualification records for approval as per ASME Section IX.

Welding consumables shall be as per ASME Sec. II part C and shall be indicated in drawing.

Qualified welders as per the accepted procedure shall be employed for welding.

Temporary attachment welds on pressure parts shall be removed. The surface under such welds which have been removed shall be properly conditioned to eliminate surface stress raisers. Such surfaces shall be examined by either magnetic particle or liquid penetrant method of examination.

All welding slag shall be removed from weld deposits by appropriate means.

No welding or weld repair is permitted on pressure parts after Post Weld Heat Treatment (PWHT).

Weld overlay shall be applied circumferentially and it shall be relatively smooth with no notches, flaws, or undercuts that would act as stress raisers. Elbows, tees

and small bore nozzles may be overlay welded longitudinally followed by grinding or machining to a smooth surface.

2.22 Heat Treatment

For carbon steel formed components, including dished ends, stress relieving shall be performed as per applicable paragraphs of ASME Section VIII Div.1.

In addition, cold formed carbon steel heads shall be stress relieved when their thickness is 16mm or greater. Hot formed heads shall also be normalized after forming in case they are formed at temperatures below the normalizing range. Hot formed dished ends or similar parts, which have not been uniformly heated in the normalizing range in the final stages of manufacture, shall be normalized.

Flange facings shall be protected against oxidation during heat treatment. Where applicable the MPC Contractor shall submit a post weld heat treatment procedure for EPCM approval.

Local PWHT may be permitted only with prior written approval by the EPCM. Any required PWHT for welds between dissimilar metals shall conform to the requirements of the material having the more stringent requirements and shall be verified by the procedure qualification tests.

Vessels shall be post weld heat treated as a complete unit including skirt/support, wherever practicable.

2.23 Tolerances

Tolerances for vessels shall be as stated in ASME Sec VIII-Div.1.

All paired instrument nozzles shall be jig set and shall have a minimum tolerance of +/- 1mm on centers.

If vessels are to be fitted with special screens or filters which require a more precise fitting, the tolerances shall be in accordance with the screen/filter manufacturer's recommendation and shall be specified on the data/requisition sheets.

Tangent lines shall be punch-marked on the dished heads, both externally and internally at the intersection of knuckle with the cylindrical section.

2.24 Impact Test Requirements

MPC Contractor shall ensure that Code mandatory requirements of impact testing are met in accordance with minimum design metal temperature specified in the datasheets.

2.25 Material and welding inspection

Non-destructive material tests and pressure testing shall be in accordance with applicable codes, standard and specification. The tests shall be witnessed and approved by an inspector representing the EPCM.

All non-destructive testing shall be performed by a third party approved and accredited Non-Destructive Testing (NDT) inspection organization.

Full traceability of all material components (to material certificates) is required.

2.26 Hydrostatic Test

Hydrostatic test shall be conducted at a minimum of code requirement after complete fabrication and post weld heat treatment.

After testing, vessels shall be thoroughly dried by blowing dry air.

Clean potable water shall be used for hydrotest. Sea water shall not be used.

2.27 Internal and External coating

Internal and External Coating shall be in accordance with the requirements specified in "Specification for Surface Preparation and Painting.

2.28 Quality assurance and certification

The EPCM will ensure all purchased products conform to specified purchase order requirements by establishing and implementing any necessary source inspections or other activities. When source inspections are required, the EPCM inspector will conduct activities based on the approved MPC Contractor's Inspection and Test Plan (ITP). The MPC Contractor shall incorporate the inspection activities identified in the MPC Contractor Inspection and test Plan. The equipment will not be allowed to ship until the EPCM inspector issues an Inspection Release Certificate.

2.29 SPARE PARTS AND SPECIAL TOOLS

- a) MPC Contractor shall include and supply the spare parts for start-up and commissioning as part of supply scope.
- b) Mandatory spares for operation.
- c) Priced two (2) year spare parts list shall be provided.
- d) Special tools and tackles, which are necessary to dismantle, service and assemble the unit shall be supplied, if required.

2.30 Name plate

Each complete vessel shall be provided with a type 316 stainless steel nameplate in accordance with ASME section VIII securely attached to the vessel shell and located so that it is clearly visible after installation, preferably near a manhole or inspection opening. Insulated vessels shall have nameplate brackets with enough projection to clear insulation by at least 25mm.

Name plate shall be SS316 and be permanently attached in the bracket by SS 316 rivets or screw. Name plate bracket welded to the vessel with a full penetration weld.

The nameplate shall be stamped with the following:

- Owner Name
- Equipment Name
- Equipment Tag no.
- Manufacturer's name
- Year of Fabrication
- Maximum Allowable Working Pressure, kg/cm²g at temperature ° C

SPECIFICATION FOR UNFIRED PRESSURE VESSEL

- Hydro-test pressure, kg/cm²g
- Date tested
- Capacity
- Design code
- Design pressure, kg/cm²g
- Design temperature ° C
- Minimum Design Metal Temperature
- Heat treatment
- Empty weight, kg
- Purchase Order No.
- Corrosion Allowance
- Radiography

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Specification for Surface preparation and Painting

	CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA AND EAST KHAGORIJAN, ASSAM SPECIFICATION FOR SURFACE PREPARATION AND PAINTING	

1 INTRODUCTION

1.1 SCOPE

This specification defines the requirements for surface preparation, selection and application of primers and paints on external surfaces of equipment, vessels, machinery, piping, ducts, steel structures, etc. The items listed in the heading of tables of paint systems is indicative only, however, the contractor is fully responsible for carrying out all the necessary painting, coating and lining on external and internal surfaces as per the requirement.

2 REFERENCE CODES & STANDARDS

IS-5	: Colour coding.
RAL DUTCH Standard)	: International Standard for colour shade (Dutch Standard)
IS-101 enamels.	: Methods of test for ready mixed paints and enamels.
IS-2379	: Indian Standard for Pipe line identification colour code.
ASTM-Vol 6.01 & 6.03	: American standard test methods for Paints and Coatings.
ANSIA 13.1	: Scheme for identification of piping systems: American National Standards Institution

3 SURFACE PREPARATION STANDARDS

SSPC-PA1	: Shop, Field and Maintenance Painting of Steel.
SSPC-PA2	: Measurement of Dry Coating Thickness with Magnetic Gauges
SSPC-SP1	: Solvent Cleaning
SSPC-SP2	: Hand Tool Cleaning
SSPC-SP3	: Power Tool Cleaning
SSPC-SP5	: White Metal Blast Cleaning
SSPC-SP6	: Commercial Blast Cleaning
SSPC-SP7	: Brush –Off Blast Cleaning
SSPC-SP10	: Near White Blast Cleaning
SSPC-SP11	: Power Tool Cleaning to bare metal
SSPC-SP12	: Surface Preparation & cleaning of Steel and Other Hard material by High and Ultra High Pressure Water Jetting prior to recoating

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4 EQUIPMENT

All tools, brushes, rollers, spray guns, abrasive material, hand / power tools for cleaning and all equipment's, scaffolding materials, shot / grit blasting equipment's & air compressors etc. required to be used shall be suitable for the work and all in good order and shall be arranged in sufficient quantity.

Mechanical mixing shall be used for paint mixing operations in case of two pack systems except that the Engineer-In-charge may allow the hand mixing of small quantities at his discretion in case of specific requirement for touchup work only.

5 SURFACE PREPARATION, SHOP PRIMER COATING APPLICATION & REPAIR AND DOCUMENTATION

5.1 GENERAL

In order to achieve the maximum durability, one or more of following methods of surface preparation shall be followed, depending on condition of surface to be painted and as instructed by Engineer-In-Charge. Adhesion of the paint film to surface depends largely on the degree of cleanliness of the metal surface. Proper surface preparation contributes more to the success of the paint protective system.

- a. Manual or hand tool cleaning.
- b. Mechanical or power tool cleaning.
- c. Blast cleaning.

Mill scale, rust, rust scale and foreign matter shall be removed fully to ensure that a clean and dry surface is obtained. Unless otherwise specified, surface preparation shall be done as per provisions of relevant tables given elsewhere in this specification. The minimum acceptable standard in case of manual or hand tool cleaning shall be St.2 or equivalent, in case of mechanical or power tool cleaning it shall be St. 3 or equivalent, in case of blast cleaning it shall be SSPC-SP or ISO8501-01.

Remove all other contaminants, oil, grease etc. by use of an aromatic solvent prior to surface cleaning.

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Blast cleaning shall not be performed where dust can contaminate surfaces undergoing such cleaning or during humid weather conditions having humidity exceed 85%. In case of internal coating of storage tanks, De-humidifiers shall be used to control the humidity levels during rainy season, if painting is to be carried out during the no rain days in case of exigency of project schedule with prior permission of EPCM Consultant.

Irrespective of the method of surface preparation, the first coat of primer must be applied by airless spray/ air assisted conventional spray if recommended by the paint manufacturer on dry surface. This should be done immediately and in any case within 4 hours of cleaning of surface. However, at times of unfavorable weather conditions, the Engineer-In-Charge shall have the liberty to control the time period, at his sole discretion and/or to insist on re-cleaning, as may be required, before primer application is taken up. In general, during unfavorable weather conditions, blasting and painting shall be avoided as far as practicable.

The external surface of R.C.C. chimney to be painted shall be dry and clean. Any loose particle of sand, cement, aggregate etc. shall be removed by scrubbing with soft wire brush. Acid etching with 10-15% HCL solution for about 15 minutes shall be carried and surface must be thoroughly washed with water to remove acid & loose particles and then dried completely before application of paint.

5.2 PROCEDURE OF SURFACE PREPARATION

Air blast cleaning with abrasives

The surfaces shall be blast cleaned using one of the abrasives like copper slag, Al₂O₃ particles, chilled cast iron or malleable iron and steel at pressure of 7kg/cm² at an appropriate distance and angle depending of nozzle size maintaining constant velocity and pressure. Chilled cast iron, malleable iron and steel shall be in the form of shot or grit of size with appropriate size of G42 grade (maximum) and S250 grade size of steel shots (maximum) to obtain a desired surface profile of 35-50 microns trough to peak or specified profile in case of steel and malleable iron. The combination of steel grits and shots shall be normally in the ratio of 3:1. The quality of abrasives shall be free from contaminants and impurities and shall meet the requirements of SSPC AB 1.

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Compressed air shall be free from moisture and oil. The blasting nozzles should be venturi style with tungsten carbide or boron carbide as the materials for liners. Nozzles orifice may vary from 3/16" to 1/2". On completion of blasting operation, the blasted surface shall be clean and free from any scale or rust and must show a grey white metallic luster. Primer/first coat of paint shall be applied within 4 hours of surface preparation. Blast cleaning shall not be done outdoors in bad weather without adequate protection or when there is dew on the metal, which is to be cleaned. Surface profile shall be uniform to provide good key to the paint adhesion (i.e. 35 to 50 microns). If possible vacuum collector shall be installed for collecting the abrasives and recycling.

Mechanical or Power Tool Cleaning

Power tool cleaning shall be done by mechanical striking tools, chipping hammers, grinding wheels or rotating steel wire- brushes. Excessive burnish of surface shall be avoided as it can reduce paint adhesion. On completion of cleaning, the detached rust mill scale etc. shall be removed by clean rags and /or washed by water or steam and thoroughly dried with compressed air jet before application of paint.

Manual or hand tool cleaning

Manual or hand tool cleaning is used only where safety problems limit the application of other surface preparation procedure and hence does not appear in the tables of paint systems.

Hand tool cleaning normally consists of the following:

- a. Hand de-scaling and/or Hammering
- b. Hand scraping
- c. Hand wire brushing

Rust, mill scale spatters, old coatings and other foreign matter, shall be removed by hammering, scrapping tools, emery paper cleaning, wire brushing or combination of the above methods. On completion of cleaning, loose material shall be removed from the surface by clean rags and the surface shall be brushed, swept, dusted and blow off with compressed air/steam to remove all

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loose matter. Finally the surface may be washed with water and dried for effective cleaning.

5.3 NON-COMPATIBLE SHOP COAT PRIMER

The paint system followed for Shop coating of structures/equipment's etc., shall be mentioned in IRN. The compatibility of finishing coat should be confirmed from the paint manufacturer. In the event of use of primer such as zinc Rich epoxy, inorganic zinc silicate etc. as shop coat, the paint system shall depend on condition of shop coat. If the shop coat is in satisfactory condition showing no major defect, the shop coat shall not be removed. The touch up primer and finishing coat(s) shall be identified for application by Engineer-in-Charge.

Shop coated (coated with Primer & finishing coat) equipment should not be repainted unless paint is damaged. Repair shall be carried out as per Table 7.2 of paint systems depending upon compatibility of paint.

Shop primed equipment and surfaces will only be 'spot cleaned' in damaged areas by means of power tool brush cleaning or hand tool cleaning and then spot primed before applying one coat of field primer unless otherwise specified. If shop primer is not compatible with field primer then shop coated primer should be completely removed before application of selected paint system for particular environment.

For Package units/equipment, shop primer should be as per the paint system given in this specification. However, manufacturer's standard can be followed after review.

5.4 COATING PROCEDURE AND APPLICATION

Surface shall not be coated in rain, wind or in environment where injurious airborne elements exists, when the steel surface temperature is less than -15°C above dew point when the relative humidity is greater than 85% or when the temperature is below 4.4°C and when the ambient/substrate temp is below the paint manufacturer's recommended temperature of application and curing. Desiccant type De-humidifier equipment shall be used to control RH and Dew point. The paint application shall not be done when the wind speed exceeds 20 KM per hour.

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Blast cleaned surface shall be coated with one complete application of primer as soon as practicable but in no case later than 4 hrs the same day.

To the maximum extent practicable, each coat of material shall be applied as a continuous film uniform thickness free of probes. Any spots or areas missed in application shall be recoated and permitted to dry before the next coat is applied. Applied paint should have the desired wet film thickness.

Each coat shall be in proper state of cure or dryness before the application of succeeding coat. Material shall be considered dry for recoating when an additional coat can be applied without the development of any detrimental film irregularities, such as lifting or loss of adhesion of the under coat. Manufacturer instruction shall be followed for inter coat interval.

When the successive coat of the same colour has been specified, alternate coat shall be tinted, when practical, sufficiently to produce enough contrast to indicate complete coverage of the surface. The tinting material shall be compatible with the material and not detrimental to its service life and shall be recommended by the original paint manufacturer.

Air spray application shall be in accordance with the following:

- The equipment used shall be suitable for the intended purpose, shall be capable of properly atomizing the paint to be applied, and shall be equipped with suitable pressure regulators and gauges. The air caps, nozzles, and needles shall be those recommended by the manufacturer of the equipment for the material being sprayed. The equipment shall be kept in satisfactory condition to permit proper paint application.
- Traps or separators shall be provided to remove oil and condensed water from the air. These traps or separators must be of adequate size and must be drained periodically during operations. The air from the spray gun impinging against the surface shall show no condensed water or oil.
- Ingredients shall be kept properly mixed in the spraypots or containers during application by continuous mechanical agitation.

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- The pressure on the material in the pot and of the air at the gun shall be adjusted for optimum spraying effectiveness. The pressure on the material in the pot shall be adjusted when necessary for changes in elevation of the gun above the pot. The atomizing air pressure at the gun shall be high enough to properly atomize the paint but not so high as to cause excessive fogging of paint, excessive evaporation of solvent, or less by over spray.
- Spray equipment shall be kept sufficiently clean so that dirt, dried paint, and other foreign materials are not deposited in the paint film.
- Any solvents left in the equipment shall be completely removed before applying paint to the surface being painted.
- Paint shall be applied in a uniform layer, with over lapping at the edge of the spray pattern. The spray patterns shall be adjusted so that the paint is deposited uniformly. During application, the gun shall be held perpendicular to the surface and at a distance which will ensure that a wet layer of paint is deposited on the surface. The trigger of the gun should be released at the end of each stroke.
- All runs and sags shall be brushed out immediately or the paint shall be removed and the surface repainted.
- Areas inaccessible to the spray gun shall be painted by brush; if not accessible by brush, daubers or sheepskins shall be used.
- All nameplates, manufacturer's identification tags, machined surfaces, instrument glass, finished flange faces, control valve items and similar items shall be masked to prohibit coating deposition. If these surfaces are coated, the component shall be cleaned and resorted to its original condition.
- Edges of structural shapes and irregular coated surfaces shall be coated first and an extra pass made later.
- If spray gun shows choking, immediately de-choking procedure shall be followed.

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Airless spray application shall be in accordance with the following procedure: as per steel structure paint Manual Vol.1 & Vol.2 by SSPC, USA, Airless spray relies on hydraulic pressure rather than air atomization to produce the desired spray. An air compressor or electric motor is used to operate a pump to produce pressures of 1000 to 6000 psi. Paint is delivered to the spray gun at this pressure through a single hose within the gun, a single paint stream is divided into separate streams, which are forced through a small orifice resulting in atomization of paint without the use of air. This results in more rapid coverage with less over spray. Airless spray usually is faster, cleaner, more economical and easier to use than conventional air spray.

Airless spray equipment is mounted on wheels, and paint is aspirated in a hose that sucks paint from any container, including drums. The unit shall have in built agitator that keep the paint uniformly mixed during the spraying. The unit shall consist of in built strainer. Usually very small quantity of thinning is required before spray. In case of high build epoxy coating (two pack). 30: 1 pump ratio and 0.020-0.023" tip size will provide a good spray pattern. Ideally fluid hoses should not be less than 3/8" ID and not longer than 50ft to obtain optimum results.

In case of gun choking, de-choking steps shall be followed immediately.

Brush application of paint shall be in accordance with the following:

- Brushes shall be of a style and quality that will enable proper application of paint.
- Round or oval brushes are most suitable for rivets, bolts, irregular surface, and rough or pitted steel. Wide flat brushes are suitable for large flat areas, but they shall not have width over five inches.
- Paint shall be applied into all corners.
- Any runs or sags shall be brushed out.
- There shall be a minimum of brush marks left in the applied paint.
- Surfaces not accessible to brushes shall be painted by spray, daubers, or sheepskin.

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Manual application by sling (where 6 O'clock position of pipe is not approachable)

A canvas strip (alternatively a tinplate strip) about 450 mm wide and 1.5m long is held under the pipe by two men holding this sling move it up and down and walk slowly forward while fresh coating is poured on the pipe and they manipulate the sling so that an even coating is obtained all round the bottom. This work shall be done very carefully and by experienced personnel. There shall not be any formation of "Whiskers" and holes in the coating. The coating film shall be inspected by mirror for each coat the painter should know the WFT corresponding to the specified OFT and standardize the paint application technique to achieve the desired WFT. This has to be ensured in the qualification trial.

5.5 DRYING OF COATED SURFACES

No coat shall be applied until the preceding coat has dried. The material shall be considered dry for re-coating when another coat can be applied without the development of any film irregularities such as lifting or loss of adhesion of under coats. Drying time of the applied coat should not exceed maximum specified for it as a first coat; if it exceeds the paint material has possibly deteriorated or maxing is faulty.

No paint shall be force dried under conditions which will cause checking, wrinkling, blistering formation of pores, or detrimentally affect the conditions of the paint.

No drier shall be added to paint on the job unless specifically called for in the manufacturer's specification for the paint.

Paint shall be protected from rain, condensation, contamination, snow and freezing until dry to the fullest extent practicable.

5.6 REPAIR OF DAMAGED PAINT SURFACE.

Where paint has been damaged in handling and in transportation, there pair of damaged coating of pre-erection / fabrication and Shop primer shall be done as given below and as per the Table 7.2 of this specification.

Repair of damaged in organic zinc silicate primer after erection / welding in the design temperature of -90°C to 550°C.

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Surface Preparation: Quickly remove the primer from damaged area by mechanical scraping and emery paper conforming to SSPC-SP-3 to expose the white metal. Blast clean the surface, if possible. Feather the primed surface over the intact adjacent surface surrounding the damaged area by emery paper.

Primer Coating: One coat of F-9 shall be applied wherever damaged was observed on pre-erection, pre-fabrication / shop primer of inorganic zinc silicate coating (F-9). F-9 shall not be applied if damaged area is not more than 5x5 cm.

5.7 PAINT APPLICATION

Shop priming / pre-erection priming with F9 or F12 shall be done only on blasted surface (SSPC-SP-10)

Shop priming / pre-erection priming with F9 or F12 shall be done only with airless spray.

For large flat surface field painting shall be done by airless spray otherwise brush can be used.

5.8 ASSESSMENT OF PAINTING REQUIREMENT

The paint system to be applied for a specific job shall be arrived at sequentially as given below:

- Identify the environment from area classification details and chose the appropriate table.
- Identify the design temperature from the technical documents
- Identify the specific field paint system and surface preparation requirement from the above identified table and temperature range.
- Identify the shop priming requirement from Table 7.1 based on compatibility of the above paint system.
- Identify the need of repair of shop primer and execute as per Table 7.2.

5.9 DOCUMENTATION

Detailed QAP.

Painting schedule.

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Daily progress report with details of weather condition, particular of applications, no of coats and type of materials applied, defects, progress of work etc.

Results of measurement of temperatures relative humidity, surface profile, film thickness, holiday detection, adhesion tests with signature of appropriate authority.

Particulars of surface preparation and paint application during trials and during the work.

Details of non-compliance reject and repair.

Type of testing equipment and calibration.

Code and batch numbers of paint materials used.

TABLE-1 (for clause 5.0) SURFACE PREPARATION STANDARDS

SI NO	DESCRIPTION	VARIOUS INTERNATIONAL STANDARDS (EQUIVALENT)			REMARKS
		IS 8501-1/SIS-05 59 00	SSPC-SP, USA	NACE, USA	
1	Manual or hand tool cleaning: Removal of loose rust, loose mill scale and loose paint. Chipping, scrapping and wire brushing. surface should have a faint metallic sheen	ST.2	SSPC-SP-2	--	This method is applied when the surface is exposed to normal atmospheric conditions when other methods cannot be adopted and also for spot cleaning during maintenance painting.
2	Mechanical or power tool cleaning: Removal of loose rust, loose mill scale and loose paint to degree specified by power tool chipping, De-scaling, sanding, wire brushing and grinding, after removal of dust, surface should have a pronounced metallic sheen.	ST.3	SSPC-SP-3	--	

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3	Dry abrasive blast cleaning: There are four common grades of blast cleaning				
3.1	White metal: Blast cleaning to white metal cleanliness. Removal of all visible rust. Mill scale, paint & foreign matter 100% cleanliness with desired surface profile.	SA 3	SSPC-SP-5	NACE # 1	Where extremely clean surface can be expected for prolong life of paint system.
3.2	Near white metal: Blast cleaning to near white metal cleanliness, until at least 95% of each element of surface area is free of all visible residues with desired surface profile.	SA 2 ½	SSPC-SP-10	NACE # 2	The minimum requirement for chemically resistant paint systems such as epoxy, vinyl, polyurethane based and inorganic zinc silicate paints, also for conventional paint systems used under fairly corrosive conditions to obtain design life of paint.
3.3	Commercial Blast: Blast cleaning until at least two-third of each element of surface area is free of all visible residues with desired surface profile.	SA 2	SSPC-SP-6	NO.3	For steel required to be painted with conventional paints for exposure to mildly corrosive atmosphere for longer life of the paint systems.
3.4	Brush-off Blast: Blast cleaning to white metal cleanliness, removal of all visible rust, mill scale, paint & foreign matter. Surface profile is not so important	SA 1	SSPC-SP-7	NO.4	

6 PAINT MATERIALS

Paint manufacturers shall furnish the characteristics of all paint materials on printed literature, along with the test certificate for all the specified characteristics given in this specification. All the paint materials shall be of first quality and conform to the following general characteristics as per the tables 6.1, 6.2 and 6.3.

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PAINT MATERIALS

TABLE No. 6.1 PRIMERS

Sl. No.	DESCRIPTION	P-2	P-4	P-6	P-7
1	Technical name	Chlorinated rubber Zinc Phosphate primer.	Etch primer/wash primer	Epoxy zinc phosphate primer	ZINGA synthetic zinc primer
2	Type and composition	Single pack, air drying chlorinated rubber based medium plasticized with unsaponifiable plasticizer, pigmented with Zinc phosphate	Two pack polyvinyl butyral resin medium cured with phosphoric acid solution pigmented with zinc tetroxychromate	Two component polyamine cured epoxy resin medium, pigmented with zinc phosphate.	One pack Synthetic Resin based zinc primer containing 96% of electrolytic zinc dust of 99.995% purity.
3	Volume Solids (minimum)	40%.	7-8%	40%	37%
4	DFT (Dry Film thickness) per coat (minimum)	30-40 μ	8-10 μ	40-50 μ	40-50 μ
5	Theoretical covering capacity in m ² /coat/litre (minimum)	8-10	8-10	8-10	4 m ² /kg
6	Weight per litre in kgs/litre (minimum)	1.3	1.2	1.4	2.67kg at 15°C
7	Touch dry at 30°C (minimum)	30 minutes	2 hrs	After 30 min.	10 minutes
8	Hard dry at 30°C (maximum.)	24 hrs	24 hrs	24 hrs	24 hrs

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9	Over coating interval	Min.: 8 hrs	Min: 4-6 hrs	Min.:8hrs	Min.:4 hrs
10	Pot life at 30°C for two component paints (minimum)	Not Applicable	Not applicable	6 - 8 hrs	Unlimited
11	Temperature (Resistance (minimum)	60°C	NA	80°C	100°C

PAINT MATERIALS

TABLE No. 6.2 FINISH PAINTS

Sl. No	DESCRIPTION	F-2	F-3	F-6 A/B	F-7
1	Technical name	Acrylic polyurethane finish paint	Chlorinated rubber based finish paint	Epoxy-High build finish paint	High build coaltar epoxy coating
2	Type & composition	Two-pack aliphatic isocyanate cured acrylic finish paint	Single pack plasticized chlorinated rubber based medium with chemical and weather resistant pigments	F6A: Two-pack polyamine cured epoxy resin medium suitably pigmented. F6B: Polyamide cured epoxy resin medium suitable pigmented.	Two-pack polyamide cured epoxy resin blended with coaltar medium, suitably pigmented
3	Volume Solids (minimum)	40%	40%	62%	65%
4	DFT (Dry Film thickness) per	30-40μ	30-40μ	100-125μ	100-125μ

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	coat (minimum)				
5	Theoretical covering capacity in m ² /coat/ litre (minimum)	10-13	8-10	5-6	5.2-6.5
6	Weight per liter in kgs/litre (minimum)	1.3	1.2	1.4	1.5
7	Touch dry at 30°C (maximum)	1 hr	30 minutes	3 hrs	4 hrs
8	Hard dry at 30°C (maximum) Full cure 30°C (for immersion / high temperature service)	16 hrs 5 days	8hrs NA	16 hrs 5 days	48 hrs 5 days
9	Over-coating interval at 30°C	Min: 12 hrs	Min: Overnight	Min: Overnight Max : 5 days	Min: 24 hrs Max: 5 days
10	Pot life (approx.) at 30°C for two component paints (minimum)	6-8 hrs	Not applicable	4-6 hrs	4-6 hrs
11	Temperature Resistance (minimum)	80°C	60°C	80°C	125°C

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PAINT MATERIALS

TABLE No. 6.3 FINISH PAINTS

Sl. No	DESCRIPTION	F-8	F-9	F-11	F-12
1	Technical name	Self priming type surface tolerant high build epoxy coating (complete rust control coating)	Inorganic zinc silicate coating	Heat resistant synthetic medium based two packs Aluminium paint suitable up to 250°C dry temp.	Heat resistant silicone Aluminium paint suitable up to 500°C dry temp.
2	Type & composition	Two pack epoxy resin based suitable pigmented and capable of adhering to manually prepared surface and old coating.	A two pack air drying self curing solvent based inorganic zinc silicate coating with minimum 80% zinc content on dry film. The final cure of the dry film shall pass the MEK rub test.	Heat resistant synthetic medium based two pack Aluminium paint suitable upto 250°C.	Single pack silicone resin based medium with Aluminium flakes.
3	Volume Solids (minimum)	72%	60%	25%	20%
4	DFT (Dry Film thickness) per coat (minimum)	100-125μ	65-75μ	20-25μ	20-25μ
5	Theoretical covering capacity in m ² /coat/	6.0-7.2	8-9	10-12	8-10

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	litre (minimum)				
6	Weight per liter in kgs/litre (minimum)	1.4	2.3	1.2	1.1
7	Touch dry at 30°C (maximum)	3 hrs	30 minutes	3 hrs	30 minutes
8	Hard dry at 30°C (maximum) Full cure 30°C (for immersion/high temperature service)	24 hrs 5days	24 hrs NA	24 hrs NA	24 hrs NA
9	Over-coating Interval	Min.:10 hrs	Min.: 12 hrs at 20°C & 50%RH	Min: 24 hrs	Min.: 24 hrs
10	Pot life at 30°C for two component paints (minimum)	90 minutes	4-6 hrs	Not applicable	Not applicable
11	Temperature Resistance (minimum)	80°C	400°C	250°C	500°C

PAINT MATERIALS

TABLE No. 6.4 FINISH PAINTS

Sl No	DESCRIPTION	F-14	F-15	F-16	F-17
1	Technical name	Polyamine cured coal tar epoxy	Two-component Epoxy phenolic coating cured with Polyamine adduct hardner system (primer + intermediate coat + finish paint)	Ambient temperature curing Poly Siloxane coating/High build cold applied inorganic copolymer based aluminium coating suitable for under insulation coating of CS and SS piping for high temperature service.	Two component solvent free type high build epoxy phenolic/ novalac epoxy phenolic coating cured with Polyamine adduct hardner system

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2	Type & Composition	Specially formulated polyamine cured coal tar epoxy suitable for application under insulation	Two pack ambient temperature curing epoxy phenolic coating system suitable for application under insulation of CS/SS piping	Amercoat 738, / Berger 938 or Intertherm 751 CSA	Two component solvent free type high build epoxy phenolic/ novalac epoxy phenolic coating cured with Polyamine adduct hardner system
3	Volume Solids (minimum)	70%	65%	60%	98-100 %
4	DFT(Dry Film thickness) per coat (minimum)	125 µm	75-100 µm	75-100µm	125-150µm
5	Theoretical covering capacity in m ² /coat/litre (minimum)	5.5	6.5- 8.5	6.0- 8.0	6.5 - 8
6	Weightperliterinkgs/litre (mix paint) (minimum)	1.5	1.7	1.3	1.7
7	Touch dry at 30°C (maximum)	4 hrs	2 hrs	1 hr	2 hrs
8	Hard dry at 30°C (maximum) Full cure 30°C (for immersion /high temp. service)	24 hrs 168 hrs (7 days)	24 hrs 168 hrs (7 days)	16 hrs -	24 hrs 168 hrs (7 days)
9	Over-coating interval	Min.6hrs Max.5 days	Min.36hrs Max.21 days	Min. 16hrs Max. NA	Min. 16hrs Max. 21 days
10	Pot life at 30°C for two component paints (minimum)	4 hrs	1.5 hrs	1 hr	1 hr
11	Temperature Resistance (minimum)	-45°C to 125°C under	-45°C to 150°C under insulation	Up to 400 deg. C for CS & SS surfaces	-45°C to 150°C for immersion service

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		insulation	(Note: 5)	under insulation	

NOTES: (For tables 6.1 to 6.4)

1. Covering capacity and DFT depends on method of application. Covering capacity specified above is theoretical. Allowing the losses during application, min specified DFT should be maintained.
2. All primers and finish coats should be cold cured and air drying unless otherwise specified.
3. All paints shall be applied in accordance with manufacturer's instructions for surface preparation, intervals, curing and application. The surface preparation, quality and workmanship should be ensured. In case of conflict between this specification and manufacturer's recommendation, the same shall be clarified.
4. Technical data sheets for all paints shall be supplied at the time of submission of quotations.
5. F-15: Two-component Epoxy phenolic coating cured with Polyamine adducts hardner system (primer + intermediate coat + finish paint) suitable upto 225°C (Intertherm 228).
6. F-16: Ambient temperature curing epoxy poly siloxane Coating or high build cold applied inorganic co-polymer based aluminium coating.

6.5 STORAGE

All paints and painting materials shall be stored only in rooms to be arranged by contractor and approved by Engineer-in-charge for the purpose. All necessary pre cautions shall be taken to prevent fire. The storage building shall preferably be separate from adjacent building. A signboard bearing the word "PAINTSTORAGE- NO NAKEDLIGHT- HIGHLY INFLAMMABLE" shall be clearly displayed outside. Manufacturer's recommendation shall be followed for storage of paint materials.

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7 PAINT SYSTEMS

The paint system should be selected based on the areas classified inside the plant as given below. The Geographical corrosive and highly corrosive conditions of a plant located in Coastal and Marine area, Highly Corrosive conditions inside a plant and Industrial Corrosive Environment are taken care in the specifications in total.

ENVIRONMENT/AREA CLASSIFICATION

- Corrosive Environment-Offsite areas (excluding Cooling Tower area, DM-plant)
- Corrosive Environment-Unit areas
- Highly Corrosive Environment-Unit & Offsite areas of a plant with corrosive fumes like HCL, H₂SO₄, Water impingement, Salty water, Chloride and water mist, Cooling Tower areas, DM Plant area.

Notes :

1. Painting systems (Primers, Finish Paints etc) based upon Area classification/ Environments (Corrosive / Highly Corrosive) / Applications are tabulated in Tables 8.0 to 17.0.
2. Primers & Finish paints covered in Tables 8.0 to 17.0 are listed in Table 7.1.
3. Repair of Pre-Erection/Pre-Fabrication & Shop priming after erection/welding shall be done as per Table 7.2.

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TABLE 7.1: LIST OF PRIMERS & FINISH COATS COVERED IN TABLE NOS. 8.0-14.0

PRIMERS	
P-2	Chlorinated rubber zinc Phosphate Primer
P-4	Etch Primer/Wash Primer
P-6	Two component Epoxy Zinc Phosphate Primer cured with polyamine hardner
P-7	Single pack, synthetic resin based 'ZINGA' zinc primer containing 96% of electrolytic zinc dust in dry film

FINISH COATS/PAINTS	
F-2	Two component Acrylic — Polyurethane finish paint
F-3	Chlorinated Rubber finish paint
F-6A	High Build Epoxy finish coating cured with polyamine hardner
F-6B	High Build Epoxy finish coating cured with polyamide hardner
F-7	High build coal tar epoxy coating cured with polyamine hardner
F-8	Self priming surface Tolerant High Build epoxy coating cured with polyamine hardner
F-9	Two component Inorganic Zinc Silicate coating
F-11	Heat resistant synthetic medium based Aluminium paint
F-12	Two component Heat resistant Silicone Aluminium paint
F-14	Specially formulated coal tar epoxy coating cured with polyamine hardner
F-15	Two component Epoxy phenolic coating cured with Polyamine adduct hardner system
F-16	Engineered Epoxy poly Siloxane Coating or high build cold applied inorganic co-polymer based aluminium coating
F-17	Two component solvent free type high build epoxy phenolic/novalac epoxy phenolic coating cured with Polyamine adduct hardner system

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TABLE 7.2 REPAIR OF PRE-ERECTION/PRE-FABRICATION & SHOP PRIMING AFTER ERECTION/WELDING for all insulated and un-insulated CS, LTCS& low alloy steel items in all environments. (Refer clauses 5.4, 5.5& 5.9)

SI No.	Design Temp. in °C	Surface Preparation	Paint System	Total DFT in Microns (min.)	Remarks
7.2.1	-40 to 150 for structures, hand rails and Gratings only	SSPC-SP-3	1 coat of F-9 or 2 coats of P-7 @ 40µDFT/coat	65-75 (F-9) or 80 (P-7)	For few isolated damaged areas of more than 5x5 CM
7.2.2	-90 to 400	SSPC-SP-3	1 coat of F-9	65-75	-DO-
7.2.3	401 to 550	SSPC-SP-3	1 coat of F- 12	20	-DO-

NOTES :

- 1) The application and repair of pre-erection/pre-fabrication & Shop Priming given in above tables shall be done for all the items to be painted. In case the damages of primer are severe and spread on large areas, the Engineer-in-Charge may decide to advice re-blasting and priming again if required.
- 2) The pre-fabrication primer P-7, 'ZINGA' primer is recommended as alternative repair primer to F-9 for Structures, Hand Rails and Gratings only. F-9 shall be used for all other areas.

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TABLE 8.0 PAINT SYSTEM FOR CORROSIVE ENVIRONMENT-OFF SITE ARE AS (excluding Cooling Tower area & DM Plant area) for external surfaces of Un-insulated Structures, Piping, Equipments, Pumps, Vessels etc (Note- 1); (For Carbon Steel, LTCS& Low Alloy Steel)

Sl. NO	Design Temperature in °C	Surface Preparation & Pre-erection / shop primer	Paint system (Field)		Total final DFT in Microns (min)	Remarks
			Primer	Finish Paint		
8.1	-90 to -15	SSPC-SP-10; 1 coat of F-9 @ 65-75 μ DFT/coat	None	None	65-75	No over-coating to be done on F-9 as it will lead to mud cracking F-3 paint shall contain pure chlorinated rubber, not modified. F-12 shall be ambient temperature curing type. Flare lines shall be painted as per Table 9.0.
8.2	-14 to 60	SSPC-SP-10; 1 coat of F-9 @ 65-75 μ DFT/coat	1 coat of P-2 @ 40 μ DFT/coat	2 coats of F-3 @ 40 μ DFT/; (2x40=80)	185	
8.3	61 to 80	SSPC-SP-10; 1 coat of F-9 @ 65-75 μ DFT/coat	1 coat of P-6 @ 40 μ DFT/coat	1 coat of F-6B @ 100 μ DFT/coat + 1 coat of F-2 @ 40 μ DFT/coat; (100+40=140)	245	
8.4	81 to 250	SSPC-SP-10; 1 coat of F-9 @ 65-75 μ DFT/coat	None	3 coats of F11 @ 20 μ DFT/coat; (3x20=60)	125	
8.5	251 to 400	SSPC-SP-10; 1 coat of F9@ 65-75 μ DFT/coat	None	2 coats of F-12 @ 20 μ DFT/coat (2x20=40) or 1 coat of F-16 @ 50 μ DFT/coat.	105-115 or 115-125	

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8.6	401 to 550	SSPC-SP-10; 1 coats of F-12 @ 20 μDFT/coat	None	2 coats of F-12 @ 20 μDFT/coat (2x20=40)	60	

NOTES:

- 1) The list of items given in the heading of the above table is not exhaustive. The Contractor is fully responsible for completing painting including pre fabrication primer for all the items supplied and fabricated through his scope of work.
- 2) For external surfaces of MS chimney with/without refractory lining and for internal surfaces of MS chimney without refractory lining 8.3, 8.4 & 8.5 shall be followed.
- 3) For external surfaces of RCC chimney: 2 coats of F-6 @ 100μ OFT/coat to obtain 2x100=200μ DFT shall be applied after making surface preparation as per guidelines in 5.1.5.
- 4) If the Pre-erection/Pre-fabrication & Shop Primer has already been completed, the same shall not be repeated again in the field. In case the damages of primer are severe and spread over large areas, the engineer-in-charge may decide & advise re-blasting and priming again. Repair of pre-fabrication/pre-erection primer, if required, shall be done as per Table 7.2.
- 5) In case of Paint systems as per SI Nos 8.5 and 8.6, the colour band shall be applied over the Aluminum paint as per the Colour coding requirement for specific service of piping given in Clause 15.0.

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TABLE 9.0 PAINT SYSTEM FOR CORROSIVE ENVIRONMENT-UNIT AREAS for external surfaces of Un-insulated Structures, Piping, Equipments, Columns, Towers, Vessels, Pumps, Compressors, Blowers etc(Note-1);(For Carbon Steel, LTCS& Low Alloy Steel)

SI.NO	Design Temperature in °C	Surface Preparation & Pre-erection /shop primer	Paint system (Field)		Total final DFT in Microns (min)	Remarks
			Primer	Finish Paint		
9.1	-90 to -15	SSPC-SP-10; 1 coat of F-9 @65-75 μDFT/coat	None	None	65-75	No over-coating to be done on F-9 as it will lead to mud cracking. F-12 shall be ambient temperature curing type
9.2	-14 to 80	SSPC-SP-10; 1coat of F-9 @ 65-75μDFT/coat	1 coat of P-6 @40 μDFT/coat	1 coat of F-6A @ 100 μDFT/coat + 1 coat of F-2 @ 40μDFT/coat; (100+40=140)	245-255	
9.3	81 to 400	SSPC-SP-10; 1 coat of F-9@ 65-75μ DFT/coat	None	2 coats of F-12@ 20 μDFT/coat (2x20=40) or 1 coat of F-16 @50 μDFT/coat	105-115 or 115-125	
9.4	401 to 550	SSPC-SP-10; 1coat of F-12 @ DFT/coat 20 μDFT/coat	None	2 coats of F-12 @ 20 μ DFT/coat (2 x 20=40)	60	

Notes:

- 1) The list of items given in the heading of the above table is not exhaustive. The Contractor is fully responsible for completing painting including prefabrication primer for all the items supplied and fabricated through his scope of work.

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2) If the Pre-erection/Pre-fabrication & Shop Primer has already been completed, the same shall not be repeated again in the field. In case the damages of primer are severe and spread over large areas, the engineer-in-charge may decide & advise re-blasting and priming again. Repair of pre-fabrication/pre-erection primer, if required, shall be done as per Table 7.2.

3) In case of paint systems as per SI Nos 9.3 and 9.4, the colour band shall be applied over the Aluminum paint as per the Colour coding requirement for specific service of piping given in clause 15.0.

TABLE 10.0 PAINT SYSTEM FOR HIGHLY CORROSIVE ENVIRONMENT- UNIT & OFFSITE AREAS OF THE PLANT with corrosive fumes like HCL, H₂SO₄, Water Impingement, Salty Water, Chloride & Water Mist, DM Plant Area, Cooling Tower Area for external surfaces of Un-insulated Structures, Piping, Equipment's, Towers, Columns, Vessels, Pumps, Compressors, Blowers etc (Note-1); (For Carbon Steel, LTCS & Low Alloy Steel)

Sl. No	Design Temperature in °C	Surface Preparation & Pre-erection /shop primer	Paint system (Field)		Total final DFT in Microns (min)	Remarks
			Primer	Finish Paint		
10.1	-90 to -15	SSPC-SP- 10; 1 coat of F-9 @ 65-75 μ DFT/coat	None	None	65-75	No over coating to be done on F-9 as it will lead to mud cracking F-12 shall be ambient temperature curing type.
10.2	-14 to 80	SSPC-SP- 10; 1 coat of F-9 @ 65-75 μ DFT/coat	1 coat of P6 @ 40 μ DFT/coat	2 coat of F-6A @ 100 μ DFT/coat + 1 coat of F-2 @ 40 μ DFT/coat; (2x 100+40=240)	345-355	
10.3	81 to 400	SSPC-SP- 10; 1 coat of F-9 @ 65-75	None	2 coats of F-12 @ 20 μ DFT/coat 2x20=40 or 1 coat of F-16	105-115 or 115-125	

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		μ DFT/coat		@ 50 μ DFT/coat.		
10.4	401 to 550	SSPC-SP- 10; 1coat of F-12 @ 20 μ DFT/coat	None	2 coats of F- 12@ 20 μ DFT/coat 2x20=40	60	

Notes :

- 1) The list of items given in the heading of the above table is not exhaustive. The Contractor is fully responsible for completing painting including prefabrication primer for all the items supplied and fabricated through his scope of work.
- 2) If the Pre-erection/Pre-fabrication & Shop Primer has already been completed, the same shall not be repeated again in the field. In case the damages of primer are severe and spread over large areas, the engineer-in-charge may decide & advise re-blasting and priming again. Repair of pre-fabrication/pre-erection primer, if required, shall be done as per Table 7 .2
- 3) In case of paint systems as per SI Nos 10.3 and 10.4, the colour bands shall be applied over the Aluminum paint as per the Colour coding requirement for specific service of piping given in clause 15.0.

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TABLE 11.0 COATING SYSTEM FOR EXTERNAL SIDE OF UNDERGROUND CARBON STEEL PLANT PIPING AND UNDER GROUND TANKS IN ALL AREAS

SI.NO	Design Temperature in °C	Surface Preparation	Paint system (field)		Total final DFT in Micro ns (min)	Remarks
			Primer	Finish Paint		
11.1	Underground carbon steel plant piping (Yard/Over the Ditch corrosion protection coating)					
11.1.1	25 to 65	SSPC-SP-10	1 coat of synthetic fast drying primer 25μ@DFT/ T/ coat	1 layer of coaltar tape coating @ 2mm +1 coat of synthetic fast drying primer 25 μ@ DFT/ coat +1 layer of coal tar tape coating @ 2mm /layer	4 mm	The primer DFT is not measurable . Reconciliation primer shall be done by coverage of maximum 10 sq. m / litre
11.2	Carbon steel plant piping (underground).					
11.2.1	66 to 150	SSPC-SP-10	1 coat of F-17 primer@ 125μ DFT/coat	1 coat of F-17 intermediate coat @125μ DFT/coat + 1 coat of F-17 finish coat @ 125μ DFT/coat; (125+125=250)	375	
11.2.2	151 to 400	SSPC-SP-10	1 coat of F-16 primer@ 125μ DFT/coat	1 coat of F-16 finish coat@125μ DFT/coat	250	
11.3	External side of un-insulated underground storage tanks					

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11.3.1	-40 to 80	SSPC-SP-10	1 coat of F-9 @65-75μ DFT/coat	3 coats of F-7@100μ DFT/coat (3x100=300)	365-375	
11.3.2	81 to 150	SSPC-SP-10	1 coat of F-17 primer@125μ DFT/coat	1 coat of F-17 intermediate coat @125μ DFT/coat + 1 coat of F-17 finish coat @ 125μ DFT/coat; (125+125=250)	375	
11.3.2	151 to 400	SSPC-SP-10	1 coat of F-16 primer @ 125 μ DFT/coat	1 coat of F-16 finish coat@125μ DFT/coat	250	

TABLE 12.0 PAINTING UNDER INSULATION (ALL ENVIRONMENT)

All areas (Units & Off-sites) for insulated Piping, Storage Tanks, Equipment's etc (Note-1); (For Carbon Steel, LTCS, Low Alloy Steel & Stainless Steel)

SI.No	Design Temperature in °C	Surface Preparation & Pre-erection / shop primer	Paint system (field)		Total final DFT in Microns (min)	Remarks
			Primer	Finish Paint		
12.1	Insulated carbon steel, LTCS, and low alloy steel piping, storage tank, Equipments etc.					
12.1.1	-45 to 125	SSPC-SP- 10; 1coat of F-9 @ 65-75µDFT/coat	None	2 coats of F-14 @125µDFT/coat; (2x125=250) or 3 coats of F-15 @ 80µDFT/coat; (3x80=240)	315-325 or 305-315	No over-coating to be done on F-9 as it will lead to mud cracking.
12.1.2	126-400	SSPC-SP- 10; 1coat of F-9 @ 65-75µ DFT/coat	None	3 coats of F-12 20µDFT/coat; (3x20=60) or 1 coats of F-16 @ 60µDFT/coat;	125-135	F-12 shall be ambient temperature curing type

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12.2	Insulated stainless steel including alloy -20 piping (Note:2)					
12.2.1	Below 0°C to all minus temperature	Aluminium sheeting with aluminium foil and “Chloride free mineral sealant coating barium chromate” shall be applied.				If the piping & equipments are already erected then surfaces shall be prepared by cleaning with emery paper and wash/flush with chloride free DM water followed by wiping with organic solvent
12.2.2	0 to 125	SSPC-SP-10 (15-25µ surface profile) 1 coat of F-14@ 125µ DFT/coat	None	1 Coat of F-14@ 125µ DFT/coat	250	
	0 to 125 (alternative)	SSPC-SP-10 (15-25µ surface profile) 1 coat of F-15@ 80µ DFT/coat	None	1 Coat of F-15 intermediate coat@ 80µ DFT/coat + 1 coat of F-15 finish coat @80µ DFT/coat; (80+80=160)	240	
12.2.3	121 to 400	SSPC-SP-10; 1 coat of F-16 @ 125µ DFT/coat	None	1 Coat of F-16@ 125µ DFT/coat	250	
12.2.4	401 to 600	SSPC-SP-10; 1 coat of Amercoat 738 @ 125µ DFT/coat	None	1 Coat of Amercoat 738 @ 125µ DFT/coat	250	Only Amercoat 738 is suitable for the temperature of 600 deg.C and cyclic temperature.
12.2.5	Cyclic service (-)196 to 480 excepting (-)45 to 120	SSPC-SP- 10 1 coat of Amercoat 738 @125µ DFT/coat	None	1 coat of Amercoat 738 @ 125µ DFT/coat	250	
12.3	No painting is required for insulated monel, incoloy and nickel lines.					

Notes :

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1. Refer Notes 1&4 of Table 8.0.
2. The blast cleaning abrasives for SS and Alloy steel surfaces shall be SS grits/shots or Aluminium oxide grits/shots.
3. For SS surfaces with cyclic temperature of -45 to 125 deg.C, both 12.2.1 & 12.2.2 are applicable.

TABLE 13.0 INTERNAL PROTECTION OF CARBON STEEL COOLERS / CONDENSERS
Water boxes, channels, partition plates, end covers and tube sheets etc.

Sl.No	Design Temperature in °C	Surface Preparation & pre-erection / shop primer	Paint system (field)		Total final DFT in Microns (min)	Remarks
			Primer	Finish Paint		
13.1	Upto 65	SSPC-SP- 10; 1coat of P-6 @ 40µDFT/coat	None	2 coats of F-7@125µ DFT/coat; (2x125=250)	290	For CS Surfaces
13.2	Upto 65	SSPC-SP- 3; 1coat of P-4 @ 8-10µDFT/coat + 1 coat of P-6@ 40µ DFT/coat	None	2 coats of F-7@125µ DFT/coat; (2x125=250)	300	(Non ferrous and brass tube sheets)

TABLE 14.0 PAINTING SYSTEM FOR EFFLUENT TREATMENT PLANT

Sl.NO	Design Temperature in °C	Surface Preparation	Paint system (field)		Total final DFT in Microns (min)	Remarks
			Primer	Finish Paint		
14.1	For external surfaces of CS/MS items: Screens, Walk way bridges, Baffles, Dual media filters, Vertical pumps, piping in treated effluent sump, bio-sludge pump, Screw pump and pump house, CS tanks, sumps and vessels					

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14.1.1	-14 to 80	SSPC-SP-10	1 coat of F-9@ 65-75µ DFT/coat	2 coats of F-6A @ 100µDFT/coat + 1 coat of F-2@ 40 Microns DFT/coat; (2x100+40=240)	305-315	
14.2	For internal surfaces of CS/MS Items: Bio-sludge sump, Filter feed sump, Process sump, Sanitary sump, Transfer sump, Sludge, Slop oil tank, and scrapping mechanism in Clarifier.					
14.2.1	-14 to 80	SSPC-SP-10	1 coat of F-9@65-75µDFT/Coat	3 coats of F-6A@100µ DFT/Coat (3X100=300)	365-375	Note-1
14.3	All R.C.C/ concrete surfaces exposed to effluent water /liquid such as tanks, structures, drains etc in Process sump, TPI separator (Process and Oil), Aeration Tank and Transfer sump etc.					
14.3.1	-14 to 80	Blast cleaning to SSPC-SP guide lines and Acid etching with 10-15% HCL acid followed by thorough water washing.	Epoxy screed lining	Epoxy screed lining	3 mm	
14.4	C.S / M.S Dual media filters (Internal), Chemical dosing tanks(internal) such as Di-ammonium Phosphate and Urea					
14.4.1	Upto 60	SSPC-SP-10	-	Rubber Lining	4.5mm	

Notes:

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1. The paint/coating manufacturers shall provide their Quality control test certificate of coating materials (F-6A) for immersion service of the exposed effluent given in 14.2

15 PIPING COLOUR CODE

The following colour coding system has been made based on international standards like ASME/ ANSI, BS and Indian Standard.

15.1 IDENTIFICATION

The system of colour coding consists of a ground colour and secondary colour bands super imposed over the ground colour. The ground colour identifies the basic nature of the service and secondary colour band over the ground colour distinguishes the particular service. The ground colour shall be applied over the entire length of the un-insulated pipes. For insulated lines ground colour shall be provided as per specified length and interval to identify the basic nature of service and secondary colour bands to be painted on these specified length to identify the particular service. Above colour code is applicable for both unit and offsite pipelines.

The following ground colour designation for identification of basic classification of various important services shall be followed:

Post office red	-	Fire protection materials
Dark admiralty grey	-	crude oil, lube oil
Sky blue	-	Water (all purities and temperatures)
Sea green	-	Air and its components

Secondary colours:

The narrow bands presenting the secondary colour which identifies the specific service, may be applied by painting or preferably by use of adhesive plastic tapes of the specific colour.

15.2 COLOUR BANDS AND IDENTIFICATION LETTERING

The following specifications of colour bands shall be followed for identifying the piping contents, size and location of bands & letters. The band width and size of

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letters in legends will depend to some extent upon the pipe diameter. Either white or black letters are selected to provide maximum contrast to the band colour. Bands usually are 50 mm wide and regardless of band width, are spaced 25 mm apart when two bands are employed.

Table 1.0: Colour bands and size of lettering for piping:

Outside diameter of pipe or covering in mm	Width of colour bands in mm	Size of legend letters in mm
19to32	200	13
38to51	200	19
64 to 150	300	32
200to 250	600	64
Over 250	800	89

In addition, ground colour as per specified length should be provided on insulated piping for easy identification of nature of fluid, on which the colour bands should be painted for identification of each service. The length of the ground colour should be 3 times the width of normal band or 2 meters, whichever is suitable depending on the length of the pipe.

Size of letters stenciled/ written for equipment shall be as given below:

Column and vessel : 150 mm (Height)

Pump, compressor and other machinery :50 mm (Height)

In addition, the contents of the pipe and/or direction of flow may be further indicated by arrows and legend. If a hazard is involved it must be identified clearly by legend.

Colour bands: The location and size of bands, as recommended, when used, shall be applied to the pipe:

- On both sides of the valves, tees and other fittings of importance.

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- Where the pipe enters and emerges from walls and where it emerges from road & walkway overpasses, unit battery limits.
- At uniform intervals along long sections of the pipe.
- Adjacent to tanks, vessels, and pumps.

For piping, writing of name of service and direction of flow for all the lines shall be done at following locations:

The letters will be in black on pipes painted with light shade colours and white on pipes painted with dark shade colours to give good contrast.

Only writing of service name shall be done on stainless steel lines. Pre cautions should be taken while painting by using low chloride content painting to avoid any damage to the stainless steel pipes. It is preferable to use adhesive plastic tapes to protect stainless steel pipes.

Colour band specification:

- a) Unit Area: Bands at intervals of 6.0 meters.
- Offsite Area: Bands at intervals of 10.0 meters.

- b) Each pipe segment will have minimum one band indication, irrespective of length.

- c) The bands shall also be displayed near walkways, both sides of culverts, tanks, dykes, tanks, vessels, suction and discharge of pumps / compressors, unit battery limit, near valves of line, etc.

For alloy steel/stainless steel pipes and fittings in stores/fabrication yard, color band (Minimum 1/2" wide) should be applied along the complete length of pipe, bends/tees, side-curved surface (on thickness) of flanges as well as valves as per the metallurgy.

In case of camouflaging requirements of civil defence or any other location requirements, the same shall be followed accordingly.

The specification for application of the complete Piping identification colour code, including base and bands colours, are presented in the following table confirming to RAL colour shades of Dutch Standard:

 ऑयल इंडिया लिमिटेड Oil India Limited	CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA AND EAST KHAGORIJAAN, ASSAM SPECIFICATION FOR SURFACE PREPARATION AND PAINTING	 KAVIN™

RECOMMENDED RAL COLOUR CODE FOR PAINTING OF PIPING AND EQUIPMENT

Sl. NO	SERVICE	RECOMMENDED COLOUR FOR PAINT SYSTEM	RALCOLOUR CODE	
			BASE COLOUR	BAND COLOUR
1	LUBE OILS	Dark Admiralty grey with 1 green band	7012	6010
2	FUEL OIL	Black with 1 yellow band	9005	1023
WATER LINES				
3	RAW WATER	Sky blue with 1 black band	5015	9005
4	INDUSTRIAL WATER	Sky blue with 2 signal red band	5015	3001
5	DRINKING WATER	Sky blue with 1 green band	5015	6010
6	ETP TREATED WATER	Sky blue with 2 oxide red bands	5015	3009
FIRE PROTECTION SYSTEM (ABOVE GROUND)				
7	FIRE WATER FOAM& EXTINGUISHERS	Post office red	3002	
AIR & OTHER GAS LINES (UNINSULATED)				
8	INSTRUMENT AIR	Sea green with 1black band	6018	9005
9	NITROGEN	Sea green with 1orange band	6018	2011
10	GAS (FUEL)	Orange with 1 aluminium band	2011	9006
UNINSULATED EQUIPMENTS, TANKS AND STRUCTURES				

	CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA AND EAST KHAGORIJAN, ASSAM SPECIFICATION FOR SURFACE PREPARATION AND PAINTING	

11	HEATER STRUCTURE	Steel grey	7011
12	HEATER CASING	Heat resistant aluminium	9006
13	VESSELS & COLUMNS	Aluminium	9006
14	HEAT EXCHANGER	Heat resistant aluminum	9006
15	TANKS	Aluminum / Off white	9006
16	COMPRESSORS AND BLOWERS	Dark admiralty grey	7012
17	PUMPS	Navy blue	5014
18	MOTORS AND SWITCH GEAR	Bluish green	5024
19	HAND RAILING	Signal red	3001
20	STAIRCASE, LADDER AND WALKWAYS	Black	9005
21	LOAD LIFTING EQUIPMENT AND MONORAILS ETC	Leaf brown	8003
22	GENERAL STRUCTURE	Black	9005
Pipes and fittings of alloy steel and SS material in store			
23	5Cr-0.5Mo	Satin blue	5012
24	2 1/4Cr-1Mo	Aircraft yellow	1026
25	1 1/4Cr-1/2 Mo	Traffic yellow	1023
26	SS-304	Dark blue grey	5008
27	SS-316	Dark violet	4005

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28	SS-321	Navy blue	5014	
SAFETY COLOUR SCHEMES				
29	Dangerous obstruction	Black and alert orange band	9005	2008
30	Dangerous or exposed parts of machinery	Alert orange	2008	

16 IDENTIFICATION OF VESSELS, PIPING ETC.

Equipment number shall be stenciled in black or white on each vessel, column, equipment & machinery (insulated or un insulated) after painting. Line number in black or white shall be stenciled on all the pipe lines of more than one location as directed by Engineer-In-Charge, Size of letter printed shall be as below:

Column & Vessels - 150mm (high)

Pump, compressor & other machinery - 50mm (high)

Piping-40-150 mm

Identification of storage tanks

The storage tanks shall be marked as detailed in the drawing.

17 PAINTING FOR CIVIL DEFENCE REQUIREMENTS

Following items shall be painted for camouflaging if required by the client.

- All Columns
 - All tanks in Off-sites
 - Large Vessels
 - Spheres

Two coats of selected finishing paint as per defense requirement shall be applied in a particular pattern as per 20.3 and as per the instructions of Engineer-In-Charge.

Method of Camouflaging

Disruptive painting for camouflaging shall be done in three colours in the ratio of 5:3:2(all matt finish).

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Dark green

Light green

Dark medium brown

5:

3:

2:

The patches should be asymmetrical and irregular.

The patches should be inclined at 30° to 60° to the horizontal.

The patches should be continuous where two surfaces meet at an angle.

The patches should not coincide with corners.

Slits and holes shall be painted in dark shades.

Width of patches should be 1 to 2 meters.

18 INSPECTION AND TESTING

All painting materials including primers and thinners brought to site by contractor for application shall be procured directly from manufactures as per specifications and shall be accompanied by manufacturer's test certificates. Paint formulations without certificates are not acceptable.

Engineer-In-Charge at his discretion may call for tests for paint formulations. Contractor shall arrange to have such tests performed including batch-wise test of wet paints for physical & chemical analysis as per clause 24.4 of relevant ASTM test method. All costs there shall be borne by the contractor.

The contractor shall produce test reports from manufacturer regarding the quality of the particular batch of paint supplied. The Engineer-in-Charge shall have the right to test wet samples of paint at random for quality of same. Batch test reports of the manufacturer's for each batch of paints supplied shall be made available by the contractor.

The painting work shall be subject to inspection by Engineer-In-Charge at all times. In particular, following stage-wise inspection will be performed and contractor shall offer the work for inspection and approval of every stage before proceeding with the next stage. The record of inspection shall be maintained in the registers. Stages of inspection are as follows:

- (a) Surface preparation
- (b) Primer application
- (c) Each coat of paint

	CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA AND EAST KHAGORIJAN, ASSAM SPECIFICATION FOR SURFACE PREPARATION AND PAINTING	

In addition to above, record should include type of shop primer already applied on equipment e.g. Red oxide zinc chromate or zinc chromate or Red lead primer etc.

Any defect noticed during the various stages of inspection shall be rectified by the contractor to the entire satisfaction of Engineer-In-Charge before proceeding further. Irrespective of the inspection, repair and approval at intermediate stages of work, contractor shall be responsible for making good any defects found during final inspection/guarantee period/defect liability period as defined in general condition of contract. Dry film thickness (DFT) shall be checked and recorded after application of each coat and extra coat of paint should be applied to make-up the OFT specified without any extra cost to owner, the extra coat should have prior approval of Engineer-in-charge.

Primer Application

After surface preparation, the primer should be applied to cover the crevices, comers, sharp edges etc. in the presence of inspector nominated by Engineer-In-Charge.

The shades of successive coats should be slightly different in colour in order to ensure application of individual coats, the thickness of each coat and complete coverage should be checked as per provision of this specification. This should be approved by Engineer-In-Charge before application of successive coats.

The contractor shall provide standard thickness measurement instrument with appropriate range(s) for measuring.

Dry film thickness of each coat, surface profile gauge for checking of surface profile in case of sand blasting. Holiday detectors and pinhole detector and protector whenever required for checking in case of immersion conditions.

Prior to application of paints on surfaces of chimneys, the thickness of the individual coat shall be checked by application of each coat of same paint on M.S.test panel. The thickness of paint on test panels shall be determined by using gauge such as 'Elko meter'. The thickness of each coat shall be checked as per provision of this specification. This shall be approved by Engineer-In-Charge before application of paints on surface of chimney.

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At the discretion of Engineer-In-Charge, the paint manufacturer must provide the expert technical service at site as and when required. This service should be free of cost and without any obligation to the owner, as it would be in the interest of the manufacturer to ensure that both surface preparation and application are carried out as per their recommendations. The contractor is responsible to arrange the same.

Final inspection shall include measurement of paint dry film thickness, Adhesion, Holiday detection check of finish and workmanship. The thickness should be measured at as many points/ locations as decided by Engineer-In-Charge and shall be within +10% of the dry film thickness, specified in the specifications.

The contractor shall arrange for spot checking of paint materials for Sp.gr., glow time (ford cup) and spreading rate.

19 GUARANTEE

The contractor shall guarantee that the chemical and physical properties of paint materials used are in accordance with the specifications contained herein/to be provided during execution of work.

20 QUALIFICATION CRITERIA OF PAINTING CONTRACTOR/SUB-CONTRACTOR

Painting contractor must have necessary equipment, machinery, tools and tackles for surface preparation, paint application and inspection. The contractor must have qualified, trained and experienced surface preparator, paint applicator, inspector and supervisors. The contractor supervisor, inspector, surface preparator and paint applicator must be conversant with the standards referred in this specification.

Functional Specification for Package Instruments

**Functional Specification for Package
Instruments**

Functional Specification for Package Instruments

1.0 OBJECTIVE

The purpose of this specification, together with the referenced project documents, is to describe the minimum technical and functional requirements for the Instrumentation and control equipment.

1.1. Codes and Standards

The following codes and standards are applicable for the Instrument design.

Codes and Standard	Standards Description
All goods and services supplied shall meet all applicable local and international regulations on health, safety and environmental issues.	
American Gas Association (AGA)	
AGA Report No. 3	Orifice Metering of Natural Gas
American National Standards Institute (ANSI)	
ANSI B 1.20.1	Pipe Threads, General Purpose
ANSI B 16.5	Steel Pipe Flanges, Flanged Valves and Fittings
ANSI B 2.1	Pipe Threads
ANSI C 96.1	Temperature Measurement Thermocouples
American Petroleum Institute (API)	
API 598	Valve Inspection and Testing
API 6D	Specification for pipeline valves
API 6FA	Fire Test for Valves
API RP 500	Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class 1, Division 1 and Division 2
API RP 520	Sizing, Selection and Installation of Pressure Relieving Devices in Refineries, Part I and Part II
API RP 521	Guide for Pressure Relief and Depressing Systems
API RP 526	Flanged Steel Safety Relief Valves
API RP 527	Commercial Seat Tightness of Safety Relief valves with Metal to Metal Seats
API RP 551	Process Measurement Instrumentation
API RP 552	Transmission Systems
API RP 554	Process Instruments and Control
American society of Mechanical Engineers (ASME)	
ASME – B31.1	Power Piping (Pressure Piping code)
ASME – B31.3	Process Piping
ASME PTC 19.3	Performance Test Code Temperature Measurement
ASME Section VIII	Sizing and Selection of Pressure Relief Valves
American Society for Testing and Materials (ASTM)	
ASTM A269	Stainless Steel Tube
ASTM A276.316L	Stainless Steel Fittings
ASTM F 1387	Standard specification for performance of piping and tubing mechanically attached fittings
B 16.10	Face to Face and End to End Dimensions of Ferrous Valves
B 16.104	Control Valve Leakages
B 16.34	Hydrostatic body and leak testing of isolation valves.
B 16.37	Hydrostatic Testing of Control Valves
B) Specific Codes and Standards for Instrumentation:	

	CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA AND EAST KHAGORIJAN, ASSAM Functional Specification for Package Instruments	

Codes and Standard	Standards Description
British Standards	
BS 1904	Specification for industrial platinum resistance thermometer sensors
BS 5501	Electrical Apparatus for Potentially Explosive Atmospheres
BS EN 60529	Specification for degrees of protection provided by enclosures (IP) codes
FCI 70.2	Leak Testing of Control Valves
International Electro-technical Commission (IEC)	
IEC 529	Classification of degree of protection provided by Enclosures.
Instrumentation Systems and Automation Society (ISA)	
ISA S 75.01.01	Flow equations for sizing control valves
ISA S 75.01.03	Face to Face Dimensions for Flanged Globe Style Control valves
ISA S-20	Specification Forms for Instruments
ISA/ANSI-S 84.01	Application of Safety Instrumented Systems for the Process Industry
ISA S-5.1	Instrumentation Symbols and Identification
ISA-S5.2	Binary Logic diagrams for process operations.
International Organization for Standardization (ISO)	
ISO 5167	Measurement of Fluid Flow by means of Orifice Plates
OMR Oil Mines Regulation (Latest edition)	
OMR	Oil Mines Regulations 2017
The design, manufacture, inspection, testing and installation of all equipment and system covered under this project shall conform to the latest editions of codes and standards at the time of procurement.	

1.2. GENERAL

All field mounted instrument and associated systems shall be reliable and suitable for continuous operation in the service conditions stated in the project specification.

The design and selection of process control instrument and systems shall include consideration of application suitability, reliability, quality, accuracy, repeatability, technology obsolescence, flexibility of use, compatibility with the environment (climatic and electrical classification), ease of maintenance, ease of operation.

All electronic instruments shall be suitable for area classification as per IEC codes certified intrinsically safe equipment shall be used or explosion proof enclosures may be considered. All intrinsically safe instruments shall be certified by the statutory bodies like ATEX/FM/UL/BASEEFA/CMRI/PTB or equivalent for use of the instruments classified area. All Electrical, Instrumentation equipment except junction boxes and solenoid valves shall be certified intrinsically safe (Ex'i) type.

All Electronic instruments shall have ingress protection to IP 65 as a minimum. Local gauges shall have ingress protection to IP 65. All instruments installed inside pressurized equipment rooms shall have ingress protection to IP 42 as a minimum.

1.3. PRESSURE AND DIFFERENTIAL PRESSURE GAUGE

Pressure gauge element shall be an elastic element like bourdon tube with material as a minimum SS 316. In case of bourdon type of gauge, the size of the bourdon tube shall be greater than 75% of the nominal diameter of the dial size.

Functional Specification for Package Instruments

Gauge construction shall ensure no leakage of process fluid to atmosphere and between the high pressure and low-pressure side (in case of differential pressure gauges) under normal condition.

The gauge socket shall be in one piece and shall also serve as element anchorage in case of bourdon tube type element, which shall be directly connected to the socket, without any capillary or tube in between. For other types of elements, the anchorage may be integral with the socket or connected with the socket using capillary tube with minimum bore of 3 millimeters.

Any joint in the process wetted system including joint between the element and the anchorage/socket shall be welded type only.

The pressure gauge shall have an over-range protection of at least 130% of maximum working pressure, as minimum.

The gauge movement material shall be SS 316. It shall be adjustable for calibration without dismantling the sensor unit.

The operating pressure shall fall in the middle 30% of the full working range i.e. operating pressure shall fall between 35% and 65% of the range selected.

Pressure gauge shall have safety type solid front case.

The gauge shall be weather proof to IP 65 as per IEC 60529 / IS 13947, as minimum.

Dial markings and dial color shall be as per IS 3624.

The pointer stops shall be provided at both ends of the scale to restrict the pointer movement beyond 5% above the maximum of scale and less than 5% below the minimum of the scale.

The dial cover shall be made out of shatter proof glass of thickness 1.5 to 3mm for gauges with dial size less than 100mm while minimum 3.0mm for gauges with dial size 100mm or greater.

All gauge shall be provided with a blow out device at the back i.e. blow out disc of aperture not less than 25mm for gauge with dial size 100mm and above, while 20mm for gauge with dial size less than 100mm.

The pressure gauge end connections shall be threaded (NPT) as per ANSI / ASME B. 1.20.1.

The accuracy of pressure gauges shall be ± 1 % of range. This accuracy is inclusive of repeatability and hysteresis of pressure gauges.

2 Valve manifold shall be supplied along with pressure instrument and 5 valve for differential pressure instrument. Material of construction of manifold shall be same as element material.

Snubber shall be considered when the service specified is pulsating type (i.e. pump discharge etc.). The material of construction shall be same as socket material.

Siphon shall be used to protect pressure measuring from excessive heating. U-form siphon shall be used for horizontal pressure tapping and trumpet-form siphon shall be used for vertical pressure tapping. Siphon material shall be same as element material.

1.4. PRESSURE AND DIFFERENTIAL PRESSURE TRANSMITTER

Pressure transmitters shall be suitable for use in a hot, humid and tropical industrial climate in which corrosive gases and/or chemicals may be present. As a minimum, all instruments and enclosures in field shall be metallic construction, dust proof and weatherproof to IP-65 as per IEC-60529/ IS-13947 and secure against the ingress of fumes, dampness, insects and vermin

All the pressure instruments shall be designed and manufactured for intrinsic safety.

Pressure transmitters shall be provided with lightning protection circuits and should be designed and manufactured to operate in 100% or above relative humidity environment.

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The pressure transmitter shall have an over-range protection of at least 130% of maximum working pressure, as minimum.

Measuring element in vacuum service shall have under-range protection down to full vacuum, without undergoing a change in calibration or permanent set.

Range for instrument shall be selected in general, such that in normal process operation the indication is between 30% and 60% of span for linear and 60% to 80% of span for square root inputs.

The set range shall be 1.1 times the maximum process value or 1.4 times the operating process value whichever is higher rounded to the nearest ten.

Pressure transmitters shall be yoke mounted type unless specified otherwise. Meter electronics is used for pressure measurement and shall include all the associated items like pre-amplifier, converter, transmitter, integrator, integral output meter (loop power indicator)

These transmitters shall be SMART 2 wire type 4-20mA analog output with superimposed digital communication with HART, for SIL & Non SIL rated transmitters.

The transmitter shall be microprocessor based and it shall incorporate a non-volatile memory which shall store complete configuration data of transmitter and sensor characterization. All necessary signal conversions, including conversion to produce output with the required protocol shall be carried out in the transmitter electronics.

Transmitter shall also run complete diagnostic subroutines and shall provide diagnostic alarm messages for sensor as well as transmitter healthiness. In the event of detection failure, the output shall be driven to a predefined value, which shall be field configurable.

Transmitter accuracy shall be $\pm 0.25\%$ of span or better.

Electrical cable entry connection shall be 1/2" NPT.

The design of electronic instruments shall be in compliance with the electromagnetic compatibility requirements as per IEC-61000-4.

Plug-in circuit boards shall be designed and manufactured such that reverse insertion or insertion of wrong chord is prevented.

The display of integral output meter shall be in engineering units for pressure, differential pressure and flow and 100% linear for level.

Terminals for electrical connections shall be clearly identified, and polarity shall be permanently marked.

Peak to peak ripple and total noise level in analog output shall not exceed 0.25% of the maximum signal.

Transmitters shall be provided with external zero and span adjustments.

For differential pressure transmitters, over-range protection shall be able to protect the sensing element from the maximum design pressure applied to each side with opposite sides vented to atmosphere. All pressure instruments shall be mounted as close as possible to sensing point.

All pressure and differential pressure transmitters shall be provided with the drain / de-pressuring valves (2 valve or 5 valve manifold) after isolation valve.

All transmitters shall have an integral output meter.

1.5. TEMPERATURE GAUGES

Temperature gauges shall be of the separate socket type suitable for well installation. Upon assembly of components, the temperature gauge element shall firmly contact the bottom of the well.

Vendor shall ensure that the operating temperature falls in the middle 30% of the full working range i.e. 30% to 60% of the offered range.

The gauge movement material shall be SS 316 as minimum.

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The case of bimetallic type of gauges shall be all angles rotatable type.
 The gauge shall be weatherproof to IP65 as per IEC 60529/ IS 13947 as a minimum
 The pointer stops shall be provided at both ends of the scale to restrict the pointer motion beyond 5% above the maximum scale and less than 5% below the minimum of the scale.
 The dial shall be made out of shatter proof glass of thickness of minimum 3.0mm
 The accuracy of temperature gauge shall be +1% of range.
 Thermowell material shall be SS316, as minimum.
 Thermowell with immersion length up to 500mm shall be machined out of forged bar stock. Built-up thermowell with welded well construction shall be considered for immersion length greater than 500mm.
 Threaded end connections shall be NPT as per ANSI/ASME B 1.20.1
 Thermowell immersion length shall be as follows:

Line Size	Immersion Length
Upto 6"	280mm
8" and above	320mm

1.6. TEMPERATURE TRANSMITTER

Temperature transmitters shall be suitable for use in a hot, humid and tropical industrial climate in which corrosive gases and/or chemicals may be present. As a minimum, all instruments and enclosures in field shall be metallic construction, dust proof and weatherproof to IP-65 as per IEC-60529/ IS-13947 and secure against the ingress of fumes, dampness, insects and vermin.

Transmitters shall be utilized for both RTD based and thermocouple based temperature measurements. For general temperature measurement and control, 3-wire RTD shall be the preferred choice for SMART transmitters, 4-20mA output. Alternatively, thermocouples may be used where the temperature is above 650 Deg C. Three wire elements used with RTD shall be Platinum Pt-100, 100 ohms at 0 Deg C, and fundamental interval of 38.5 ohms. RTD shall comply with IEC 751. All applications shall use single element RTD. The element head shall have 2 cable entries, one of which shall be fitted with a certified plug.

The electronic transmitters should be designed to be immune to Radio frequency & Electromagnetic interference with field strength of 15 volts / meter or less over frequency range of 50 Hz to 450 MHz.

All the Temperature transmitters shall be designed and manufactured for intrinsic safety.

All the transmitters shall be provided with lightning protection circuits and should be designed and manufactured to operate in 100% or above Relative Humidity environment.

Measuring element in vacuum service shall have under-range protection down to full vacuum, without undergoing a change in calibration or permanent set.

These transmitters shall be SMART 2 wire type having 4-20mA analog output with superimposed digital communication with HART protocol for SIL & Non SIL rated transmitters.

The transmitter shall be microprocessor based and it shall incorporate a non-volatile memory which shall store complete configuration data of transmitter and sensor characterization. All necessary signal conversions, including conversion to produce output with the required protocol shall be carried out in the transmitter electronics.

The Accuracy of Temperature transmitter shall be 0.1% of FSD.

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The over-range/static pressure protection of the transmitter shall be 130% of range.

Electrical cable entry connection shall be 1/2" NPT (F).

The temperature transmitter end connections shall be threaded (NPT) as per ANSI / ASME B1.20.1.

Thermowell end connection shall be flanged and flange face finish shall be as per ANSI/ASME B 16.5.

The transient protection and design of electronic instruments shall be in compliance with the electromagnetic compatibility requirements as per IEC-61000-4.

Plug-in circuit boards shall be designed and manufactured such that reverse insertion or insertion of wrong chord is prevented.

The display of integral output meter shall be in engineering units for temperature.

Terminals for electrical connections shall be clearly identified, and polarity shall be permanently marked.

Peak to peak ripple and total noise level in analog output shall not exceed 0.25% of the maximum signal.

Temperature sensing elements shall be installed in thermowell. Thermowells shall be solid drilled and tapered. Thermowell material shall be 316 stainless steel as minimum. The internal diameter of thermowell shall be to suit RTD elements of 6mm in diameter as standard. The surface of the thermowell shall be smooth and free from burrs and notches.

1.7. LEVEL TRANSMITTER**MAGNETIC LEVEL TRANSMITTER**

Magnetic gauge consists mainly of a float inside a sealed nonmagnetic chamber, and an indicator mounted outside the chamber, coupled magnetically to indicate level.

Magnetic type level transmitters shall be used for all process applications up to 2997mm. The float chamber will be mounted as a communicating chamber to the process vessel. Chamber material shall conform to the wetted material requirement. Vessel connection shall be 2" flanged. The float shall be approximately 70-80% of its mass submerged in the process liquid. The float inside the chamber will always be suspended in the liquid at the same depth and will always have the center line of its magnetic field at the surface of the liquid. Top and bottom float stoppers shall be provided.

The visible range of level gauge shall be selected to cover the complete operating level as well as measuring range of the other level instruments provided for the same purpose.

Level gauge with C-C more than 1000mm shall be supplied with a clip of 12mm thick, SS316 and positioned exactly in the middle of the two nozzles for supporting purpose.

The magnetic float material and design shall be designed based on the process parameters like pressure, temperature, fluid density etc.

The magnetic float shall be designed with magnets placed on the periphery of the float so that revolutions of float inside the chamber do not affect the reading. The indicator shall, as a minimum, cover the center to center.

A flag type arrangement shall be provided for indication through the gauge body, the level measurement with two distinct color, red color for level and white color if no level.

For local level indication, the preferred gauge type shall be the magnetic follower-type level gauge, complete with external bar graph indicators, where the fluid specific gravity and design pressure and temperature allows the use of floats.

When external chambers instruments are used the chamber pressure / temperature rating shall be at least equal to the standard applicable to the end flanges. They shall be supplied with 2" ANSI flanged process connections. All flanges on the level

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instrument pressure retaining parts shall be of the same type and rating as the process flanges and shall be in accordance with the vessel trim specification.

Each Level gauge shall be hydro tested to a pressure of 1.5 times the design/max/ process pressure. The manufacturer before shipment shall perform calibration and alignment of all instruments.

Resolution of the markings on the gage shall be $\pm 2\text{mm}$.

MAGNETROSTRICTIVE LEVEL TRANSMITTER

The transmitter sensing shall be based on Magnetostrictive type. The electronic module shall be integral mounted unless otherwise specified. The electronic module shall be easily replaceable without recalibration.

These transmitters shall be 2 wire systems having 4-20mA DC output with superimposed digital signal having simultaneous analog and digital communication with HART communication protocol for SIL rated transmitters & Non SIL rated transmitters shall be compatible to protocol, unless otherwise specified.

Level Transmitters shall be provided with integral digital indicator or LCD having user configurable engineering unit indicating total level in “mm” and “%”. VENDOR to note that Transmitter circuit shall ensure signal loop continuity is not lost in case of local indicator failure or removal.

Effect on accuracy due to density variation shall be minimized. VENDOR shall submit float curve to confirm effect of density variation.

The offered level transmitters shall have zero and span adjustments, easily accessible. All transmitters shall be installed directly on float chamber (externally) and accurately aligned. Electronic housing shall preferably be mounted at bottom of float chamber and sensor upward to minimize cable routing.

The level transmitter shall be weather proof to IP 66 for electrical enclosure.

A combined magnetic level gauge and magnetostrictive transmitter for control purposes can be provided. The performance of Magnetic level transmitters shall have an accuracy of $\pm 0.015\%$, repeatability of $\pm 0.005\%$ of full span and linearity of 0.020% of full span.

DIFFERENTIAL PRESSURE LEVEL TRANSMITTER

Differential pressure type level transmitters may be used where the application requires wide throttling ranges and fluid Specific Gravity is constant.

Seals shall be provided as required. These instruments shall have zero elevation/ suppression adjustment wherever required.

Transmitters with remote diaphragm seals shall be mounted at or below the high-pressure nozzle (lower vessel nozzle). Provisions shall be made for relieving pressure between the block valve and the diaphragm seal.

Purge connections may be required on the process side of diaphragm seals in applications where plugging is likely occurs. Capillary tubing seal legs shall be mechanically protected and adequately supported to prevent sagging. Remote diaphragm seals used in vacuum service applications shall be specifically designed for vacuum service by the manufacturer. Welded capillary connections shall be specified for vacuum applications.

Fill fluid shall be rated for the maximum temperature and maximum vacuum conditions. The length of the diaphragm seal capillary tubing shall be designed to take into account routing requirements. The Capillary tubing shall be as per manufacturer standard lengths.

All flanges on the level instrument pressure retaining parts shall be of the same type and rating as the process flanges and shall be in accordance with the vessel trim specification.

The maximum error shall not exceed $\pm 1\%$ of the span. Units for level indicating scale 0 – 100%.

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1.8. LEVEL GAUGES

Level Gauge may be transparent type or Reflex type depending on the nature of process fluid, for physical measurement of the level in the vessel / tanks.

Process connections shall be side and side.

All flanges on the level instrument pressure retaining parts shall be of the same type and rating as the process flanges, and shall be in accordance with the vessel trim specification.

Gauge Glasses shall be provided on all vessels except product storage tanks, to cover the complete operating range of level including the spans of level transmitters and level alarm switches.

Gauge glass assemblies shall be chosen for the design pressure and temperature of the respective vessel.

Body and cover plate material shall be to suit the process conditions. Bolts and nuts shall be to suit the body and cover plate material offered. The glass shall be toughened borosilicate which is resistant to thermal and mechanical shocks. Ball checks plunger seat and valve stem shall be type SS 316. Drain connection shall be ½" NPT and shall be provided with a SS 316 drain valve. Wherever necessary, higher-grade material suitable for the process conditions shall be used. Vent connection shall be ½" NPT on top of each gauge glass. Drain connections shall be piped to drip pans or drains.

1.9. ELECTROMAGNETIC FLOWMETER

Electro-magnetic flow meters shall be used as the flow measuring system with flanged end connections primarily as per ANSI B 16.5, the rating and facing of which shall be as per the piping specifications.

The flow direction shall be clearly stamped or cast on the body to avoid polarity errors. Meter shall have forward & reverse measurement functions and reverse flow shall be confirmed by status output / indication.

Meter signal / power cable entry shall be ½" NPTF respectively, as per ANSI B 2.1.

These transmitters shall be 2 wire type having 4-20mA analog signal with superimposed digital signal with HART communication protocol for SIL & Non SIL rated transmitters.

In addition, the meter shall be capable of providing the output in other required form (pulse, serial, contact, etc.,)

The meter enclosure housing the electrical parts shall be suitable for the hazardous area classification. Unless otherwise specified, the enclosure shall be Ex'd' type, Flameproof enclosures and IP 65 or better.

Electro-Magnetic Meter field coils shall be hermetically sealed. Coil insulation shall be class F suitable for high temperature. Suitable grounding type system and material shall be selected for the meter.

Field coils may operate on the alternating supply voltage. Replaceable electrodes/ Frequency excitation methods are also acceptable where the magnetic flow meter is operated on AC/DC voltages. Vendor shall indicate the power supply requirements and furnish the power consumption for the meter (sensor, transmitter, display, etc.) along with the sizing calculations for the selected meter. Standard Signal types and communication protocols shall be offered. Appropriate EMI / RFI protection for the meter shall be considered.

Meter shall not necessarily be of the line size indicated in the P&ID, but shall be sized for range of flow regime and the conductivity /velocity requirement desired for the meter. However, the meter shall be 'Full bore' meter with respect to its meter run. Straight run requirement shall be sized as per the manufacturer recommendations.

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Meeting the flow profile requirement for the meter by providing necessary straighteners / flow conditioners etc., shall be vendor responsibility.

Magnetic Flow Meter shall be Microprocessor based system, in explosion proof housing. Meter shall have a non-volatile memory for data access and data transfer to remote controllers / indicators / DCS. There shall be no data loss upon the loss of the power supply to the meter.

Where the process fluid may result in coating of the electrodes, suitable measures / special installation requirements to minimize such coating shall be a part of the design consideration in selection of meters. Monitoring of such adhesions [Electrode scaling/ Electrode corrosion], Electrode leakage, Liner deformation, gas bubbles and solid identification, shall be a part of the meter diagnostics. Meter shall also have diagnostics features such as incorrect installation and partial filled meter. Electrodes shall be replaceable type.

Where the fluid is having low conductivity / contain solids in the streams (like slurries containing magnetic particles), vendor shall offer system with suitable circuitry for compensating the signal changes so induced by the permeable solids.

The 'minimum' fluid conductivity shall be specified for which the meter performance is within specified values.

The configuration capabilities of the meter shall be for LCD display of indication of actual flow rate, forward, reverse, sum total flow indications, conductivity, temperature, status indications. The same shall be available as user selectable parameter on the LCD display of the meter.

The 'local' 2 line, 6 ½ digit (minimum) alphanumeric backlit LCD display shall be provided 'integral' with the meter / transmitter and shall be easily visible from grade.

Software security shall be provided in the meter. Upscale / downscale alarms & Engineering units shall be user selectable. Programming for range, alarms and display settings shall be possible through front face of the meter and without opening the transmitter housing in hazardous area. The programming method shall be touchpad keys / magnetic keys / optical key.

Manual / Auto zeroing (nulling) facility shall be provided for the meter to offset effects of nearby magnetic disturbances in 'no-flow' condition. This shall be done from the meter front face display without opening the cover in the Hazardous area.

The material requirements for Electro-Magnetic Flow Meters shall in general be internals of SS 316 minimum. As a minimum, the meter flow tube, electrodes and coil housing shall be SS 316. The housing shall be fully welded. Bolted coil housing with rubber or plastic gaskets is not acceptable.

Tube liners shall be selected to meet the process requirement and shall be proven for the application.

Transmitter housing and mounting accessories required for meter shall be SS 316 or better. Meter enclosure shall be suitable for the specified hazardous area. All instrument supports shall be galvanized type for installation.

Over range shall be designed for at least 130% of Max flow. Accuracy shall be ±0.5% of the reading or better. Repeatability shall be ±0.1%

1.10. PRESSURE SAFETY RELIEF VALVE

The term "Safety Relief Valve" applies to all types of valves used as Thermal / Pressure relieving devices required in the ASME code. For definition of valve types reference shall be made to API RP 520 Part 1.

Relief valves shall be carbon steel with stainless steel trim as a minimum. Carbon steel springs with Nickel plating shall be used for temperature services lower than 250 Deg

Functional Specification for Package Instruments

C. Tungsten alloy springs shall be used for temperatures greater than 250 Deg.C. Aluminum sprayed springs shall be used in corrosive services.

The minimum requirements for Safety Relief Valves shall be:-

- Enclosed spring
- Bolted bonnet
- Screwed cap, complete with fitted gag
- Full nozzle

Nozzle and disc seating areas shall be such that several maintenance lapping operations can be carried out.

Back pressure shall not exceed the pressure rating of the discharge flange.

Lifting levers shall be fitted to valves on steam, or air service. Lifting levers shall not be fitted to valves on process fluid services.

Pressure balance valves shall be used where downstream back pressure varies, as indicated on the relief valve datasheet.

All relief valves of size 1" and above shall be full nozzle full lift type. Relief valves with size less than 1" shall be modified nozzle type.

Flanged relief valves for process piping, excluding steam and air pressure piping, shall be either the enclosed spring type or pilot-operated type.

Balanced relief valves shall be used if the variable backpressure is more than 10% of valve set pressure or where the service is corrosive. Balanced relief valves suitable for variable Backpressure may also be used where appreciable savings in the discharge disposal system Piping can be affected by virtue of the increased allowable backpressure. Balanced bellow Materials shall be the same as the valve trim.

$\frac{3}{4}$ " and 1" relief valves may have screwed ends. All process Relief valve 1" size and larger shall have flanged inlet and outlet connections.

Thermal relief valves shall have a minimum orifice area of 38.7mm².

Lifting levers may be provided for periodic testing of the Safety Valve. Closed bonnet Construction shall be used.

All castings and welding shall be 100% radiographed.

The pressure relief valve shall meet the requirements of API recommended practice RP 526 "Flanged Steel Safety Relief Valves" and RP 521 "Pressure Relieving and Anti Pressurizing system" and shall be of direct acting angle pattern, full nozzle entry and high capacity type.

The MPC Supplier shall size safety relief valve according to capacity, set point, reset differential and the blow down requirements of the Process for the Project.

The selected orifice shall be the next standard orifice size available above the calculated area. Valve capacity shall then be calculated based on the selected orifice code.

In Safety Relief valve sizing calculations, the fail open state of a control valve (if any) shall be taken into consideration.

Set point of the Safety Relief valves shall not be higher than the design pressure of the system being protected by the valve, except as permitted by the relevant API 521/526.

The allowing tolerances in set pressure are as below:

- ± 0.14 Kg/cm²g for set pressure up to and including 5 Kg/cm²g.
- $\pm 3\%$ for set pressure above 5 Kg/cm²g.

The material requirements for safety relief valve shall in general be according to Piping material specification and Valve material specification.

Relief valves for set pressures of 17.5 kg/cm²g (250 psig) or less a range of adjustment of plus or minus 10% of the set pressure.

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Relief valves set at pressures higher than 17.5 kg/cm²g (250 psig) shall have springs suitable for a range of adjustment of plus or minus 5% of the set pressure. Range identification shall be provided on the spring.

Safety relief valve shall be installed after testing/setting for set pressure, blow down and seat tightness.

Discharges from all safety valves shall be individually routed to a safe location, unless specified otherwise. All safety valves discharge lines shall join the relief header from top and shall be at an angle of 30 to 40 degrees with the axis of the header.

All safety valves discharge and equipment depressurizing lines shall be free draining to vent header and shall have no pockets up to and including header.

Discharge piping shall be designed to avoid liquid collection, backpressure build up, and stress on the valve body under all conditions. A low point discharge drain may only be fitted on relief valves venting to atmosphere.

1.11. CONTROL VALVE

DESIGN PHILOSOPHY

Control Valve data sheet specify the minimum acceptable materials for the control valve body and trim. Alternate superior materials for the control valve body and trim shall also be acceptable subject to supplier assuming complete responsibility for proper selection of material for these parts for their compatibility with the process fluid and its operating conditions.

Control Valve data sheet specifies the control valve size, flow coefficient (CV) and required flow rangeability.

Vendor shall be responsible for

- ❖ Selecting their standard valve flow coefficient suitable for the specified service and process conditions specified in the data sheets.
 - ❖ Selection of actuator to meet the shut off differential pressure indicated in the data sheets.
 - ❖ Checking for cavitation, flashing and noise generated and provide suitable trim and treatment to limit these within appropriate limits.
 - ❖ Whenever specifically indicated a detailed specifications sheet for each control valve which shall provide information regarding type, material of construction, capacity etc., of the control valve and its valve accessories. The material specifications and units of measurement indicated in the specification sheet shall to be the same standards as those in data sheet.
 - ❖ Whenever the requirement of sizing calculation is specifically indicated in the materials requisitions, vendor shall furnish sizing calculation for each tag number clearly highlighting the standard used for calculation, noise level, cavitation or flashing, CV selected %age opening at minimum, normal and maximum flow, inlet & outlet velocity etc.
 - ❖ Limitation, if any, in changing actuator orientation at site.
- Deviations on technical requirements shall not be entertained. In case vendor has any valid technical reason, they must include the deviations tag number wise, summing up all the deviations from the data sheets and other technical specification along with the technical reasons for each of these deviations.

All documentation submitted by the vendor including their quotation, catalogues, drawings, installation, operation and maintenance manuals etc., shall be in English language only.

BODY

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Control valves shall have flanged end connections integral to the valve body. Split body type valve design shall not be offered unless specifically indicated in the data sheets.

The minimum control valve body size shall be 1 inch. Control valve body size of less than 1 inch shall be offered only when specifically indicated in the data sheet.

The valve body rating should be equal to or higher than the flange rating specified in the data sheets.

The control valves shall be suitable for installation in horizontal as well as in vertical lines.

FLOW DIRECTION

In general, flow direction shall be as below:

- Flow tending to open for single seated unbalanced valve design.
- Flow entering between the seats for double seated valves.
- Flow entering at the side and leaving at the bottom for angle valves.

For valves design other than those specified above flow direction shall be as per manufacturer standard. Flow direction shall be clearly marked on the control valve body.

For 3 way control valves, service like mixing or diverting, shall be clearly identified with inlet and outlet end connection clearly marked on the control valve body.

END CONNECTIONS

Unless otherwise mentioned, end connection details shall be as below:-

- Threaded end connections shall be NPT as per ANSI/ASME B1.20.1
 - Flanged end connections shall be as per ANSI/ASME B 16.5 or B 16.47-B or as specified in datasheet.
 - Flange face finish shall be serrated concentric as per ANSI B 16.5
 - Ring type joint flanges shall have octagonal grooves as per ANSI B 16.20
- Face to face dimension of globe type control valves shall be in accordance with ANSI/ISA 75.08 Where provided control valve bottom drains shall be plugged off or blind flanged where a plug is used threads shall correspond to ANSI/ASME B1.20.1 (NPT). Where a flange is used its dimensions and rating shall correspond to ANSI/ASME B16.5.

MATERIAL OF CONSTRUCTION

The material of construction of control valves shall be as specified in the data sheet. No material shall be substituted by vendor without specific written approval from OIL / M/s KAVIN.

Control valve body, bonnet bottom flange, line flanges and other pressure containing assemblies shall be of the same material of construction as specified for valve body in the data sheets.

The bonnet flange and bottom flange shall have metallic spiral wound gaskets suitable for the specified service. The gaskets with asbestos bearing fillers shall not be used.

Vendor shall be responsible for selecting proper material for the internal parts of control valve. All such materials shall have the same or better specification than specified in the data sheets.

TRIM

The term 'trim' covers those parts of valve assembly (excluding the body, bonnet and bottom flange) which are exposed to and are in contact with the line medium consisting of but not limited to the seat ring, valve stem, valve plug, Valve plug guide, guide bushing and cage.

In case of rotary type of control valves like butterfly, ball, segmental ball, rotary plug, eccentric disc and rotary disc, the term trim covers disc/ball, seat ring, shaft and bearing.

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GUIDING

Single seated globe (unbalanced) and angle type control valves shall have heavy top plug guiding. Stem guided control valve design shall not be acceptable unless specifically indicated elsewhere.

Single seated globe (balanced) control valves shall have cage guided design. The cage shall provide a continuous plug guiding.

Double seated valves shall have top and bottom or cage guiding and shall be of the pressure balanced type.

Unless specifically indicated otherwise, whenever cage type control valves are specified, top guided or top and bottom guided control valves can be offered provided it meets all other process and functional requirements. But whenever top or top and bottom type of guiding is specified, cage type control valves shall not be offered.

3 way control valves of either diverting or mixing type shall have top guiding. Rotary control valves like butterfly segmental ball, eccentric rotary plug etc shall have blowout proof shaft guiding design.

Guide bushings shall be of a sufficiently hard material to resist side thrust on the plug.

TRIM DESIGN

Control valve manufacturer/vendor shall be responsible for trim selection and trim design of the control valve. However it shall meet the following minimum requirements:

- a) Control valve trim design shall suit the type of guiding specified.
- b) The trim design and material of construction shall be selected to minimize the risk of galling particularly in case of cage guided valves. Vendor shall select proper material pairs, surface finish, hardness and clearness wherever possibility of galling exist.
- c) Under extreme temperature conditions, vendor shall consider increased clearances at room temperature and seal welding of threaded seat rings etc. Hard facing of trim shall be used in high temperatures. For very low temperature application material used shall have adequate cold impact strength.
- d) For globe/angle/3way type of control valves, stem and plug shall be detachable and shall be attached together by suitable threaded design secured with a pin to avoid plug rotation during operation.
- e) For top and bottom guided control valves with sizes above 8" post and guide bushing design shall be used to prevent rotation of plug and stem.
- f) Whenever cavitations are expected, vendor shall select a special anti-cavitation trim design and shall use trim material of sufficiently high hardness.
- g) Whenever the possibility of aerodynamic noise in a control valve exists under any operating condition specified in data sheet, vendor shall select a special low noise trim for that application.

The plug inherent characteristics shall be as indicated. However following shall be followed unless otherwise specified:

- a) Control valves with low noise and anti-cavitation trim design shall have modified equal percentage or linear characteristics.
- b) Rotary type control valves shall have modified equal percentage or equal percentage characteristics.
- c) Control valves with flow coefficient less than 0.4 shall have equal percentage or linear characteristics.
- d) All other control valves shall have equal percentage characteristics. Whenever liner or modified equal percentage characteristics are specified equal percentage characteristics shall also be acceptable. Characterized positioner cam design to meet specified inherent control valve characteristics shall not be offered, unless specifically indicated.

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LEAKAGE CLASS

- Leakage class as per ANSI FCI 70.2 shall be specified for each control valve. Where no leakage class is specified, the same shall be considered as Class IV. Higher leakage class shall be provided wherever indicated.
- For control valves specified with Class VI leakage class, vendor shall select the soft seat (elastomer) material suitable for the process conditions i.e., shut off pressure, maximum temperature and process fluid.
Control valve experiencing cavitation, flashing and noise are generally identified. In case vendor's calculation show occurrence of cavitation, flashing or noise under any of the specified process condition, vendor shall select proper type of valve trim to suit such process condition.

SIZING

The control valve capacities in terms of flow coefficient (CV) shown have been calculated based on the formulae given in the standard ANSI/ISA 75.01 "Control valve sizing equations".

All factors used while arriving at the sizing are also as per ANSI/ISA 75.01. Vendor must resize the control valves considering various factors specific to the offered valves. Indicates calculated flow co-efficient values at minimum, normal and maximum operating conditions. Vendor shall calculate this co-efficient as per the offered Control valve and select the size considering valve openings as under:

- At maximum flow - less than 90% open
- At normal flow - typically 75% open
- At minimum flow - more than 15% open

Rangeability of globe type of valves shall be 30:1, as a minimum. Vendor shall ensure that the actual rangeability of offered valves shall meet these requirements. For other types of offered control valves, vendor to specify that the available rangeability of the offered valves meet the requirements specified.

Conventional butterfly valves shall be sized assuming a 60 degree opening at maximum flow. Wherever high performance butterfly valves are specified, these shall be sized considering maximum opening of 90 degree at maximum flow.

NOISE

Vendor shall examine each control valve for noise generation possibilities. The noise level shall be calculated as per ISA 75.17 or any other equivalent standard.

Noise generated by control valve during operation shall be limited to OSHA specified levels i.e., the maximum allowable noise shall be less than 85dBA, when measured at a distance governed by ISA 75.17.

If the predicted noise level is found to exceed 85dBA SPL, control valve shall be treated for noise. Source treatment for noise shall be resorted to. When source treatment for noise is not sufficient to reduce the noise level below 85dBA, Vendor shall provide path treatment like diffuser plate/ silencer etc in addition to source treatment so as to reduce the level below 85dBA. Whenever additional path treatment is recommended, the maximum differential pressure across the silencer/diffuser plate shall not exceed 40% of the specified differential pressure.

Vendor shall also furnish noise calculations with and without the use of these devices and the noise abatement achieved in individual components.

PACKING BOX

The packing box shall be flanged bolted to the bonnet and shall meet the requirements specified.

Gasket material shall be as per Piping Material Specification.

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Whenever specifically indicated, control valve shall have its packing box drilled and tapped to ¼" NPT (F) for connecting external lubricator. When external lubricator is not provided, this hole shall be plugged.

An isolating valve shall be provided with all valves having external lubrication provision. Vendor shall specify the lubrication stick material used in each case.

For application in vacuum services, vendor to provide inverted packing design suitable for vacuum service. For pressure-cum-vacuum service, the control valve shall have dual packing design suitable for the application. Dual packing design shall also be provided for control valves in toxic service.

Wherever environmental packing design is specified, vendor shall supply special packing design suitable to minimize fugitive emission.

BONNET

The bonnet shall be flanged bolted to the body. Threaded bonnets are not acceptable.

Wherever the operating temperature of the fluid is above 200 °C, extension or radiation finned bonnet shall be provided. Vendor standard bonnet design shall also be acceptable if these are suitable for higher temperatures.

For temperature below 0°C, Vendor shall provide extended bonnet design. For valves in cryogenic application bonnet extension shall be as per BS-6364 as a minimum.

STEM

The stem surface finish shall be fine. Extra fine surface finish shall be provided wherever the packing material is PTFE.

The stem/shaft shall be designed for the maximum thrust of the actuator without any measurable deflection.

The valve stem/shaft shall be connected to the actuator stem/shaft by suitable arrangement to avoid backlash problem.

PNEUMATIC ACTUATOR

Actuator shall be sized for the shut-off differential pressure indicated in data sheets. However, for 3-way type control valve, the actuator shall be sized for maximum differential pressure, unless specifically indicated.

The actuator shall be designed to move the valve to the failure position specified. For failure position specified as 'fail-locked', vendor shall provide fail-lock relays to meet the requirement.

Non metallic actuator casing shall not be offered.

Springs shall be corrosion-resistant and shall be cadmium or nickel plated. Alternately vendor standard coating shall also be acceptable. These shall be of the enclosed type.

The compression of the springs shall be adjustable.

In general, an actuator operating range of 0.2 to 1.0kg/cm²g is preferred. However when vendor standard actuator model is not able to meet the specified shutoff pressure, higher actuator operating range may be offered.

In general, spring opposed diaphragms type actuators shall be used. Only when this type of actuators become extremely unwieldy, based on the data specified in the data sheet, should a piston and cylinder type of actuator be considered. Whenever piston and cylinder actuator is considered, single acting spring return type shall be used.

Whenever double acting springless type of actuator is unavoidable, all accessories like pilot valves, booster relays, non return valve, pressure gauge, volume tank etc. Shall be provided to ensure desired action on air failure. The volume tank shall be sized considering full stroking of the valve for two complete cycles. The volume tank shall be of carbon steel construction and sized as per ASME Section VIII with design pressure of 10kg/cm²g as a minimum. All accessories and tubings etc shall be 316 stainless steel constructions.

Functional Specification for Package Instruments

The actuator casings and diaphragms shall be designed for minimum twice the maximum pneumatic operating pressure of the control valve.

Valve stem position indicator shall be provided for every control valve. The position indicator scale shall be marked from 0 to 100% in steps of 10%.

In general side mounted hand wheels will be used. Hand wheels shall provide manual control in both opening and closing directions independent of spring action. Hand wheels shall be of non-rising type suitable for accurate valve positioning.

Actuator orientation shall be as per vendor recommended orientation. It shall be possible to change this orientation at site for the offered valve actuator combination in case it is found necessary.

ACTUATOR SIZING

Vendor shall be fully responsible for the sizing and selection of the correct actuator for the specified control valve. While sizing the actuator, vendor shall ensure that the actuator is able to develop sufficient thrust to properly seat the control valve plug/disc at the actuator air pressure (lowest specified pressure) and shut off conditions specified.

While sizing the actuator, vendor must ensure that the sizing factors indicated below are fully complied. Higher sizing factor may be considered if found necessary by vendor.

- a) For control valves with leakage class IV and below, the actuator shall be sized considering actuator thrust more than 1.3 times the total force induced by shut off conditions specified in the data sheet and the force required to overcome packing friction. Vendor shall utilize this factor as 1.5 in case the control valve is operating between 80% to 90% or 10% to 20% in any of the specified conditions.
- b) For control valves with leakage class V and above, the actuator shall be sized considering actual thrust more than 1.7 times the total force induced by specified shut off conditions in the data sheet and the force required to overcome packing friction.

POSITIONERS

Positioners shall be smart type. They shall be direct acting, with an adjustable gain unless otherwise specified. Every positioner shall have two pressure gauges mounted on it, one each for air supply and for positioner output to actuator. In addition, pneumatic positioner shall have third pressure gauge for control signal. Positioners shall be side mounted on the control valve and shall have corrosion resistant linkages and rugged brackets, unless remote mounted positioner is offered when specified in the datasheet. Positioner material of construction shall be SS 316 and IP rating IP65 or better.

AIR FILTER REGULATOR

Vendor shall supply air filter regulator with each positioner complete with and integral output gauge. Air filter regulator shall be sized considering the air supply pressure and flow required to meet requirements specified. Filter material shall be sintered bronze. Filter size shall be maximum 5 microns. However, lower filter mesh size shall be considered to suit the electro pneumatic converter vendor's requirement.

1.12. ACTUATED ON-OFF VALVE

The specifications for the on-off valves and associated accessories shall be followed

Ball valves shall be of floating ball / trunnion mounted type as per PMS & VMS.

For trunnion mounted ball valves, seat shall be spring loaded.

All ball valves with leakage Class VI shall be provided with pressure equalization seats to relieve body-bonnet cavity over-pressure.

Ball valves shall be 2-piece valves. The valves shall be full port valves.

Functional Specification for Package Instruments

All on-off valves shall meet Class VI seat leakage class.

Valve body & flange rating shall be minimum 300# as per ANSI. Flanges for the shall be as per ASTM B 16.5.

Flow direction shall be stamped or cast on the body.

Bonnet shall be provided with cooling fins or extension when the fluid temperature is 230 °C and more and shall be of extension type for low temperature -18 °C and below. For other services, standard bonnet shall be provided.

Valves shall be provided with anti-static devices to achieve electrical continuity between the ball, stem & the valve body.

Valve noise shall be restricted to 85dBA maximum at 1 meter distance away from the valve.

Valve actuator shall be painted green for air fail-to-open (FO) valves and red for air fail-to-lose (FC) valves.

TRIM

- Quick opening trim shall be used for On-Off and Shutdown Valves. Material of trim shall be as specified.
- Stem for ball valves shall be anti-blowout type.
- For trunnion mounted ball valves, seat spring shall be provided.

ACTUATOR

- Rotary piston actuators shall be provided for the ball valves. The actuators shall be spring return or double-acting type as per the fail-safe condition required. Local open/close indication shall be provided on the actuator.
- All actuators shall be adequate to fully stroke the valve under the maximum differential pressure specified by the process requirements. They shall be sized for the shut off differential pressure.
- No by-pass or hand wheel shall be provided for shutdown valves.
- Limit switches shall be of Proximity type. They shall meet NAMUR requirements when used in classified area. Limit switches shall be provided both for close and open positions of the valves.
- Other auxiliary devices such as air lock relay, pilot relay, booster relay volume tank etc. shall be provided as parts of the actuating system in order to achieve the required stroke-speed, fail safe action.

SOLENOID VALVES

- Solenoid valves (Direct acting type) shall be used as the pilot valve for operation of On/Off valves.
- The solenoid valves shall be universal type three-way.
- Solenoid valve body & trim shall be of SS316, as minimum.
- Solenoid valves shall be in energized condition during normal operation. It shall have integral terminal box with 1/2" NPT(F) cable entry. Flying leads are not acceptable.

PNEUMATIC TUBES AND FITTINGS

- Material of pneumatic tubing & fittings shall be as specified.
- Fittings shall be double ferrule compression type consisting of two ferrules, nut and body with one selected compression fitting manufacturer used for all the valves.
- Internal tubing for on – off valves shall be either ¼" or ½" tube only. No other sizes are acceptable. On – off valve size for 4" and below the tubing internal and external to be ¼" and for sizes above 4", the internal and external tubing shall be ½" only.

TESTS

Functional Specification for Package Instruments

Valve Inspection & Testing shall be carried out as per API 598. The following tests shall be conducted:

- Dimension checking
- Hydro test (1.5 times design Pressure), leak test for body & seat for all valves as per API 598
- Seat Leakage Test as per ANSI B 16.104
- Material traceability test as per EN 10204.
- Radiography shall be carried out as below:

Radiography procedure, areas of casting to be radiographed shall be as per ASME B16.34 and acceptance criteria shall be as per ASME B16.34 Annexure-B. However for areas of casting to be radiographed for types of valves not covered in ASME B16.34, vendor shall enclose details of areas to be radiographed in line with ASME B16.34.

- IBR certification for valves in steam service, if any.
- All valve castings in hydrogen service shall undergo helium leak test. Test reports shall be provided. Wherever NACE is applicable necessary certifications shall be provided.
- * Pneumatic test for all pneumatic actuators at pressure 1.5 times of actuator design pressure (i) Calibration/Stroke Check
- * Testing of accessories (i.e. Solenoid valves, Air filter & regulator, etc)

Note: All tests prefixed with (*) shall be witnessed by owner/ owner's appointed third party inspector.

1.13. MOISTURE ANALYSER

The electronic of the analyzer shall be field mounted in a hazardous area certified and weatherproof housing.

Each moisture analyzer must include a comprehensive and effective sample and sample conditioning system which ensures a representative sample and reliable accurate operation with minimum maintenance.

The sample conditioning system shall include local gauges for the measurement of all points and parameters in the system relevant to the correct operation of the analyzer including flow rotameters, temperature gauges, and pressure gauges.

1.14. MATERIAL TAKE-OFF

Cable gland shall be Nickel Plated Brass suitable for Installation in classified area.

Cable Glands shall be double compression explosion proof type and have an ingress protection of IP65.

All low power instrument cables shall be by single or multi-core copper stranded with XLPE or EPR insulation, low smoke, halogen free sheathed cables to relevant IEC standards. All the Instrument, Control and low voltage power cables shall be MUD resistant type. Cables shall be of stranded copper conductor.

Fire resistant & Flame retardant type cables are required for safety related instruments and ESD/F&G system devices. The fire resistant type cables shall conform to IEC 60331.

All control and analogue signal cables connected to DCS system shall be of flame retardant type. The Flame retardant cables shall conform to IEC 60332-3.

Electrical Cables shall have the following sheath colors as a standard

- IS Cables (Instrument Signal): Blue
- Non IS (Instrument Signal): Grey
- Low Power and Instrument Control: Black
- Instrument earth: yellow/green (with red mark at each end)

Functional Specification for Package Instruments

- IS earth: yellow/green (with blue mark at each end)

Instrument junction boxes shall be certified. For intrinsically safe circuits, boxes certified Increased Safety Ex e shall be used. For non-intrinsically safe circuits, boxes certified Explosion Proof / Flame proof Ex d shall be used. Boxes (Ex e, Ex d) shall have minimum IP 66 ingress protection.

Separate junction boxes shall be used for intrinsically safe wiring. Junction boxes in any cable path from field to control room shall be limited to one only unless otherwise.

Instrument junction boxes shall not be used for electrical power cables

For Ex d junction boxes cable entries shall have NPT threads; where this is not possible certified 316 SS adaptor shall be fitted.

All Ex e and Ex d enclosures shall have all spare entries sealed with suitably certified 316 SS plugs.

Entries shall be suitably spaced to enable ease of installation of cable glands. Tapped cable entries shall be of good quality, without stripped or damaged threads. The thread shall be continuous and shall permit the cable gland to fit squarely against the gland plate (or enclosure).

Where the gland plate is not thick enough for tapping, cable glands shall be fitted with double locknuts.

The threads of all cable glands and adaptors shall be greased on assembly.

Cable glands fitted to all Ex e enclosures, and industrial enclosures, may have a nylon or lead sealing washer between the Cable Gland and Gland Plate (or enclosure) to ensure IP 66 protection. Sealing washers shall not be fitted to glands entering Ex d enclosures.

All junction boxes shall be effectively sealed, once uncrated or fitted into position. All lids shall be replaced during any break in work. Where this is impractical, e.g. large multi-cable junction boxes, a heavy PVC sheet shall be used to cover the junction box to exclude rain and dust.

All terminals (including unused terminals) shall be tightened down. For communing of terminals, feed through cross connection bar shall be used. Comb connectors shall not be used.

Junction box shall have terminals arranged in vertical orientation. IS terminal color shall be BLUE and NON IS terminal shall be GREY in color.

1.15. CABLE ROUTES, FIXING, SUPPORTING AND FASTENING

In general, instrument cables shall be installed overhead on cable ladders, trays or on special constructions.

The cables shall be grouped according to the signal types. The main groups are:

- Electrical signals.
- Electronic and pyrometric signals.
- Intrinsically safe signals, non-smart instruments.
- Intrinsically safe signals, smart instruments.

Two (2) cable layers maximum are allowed per tray/ladder or trenches.

(a) Distance of 100 mm should be provided between each group of signals.

(b) A distance of at least 300 mm shall be provided between instrument cables and electrical low-voltage power cables.

(c) Electrical low-voltage power cables shall not be laid in the same cable ladder/tray as those of instrument cables.

(d) A distance of 300 mm should be provided between electrical and instrument cable crossings.

Functional Specification for Package Instruments

1.16. CABLE LADDERS/TRAYS, FIXING SUPPORTING

Fiber Reinforced Plastic (FRP) cable trays shall be used.

The cable trays shall be located away from where they are subject to mechanical damage, spilt liquids, escaping vapors and corrosive gases. Where cable trays are liable to damage by traffic, they shall be protected by freestanding and sturdy mechanical structures.

Cables may be laid sideways in the trays instead of pulling them through consecutive holes. Free space over the trays should depend on trays accessibility.

Angles in cable trays and/or trenches shall be based on the minimum bending radius of the thickest cable.

The cable trays should be designed considering the following:

- (a) Cable tray filling shall be such that 20% spare space remains on each cable ladder.
- (b) In case of main tracks, with several cable trays being used for the same cable group, these racks can be filled up, the required spare of 20% per group may be fulfilled by additional (empty) racks.

All fixing accessories such as saddles, cleats and bolting material shall be works manufactured from cadmium plated steel bolts adequate for the load to be imposed without undue stress or sagging. Cadmium plated steel materials shall be isolated from supporting steelwork by means of suitable hard Teflon pads, washers, etc.

Cable tray shall be of a rigid design and self-supporting between holding brackets without excessive deformation after the cables are installed (spacing of horizontal pipe rack members is three (3) meters.)

Cable tray systems shall be designed and installed to ensure electrical continuity throughout the run and such that water cannot collect or remain in any part of the system.

Cables installed aboveground shall be routed to avoid high-risk areas, e.g. high fire risk areas, and those areas where accidental leakage or spillage may occur and cause damage to cables supports.

Cable trays within a building may be without covers. Cable trays in the open area shall be provided with cover.

Where cables are required to be installed through or across the edges of tray or other metal work, the edge of the lips shall be smoothed painted with special paint and lined with a protective sleeving to avoid cable damage.

Supporting steelwork shall be manufactured from good quality heavy gauge steel. The material shall be painted in accordance with the specification for surface preparation and painting.

Precast concrete members should not be drilled for any reason. Fixing shall always be by means of clamping brackets in the most efficient way and in consultation with EPCM's representative.

Under no circumstances shall welding be carried out to any process plant equipment, vessels, pipelines or structures or to any protected surface, unless specifically indicated on the drawings and documentation and then in strict accordance with a procedure subject to EPCM's approval.

Fixings to the above should be made where brackets and so on, have already been provided, or when agreed, by the use of purpose built clamps.

CABLE ENTRY SEALINGS

Where cables have to be led through exterior walls or partitions with a fire blocking, water blocking or sealing function, gastight cable transits shall be installed.

The cable transits should be well accessible with respect to mounting, inspection and testing for leaks.

Functional Specification for Package Instruments

The spare space to be kept in the cable transits should correspond to the spare space on the cable trays, but should at least be such that after final assembly 20% additional cables can be led through.

All cable and cabinet entries through the floors shall be sealed with polyurethane foam.

1.17. INSTALLATION INSTRUCTIONS

The MPC Supplier shall ensure that all equipment is mounted in its correct location, piped and wired correctly in accordance with drawings and specifications prior to pre-commissioning.

The MPC Supplier shall ensure that all manufacturer's instructions applicable to instrument handling and installations are complied with. The MPC Supplier shall ensure that control panels and consoles are adequately protected against damage during installation.

The MPC Supplier shall ensure that following labels are attached to relevant equipment after testing :

(a) Red labels for loop testing complete.

(b) Yellow labels for hydraulic test.

Junction boxes shall be mounted in the vertical plane, and protected during construction against the ingress of moisture; unused entry holes are to be blanked off. All cable and wiring connections shall be clearly marked with the correct designation as shown on drawings and specifications.

The type, design and methods of manufacture of racks, brackets and other special supporting steelwork shall be subject to the approval of the consultant.

The number and size of brackets, racks, clips or other support equipment or cables in position without imposing strain on the equipment or cables and the finished installation shall present a neat appearance.

The drilling, cutting and/or welding to steel work or building structures shall not be carried out without prior approval of the consultant. Drilling, cutting and/or welding to pressure vessels or pipe work are not permitted under any circumstances.

Where the MPC Supplier is required to cut away and repair the building, the materials used for repairing shall be the same as the original materials and the standard of workmanship at least equal to the original standard.

The MPC Supplier shall provide personnel who will be conversant with the types of instrumentation to be installed.

Instruments shall be located as shown on the instruments location plans, however, final location and orientation of instruments shall take into consideration the ease of accessibility for service and maintenance and "readability" from walkways, platforms, ladders, grade, etc.

Prior to installation of instruments, particularly those of delicate nature, consideration must be given to the amount and type of other activities taking place in the area e.g. erection of vessels, steel work, piping, scaffolding etc.

1.18. INSTRUMENT PROCESS PIPING AND TUBING

All tubing shall be imperial sizes, expressed in nominal outside diameter (OD) and all threads shall be NPT ANSI B 1.20.1.

Tubing shall be of TP 316 / 316L (dual certified) material to ASTM 'A 269' or equivalent (i.e., BS 970-316-S31, DIN4401 or ASME SA 479-316), unless otherwise specified. Molybdenum content shall be 2.5% minimum and carbon content of $\leq 0.03\%$. The minimum size shall be $\frac{1}{4}$ " OD.

 ऑयल इंडिया लिमिटेड Oil India Limited	CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA AND EAST KHAGORIJAN, ASSAM Functional Specification for Package Instruments	

Stainless steel tubing shall be soft annealed seamless TP 316 / 316L (dual certified) as per ASTM A269. Sizes shall be as follows:

Instrument “hook-ups” shall be in accordance with drawings provided and shall be prefabricated as far as practical and possible. Instrument piping shall be installed using the minimum number of fittings, but executed so that the removal of the instrument for maintenance is possible. All pressure lines and pneumatic lines to and from instruments are to be thoroughly cleaned of burrs, internal slivers and foreign matter before being put into operation. Where a pipe rack is not provided, pneumatic lines and/or cables (generally three (3) or less) may be strapped to sub air headers.

Air supply piping and cable ladders shown on piping and structural drawings respectively shall be supported by existing steel work; sub air header piping and cable racks (branches) shall be supported by materials delivered by the MPC Contractor.

Process lead lines, tubes, etc., shall be fixed throughout their length by means of approved saddles, clips and/or cleats. For lengths up to 1 m the instrument pressure piping is self-supporting, for longer lengths the instrument piping shall be supported at approximately 1 m intervals and shall be protected against damage. Process lead lines and tubes passing through floors or other positions where they are liable to mechanical damage, shall be protected.

When instrument piping supports are clamped on structures of a different material, insulating barriers, e.g. tape or gasket material shall be applied to prevent electrolytic corrosion. When instrument piping supports have to be fixed to fireproofed plant structures, these support should be applied welded to the steel structure before the fireproofing is applied, otherwise the supports should be fixed by means of clamps around the fireproofing, if allowed by civil engineering.

Screwed instrument connections shall not be seal welded. Instrument process piping shall be routed and sloped to avoid any pockets or traps, otherwise, drip pots shall be installed at low points.

Specification for Electrical requirements for MPC-4 Package

1 SCOPE

This Electrical Specification broadly outlines the minimum requirements for the Design, Engineering, Selection, Sizing and Installation of the electrical equipment and associated systems of the installation/ facility. The philosophies as described in following section shall be referred for those equipment / system which are applicable for this project.

The electrical scope shall include design, engineering, procurement, manufacture, testing at manufacturers' works, packing, transportation, unloading, storage, insurance, transportation from stores to erection site, erection, site testing, commissioning, demonstration of performance guarantee test of the electrical equipment and handing over to OWNER including submission of hardcopy and soft copy of all as-built drawings, O&M manuals etc. required for successful operation of the facilities. The scope indicated in the following clauses shall be read in conjunction with detailed technical specification of this tender and the bid drawings. The major items covered are detailed as follows:

- Electrical equipment such as electric motors, Lighting and Distribution Boards (As required)
- On skid cabling and cable trays with supports, including interconnecting cabling
- On skid Lighting (Normal, Emergency and Critical), small power receptacles and Lighting & Small Power Distribution Board
- Terminal boxes at skid edge for field connection by MPC Contractor (except motors)
- Cable glands
- On skid earthing system (safety and continuity)
- Earth bolts for skid earthing to structure
- Supports for motor control stations (As required)

2 CODES AND STANDARDS

- a) The equipment shall comply with the requirements of the latest revision of the following standards issued by BIS unless otherwise specified.

CODES

IS-1646	Code of practice for the fire safety of buildings – Electrical Installations
IS-2189	Code of practice for selection: installation and maintenance of automatic fire detection and alarm system
IS-3043	Code of practice for Earthing
IS-3646	Code of practice for Interior Illumination
IS-5571	Guide for selection of electrical equipment for hazardous area
IS-5572	Classification of Hazardous Area (other than mines) having flammable gases and vapours for electrical installation
IS 5780	Electrical apparatus for explosive gas atmospheres
IS 5831	PVC insulation and sheath of electric m cables
IS-6665	Code of practice for industrial Lighting
IS 7098-Part-1	Cross linked polyethylene insulated PVC sheathed cables: Part 1 for working voltage upto and including 1100 V
IS / IEC 60529	Degree of protection provided by enclosures (IP Code)
IEC 60228	Specification for conductor of insulated cables
IEC 60287	Electric cables - Calculation of the current rating (Current rating equations (100% load factor) and calculation of losses)

IEC 60502-1 Power cables with extruded insulation and their accessories for rated voltages from 1kV (Um=1.2kV) up to 30kV (Um=36kV)

OISD-STD-110 Recommended Practices on Static Electricity

OISD-RP-149 Design Aspects for Safety in Electrical System

OISD STD-173 Fire Protection System for Electrical Installations

b) In case of imported equipment standards of the country of origin shall be applicable if these standards are equivalent or stringent than the applicable Indian standards.

c) In case Indian standards are not available for any equipment, standards issued by IEC / BS / VDE / IEEE / NEMA or equivalent agency shall be applicable.

d) In case of any contradiction between various referred standards specifications data sheet and statutory regulations the following order of priority shall govern:

- Statutory regulations
- Design Basis
- Equipment specification
- Codes and standards

3 ELECTRICAL SYSTEM VOLTAGE AND VARIATIONS

3.1 Voltage levels

LV Switchgear	415 V +6/-10%%, 50 Hz $\pm$ 3%, 3 Phase, 3 Wire
Lighting & Small Power Distribution	240 V +6/-10%%, 50 Hz $\pm$ 3%, between Phase to Phase, 2 Wire
Heat tracing power distribution	240 V +6/-10%%, 50 Hz $\pm$ 3%, between Phase to Phase, 2 Wire and Earth

UPS system (for control & protection circuits, PLC, instrumentation)

240 V $\pm$ 1%, 50 Hz $\pm$ 3%, 1 Phase, 2 Wire

3.2 Control supply Voltage

SL. NO	CIRCUIT	RATED VOLTAGE (V)	SOURCE OF SUPPLY
1	Motor Control	110V AC for Safe Area Motors	Through Incomer control transformer wire bus
		30V DC for classified area motors	Internally derived from intrinsically safe relay

3.3 Short Circuit Levels

Switchboards and distribution boards shall be designed to meet the following short circuit levels:

415 V Systems: 50 kA (rms) for 1 sec

240 V Systems: 16 kA (rms) for 1 sec

(UPS) System: 10 kA (rms) for 1 sec

System protective devices (relays, fuses, breaker trip units, etc.) shall be selected and coordinated to ensure that the closest interrupter to the point of short circuit (or high overload) shall open first and minimize disturbances on the rest of the system.

4 ELECTRICAL EQUIPMENT FOR CLASSIFIED AREAS

All the areas within the Battery limits shall be classified for degree and extent of hazard from flammable materials. The basis for hazardous area classification recognizes the differing degrees of probability with which flammable atmosphere may arise in the installation, in terms of the frequency of occurrence and the probable duration of existence on each occasion.

Following factors shall be considered for proper selection of electrical apparatus and equipment for areas where flammable gas or vapor risks may arise:

- (a) Area classification, i.e. Zone 0, 1 or 2
- (b) Gas group classification, i.e. gas groups IIA, IIB or IIC.
- (c) Temperature classification i.e. T3/T6.
- (d) Environmental conditions in which apparatus is to be installed.

Wherever practicable, electrical apparatus in general and switch and control apparatus in particular shall be installed in safe area. Substation and control room shall be located in safe area. Electrical equipment intended for service in hazardous area shall be selected in accordance with IS : 5571 and these shall be certified by recognized testing/certifying authorities of country of origin (e.g. CIMFR, LCIE, UL, FM, PTB, Baseefa etc.).

For details on hazardous area classification, enclosure protection etc. OISD standard 113, National Electric Code, IS 5571, 5572, Petroleum Rules and Oil Mines Regulations shall be referred.

However, irrespective of area classification, all the electrical equipment which are located in hazardous areas, shall be of Ex'd' type, Flame proof enclosures. All indigenous flameproof equipment shall have valid BIS / International license as a mandatory.

5 DEGREE OF PROTECTION

The degree of protection against dust and water ingress, necessary for individual electrical items is determined by the equipment duty, its environment, its location and the hazardous area classification. The equipment located outside or subject to deluge from fire water system/rains are to be of specified weather proof construction and protected against the most adverse conditions that are anticipated. These enclosures are to be classified to IP-55 as a minimum degree of protection, increased as necessary where the location/situation demands. Indoor equipment shall be a minimum of IP-52 protection and accessible equipment within enclosures will be a minimum of IP-22 degree of protection. Ingress protection of IP-42 shall be considered for only indoor equipment with specific ventilation requirements.

6 ELECTRICAL EQUIPMENT PROTECTION

Electrical system and equipment shall conform to the amendment regulation 100, Sub regulations (1) of Central Electricity Regulations 2010.

7 EQUIPMENT DESIGN BASIS

7.1 LV INDUCTION MOTORS

7.1.1 LV Motors shall be:

- (a) Energy Efficient Type (IE2).
- (b) TEFC, minimum IP55 for indoor, outdoor or under shed installation, severe duty, high efficiency, squirrel cage induction type.
- (c) Suitable for satisfactory operation at 415 V +/- 10 %, 50 Hz +/- 3 %, 3 Phase.
- (d) Suitable for DOL starting or soft starter starting or VFD starting as applicable. Starting current shall not exceed 7.0 times the rated current for motors rated up to 37 kW; 6.0 times for motors rated 37 kW and above.
- (e) Class F insulation with temperature rise limited to Class B.
- (f) For motors in Zone 1 / Zone 2 classified areas, flameproof (Ex'd') construction shall be used. In classified areas, all motors shall be rated for temperature class T3, gas group IIA/B, minimum IP-55 ingress protection.
- (g) Space heaters shall be provided for motors rated 30 kW and above.
- (h) Noise level shall be maintained as per IEC 34-9.
- (i) Motor vibration shall be within the limit specified in IS 4729.

7.2 MOTOR CONTROL & MONITORING

7.2.1 Each motor shall be equipped with a local control station near the motor in the field according to relevant P&ID requirement.

7.2.2 Local control station shall include the following equipment as per individual requirement:

- (a) Start & Stop push buttons
- (b) Ammeter (for motors rated for 30kW and above)
- (c) Auto / Manual or Local / Remote selector switch based on process requirement specified in P&ID.

7.2.3 Stop push button shall generally have stay put feature, be of lockable type.

7.3 AC & DC Distribution Boards (AS required)

7.3.1 AC and DC Distribution boards, such as those to cater to lighting and small power circuits, heat tracing loads, Main & Telecom UPS consumers, DC system loads, etc. shall preferably of indoor type, wall or floor

mounted in electrical room. These boards shall be typically rated 240 V (Phase to Phase), 3 Phase, 3 Wire, 50 Hz.

7.4 Lighting System

- 7.4.1 Areas which are normally accessible to personnel movement or where equipment is installed shall be sufficiently illuminated. Lighting system shall be designed as per standard industry practice and the illumination intensities shall comply to IS 3646 and OISD RP 149 guidelines.
- 7.4.2 Sufficient lighting shall be provided so as to enable plant operators to move safely within the accessible areas of plant and to perform routine operations. In the event of normal power failure, emergency lighting should be provided. Desired lux level shall be achieved considering that both the lighting fixtures, normal as well as emergency one are energized. In the event of normal power failure, emergency lighting shall remain energized through emergency power source.
- (a) Normal / Emergency lighting shall be on 240 V AC (Phase - Phase), 50 Hz.
- (b) Critical lighting shall be on 110 V DC UPS.
- 7.4.3 For compressor room lux level shall be 200 lux as per OISD-RP-149 recommendations.
- 7.4.4 As a good engineering practice the AC emergency load is generally considered as 20-25% of Normal Lighting load.
- 7.4.5 The operational philosophy recommended is, under normal operation, both emergency and normal lighting shall be fed by Normal power source. On failure of normal supply, emergency lighting load will be transferred to emergency source after the start of EDG set within 60 seconds. Critical lighting (DC supply based) will be normally kept 'ON' and during Normal/emergency power failure, battery will provide power.
- 7.4.6 As per CEAR recommendations, Energy conservation measures shall be adopted while designing the lighting system. Illumination system shall be Energy Efficient/LED based as far as practicable. For battery backed emergency lighting, only Energy Efficient/ LED fixtures shall be used.
- 7.4.7 Outgoing circuits shall be protected by MCB + ELCB and incomer by MCCB. Arrangement shall be such that in case of earth leakage in one outgoing circuit, the entire DB need not be tripped. The total estimated load of each circuit shall not exceed 80% of circuit rating. Load on each circuit shall be limited to One (1) kW. Minimum 20% spare circuits shall be provided in each distribution board / panel.
- 7.4.8 Illumination intensities defined in IS 3646 and OISD RP 149 shall be considered as in-service values after applying a maintenance factor of minimum 0.8 and a utilization factor depending on the type of lighting fixture. These figures are the minimum vertical component values for the

locations described on a horizontal plane being 0.75 m from the floor levels in buildings and the ground or platform levels in other areas.

7.4.9 Phase to phase voltage in the lighting system shall be limited to the maximum of 250V.

7.4.10 All lighting fixtures and equipment shall be connected between two phases at a voltage 240V phase to phase.

7.4.11 In case of lighting of building within the plant premises, double pole switches or 2-pole MCBs shall be used in lighting circuits instead of conventional single pole switches.

7.4.12 SOCKET OUTLETS

- (A) Small power loads shall be powered from plant lighting panel.
- (B) Each receptacle circuit shall be protected by MCB + ELCB. Not more than two socket outlets shall be supplied by one circuit.
- (C) Convenience socket outlets shall have necessary mechanical interlocks and earthing facilities. The enclosure shall have suitable protection for site conditions specified (flame proof, weather proof, dust proof, corrosion resistant, etc.).
- (D) Adequate number of three-pin sockets of rating 15A, 240 V ph to ph with earth connection shall be provided for lamps and portable tools at suitable locations. Hand lamps and portable tools shall be earthed through flexible cords.

7.5 EARTHING SYSTEM

7.5.1 Earthing system in general, shall cover the following

- Equipment earthing for personnel safety,
- System neutral earthing, and
- Static and lightning protection.

7.5.2 The earthing system envisages an earthing network with designed number of earth electrodes attached to it. The following shall be earthed:

- Metallic non-current carrying parts of all electrical apparatus such as motors, lighting/power panels, terminal boxes, control stations, lighting fixtures, receptacles etc.
- Steel structures, loading platform etc.
- Cable trays and racks, lighting mast and poles.
- Cable shields and armor

7.5.3 As far as possible, all earth connections shall be visible for inspection.

7.5.4 All connections shall be carefully made and adequately locked against loosening. Normally earthing system shall comprise of Aluminium strip as

main earth grid along with suitably located Aluminium disconnecting plates to provide multiple earth connections between earth grid and equipment and for connections between main earth grid and electrodes.

7.5.5 Connections between Aluminium earth electrode and the disconnecting plates shall be done by Aluminium strip. For highly corrosive areas, PVC insulated Aluminium / Copper Conductor cable (un-armoured) can be used.

7.5.6 The maximum values of earth fault current for the design of the earthing system shall be taken as follows:

415 systems: 50 kA for 1 sec

7.5.7 CONNECTION

- i. All electrical equipment is to be doubly earthed by connecting two points on equipment to a main earthing ring. The cable armor shall be earthed through the cable glands.
- ii. Two copper earthing leads shall be provided for Generator neutrals and each shall be directly connected to a separate earth pit which in-turn shall be connected to main earthing grid.
- iii. Anchor bolts or fixing bolts shall not be used for earthing connection.
- iv. All hardware used for earthing installation shall be hot dip galvanized or zinc passivated. Spring washers shall be used for all earthing connections of equipment.
- v. Wherever the equipment does not have provision of termination of Aluminium Strip directly, suitable tinned copper jumpers lugged on both ends shall be used.
- vi. For sensitive electronic process equipments & PLC system, separate earth pit with copper plate electrodes & copper strips of suitable size shall be provided. These shall be clean earth. These shall be separate from electrical earth system.
- vii. The earthing conductor shall be sized based on fault current and its duration. Minimum Earthing conductor sizes for major equipment shall be as per OISD RP 149.

7.6 Cabling

7.6.1 Design Criteria for Power cable shall be as follows:

- (a) Continuous current carrying capacity
- (b) Short circuit rating –
 - Incomer - Short circuit withstand for 0.6 second

- Tie feeders at Generator Panel - Short circuit withstand - 0.6 sec.
- Breaker controlled motors and Distribution transformers. 0.16 sec.

(c) Voltage drop – As stated in Clause 8.2 of this design basis.

(d) Derating Factor considering laying conditions.

(e) All Power and Control Cables shall be with copper conductor

7.6.2 Minimum Cross-section of cable conductors:

- LV Power Cables : 2.5 mm² (Min)
- LV Control Cables: 2.5 mm² (Min)
- Lighting cables : 2.5 mm² (Min)

In cases where the minimum cross-sectional area requirement is higher than 240 mm², single core cables shall be utilized.

7.6.3 415V System Power Cables shall be 1100V grade, single / multicore, stranded copper conductor, XLPE insulated, with PVC inner sheath, armoured and outer sheath made of specially formulated FRLS PVC compound. Single core cables shall have aluminium wire / formed wire armour, whereas multicore cables shall have galvanized steel strip armour.

7.6.4 110V DC system cables shall be 1100V grade; stranded copper conductor cables identical to 415V system power cables described above shall be used.

7.6.5 Lighting wires shall be 2.5 / 4 Sq.mm, single core, stranded, copper conductor, PVC insulated wires conforming to IS: 694 (1990) / IEC-227 part-1 to 5 (1979) / IEEE -719 (1981) shall be used.

7.6.6 Control cables shall be 1100V grade, multicore, 1.5 / 2.5 sq.mm cross section, stranded copper conductor having 7 strands, PVC insulated as per IS 1554, inner PVC sheathed, and outer sheath made of FRLS PVC compound conforming to the performance requirements outlined above shall be used. For multi-core control cables, no of core to be chosen with 20% of total cores or min. 1 core shall be kept as spare in addition to actual core requirement.

7.7 Cable Carrier System

7.7.1 Cables from Switchgear Units and MLDBs shall be routed on prefabricated ladder type FRP cable trays with supported on site fabricated tray supports inside the buildings.

7.7.2 Separate cable trays shall be used for 415V power, control and instrumentation cables. FRP sheet cover shall be used in all exposed cable trays in outdoor areas.

7.7.3 In Substation / Indoor areas the cables shall be laid on FRP ladder type/perforated cable trays running in the built up RCC trenches.

7.7.4 Cables shall be laid in overhead cable racks / RCC trenches filled with sand / pipe racks / in outdoor areas. Other areas the cables shall be laid in overhead FRP ladder/perforated cable trays which shall be supported from slabs/walls/Columns and pipe racks as found suitable.

7.7.5 CABLE TRAYS

- i. All cable trays shall be of ladder type or perforated type construction of various sizes with accessories. There shall be a maximum spacing of 2000mm between horizontal cable tray supports and 1500 mm between vertical cable tray supports, except fittings (elbows, tees, etc.) which shall be supported at each splice.
- ii. Solid bottom trays shall be provided for all special noise-sensitive circuits and analog instrumentation circuits. For instrumentation and control cables perforated cable trays shall be used.
- iii. Clearance: The minimum design vertical spacing for trays shall be 300 mm measured from the bottom of the upper tray to the bottom of the lower tray excluding the thickness of the support of the upper tray. At least a 300 mm clearance shall be maintained between the top of a tray and beams, piping, or other obstacles to facilitate installation of cables in the tray. A working space of not less than 600 mm shall be maintained on at least one side of each tray.
- iv. These shall be prefabricated FRP trays.
- v. The cable trays shall be categorized into two, Power and control the width of trays used shall be of 150,300,450,600 & 750mm wide. Flange height shall be 100mm and 50mm for power and control trays respectively.
- vi. Power trays shall be loaded in single tier for 75% and control trays shall be loaded in double tier for 75%.

Package specification for Structural works

1 SCOPE

This specification defines the minimum requirements for the design, material procurement, manufacturing & assembly of Structural works.

2 ANALYSIS AND DESIGN

- a) All analysis and design work related with structural steel shall be carried out using STAAD Pro latest version.
- b) Limit State Method of design as per IS 800 shall be followed in the design of steel structures unless otherwise specified elsewhere in this document for special structures

3 DESIGN LOADS

All loading for this project shall be designed as per IS 875, IS 1893.

4 DESIGN PHILOSOPHY OF STRUCTURAL DESIGN OF STEEL STRUCTURES

4.1 GENERAL

- a) All steel bars, sections, plates, and other miscellaneous steel materials, etc. shall be free from loose mill scales, rust as well as oil, mud, paint or other coatings. The materials, construction specifications such as dimensions, shape, weight, tolerances, testing etc., for all materials covered under this section, shall conform to respective IS codes.
- b) The design of all structural steel work will be carried out in accordance with Limit State Design method as per IS 800: 2007.
- c) Design, fabrication and erection of all structural steel works shall be carried out in accordance with the following IS Codes as applicable to the specific structures, viz. IS 800:2007, IS:801, IS:802, IS:806, IS:814, IS:816, IS:875, IS:1893, IS:3502, IS:9178, IS:9595, IS:6533 etc. Basic consideration of structural framework shall primarily be stability, ease of fabrication / erection and overall economy satisfying relevant Indian Standard Codes of Practice.
- d) Simple and fully rigid design as per IS: 800 shall be used. Where fully rigid joints are adopted they shall generally be confined to the major axis of the column member.
- e) Structural elements continuously exposed to temperatures above

200deg.C shall be designed for reduced stress as per Table 4 of IS: 6533 (Part 2). The expected temperature of steel components shall not be allowed to exceed 400deg.C.

4.2 STEEL GRADE

Structural steel shall be of yield stress of 250 MPa conforming to Grade A of IS: 2062. Tubular steel shall conform to Yst 240 of IS: 1161. All Holding down Bolts (HD Bolts) or threaded rods for non-post tensioned applications shall be out of Mild Carbon Steel conforming to IS 2062 with $F_y = 250$ MPa.

4.3 FIREPROOFING OF STEEL STRUCTURES

Fire-proofing of steel structures, wherever required as per OISD-STD-164, shall be done for 2 hours fire rating.

4.4 DESIGN CRITERIA

STEEL STAIRCASE, LADDERS, HANDRAILS AND GRATINGS

- a) Steel staircases for main approaches to operating platforms shall have channels provided as stringers with minimum clear width of 750mm and slope of app.41 degree. The vertical height between successive landings shall not be less than 2.6m nor exceed 4.0meters. Treads shall be minimum 230mm wide made of grating (with suitable nosing) spaced equally so as to restrict the rise to maximum 200mm. The minimum width of concrete staircase for control rooms/switch houses etc. shall be 1000mm.
- b) All handrails, staircase steps and platform gratings shall be hot dip galvanized as per specs/IS Codes.
- c) Ladders shall be provided with safety cages when the top of the ladder is more than 3.0 m above the landing level. Safety cages shall start 2.1 meter above the lower landing level. Ladders shall be of 450mm clear width with 20mm diameter MS rungs spaced at 300mm (maximum). Ladders shall preferably be vertical.
- d) Handrails, 1000mm high, shall be provided to all walkways, platforms, and staircases. Toe plate (100mmx5mm) shall be provided for all hand railing (except for staircases). Spacing of uprights shall be 1500mm (maximum).

- e) Types of hand railing shall be provided as under:
 - f) i. For walkways, platforms (except platform supported on vessels) and staircases: Top rail, mid rail and upright shall be 32 (M) NB MS tubes.
 - g) ii. For platforms supported on vessels: Top rail shall be 32 (M) NB MS tubes but mid rail (flat 50x6) and upright (angle 50x50x6) shall be of structural steel.
- h) All M.S. Tubes and fittings for handrail shall confirm to IS 1239.
- i) MS Gratings shall be Electro-forged/Weld forged/welded, hot dip galvanized and minimum 25 mm deep. The maximum size of voids in the grating shall be limited to 30mm x 100mm. The minimum weld length shall be as per IS: 816.
- j) Galvanization shall be done in accordance with IS: 2629 and tested as per IS: 2633 and IS: 6745. Quantity of zinc coating shall be minimum 610 g/m² of surface area.

5 SKIDS AND BASE FRAMES

Following design considerations shall be taken into account for pre-fabricated structures including power skids:

- a) External forces acting on the pre-assembly and it's components due to transportation, shipping and lifting shall be derived by Transportation and Heavy Lift Contractor. The final design shall take into account all stresses included in the pre-assembly frame due to these forces.
Increased section sizes or additional temporary members and bracing are to be included as necessary. Design of base steelwork for pre-assemblies will normally depend on the magnitude of transportation, shipping and lifting loads. Transportation and heavy lift philosophy shall be established prior to commencement of design.
- b) The primary members shall be adequately cross-braced to prevent flexing or distortion of preassembly during transportation, lifting and installation. Equipment mounted on preassemblies shall not be considered as bracing for the "in-place condition". The pre-assembly and equipment support shall be designed to withstand transportation load acceleration.
- c) Worst state cases shall be used in the absence of firm data from

Transportation and Heavy Lift Contractor. When definitive data becomes available it shall be checked against the factors used.

- d) Equipment shall be arranged, as nearly as practicable, such that the centre of gravity of the assembly lines up with the physical centre of the skid. The offset shall be dimensioned and the lifting lugs shall be positioned such that the lifting is leveled.
- e) The skid base shall be designed as all welded units to sound structural engineering principles.
- f) The skid base shall comprise at least 3 equally spaced primary beams adequately cross braced to prevent flexing or distortion of the skid during transport and installation.
- g) Equipment mounted on the skid shall not contribute to the structural strength of the skid.
- h) Each skid shall further be capable of being winched onto a flat transporter without skid
- i) Distortion or damage to equipment.
- j) Suitably designed pad type lifting lugs or other approved lifting arrangements shall be provided to facilitate loading and unloading of each fully assembled skid. If required by the designed method of lifting, one spreader bar in total shall be provided for each size of skid, to allow single point pick-up. Lifting lugs shall be designed for double the anticipated loads OR in other words, a dynamic amplification factor of 2.0 shall be considered for the design of lifting lugs and main beams.
- k) Steelwork shall be designed to be suitable for supporting all items of equipment. Floor grating or chequered plates shall not be used as a mounting for equipment or for supports.
- l) Metal thickness at points of equipment or support bolting shall be not less than 10 mm.

Piping Design Basis

1 SCOPE

This design basis briefly covers the basic requirements for the design of piping systems. These shall be adhered by MPC contractor(s) or his sub-contractor(s) or skid package suppliers during the course of engineering & construction.

2 DESIGN PHILOSOPHY / CRITERIA

2.1 Equipment Layout

a) Equipment layout shall be developed based on the following data:

- P&IDs.
- Overall Plot Plan.
- Plant North, true North and Wind direction.
- Equipment Data Sheets.
- Process Flow

b) The following aspects shall be considered during development of equipment layout:

- All Skids are modularized type except Storage Tanks.
- Process Requirement - i.e. proper interconnection between equipment as per P&IDs to achieve the intended process parameters.
- Economy of piping material- Minimize the quantity of piping.
- Erection & Construction requirement -Erection scheme and schedule of all equipment must be considered during equipment layout to have smooth erection, approach road for cranes / derrick etc.
- Safety Requirements-As a minimum, OMR-2017 & 'OISD Std. 118' shall be followed.
- Firefighting facilities shall be provided as per 'OISD' & 'NFPA' norms.
- Constructability, Operation and Maintenance Requirement:
 - Overhead and side clearances for individual equipments
 - Horizontal & overhead clearances for easy movement of working Personnel
 - Provision of Mobile crane access
 - Provision for Laydown area
 - Provision of operator's cabin

PIPING DESIGN BASIS**2.2 Piping Layout**

- a) Piping shall be grouped as far as possible for the ease of supports.
- b) Column / vessel platforms should be designed in such a way so that all the nozzles should be approachable from platforms.
- c) Pump discharge check valve if installed in vertical lines shall be fitted with a drain connection as close as possible downstream of the valve.
- d) All valves shall be located at operable height.
- e) Pockets in the flare header and blow down system shall be prohibited.
- f) Relief valve discharge piping shall be taken to safe location as per OISD requirements.
- g) Low point drain and High point Vents shall be provided as required for the system.

3 CLEARANCES & ACCESSIBILITY**3.1 Vertical and Horizontal Clearance**

- h) Over head clearance shall be maintained to 2.2 m.
- i) Horizontal clearance around equipments and walkway shall be around 900mm.

3.2 Platforms with ladder access shall be provided for

- a) Items that require occasional operating access including valves, spectacle blind
- b) And motor operated valves, heater stack sampling points.
- c) Man ways above grade on equipment.

3.3 Ladder Location

- a) Wherever practicable, ladder shall be so arranged that users face equipment or platform rather than facing open space.
- b) Landings shall be staggered. No ladder shall be more than 6M in one flight.
- c) Platforms, ladders & stairways shall be consistent with access & safety requirements.

3.4 Material Handling

- a) Material handling access shall be provided for each maintenance item of the Compressor, rotating equipments etc.
- b) Mobile Crane access shall be considered for Layout design.

4 SPECIFICATION FOR DELIVERABLES**4.1 General**

- a) 3D model 'STEP file' for Critical equipments such as Compressor, Nitrogen generator, etc. shall be provided by MPC Contractor. The 3D model file shall match with the dimensions of the specific Equipment Model supplied for the project. EPCM shall prepare the 3D Modeling based on the provided documents.
- b) All dimensions and sizes shall be in SI units (mm) with the exception of line sizes (NPS), which shall be indicated in inches.
- c) All documents shall be provided with a document number, strictly in accordance with the document list, which follows the Master Document Schedule (MDS). EPCM CONSULTANT shall generate all document numbers.

4.2 Quality Control

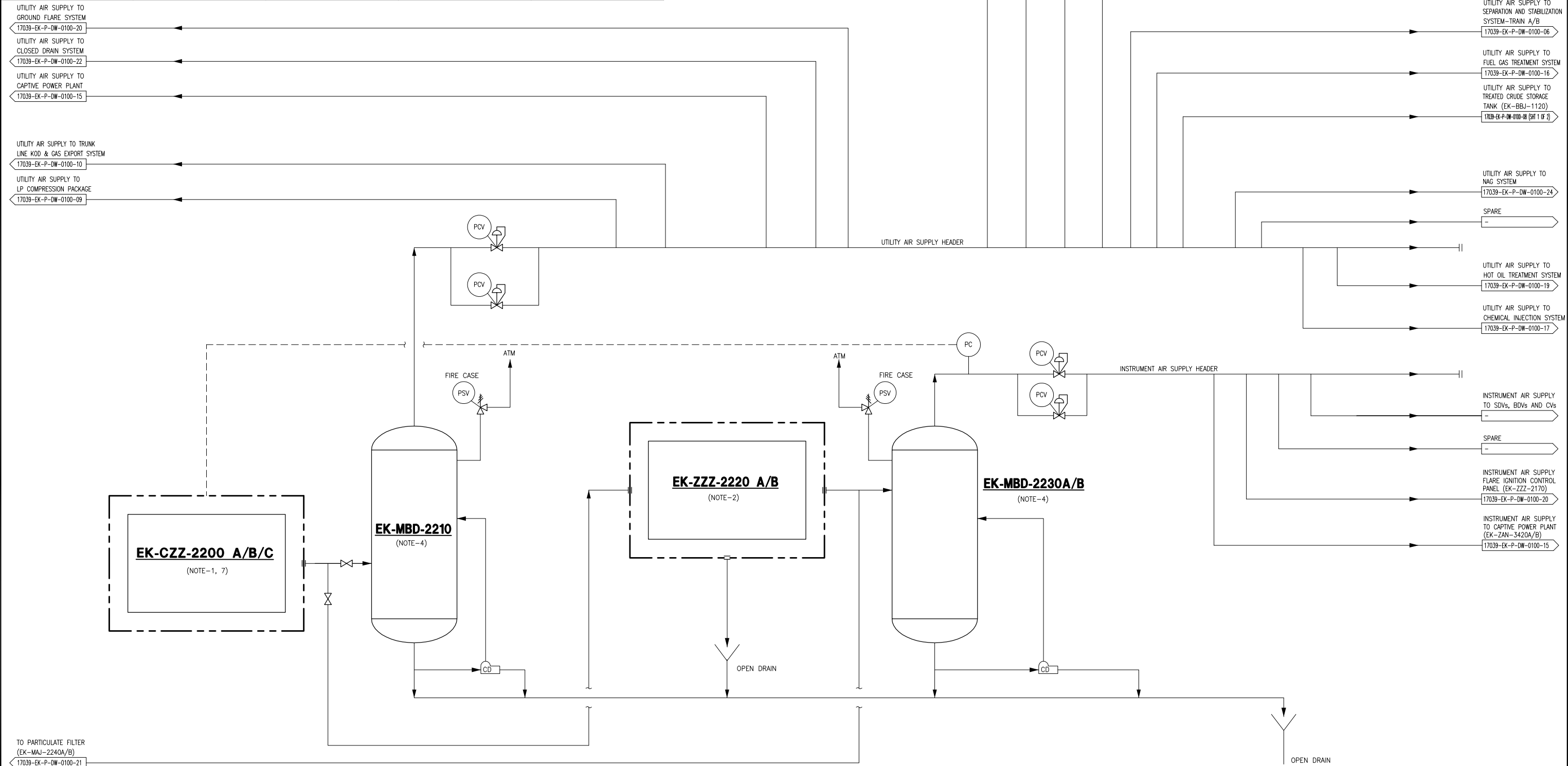
- a) EPCM CONSULTANT and/or its representative reserves the right to audit the progress, quality and work in general at any time to assure that they are in accordance with the specifications and within schedule.

4.3 2D CAD

- a) CAD drawings shall be generated using a version of AutoCAD 2016. Other computer aided drafting programs may be used with EPCM CONSULTANT approval
- b) Drawings shall be generated using the standard EPCM CONSULTANT layers and font sizes. Line type and colors will be layer dependent. EPCM CONSULTANT approval shall be obtained for any deviation from these standards.

Section - III
Annexure

TAG NUMBER		EK-CZZ-2200 A/B/C (NOTE-5,7)	EK-MBD-2210	EK-ZZZ-2220 A/B	EK-MBD-2230A/B
DESCRIPTION		IA/UA COMPRESSOR PACKAGE (3x50%)	UTILITY AIR RECEIVER	IA DRIER PACKAGE (2x100%)	INSTRUMENT AIR RECEIVER (2x50%)
TYPE		OIL FREE TYPE SCREW COMPRESSOR (ELECTRIC MOTOR DRIVEN)	VERTICAL	HEATLESS TYPE	VERTICAL
SERVICE		INSTRUMENT AIR/UTILITY AIR	UTILITY AIR	INSTRUMENT AIR	INSTRUMENT AIR
PRESSURE	DESIGN kg/cm ² g	12.5	12.5/FV	12.5/FV	12.5/FV
	OPERATING kg/cm ² g	8.8 (@ COMPRESSOR PACKAGE OUTLET)	6.8-8.8	6.8-8.8	6.5-8.5
TEMPERATURE	DESIGN °C	85	85	85	85
	OPERATING °C	51	51	51	51
DESIGN CAPACITY		Nm ³ /hr 400 (EACH) (NOTE-6)	100 (HOLD-3)	800 (HOLD-4)	300 (EACH) (HOLD-3)
DIMENSION		mm -	1290 (I/D) x 3500 (T/T) (HOLD-1) (NOTE-4)	-	2000 (I/D) x 4250 (T/T) (HOLD-1) (NOTE-4)
POWER/DUTY		kW 66 (HOLD-2)	-	-	-
DESIGN CODE		API-619	ASME SEC.VIII DIV-1	-	ASME SEC.VIII DIV-1
MATERIAL OF CONSTRUCTION		VENDOR TO ADVISE	CS + 3mm CA	VENDOR TO ADVISE	CS + 3mm CA



NOTES:

- AIR COMPRESSOR SHALL BE OIL FREE TYPE SCREW COMPRESSOR.
- DRYER PACKAGE INCLUDES AIR DRYER, PRE-FILTER AND AFTER FILTER.
- DELETED.
- INSTRUMENT AIR RECEIVER AND UTILITY AIR RECEIVER ARE SIZED WITH 5 MINUTES RESIDENCE TIME BETWEEN NORMAL AND MINIMUM SUPPLY PRESSURE.
- TOTALLY 3 NOS OF 400 Nm³/hr COMPRESSORS, 2 IS IN OPERATION, AND 1 IS OPERATIONAL STAND BY.
- THE GIVEN IA/UA COMPRESSOR PACKAGE CAPACITY IS PRELIMINARY AND WILL BE CONFIRMED.
- COMPRESSOR VENDOR SHALL PROVIDE ALL THE DETAILS INSIDE THE PACKAGE AS PER CLIENT REQUIREMENT INCLUDING THE CONTROL PANEL.

HOLD:

- EQUIPMENT SIZE TO BE CONFIRMED.
- IA/UA COMPRESSOR PACKAGE DUTY TO BE UPDATED BASED ON VENDOR INFORMATION.
- IA/UA RECEIVER CAPACITY.
- IA DRIER PACKAGE CAPACITY.

B	14 FEB 18	ISSUED FOR BID	DAM	PSN/TKV/MSB/MSR					
A	28 NOV 17	ISSUED FOR REVIEW	DAM	PSN/TKV/MSB/MSR					
REV	DATE	DESCRIPTION	DRAWN	CHK	APPR.				

COMPANY:

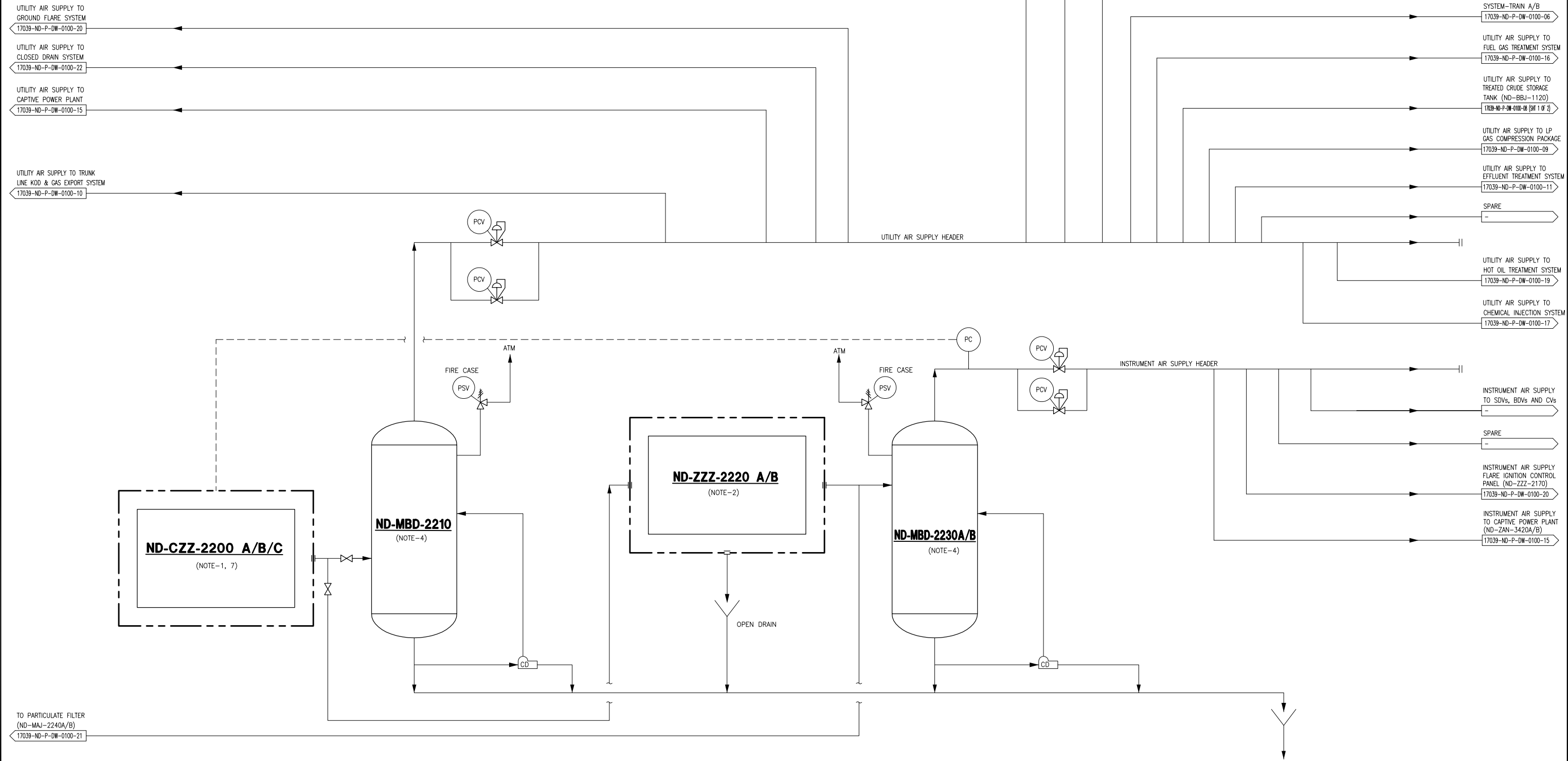
Oil India Limited

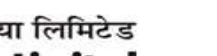
EPCM CONSULTANT:

KAVIN™

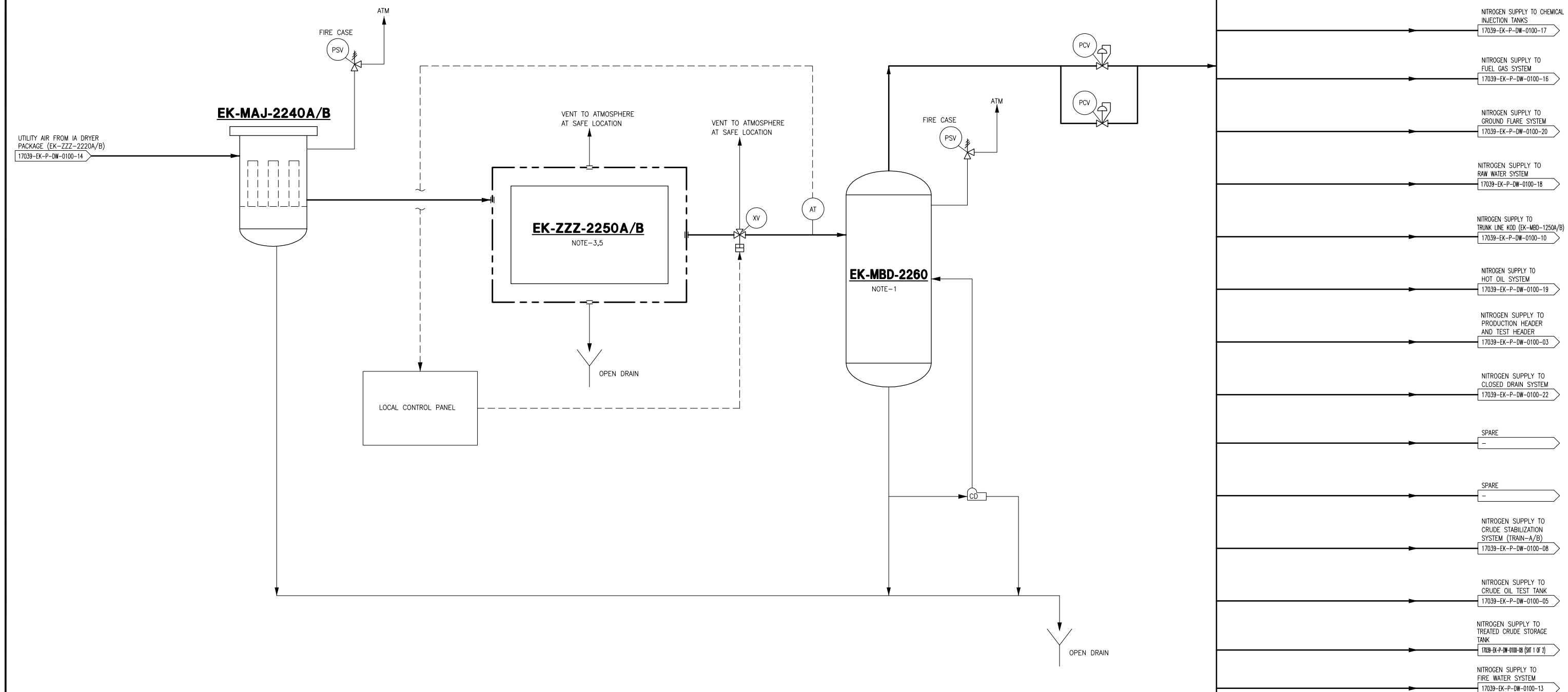
PROJECT : CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN				
THIS DRAWING AND ALL DESIGN DETAILS AND DATA SHOWN HEREON, IS THE SOLE PROPERTY OF OIL INDIA LTD AND SHALL NOT BE REPRODUCED IN ANY MANNER OR USED FOR ANY PURPOSE WHATSOEVER, EXCEPT BY WRITTEN PERMISSION OF OIL INDIA LTD.				
TITLE : UTILITY FLOW DIAGRAM INSTRUMENT AIR/UTILITY AIR SYSTEM				
PROJECT NO.: KIP-17039		PROJECT SITE:	EAST KHAGORIJAN	
DRAWING NO.:	17039-EK-P-DW-0100-14	REV: B	SHEET : 1 OF 1	SCALE : NTS

TAG NUMBER		ND-CZZ-2200 A/B/C (NOTE-5,7)	ND-MBD-2210	ND-ZZZ-2220 A/B	ND-MBD-2230A/B
DESCRIPTION		IA/UA COMPRESSOR PACKAGE (3x50%)	UTILITY AIR RECEIVER	IA DRIER PACKAGE (2x100%)	INSTRUMENT AIR RECEIVER (2x50%)
TYPE		OIL FREE TYPE SCREW COMPRESSOR (ELECTRIC MOTOR DRIVEN)	VERTICAL	HEATLESS TYPE	VERTICAL
SERVICE		INSTRUMENT AIR/UTILITY AIR	UTILITY AIR	INSTRUMENT AIR	INSTRUMENT AIR
PRESSURE	DESIGN	kg/cm ² g	12.5	12.5/FV	12.5/FV
	OPERATING	kg/cm ² g	8.8 (⊙ COMPRESSOR PACKAGE OUTLET)	6.8-8.8	6.5-8.5
TEMPERATURE	DESIGN	°C	85	85	85
	OPERATING	°C	51	51	51
DESIGN CAPACITY		Nm ³ /hr	400 (EACH) (NOTE-6)	100 (HOLD-3)	800 (HOLD-4)
DIMENSION		mm	-	1290 (I/D) x 3500 (T/T) (HOLD-1) (NOTE-4)	2000 (I/D) x 4250 (T/T) (HOLD-1) (NOTE-4)
POWER/DUTY		kW	66 (HOLD-2)	-	-
DESIGN CODE		API-619	ASME SEC.VIII DIV-1	-	ASME SEC.VIII DIV-1
MATERIAL OF CONSTRUCTION		VENDOR TO ADVISE	CS + 3mm CA	VENDOR TO ADVISE	CS + 3mm CA

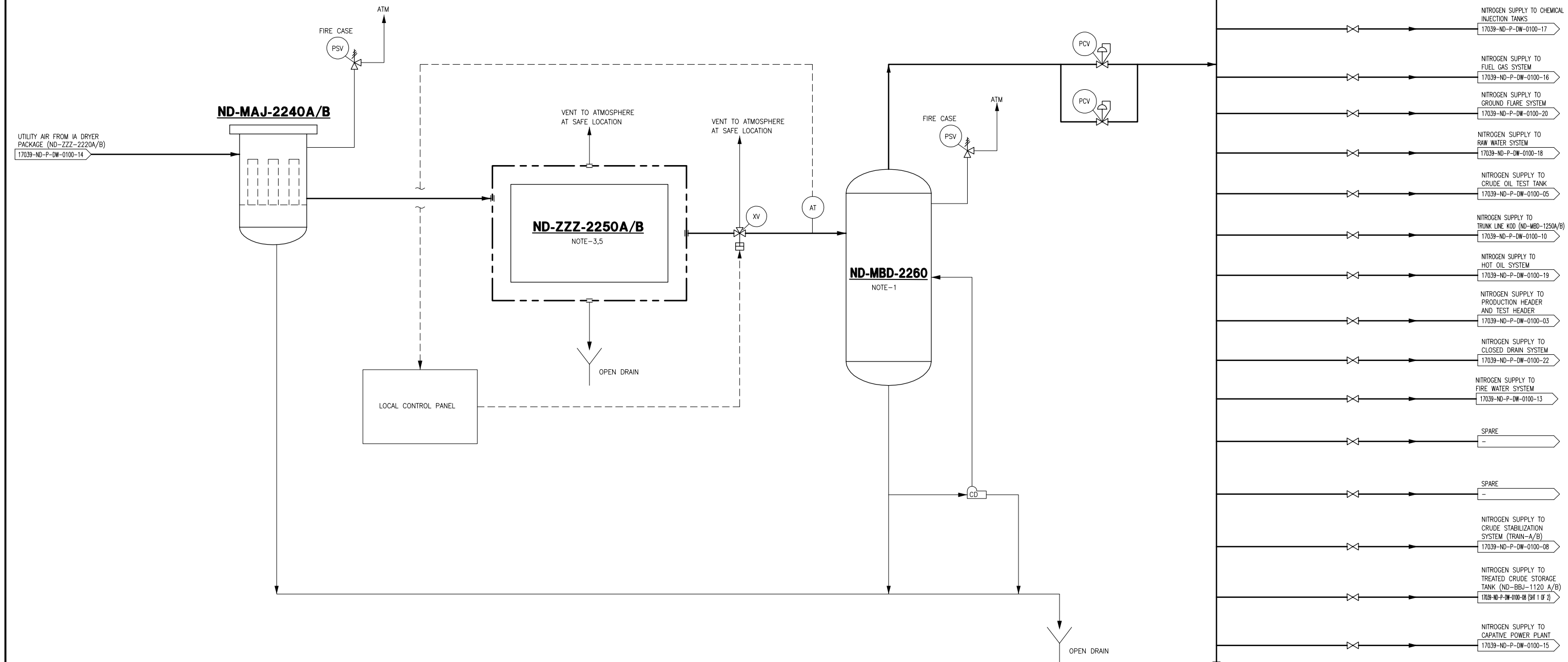


NOTES: 1. AIR COMPRESSOR SHALL BE OIL FREE TYPE SCREW COMPRESSOR. 2. DRYER PACKAGE INCLUDES AIR DRYER, PRE-FILTER AND AFTER FILTER. 3. DELETED. 4. INSTRUMENT AIR RECEIVER AND UTILITY AIR RECEIVER ARE SIZED WITH 5 MINUTES RESIDENCE TIME BETWEEN NORMAL AND MINIMUM SUPPLY PRESSURE. 5. TOTALLY 3 NOS OF 400 Nm ³ /hr COMPRESSORS, 2 IS IN OPERATION, AND 1 IS OPERATIONAL STAND BY. 6. THE GIVEN IA/UA COMPRESSOR PACKAGE CAPACITY IS PRELIMINARY AND WILL BE CONFIRMED. 7. COMPRESSOR VENDOR SHALL PROVIDE ALL THE DETAILS INSIDE THE PACKAGE AS PER CLIENT REQUIREMENT INCLUDING THE CONTROL PANEL.	HOLD: 1. EQUIPMENT SIZE TO BE CONFIRMED. 2. IA/UA COMPRESSOR PACKAGE DUTY TO BE UPDATED BASED ON VENDOR INFORMATION. 3. IA/UA RECEIVER CAPACITY. 4. IA DRIER PACKAGE CAPACITY.							COMPANY: 	PROJECT : CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJJAN	
										THIS DRAWING AND ALL DESIGN DETAILS AND DATA SHOWN HEREON, IS THE SOLE PROPERTY OF OIL INDIA LTD AND SHALL NOT BE REPRODUCED IN ANY MANNER OR USED FOR ANY PURPOSE WHATSOEVER, EXCEPT BY WRITTEN PERMISSION OF OIL INDIA LTD.
										TITLE : UTILITY FLOW DIAGRAM INSTRUMENT AIR/UTILITY AIR SYSTEM
										PROJECT NO.: KIP-17039PROJECT SITE: NADUA
										DRAWING NO.: 17039-ND-P-DW-0100-14REV: B SHEET : 1 OF 1 SCALE : NTS

ITEM NUMBER		EK-MAJ-2240 A/B	EK-ZZZ-2250A/B	EK-MBD-2260
DESCRIPTION		PARTICULATE FILTER (2x100%)	NITROGEN GENERATION PACKAGE (2x100%)	NITROGEN RECEIVER
TYPE		VERTICAL	MEMBRANE TYPE (HEATLESS)	VERTICAL
SERVICE		UTILITY AIR	UTILITY AIR/NITROGEN	NITROGEN
PRESSURE	DESIGN kg/cm ² g	12.5	12.5	12.5
	OPERATING kg/cm ² g	6.5–8.5	6.3–8.3	6.3–8.3
TEMPERATURE	DESIGN °C	85	85	85
	OPERATING °C	51	51	51
DESIGN CAPACITY MMSCF		400 Nm ³ /hr (NOTE–3)	100 Nm ³ /hr (NOTE–5)	100 Nm ³ /hr
DIMENSION / DUTY mm/kW		VTA	–	1290 (I/D) x 3500 (T/T) (NOTE–1) (HOLD–1)
DESIGN CODE		ASME SEC.VIII DIV–1	–	ASME SEC. VIII DIV.1
MATERIAL OF CONSTRUCTION		CS + 3mm CA	CS + 3mm CA	CS + 3mm CA

[illegible]

ITEM NUMBER		ND-MAJ-2240 A/B	ND-ZZZ-2250A/B	ND-MBD-2260
DESCRIPTION		PARTICULATE FILTER (2x100%)	NITROGEN GENERATION PACKAGE (2x100%)	NITROGEN RECEIVER
TYPE		VERTICAL	MEMBRANE TYPE (HEATLESS)	VERTICAL
SERVICE		UTILITY AIR	UTILITY AIR/NITROGEN	NITROGEN
PRESSURE	DESIGN kg/cm ² g	12.5	12.5	12.5
	OPERATING kg/cm ² g	6.5–8.5	6.3–8.3	6.3–8.3
TEMPERATURE	DESIGN °C	85	85	85
	OPERATING °C	51	51	51
DESIGN CAPACITY MMSCFD		400 Nm ³ /hr (NOTE–3)	100 Nm ³ /hr (NOTE–5)	100 Nm ³ /hr
DIMENSION / DUTY mm/kW		VTA	–	1290 (I/D) x 3500 (T/T) (NOTE–1) (HOLD–1)
DESIGN CODE		ASME SEC.VIII DIV–1	–	ASME SEC VIII DIV.1
MATERIAL OF CONSTRUCTION		CS + 3mm CA	CS + 3mm CA	CS + 3mm CA



NOTES:

1. NITROGEN RECEIVER IS SIZED WITH 5 MINUTES RESIDENCE TIME BETWEEN 6.3 kg/cm²g AND 8.3 kg/cm²g.
2. NITROGEN IS USED FOR PURGING. IT IS AN INTERMITTENT PROCESS AND ITS REQUIREMENT WILL BE FULFILLED BY USING NITROGEN GENERATION PACKAGE.
3. DESIGN CAPACITY PROVIDED IS PRELIMINARY AND WILL BE CONFIRMED DURING DETAIL ENGINEERING.
4. NITROGEN PURITY AT NITROGEN GENERATOR OUTLET SHALL BE 98% (MIN) AND OXYGEN SHALL BE 2% (MAX).
5. NITROGEN REQUIREMENT AT NITROGEN GENERATION PACKAGE SHALL BE 100Nm³/hr. VENDOR TO ADVISE NITROGEN GENERATION PACKAGE INLET FLOW RATE.

NOTES: 1. NITROGEN RECEIVER IS SIZED WITH 5 MINUTES RESIDENCE TIME BETWEEN	HOLD: 1. EQUIPMENT SIZE TO BE CONFIRMED DURING DETAILED ENGINEERING.

B	14 FEB 18	ISSUED FOR BID	DAM	PSN/TKV	MSB/MSR
A	24 NOV 17	ISSUED FOR REVIEW	DAM	PSN/TKV	MSB/MSR
REV	DATE	DESCRIPTION	DRAWN	CHK.	APPR.

COMPANY:



EPCM CONSULTANT :



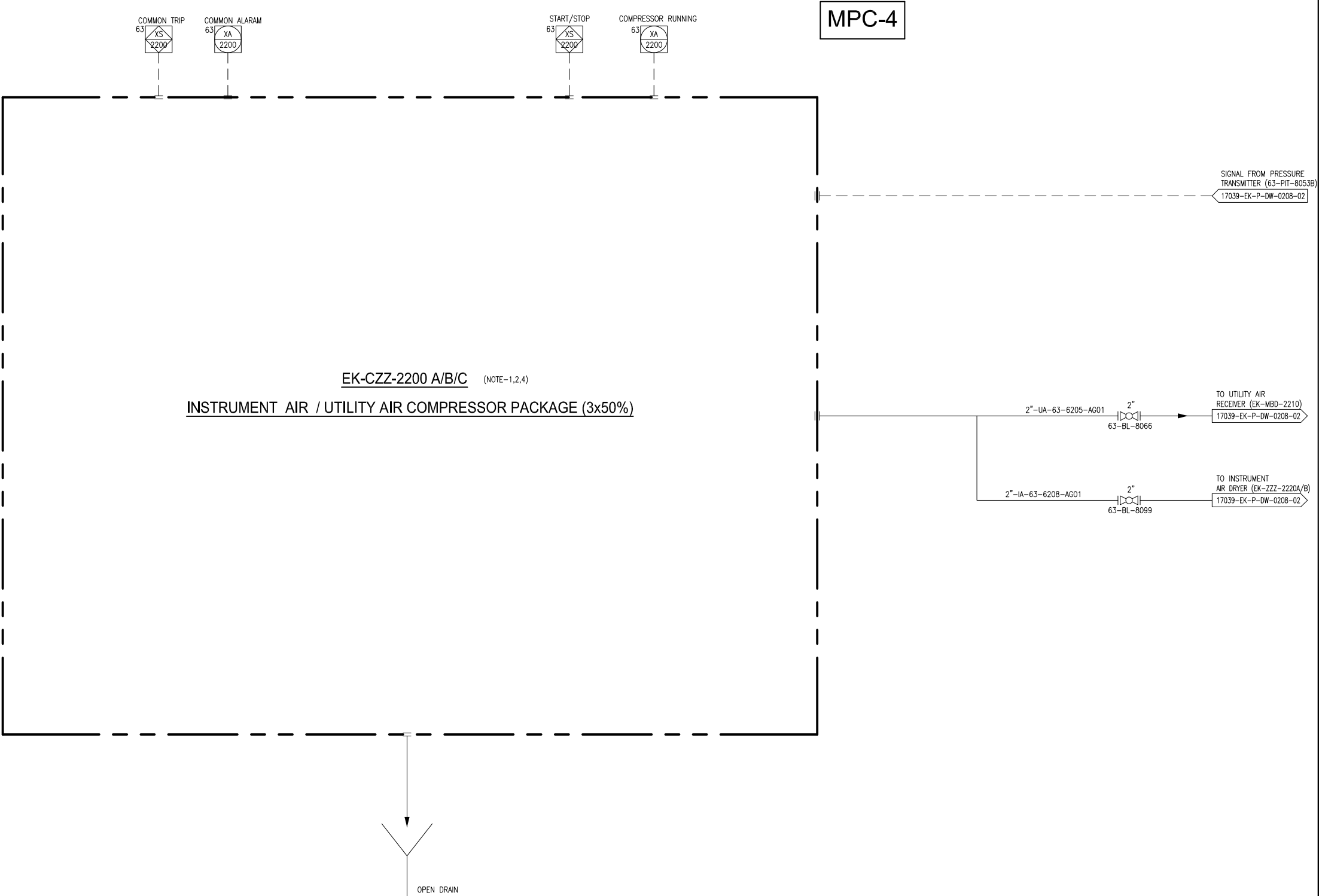
PROJECT :	CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN

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TITLE : UTILITY FLOW DIAGRAM
NITROGEN GENERATION SYSTEM

PROJECT NO.: KIP-17039		PROJECT SITE:		NADUA	
DRAWING NO.:	17039-ND-P-DW-0100-21	REV: B	SHEET : 1 OF 1	SCALE : NTS	

TAG NUMBER		EK-CZZ-2200 A/B/C (NOTE-1,2,4)	
DESCRIPTION		INSTRUMENT AIR/UTILITY AIR COMPRESSOR PACKAGE (3x50%)	
TYPE		OIL FREE TYPE SCREW COMPRESSOR (ELECTRIC MOTOR DRIVEN)	
SERVICE		INSTRUMENT AIR/UTILITY AIR	
PRESSURE	DESIGN	kg/cm ² g	12.5
	OPERATING	kg/cm ² g	8.8 (@ COMPRESSOR PACKAGE OUTLET)
TEMPERATURE	DESIGN	°C	85
	OPERATING	°C	51
DESIGN CAPACITY		Nm ³ /hr	400 (EACH) (NOTE-3)
DIMENSION		mm	—
POWER / DUTY		kW	66 (HOLD-1)
DESIGN CODE		API-619	
MATERIAL OF CONSTRUCTION		VENDOR TO ADVISE	



SEQUENCE NUMBER FOR LINES, INSTRUMENTS, VALVES & FOR SPECIALTY ITEMS EXCEPT EQUIPMENT SHALL BE CHANGED AS PER LEGEND DURING DETAIL DESIGN.

NOTES:

- COMPRESSOR VENDOR SHALL PROVIDE ALL THE DETAIL INSIDE THE PACKAGE AS PER CLIENT REQUIREMENT INCLUDING THE CONTROL PANEL.
- THE AIR COMPRESSOR SHALL BE OIL FREE TYPE SCREW COMPRESSOR.
- THE GIVEN UA/IA COMPRESSOR PACKAGE CAPACITY IS PRELIMINARY AND WILL BE CONFIRMED DURING DETAILED ENGINEERING.
- TOTALLY 3 NOS OF 400 Nm³/hr COMPRESSORS, 2 IS IN OPERATION, 1 IS OPERATIONAL STAND BY.
- ALL INSTRUMENTS, VALVES, PSV, EQUIPMENT TAG NO's SHALL BE PREFIRED BY UNIT 'EK'.

HOLD:

- IA/UA COMPRESSOR PACKAGE DUTY TO BE UPDATED BASED ON VENDOR INFORMATION.

B	23 FEB 18	ISSUED FOR BID	MG	PSN/TKV/MSB/MSR		
A	29 NOV 17	ISSUED FOR REVIEW	MG	PSN/TKV/MSB/MSR		
REV	DATE	DESCRIPTION	BY	CHK.	APPR.	

COMPANY:



EPCM CONSULTANT :



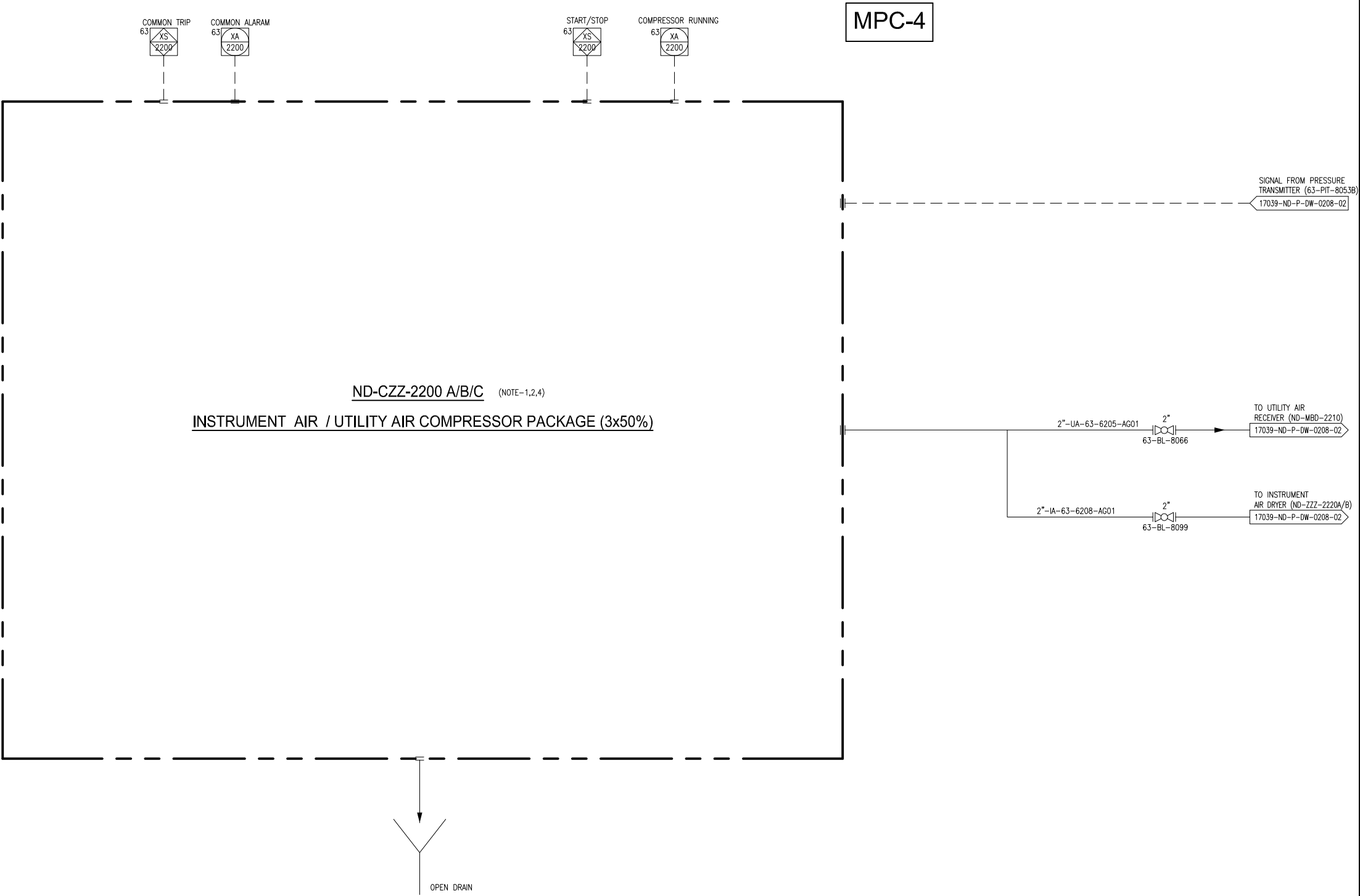
PROJECT : CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJJAN

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TITLE : PIPING AND INSTRUMENTATION DIAGRAM
INSTRUMENT AIR / UTILITY AIR COMPRESSOR PACKAGE

PROJECT NO.: KIP-17039	PROJECT SITE:	EAST KHAGORIJJAN	
DRAWING NO.: 17039-EK-P-DW-0208-01	REV: B	SHEET : 1 OF 1	SCALE : NTS

TAG NUMBER		ND-CZZ-2200 A/B/C (NOTE-1,2,4)	
DESCRIPTION		INSTRUMENT AIR/UTILITY AIR COMPRESSOR PACKAGE (3x50%)	
TYPE		OIL FREE TYPE SCREW COMPRESSOR (ELECTRIC MOTOR DRIVEN)	
SERVICE		INSTRUMENT AIR/UTILITY AIR	
PRESSURE	DESIGN	kg/cm ² g	12.5
	OPERATING	kg/cm ² g	8.8 (@ COMPRESSOR PACKAGE OUTLET)
TEMPERATURE	DESIGN	°C	85
	OPERATING	°C	51
DESIGN CAPACITY		Nm ³ /hr	400 (EACH) (NOTE-3)
DIMENSION		mm	—
POWER / DUTY		kW	66 (HOLD-1)
DESIGN CODE		API-619	
MATERIAL OF CONSTRUCTION		VENDOR TO ADVISE	



SEQUENCE NUMBER FOR LINES, INSTRUMENTS, VALVES & FOR SPECIALTY ITEMS EXCEPT EQUIPMENT SHALL BE CHANGED AS PER LEGEND DURING DETAIL DESIGN.

NOTES:

- COMPRESSOR VENDOR SHALL PROVIDE ALL THE DETAIL INSIDE THE PACKAGE AS PER CLIENT REQUIREMENT INCLUDING THE CONTROL PANEL.
- THE AIR COMPRESSOR SHALL BE OIL FREE TYPE SCREW COMPRESSOR.
- THE GIVEN UA/IA COMPRESSOR PACKAGE CAPACITY IS PRELIMINARY AND WILL BE CONFIRMED DURING DETAILED ENGINEERING.
- TOTALLY 3 NOS OF 400 Nm³/hr COMPRESSORS, 2 IS IN OPERATION, 1 IS OPERATIONAL STAND BY.
- ALL INSTRUMENTS, VALVES, PSV, EQUIPMENT TAG NO's SHALL BE PREFIRED BY UNIT 'ND'.

HOLD:

- IA/UA COMPRESSOR PACKAGE DUTY TO BE UPDATED BASED ON VENDOR INFORMATION.

B	06 JAN 18	ISSUED FOR BID	MG	PSN/TKV/MSB/MSR		
A	28 NOV 17	ISSUED FOR REVIEW	MG	PSN/TKV/MSB/MSR		
REV	DATE	DESCRIPTION	BY	CHK.	APPR.	

COMPANY:



EPCM CONSULTANT :



PROJECT :

CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN

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TITLE :

PIPING AND INSTRUMENTATION DIAGRAM
INSTRUMENT AIR / UTILITY AIR COMPRESSOR PACKAGE

PROJECT NO.: KIP-17039

PROJECT SITE:

NADUA

DRAWING NO.:

17039-ND-P-DW-0208-01

REV: B

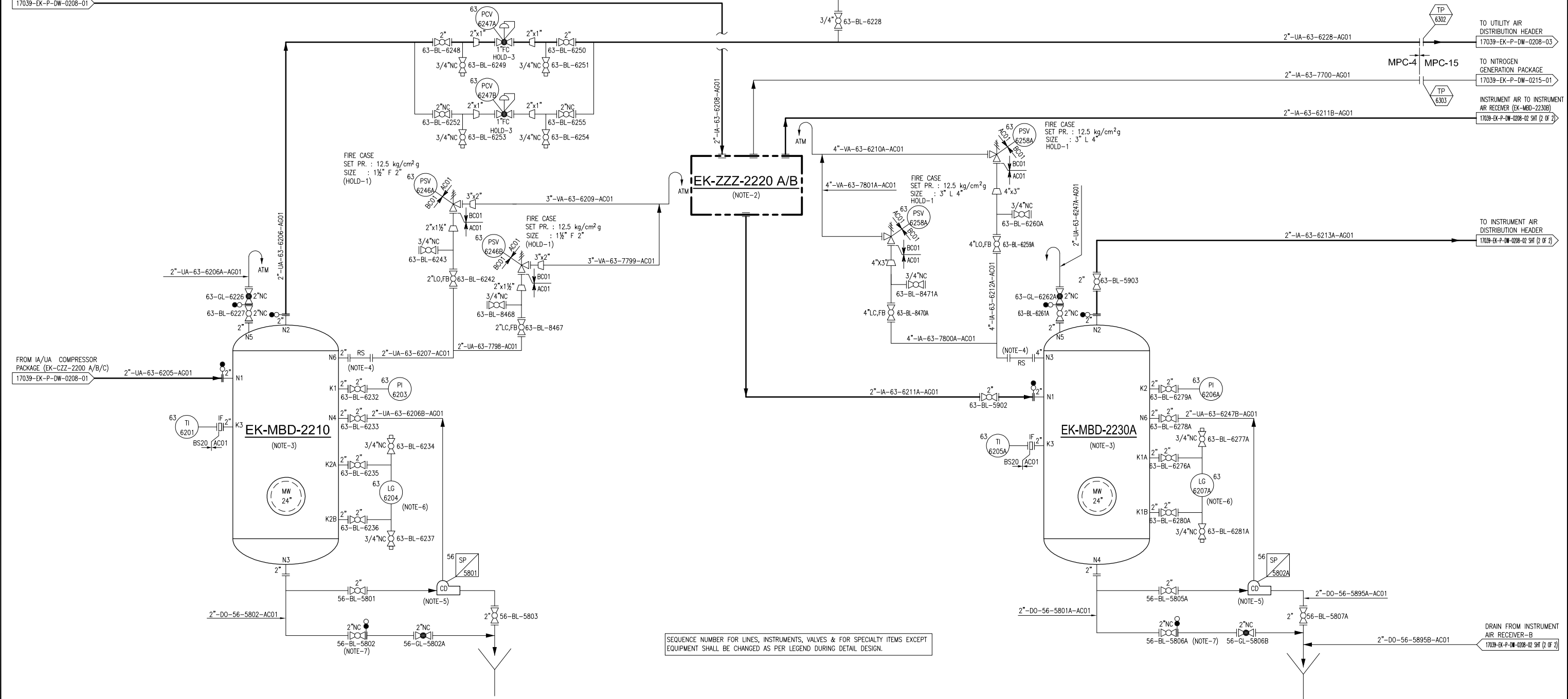
SHEET : 1 OF 1

SCALE : NTS

TAG NUMBER		EK-MBD-2210	EK-MBD-2230A	EK-ZZZ-2220 A/B
DESCRIPTION		UTILITY AIR RECEIVER	INSTRUMENT AIR RECEIVER	IA DRYER PACKAGE (2X100%)
TYPE		VERTICAL	VERTICAL	HEATLESS TYPE
SERVICE		UTILITY AIR	INSTRUMENT AIR	
PRESSURE	DESIGN kg/cm ² g	12.5/FV	12.5/FV	12.5/FV
	OPERATING kg/cm ² g	(6.8–8.8)	6.5–8.5	6.8–8.8
TEMPERATURE	DESIGN °C	85	85	85
	OPERATING °C	51	51	51
DESIGN CAPACITY		Nm ³ /hr 100 (HOLD–4)	300 (HOLD–4)	800 (HOLD–4)
DIMENSION		mm 1290 (I/D) x 3500 (T/T) (HOLD–2)	2000 (I/D) x 4250 (T/T) (HOLD–2)	–
DESIGN CODE		ASME SEC VIII DIV–1	ASME SEC VIII DIV–1	–
MATERIAL OF CONSTRUCTION		CS + 3mm CA	CS + 3mm CA	VENDOR TO ADVISE

MPC-4

FROM IA/UA COMPRESSOR PACKAGE (EK–CZZ–2200 A/B/C)
17039-EK-P-DW-0208-01



SEQUENCE NUMBER FOR LINES, INSTRUMENTS, VALVES & FOR SPECIALTY ITEMS EXCEPT EQUIPMENT SHALL BE CHANGED AS PER LEGEND DURING DETAIL DESIGN.

NOTES:

1. PIPING SHALL BE PROVIDED WITH HIGH POINT VENT AND LOW POINT DRAIN THESE ARE NOT SHOWN IN P&IDS.
2. DRYER PACKAGE INCLUDES AIR DRYER, PRE–FILTER, AFTER FILTER.
3. INSTRUMENT AIR RECEIVER AND UTILITY AIR RECEIVER ARE SIZED WITH 5 MINUTES RESIDENCE TIME BETWEEN NORMAL AND MINIMUM SUPPLY PRESSURE.
4. REMOVABLE SPOOL PIECE FOR MAINTENANCE PURPOSE.
5. INVERTED TYPE CONTINUOUS DRAINER.
6. MAGNETIC TYPE LEVEL GAUGE.
7. VESSEL SHALL BE COMPLETELY DEPRESSURIZED PRIOR TO OPENING OF THESE VALVES IN ORDER TO AVOID OVERPRESSURE IN THE DOWNSTREAM SYSTEM

HOLD:

1. PSV SIZE AND ITS ASSOCIATED LINE SIZE PROVIDED ARE PRELIMINARY AND WILL BE CONFIRMED LATER.
2. EQUIPMENT SIZE PROVIDED IS PRELIMINARY AND WILL BE CONFIRMED.
3. REGULATOR SIZE AND ITS ASSOCIATED LINE SIZE PROVIDED ARE PRELIMINARY AND WILL BE CONFIRMED LATER.
4. THE GIVEN INSTRUMENT AIR/UTILITY AIR COMPRESSOR PACKAGE CAPACITY IS PRELIMINARY AND WILL BE CONFIRMED DURING DETAILED ENGINEERING.

COMPANY:



EPCM CONSULTANT :



PROJECT :

CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN

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TITLE :

PIPING AND INSTRUMENTATION DIAGRAM
INSTRUMENT AIR RECEIVER - A AND UTILITY AIR RECEIVER

PROJECT NO.: KIP-17039

PROJECT SITE:

EAST KHAGORIJAN

DRAWING NO.:

17039-EK-P-DW-0208-02

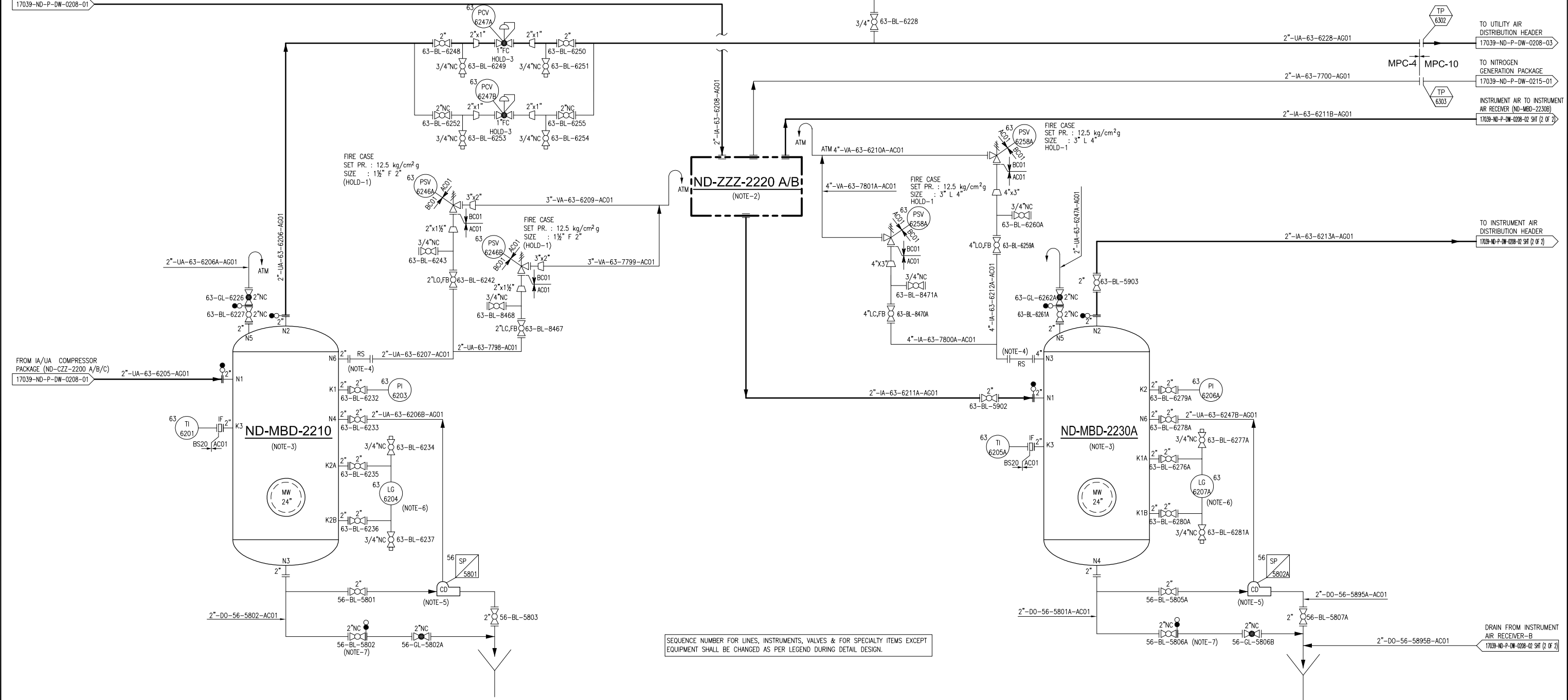
REV: B

SHEET : 1 OF 2

SCALE : NTS

TAG NUMBER		ND-MBD-2210	ND-MBD-2230A	ND-ZZZ-2220 A/B
DESCRIPTION		UTILITY AIR RECEIVER	INSTRUMENT AIR RECEIVER	IA DRYER PACKAGE (2X100%)
TYPE		VERTICAL	VERTICAL	HEATLESS TYPE
SERVICE		UTILITY AIR	INSTRUMENT AIR	INSTRUMENT AIR
PRESSURE	DESIGN kg/cm ² g	12.5/FV	12.5/FV	12.5/FV
	OPERATING kg/cm ² g	(6.8–8.8)	6.5–8.5	6.8–8.8
TEMPERATURE	DESIGN °C	85	85	85
	OPERATING °C	51	51	51
DESIGN CAPACITY		Nm ³ /hr 100 (HOLD–4)	300 (HOLD–4)	800 (HOLD–4)
DIMENSION		mm 1290 (I/D) x 3500 (T/T) (HOLD–2)	2000 (I/D) x 4250 (T/T) (HOLD–2)	–
DESIGN CODE		ASME SEC VIII DIV–1	ASME SEC VIII DIV–1	–
MATERIAL OF CONSTRUCTION		CS + 3mm CA	CS + 3mm CA	VENDOR TO ADVISE

FROM IA/UA COMPRESSOR PACKAGE (ND–CZZ–2200 A/B/C)
17039–ND–P–DW–0208–01



- NOTES:**
1. PIPING SHALL BE PROVIDED WITH HIGH POINT VENT AND LOW POINT DRAIN THESE ARE NOT SHOWN IN P&IDs.
 2. DRYER PACKAGE INCLUDES AIR DRYER, PRE–FILTER, AFTER FILTER.
 3. INSTRUMENT AIR RECEIVER AND UTILITY AIR RECEIVER ARE SIZED WITH 5 MINUTES RESIDENCE TIME BETWEEN NORMAL AND MINIMUM SUPPLY PRESSURE.
 4. REMOVABLE SPOOL PIECE FOR MAINTENANCE PURPOSE.
 5. INVERTED TYPE CONTINUOUS DRAINER.
 6. MAGNETIC TYPE LEVEL GAUGE.
 7. VESSEL SHALL BE COMPLETELY DEPRESSURIZED PRIOR TO OPENING OF THESE VALVES IN ORDER TO AVOID OVERPRESSURE IN THE DOWNSTREAM SYSTEM

- HOLD:**
1. PSV SIZE AND ITS ASSOCIATED LINE SIZE PROVIDED ARE PRELIMINARY AND WILL BE CONFIRMED LATER.
 2. EQUIPMENT SIZE PROVIDED IS PRELIMINARY AND WILL BE CONFIRMED.
 3. REGULATOR SIZE AND ITS ASSOCIATED LINE SIZE PROVIDED ARE PRELIMINARY AND WILL BE CONFIRMED LATER.
 4. THE GIVEN INSTRUMENT AIR/UTILITY AIR COMPRESSOR PACKAGE CAPACITY IS PRELIMINARY AND WILL BE CONFIRMED DURING DETAILED ENGINEERING.

B	22 FEB 18	ISSUED FOR BID	MG	PSN/TKV/MSB/MSR		
A	29 NOV 17	ISSUED FOR REVIEW	MG	PSN/TKV/MSB/MSR		
REV	DATE	DESCRIPTION	BY	CHK.	APPR.	

COMPANY:

Oil India Limited

EPCM CONSULTANT :

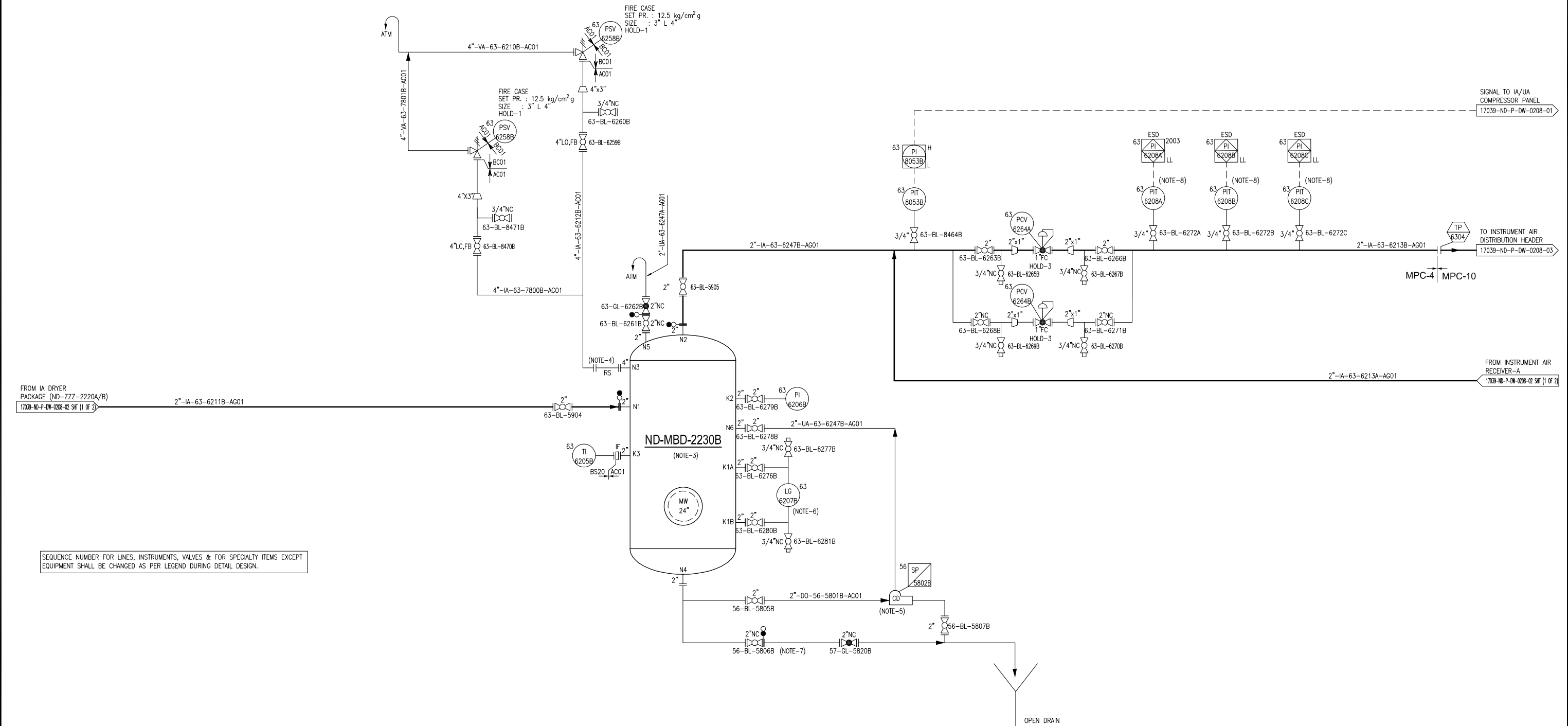
KAVIN™

PROJECT :		CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJJAN		
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TITLE :		PIPING AND INSTRUMENTATION DIAGRAM INSTRUMENT AIR RECEIVER - A AND UTILITY AIR RECEIVER		
PROJECT NO.:		KIP-17039	PROJECT SITE:	NADUA
DRAWING NO.:		17039-ND-P-DW-0208-02	REV: B	SHEET : 1 OF 2
			SCALE :	NTS

MPC-4

TAG NUMBER		ND-MBD-2230B	
DESCRIPTION		INSTRUMENT AIR RECEIVER	
TYPE		VERTICAL	
SERVICE		INSTRUMENT AIR	
PRESSURE	DESIGN	kg/cm ² g	12.5/FV
	OPERATING	kg/cm ² g	6.5-8.5
TEMPERATURE	DESIGN	°C	85
	OPERATING	°C	51
DESIGN CAPACITY		Nm ³ /hr	300 (HOLD-4)
DIMENSION		mm	2000 (I/D) x 4250 (T/T) (HOLD-2)
DESIGN CODE		ASME SEC VIII DIV-1	
MATERIAL OF CONSTRUCTION		CS + 3mm CA	

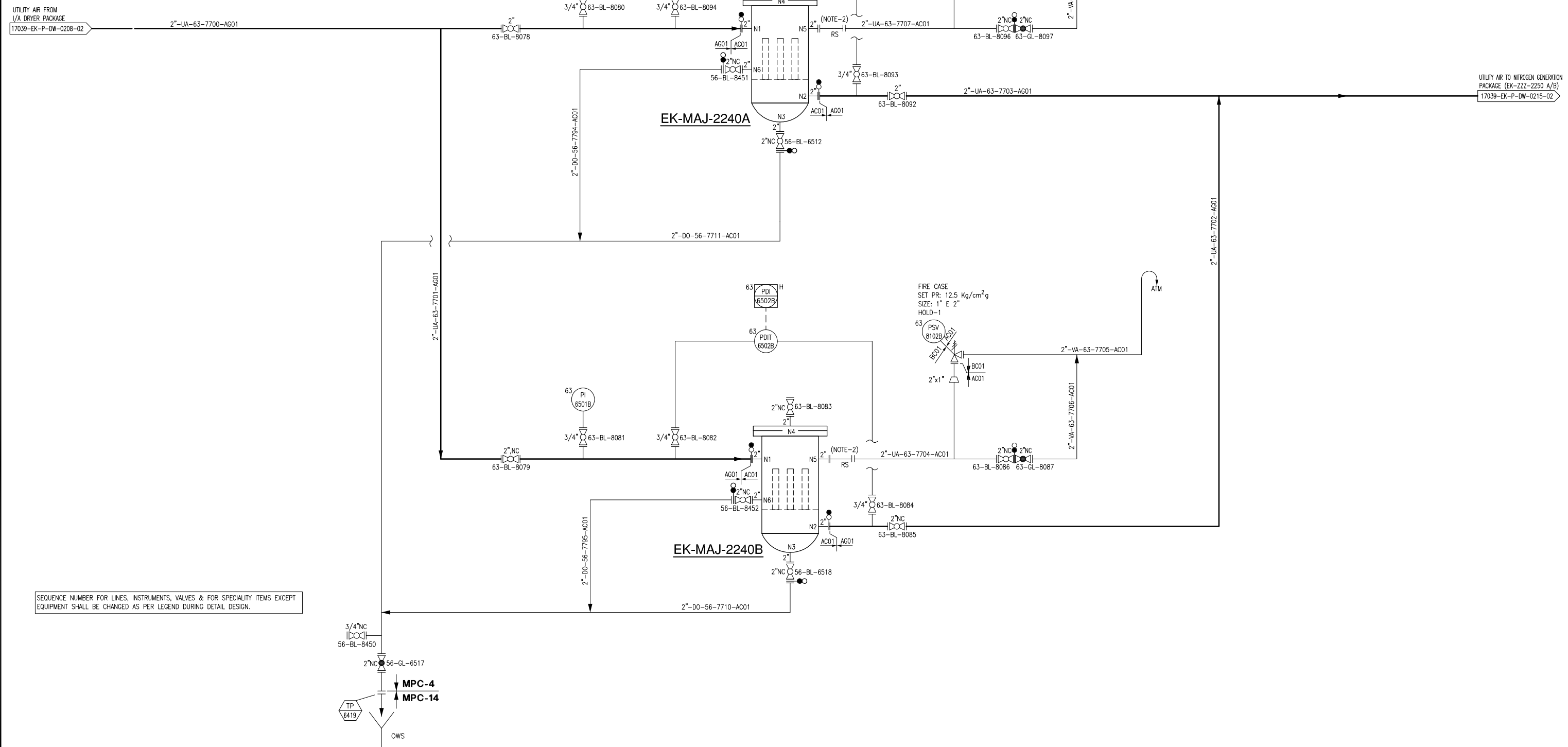
MPC-4



SEQUENCE NUMBER FOR LINES, INSTRUMENTS, VALVES & FOR SPECIALTY ITEMS EXCEPT EQUIPMENT SHALL BE CHANGED AS PER LEGEND DURING DETAIL DESIGN.

NOTES: 1. PIPING SHALL BE PROVIDED WITH HIGH POINT VENT AND LOW POINT DRAIN THESE ARE NOT SHOWN IN P&IDs. 2. THE GIVEN INSTRUMENT AIR/UTILITY AIR COMPRESSOR PACKAGE CAPACITY IS PRELIMINARY AND WILL BE CONFIRMED. 3. INSTRUMENT AIR RECEIVER IS SIZED WITH 5 MINUTES RESIDENCE TIME BETWEEN NORMAL AND MINIMUM SUPPLY PRESSURE. 4. REMOVABLE SPOOL PIECE FOR MAINTENANCE PURPOSE. 5. INVERTED TYPE CONTINUOUS DRAINER. 6. MAGNETIC TYPE LEVEL GAUGE. 7. VESSEL SHALL BE COMPLETELY DEPRESSURIZED PRIOR TO OPENING OF THESE VALVES IN ORDER TO AVOID OVERPRESSURE IN THE DOWNSTREAM SYSTEM. 8. 2 OUT OF 3 VOTING PRESSURE TRANSMITTER SHALL BE CONSIDERED.		HOLD: 1. PSV SIZE AND ITS ASSOCIATED LINE SIZE PROVIDED ARE PRELIMINARY AND WILL BE CONFIRMED LATER. 2. EQUIPMENT SIZE PROVIDED IS PRELIMINARY AND WILL BE CONFIRMED. 3. REGULATOR SIZE AND ITS ASSOCIATED LINE SIZE PROVIDED ARE PRELIMINARY AND WILL BE CONFIRMED LATER. 4. THE GIVEN INSTRUMENT AIR/UTILITY AIR COMPRESSOR PACKAGE CAPACITY IS PRELIMINARY AND WILL BE CONFIRMED DURING DETAILED ENGINEERING.		COMPANY: 		PROJECT : CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN THIS DRAWING AND ALL DESIGN DETAILS AND DATA SHOWN HEREON, IS THE SOLE PROPERTY OF OIL INDIA LTD AND SHALL NOT BE REPRODUCED IN ANY MANNER OR USED FOR ANY PURPOSE WHATSOEVER, EXCEPT BY WRITTEN PERMISSION OF OIL INDIA LTD.	
				EPCM CONSULTANT : 		TITLE : PIPING AND INSTRUMENTATION DIAGRAM INSTRUMENT AIR RECEIVER - B	
PROJECT NO.: KIP-17039		PROJECT SITE: NADUA		DRAWING NO.: 17039-ND-P-DW-0208-02		REV: B SHEET : 2 OF 2 SCALE : NTS	

ITEM NUMBER		EK-MAJ-2240 A/B	
DESCRIPTION		PARTICULATE FILTER (2x100%)	
TYPE		VERTICAL	
SERVICE		UTILITY AIR	
PRESSURE	DESIGN	kg/cm ² g	12.5
	OPERATING	kg/cm ² g	6.5-8.5
TEMPERATURE	DESIGN	°C	85
	OPERATING	°C	51
DESIGN CAPACITY		MMSCFD	400 Nm ³ /hr (NOTE-3)
DIMENSION / DUTY		mm/kW	VTA
DESIGN CODE		ASME SEC.VIII DIV-1	
MATERIAL OF CONSTRUCTION		CS + 3mm CA	



NOTES:

1. PIPING SHALL BE PROVIDED WITH HIGH POINT VENTS AND LOW POINT DRAINS THESE ARE NOT SHOWN ON P&ID.
2. REMOVABLE SPOOL PIECE FOR MAINTENANCE PURPOSE.
3. THE CAPACITY PROVIDED IS PRELIMINARY AND WILL BE CONFIRMED DURING DETAILED ENGINEERING BASED ON NITROGEN PACKAGE VENDOR INFORMATION.
4. ALL INSTRUMENTS, VALVES, PSV, EQUIPMENT TAG NO'S SHALL BE PREFIXED BY UNIT EX.

HOLD:

1. PSV AND ITS ASSOCIATED LINE SIZES ARE PRELIMINARY AND WILL BE CONFIRMED.
2. FILTER SIZE TO BE CONFIRMED.

B	23 FEB 18	ISSUED FOR BID	MG	PSN/TKV	MSB/MSR
A	29 NOV 17	ISSUED FOR REVIEW	MG	PSN/TKV	MSB/MSR
REV	DATE	DESCRIPTION	BY	CHK.	APPR.

COMPANY:

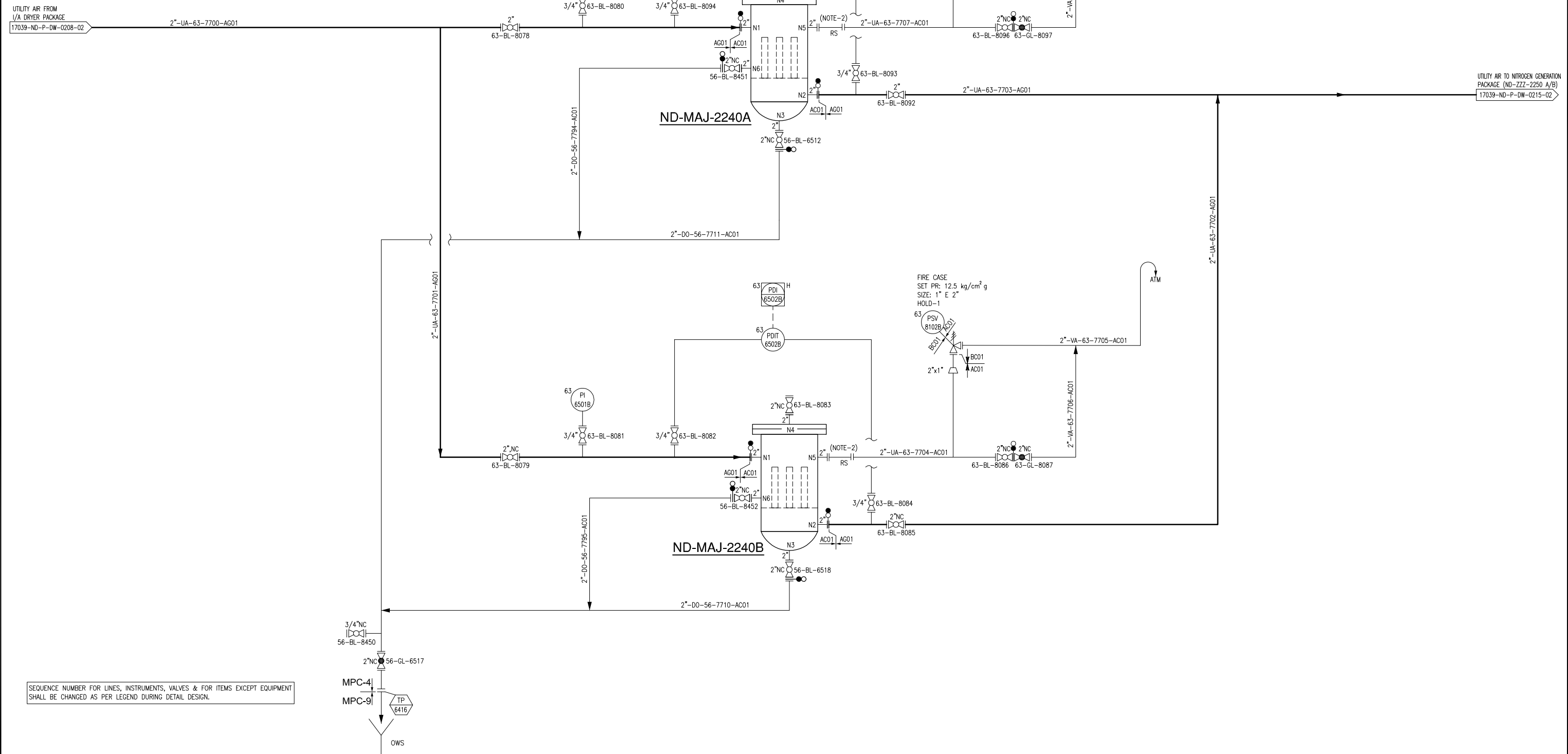


EPCM CONSULTANT:



PROJECT :				CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN			
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TITLE :				PIPING AND INSTRUMENTATION DIAGRAM PARTICULATE FILTER			
PROJECT NO.: KIP-17039				PROJECT SITE:		EAST KHAGORIJAN	
DRAWING NO.: 17039-EK-P-DW-0215-01				REV: B	SHEET : 1 OF 1	SCALE : NTS	

ITEM NUMBER		ND-MAJ-2240 A/B	
DESCRIPTION		PARTICULATE FILTER (2x100%)	
TYPE		VERTICAL	
SERVICE		UTILITY AIR	
PRESSURE	DESIGN	kg/cm ² g	12.5
	OPERATING	kg/cm ² g	6.5-8.5
TEMPERATURE	DESIGN	°C	85
	OPERATING	°C	51
DESIGN CAPACITY		MMSCFD	400 Nm ³ /hr (NOTE-3)
DIMENSION / DUTY		mm/kW	VTA
DESIGN CODE		ASME SEC.VIII DIV-1	
MATERIAL OF CONSTRUCTION		CS + 3mm CA	



NOTES:

1. PIPING SHALL BE PROVIDED WITH HIGH POINT VENTS AND LOW POINT DRAINS THESE ARE NOT SHOWN ON P&ID.
2. REMOVABLE SPOOL PIECE FOR MAINTENANCE PURPOSE.
3. THE CAPACITY PROVIDED IS PRELIMINARY AND WILL BE CONFIRMED DURING DETAILED ENGINEERING BASED ON NITROGEN PACKAGE VENDOR INFORMATION.
4. ALL INSTRUMENTS, VALVES, PSV, EQUIPMENT TAG NO.'S SHALL BE PREFIXED BY UNIT NO.

HOLD:

1. PSV AND ITS ASSOCIATED LINE SIZES ARE PRELIMINARY AND WILL BE CONFIRMED.
2. FILTER SIZE TO BE CONFIRMED.

B	06 JAN 18	ISSUED FOR BID	MG	PSN/TKV	MSB/MS
A	28 NOV 17	ISSUED FOR REVIEW	MG	PSN/TKV	MSB/MS
REV	DATE	DESCRIPTION	BY	CHK.	APPR.

COMPANY:



EPCM CONSULTANT:

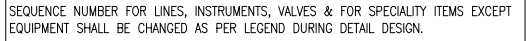


PROJECT :	CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN

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TITLE : PIPING AND INSTRUMENTATION DIAGRAM
PARTICULATE FILTER

PROJECT NO.: KIP-17039		PROJECT SITE:		NADUA	
DRAWING NO.: 17039-ND-P-DW-0215-01		REV: B	SHEET : 1 OF 1		SCALE : NTS

MPC-4

1. PIPING SHALL BE PROVIDED WITH HIGH POINT VENT AND LOW POINT DRAIN THESE ARE NOT SHOWN IN P&IDS.
2. THE NITROGEN PURITY AT NITROGEN GENERATOR OUTLET SHALL BE 98% (MIN.) AND OXYGEN SHALL BE 2% (MAX.).
3. GIVEN FLOW RATE OF 100 Nm³/hr IS AT NITROGEN GENERATOR PACKAGE OUTLET AND THE NITROGEN GENERATOR PACKAGE INLET FLOW RATE SHALL BE CONFIRMED BY VENDOR.
4. ROTAMETER TYPE FLOWMETER.
5. THE GIVEN DETAILS OF NITROGEN GENERATION PACKAGE IS PRELIMINARY AND SHALL BE CONFIRMED BY VENDOR.
6. ALL INSTRUMENTS, VALVES, PSV, EQUIPMENT TAG NO'S WILL BE PREFIXED BY UNIT 'EK'.

1. THE ALARM AND TRIP VALUE GIVEN IS PRELIMINARY AND WILL BE CONFIRMED DURING DETAILED ENGINEERING.

B	23 FEB 18	ISSUED FOR BID	MG	PSN/TKV	MSB/MSR
A	29 NOV 17	ISSUED FOR REVIEW	MG	PSN/TKV	MSB/MSR
REV	DATE	DESCRIPTION	BY	CHK.	APPR.



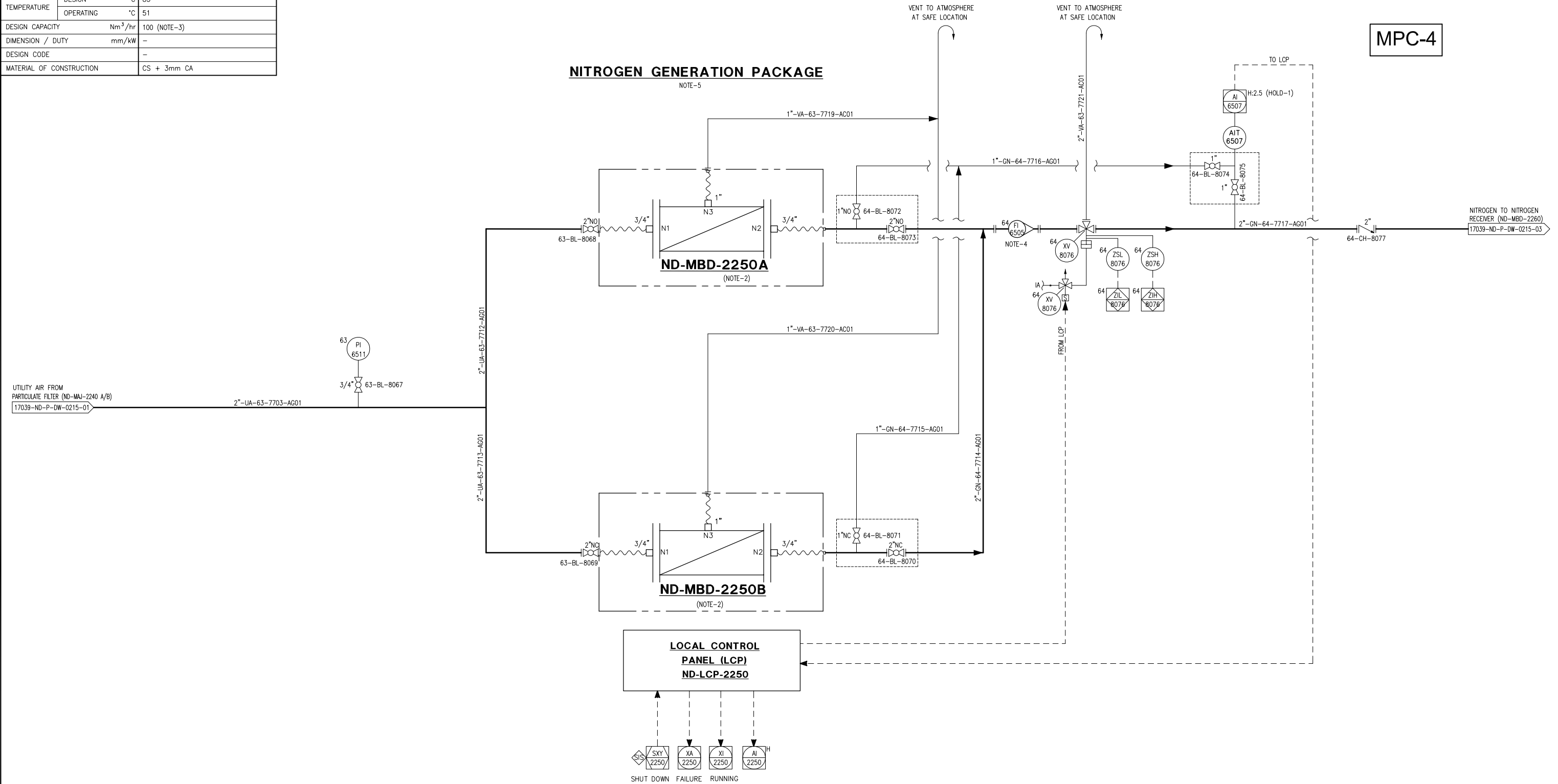
ऑयल इंडिया लिमिटेड
Oil India Limited



KAVINTM

PROJECT NO.: KIP-17039		PROJECT SITE:		EAST KHAGORIJAN	
DRAWING NO.:	17039-EK-P-DW-0215-02	REV: B	SHEET : 1 OF 1	SCALE : NTS	

TAG NUMBER		ND-ZZZ-2250A/B	
DESCRIPTION		NITROGEN GENERATION PACKAGE (2x100%)	
TYPE		MEMBRANE TYPE (HEATLESS)	
SERVICE		UTILITY AIR/NITROGEN	
PRESSURE	DESIGN	kg/cm ² g	12.5
	OPERATING	kg/cm ² g	6.3-8.3
TEMPERATURE	DESIGN	°C	85
	OPERATING	°C	51
DESIGN CAPACITY		Nm ³ /hr	100 (NOTE-3)
DIMENSION / DUTY		mm/kW	-
DESIGN CODE		-	
MATERIAL OF CONSTRUCTION		CS + 3mm CA	



SEQUENCE NUMBER FOR LINES, INSTRUMENTS, VALVES & FOR ITEMS EXCEPT EQUIPMENT SHALL BE CHANGED AS PER LEGEND DURING DETAIL DESIGN.

NOTES:

1. PIPING SHALL BE PROVIDED WITH HIGH POINT VENT AND LOW POINT DRAIN THESE ARE NOT SHOWN IN P&IDS.
2. THE NITROGEN PURITY AT NITROGEN GENERATOR OUTLET SHALL BE 98% (MIN.) AND OXYGEN SHALL BE 2% (MAX.).
3. GIVEN FLOW RATE OF 100 Nm³/hr IS AT NITROGEN GENERATOR PACKAGE OUTLET AND THE NITROGEN GENERATOR PACKAGE INLET FLOW RATE SHALL BE CONFIRMED BY VENDOR.
4. ROTAMETER TYPE FLOWMETER.
5. THE GIVEN DETAILS OF NITROGEN GENERATION PACKAGE IS PRELIMINARY AND SHALL BE CONFIRMED BY VENDOR.
6. ALL INSTRUMENTS, VALVES, PSV, EQUIPMENT TAG NO'S WILL BE PREFIXED BY UNIT 'ND'.

HOLD:

1. THE ALARM AND TRIP VALVE GIVEN IS PRELIMINARY AND WILL BE CONFIRMED DURING DETAILED ENGINEERING.

B	06 JAN 18	ISSUED FOR BID	MC	PSN/TKV/MSB/MSR			
A	28 NOV 17	ISSUED FOR REVIEW	MG	PSN/TKV/MSB/MSR			
REV	DATE	DESCRIPTION	BY	CHK.	APPR.		

COMPANY:



EPCM CONSULTANT:



PROJECT : CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJJAN

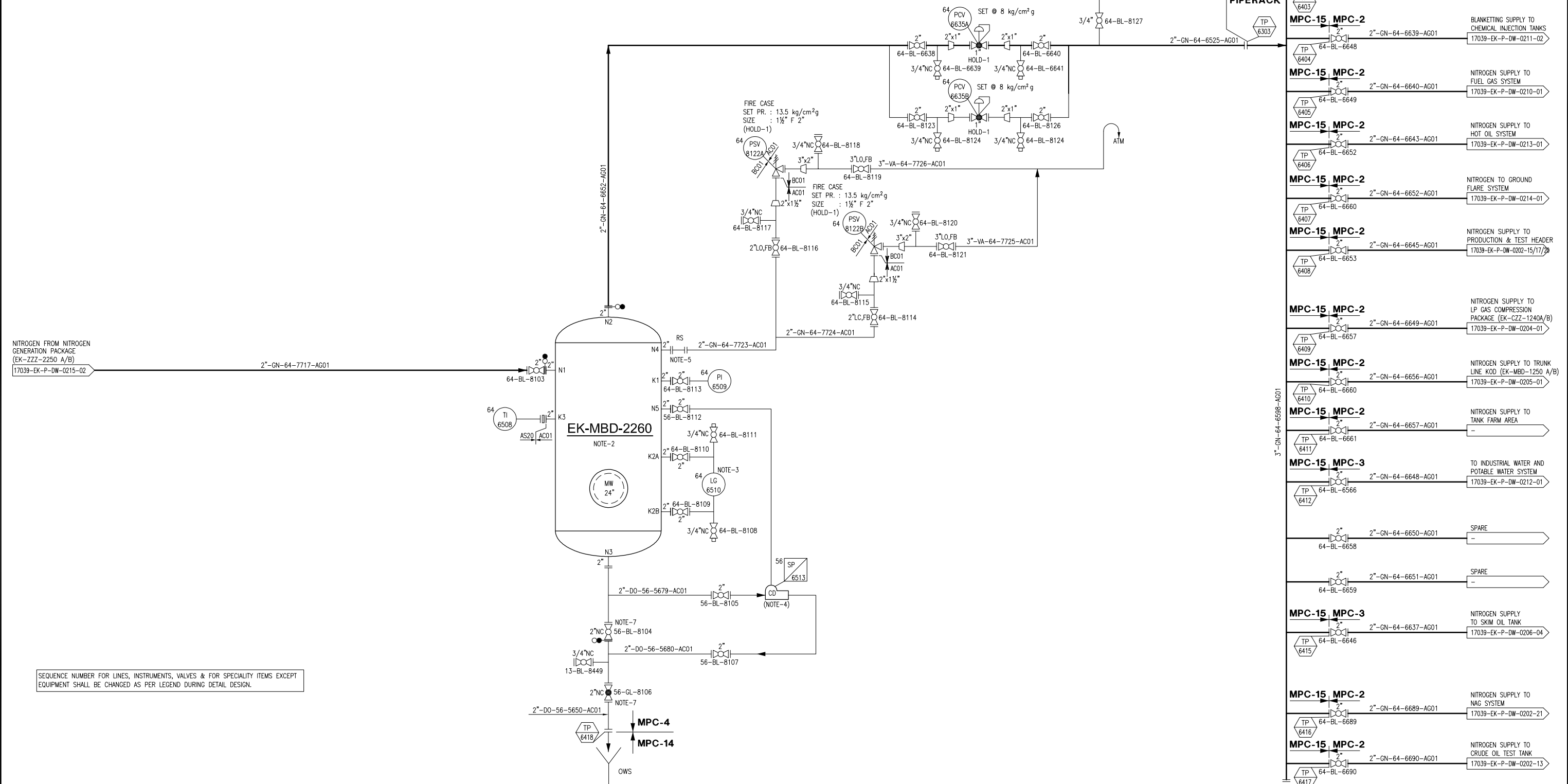
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TITLE : PIPING AND INSTRUMENTATION DIAGRAM
NITROGEN GENERATION PACKAGE

PROJECT NO.: KIP-17039	PROJECT SITE:	NADUA
DRAWING NO.: 17039-ND-P-DW-0215-02	REV: B	SHEET : 1 OF 1 SCALE : NTS

TAG NUMBER				EK-MBD-2260			
DESCRIPTION				NITROGEN RECEIVER			
TYPE				VERTICAL			
SERVICE				NITROGEN			
PRESSURE	DESIGN	kg/cm ² g	12.5				
	OPERATING	kg/cm ² g	6.3-8.3				
TEMPERATURE	DESIGN	°C	85				
	OPERATING	°C	51				
DESIGN CAPACITY		Nm ³ /hr	100				
DIMENSION / DUTY		mm/kW	1290 (I/D) x 3500 (T/T) (NOTE-6)				
DESIGN CODE			ASME SEC VIII DIV.1				
MATERIAL OF CONSTRUCTION			CS + 3mm CA				

MPC-4



NOTES:			
1. PIPING SHALL BE PROVIDED WITH HIGH POINT VENT AND LOW POINT DRAIN THESE ARE NOT SHOWN IN P&IDs.			
2. NITROGEN RECEIVER VESSEL IS SIZED WITH 5 MINUTES RESIDENCE TIME BETWEEN 6.3 kg/cm ² g AND 8.3 kg/cm ² g.			
3. MAGNETIC TYPE LEVEL GAUGE.			
4. INVERTED TYPE CONTINUOUS DRAINER.			
5. REMOVABLE SPOOL PIECE FOR MAINTENANCE PURPOSE.			
6. GIVEN SIZE IS PRELIMINARY & WILL BE CONFIRMED.			
7. VESSEL SHALL BE COMPLETELY DEPRESSURIZED PRIOR TO OPENING THESE VALVES IN ORDER TO AVOID OVERPRESSURE IN DOWNSTREAM SYSTEM.			
8. ALL INSTRUMENTS, VALVES, PSV, EQUIPMENT TAG NO'S WILL BE PREFIXED BY UNIT EK.			

HOLD:			
1. PSV, PRESSURE REGULATOR SIZES AND ITS ASSOCIATED PIPING SIZES PROVIDED ARE PRELIMINARY AND WILL BE CONFIRMED.			

B	23 FEB 18	ISSUED FOR BID	MG	PSN/TKV	MSB/MSR		
A	29 NOV 17	ISSUED FOR REVIEW	MG	PSN/TKV	MSB/MSR		
REV	DATE	DESCRIPTION	BY	CHK.	APPR.		

COMPANY:

**Oil India Limited**

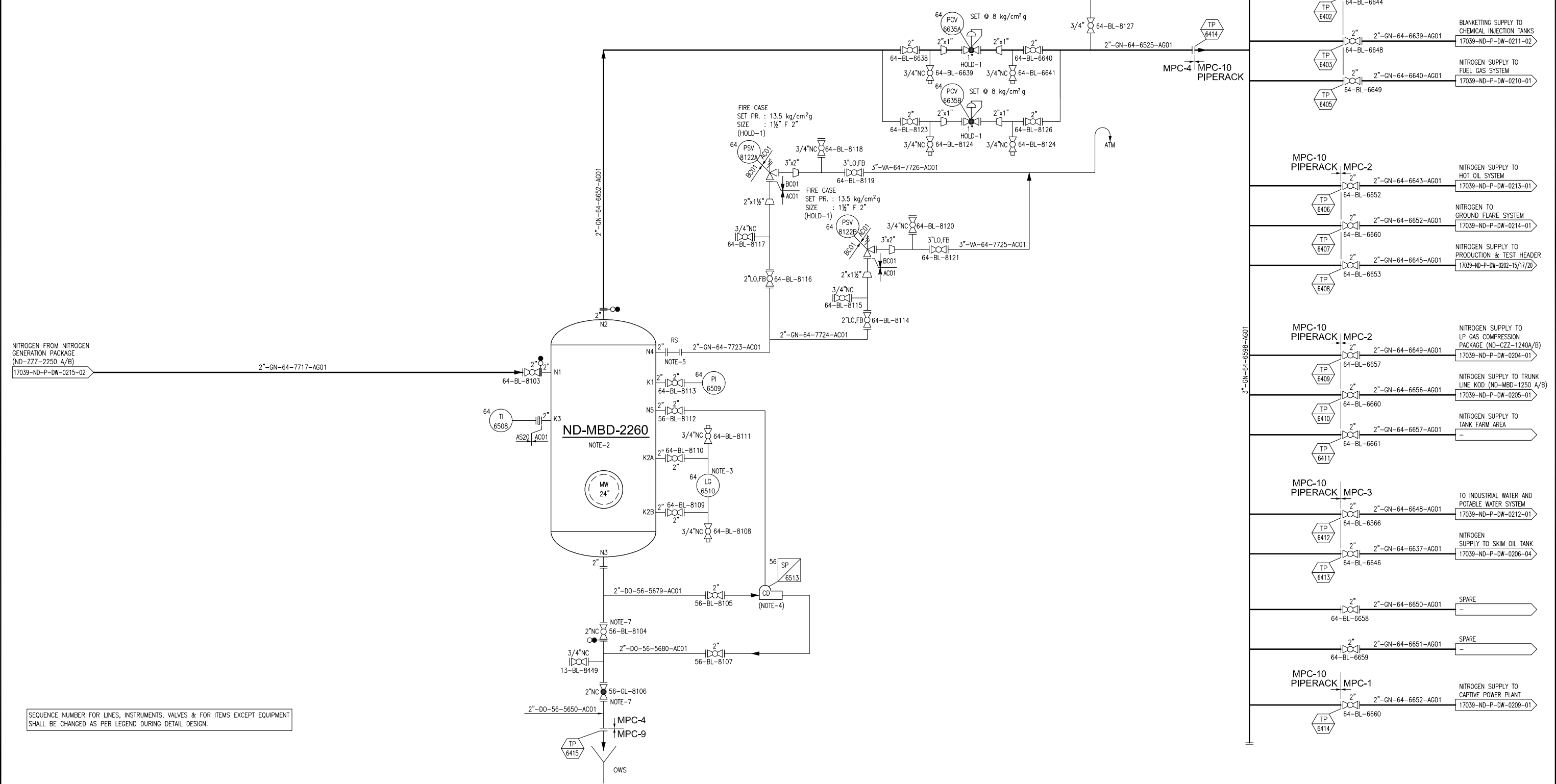
EPCM CONSULTANT :

**KAVIN™**

PROJECT : CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN			
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TITLE : PIPING AND INSTRUMENTATION DIAGRAM NITROGEN RECEIVER			
PROJECT NO.: KIP-17039	PROJECT SITE:	EAST KHAGORIJAN	
DRAWING NO.: 17039-EK-P-DW-0215-03	REV: B	SHEET : 1 OF 1	SCALE : NTS

TAG NUMBER		ND-MBD-2260	
DESCRIPTION		NITROGEN RECEIVER	
TYPE		VERTICAL	
SERVICE		NITROGEN	
PRESSURE	DESIGN	kg/cm ² g	12.5
	OPERATING	kg/cm ² g	6.3-8.3
TEMPERATURE	DESIGN	°C	85
	OPERATING	°C	51
DESIGN CAPACITY		Nm ³ /hr	100
DIMENSION / DUTY		mm/kW	1290 (I/D) x 3500 (T/T) (NOTE-6)
DESIGN CODE		ASME SEC VIII DIV.1	
MATERIAL OF CONSTRUCTION		CS + 3mm CA	

MPC-4



SEQUENCE NUMBER FOR LINES, INSTRUMENTS, VALVES & FOR ITEMS EXCEPT EQUIPMENT SHALL BE CHANGED AS PER LEGEND DURING DETAIL DESIGN.

- NOTES:**
1. PIPING SHALL BE PROVIDED WITH HIGH POINT VENT AND LOW POINT DRAIN THESE ARE NOT SHOWN IN P&IDS.
 2. NITROGEN RECEIVER VESSEL IS SIZED WITH 5 MINUTES RESIDENCE TIME BETWEEN 6.3 kg/cm²g AND 8.3 kg/cm²g.
 3. MAGNETIC TYPE LEVEL GAUGE.
 4. INVERTED TYPE CONTINUOUS DRAINER.
 5. REMOVABLE SPOOL PIECE FOR MAINTENANCE PURPOSE.
 6. GIVEN SIZE IS PRELIMINARY & WILL BE CONFIRMED.
 7. VESSEL SHALL BE COMPLETELY DEPRESSURIZED PRIOR TO OPENING THESE VALVES IN ORDER TO AVOID OVERPRESSURE IN DOWNSTREAM SYSTEM.
 8. ALL INSTRUMENTS, VALVES, PSV, EQUIPMENT TAG NO'S WILL BE PREFIXED BY UNIT NO.

- HOLD:**
1. PSV, PRESSURE REGULATOR SIZES AND ITS ASSOCIATED PIPING SIZES PROVIDED ARE PRELIMINARY AND WILL BE CONFIRMED.

B	06 JAN 18	ISSUED FOR BID	MC	PSN/TKV/MSB/MSR			
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TITLE :		PIPING AND INSTRUMENTATION DIAGRAM NITROGEN RECEIVER		
PROJECT NO.: KIP-17039		PROJECT SITE:		NADUA
DRAWING NO.: 17039-ND-P-DW-0215-03		REV: B	SHEET : 1 OF 1	SCALE : NTS

CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN

Document Title : MPC-4 PROCESS DESIGN BASIS

Kavin Document No. : 17039-EK-P-DB-1001

B	08 FEB 2018	ISSUED FOR BID	MG	PSN/TKV	MSB/MSR
A	23 NOV 2017	ISSUED FOR REVIEW	MG	PSN/TKV	MSB/MSR
REV.	DATE	DESCRIPTION	BY	CHECKED	APPROVED

PROJECT DOCUMENTS ARE CONTROLLED DOCUMENTS.
REVISIONS ARE DENOTED AS | IN RIGHT HAND MARGIN

COMPANY:

OIL INDIA LIMITED

EPCM CONSULTANT:

**KAVIN ENGINEERING AND SERVICES
PRIVATE LIMITED**

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ABBREVIATION

ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
BBL	Barrel
BDV	Blow Down Valve
BS&W	Basic Sediment and Water
BTL	Bottom Tan Line
CCR	Central Control Room
CI	Chemical Injection
CPCB	Central Pollution Control Board
CPP	Captive Power Plant
CTF	Central Tank Farm
DCS	Distributed Control System
EK	East Khagorijan
EPCM	Engineering Procurement Construction Management
ESDV	Emergency Shutdown Valve
ETP	Effluent Treatment Plant
FBHP	Flowing Bottom Hole Pressure
FTHP	Flowing Tubing Head Pressure
GED	Gas Engine Driven
GGG	Group Gathering Station
GOR	Gas Oil Ratio
HAZID	Hazard Identification Study
HAZOP	Hazard and Operability Study
HC	Hydrocarbon

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HLL	High Liquid Level
HP	High Pressure
IA	Instrument Air
KL	Kilo Litres
KLPD	Kilo Litres Per Day
KOD	Knock Out Drum
LAH	Liquid Alarm High
LAHH	Liquid Alarm High High
LAL	Liquid Alarm Low
LALL	Liquid Alarm Low Low
LLH	Liquid Level High
LLHH	Liquid Level High High
LLL	Liquid Level Low
LLLL	Liquid Level Low Low
LP	Low Pressure
LPM	Litres Per Minute
MCC	Motor Control Centre
MMSCFD	Million Metric Standard Cubic Feet Per Day
MMSCMD	Million Metric Standard Cubic Meters per Day
NB	Nominal Bore
ND	Nadua
NFPA	National Fire Protection Association
NHK	Nahorkatia
NLL	Normal Liquid Level
NPSH	Net Positive Suction Head
OCS	Oil Collecting Station
OISD	Oil Industry Safety Directorate

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OMR	Oil Mines Regulations
PCB	Pollution Control Board
PFD	Process Flow Diagram
RFP	Requisition For Proposal
P&ID	Piping & Instrumentation Diagram
PPM	Parts Per Million
PSD	Process Shutdown
PSV	Pressure Safety Valve
RAM	Reliability Availability and Maintainability
RP	Recommended Practice
RPM	Rotations Per Minute
RVP	Reid Vapour Pressure
SDV	Shut-Down Valve
STD	Standard
STF	Secondary Tank Farm
TBP	Technical Bid Package
TVP	True Vapour Pressure
UA	Utility Air

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1.0 INTRODUCTION

OIL INDIA LIMITED (OIL) a Government of India Enterprise, proposes to construct two number of Surface Production facilities primarily for separation of Oil, Gas & Water and processing of non-associated & associated gas in its producing field at Nadua and East Khagorijan. The installation will be constructed on Modular design concept with emphasis on skid mounted prefabricated facilities minimizing construction work at site to the extent possible as per functional specifications of various process/utility packages. Instead of permanent civil buildings, containerized offices/structures will be preferred.

KAVIN ENGINEERING AND SERVICES PRIVATE LIMITED is awarded a contract for Engineering Procurement Construction Management to conceptualize / finalize the requirements needed for the Oil Collecting Station (OCS) at Nadua and Group Gathering Station (GGS) at East Khagorijan.

The East Khagorijan (GGS) field is located near Dibrugarh town in Assam at a location approximately 200m south (aerial distance) of LoC# TAI at 27032'N 95009'E approx. elevation 121 M MSL. The field is presently producing from 02 Nos. of wells through a QPS (Quick Production Setup). Considering the potential of the field it is envisaged that Oil production is expected to rise to a level of 1000 KLPD from 06 HP wells, 06 LP wells and 06 Non Associated Gas wells. Associated Gas is expected to be around 0.1 MMSCMD. The East Khagorijan oil field also having the huge amount of non-associated gas potential and it is expected to produce about 1 MMSCMD of non-associated natural gas from this area. It is also expected that the field will produce about 800 KLPD of water along with the 1000 KLPD of crude, so the plant design will be for handling 1800KLPD of total well fluid. Oil India Limited proposes to construct a Group Gathering Station at East Khagorijan to cater to the production in that area.

Pipelines from Oil & Gas wells to the proposed plant and transfer lines for transporting Dry Crude, Separated Gas, treated water from the proposed plant to outside are not in the Project

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scope. Procurement of LAND and construction of boundary wall in the land is not in the project scope and will be done / arranged by OIL separately.

2.0 OBJECTIVE

This document “Process Design basis” defines the basis on which Process and Utility systems are to be designed. It presents an overview of concept / system selection for gas, crude oil and effluent water processing to meet product specification for gas, oil and effluent water. It also provides the basis for all the facilities design involved in Group Gathering Station (GGS) at East Khagorijan.

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3.0 CODES AND STANDARDS

Table 3.0-1 Codes and Standards

STANDARDS	DESCRIPTION
API 11P	Specification for Packaged Reciprocating Compressors for Oil and Gas Production Services
API 12J	Specification for Oil and Gas Separators
API 2030	Application of Fixed Water Spray Systems for Fire Protection in the Petroleum Industry
API 537	Flare Details for General Refinery and Petrochemical Service
API 650	Welded Steel Tanks for Oil Storage
API RP 14C	Analysis, Design, Installation & Testing of Basic Surface Safety Systems for Offshore Production Platforms
API RP 14E	Design and Installation of Offshore Production Platform Piping Systems
API RP 550	Manual on Installation of Refinery Instruments and Control Systems (Instrumentation)
API STD 521	Guide for Pressure Relieving and Depressurizing Systems
API STD 2000	Venting Atmospheric and Low-Pressure Storage Tanks
API STD 520 Part 1	Sizing, Selection and Installation of Pressure Relieving Devices in Refineries – Sizing and Selection
API STD 520 Part 2	Sizing, Selection and Installation of Pressure Relieving Devices in Refineries – Installation
API STD 526	Flanged steel Pressure Relief Valves
ASME – B31.1	Power Piping (Pressure Piping code)
ASME – B31.3	Process Piping (Pressure Piping code)
ASME SEC VIII	Boiler and Pressure Vessel Code – Rules for Construction of Pressure Vessels
IS 10500 : 2012	Drinking Water Specification
IS 1172 : 1993	Code of Basic Requirement for Water Supply, Drainage and Sanitation
ISO 13631 (2002)	Petroleum and Natural Gas Industries - Packaged Reciprocating Gas Compressors
NFPA - 2001	Standard on Clean agent Fire Extinguishing Systems
NFPA – 11	Standard for Low, Medium and High-Expansion Foam
NFPA – 12	Standard On Carbon Dioxide Extinguishing System
NFPA – 13	Standard for The Installation of Sprinkler Systems
NFPA – 15	Water Spray Fixed Systems for Fire Protection
NFPA – 20	Standard for The Installation of Stationary Pumps for Fire Protection

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NFPA – 22	Standard for Water Tanks for Private Fire Protection
OISD RP 108	Recommended practices on Oil Storage and Handling
OISD STD 116	Fire Protection Facilities for Petroleum Refineries and Oil/Gas Processing Plants
OISD STD 118	Layouts for Oil and Gas Installations
OISD STD 163	Safety of Control Room for Hydrocarbon Industry
OISD STD 173	Fire Prevention and Protection System for Electrical Installations
OISD STD 189	Fire Protection System for Onshore Drilling Rigs, Work Over Rigs and Oil/Gas Production Installations
OMR	Oil Mines Regulations 2017

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3.1 DESIGN LIFE

Facility design life - 20 Years

3.2 LIST OF SOFTWARES

1. Process Simulation – Hysys 8.8 (or) Higher version (or) equivalent
2. Flarenet Study – Aspen Flare System Analyser (Flarenet) (or) equivalent
3. Firewater Network Analysis – AFT Impulse, Pipenet (or) equivalent
4. P&IDS / PFD / Drawings - AutoCAD

3.3 INSTRUMENT / UTILITY AIR SYSTEM

The instrument and utility air system is used to provide the air for control valves, shutdown valves, on/off valves, fire water pump start-up, captive power plant start-up, etc and maintenance of vessels. Instrument/utility air systems are designed to cater all the requirements. Instrument/utility air system consist of

- IA/UA Compressor package (3 x 50%)
- Utility Air receiver (1 x 100%)
- Instrument Air dryer package (2 x 100%)
- Instrument Air receiver (2 x 50%)

Atmospheric air is compressed through the IA/UA compressor package to the required pressure. IA/UA compressor is designed to deliver the 800 Nm³/hr air capacity (3 x 50%, 2 is in operation and 1 for operational standby). The IA dryer package should be heatless type and 20% of the dried air from dryer outlet is used for dryer bed regeneration. Utility Air receiver and IA Dryer package receives inlet from IA/UA compressor package discharge header. Utility Air Receiver distributes the utility air to utility air consumers. Instrument Air dryer is used to remove water vapor and to achieve the dew point of -40°C at atmospheric pressure from compressed air to use as instrument air. The process of air compression concentrates atmospheric contaminants, including water vapor. This raises the dew point of the compressed air relative to free atmospheric air and leads to condensation within pipes as

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the compressed air cools downstream of the compressor. Excessive water in compressed air, either in the liquid or vapor phase, can cause a variety of operational problems for users of compressed air. These include freezing of outdoor air lines; corrosion of equipment; fouling of processes and products. After drying the air, it is sent to the instrument air receiver. Instrument air is distributed to the consumers from the instrument air receiver.

The IA/UA compressor starts automatically once the utility air receiver pressure reaches the low level. The IA/UA compressor is programmed with auto start/stop function.

DESIGN BASIS

- Inlet filter at air intake to the compressor is provided.
- The minimum dew point of water at dryer outlet is -40°C at atmospheric pressure.
- Instrument air receiver & utility air receiver is sized with 5 minutes residence time between normal and minimum supply pressure.

3.4 NITROGEN GENERATION SYSTEM

Nitrogen Generation system receives the inlet from Instrument Air dryer package outlet. Nitrogen is required for initial purging of process equipment, power generation system for engine purging and piping prior to admission of hydrocarbon to reduce O₂ level, maintenance of process equipment. Nitrogen is also required to purge the Flare header continuously.

Membrane type nitrogen generation is adopted to supply nitrogen to processing facilities in Nadua OCS. Nitrogen is generated from compressed air by using the membrane based nitrogen generation system. The membrane system uses hollow-fiber membranes to separate air into nitrogen and oxygen. The operation of membrane system is based on the principle of differential velocity with which various gas membrane components permeate membrane substance. The driving force in the gas separation process is the difference in partial pressure on different membrane sides. The permeation speed is different for each type of gas. Nitrogen

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permeates slowly through the membrane, oxygen & water vapor quickly. Nitrogen purity for the membrane technology is 98%.

The Equipment associated with the system are

1. Particulate filter (2 x 100%)
2. Nitrogen Generation Package (2 x 100%)
3. Nitrogen Receiver (1 x 100%)

Nitrogen receiver is sized with 5 minutes residence time between normal and minimum supply pressure.

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4.0 PROCESS DESIGN CRITERIA

This section is to provide criteria for equipment selection, sizing and a basis for design pressure and temperature selection for various systems in OCS.

4.1 PROCESS EQUIPMENT SIZING AND SELECTION

4.1.1 VESSELS

Horizontal vessels are preferred for 3 phase separation system as they provide more surface area for liquid settling. The greater liquid surface area in this configuration provides optimum conditions for releasing entrapped gas. Horizontal separators are better where slugs and surges are anticipated and to increase the retention time and allow to improve the separation of oil and water when the droplet size is small.

Vertical vessels are preferred for 2 phase separation systems and usually selected when the gas-liquid ratio is high or total liquid volumes are low. LP Gas Compressor suction/Discharge KOD, NAG Inlet Separator, Trunk line KOD etc., shall be of vertical 2 phase design.

HORIZONTAL VESSELS

The following design criteria are applied for design of horizontal vessels. Horizontal separators with mist extractors shall be sized using the equation given below.

$$V_a = K \{ (d_l - d_g) / d_g \}^{1/2}$$

Where,

V_a - maximum allowable superficial velocity (m/s)

d_l - Density of Liquid phase at operating conditions (kg/m³)

d_g - Density of Gas phase at operating conditions (kg/m³)

K - Constant (m/s) depending on design and operating conditions

K values recommended for horizontal vessels are listed in the table below.

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Table 4.1.1-1 K values for Horizontal vessels

Length (m)	K-Vessel, (m/s)
3	0.12 - 0.15
>3	$0.12 - 0.15 \times (L/3)^{0.56}$

The liquid retention time for 3-phase separator shall be considered as follows.

Table 4.1.1-2 Liquid retention time for 3-phase separators

Oil Gravities	Minutes
Above 35° API	3 to 5
Below 35° API	
100 + °F	5 to 10
80 + °F	10 to 20
60 + °F	20 to 30

VERTICAL VESSELS

The following design criteria are applied for design of vertical vessels. Vertical separators with mist extractors shall be sized using the equation given below.

$$V_a = K \{(d_l - d_g) / d_g\}^{1/2}$$

Where,

V_a - maximum allowable superficial velocity (m/s)

d_l - Density of Liquid phase at operating conditions (kg/m³)

d_g - Density of Gas phase at operating conditions (kg/m³)

K - Constant (m/s) depending on design and operating conditions

K values recommended for vertical vessels are listed in the table below.

Table 4.1.1-3 - K values for Vertical vessels

Height (m)	K-Vessel, (m/s)
1.5	0.04 - 0.07
3	0.05 - 0.1

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The liquid retention time for 2-phase separator shall be considered as follows:

Table 4.1.1-4 Liquid retention time for 2-phase separators

Oil Gravities	Minutes
Above 35° API	1
20° - 30° API	1 - 2
10° - 20° API	2 - 4

LEVEL SETTING FOR SEPARATORS

The following table 4.1.1-5 shall be followed for minimum level setting for both vertical and horizontal vessel.

Table 4.1.1-5 Level setting for vessels

Level	Criteria
LAHH	0.1 m above LAH (or) 1 min whichever is higher
LAH	Minimum distance between LAH and LAL is 0.35 m (or) 3 min whichever is higher
LAL	0.10 m above LALL (or) 60 sec whichever is higher
LALL	0.25 m above BTL (Bottom Tan Line) / 0.3m above BTL for horizontal vessel

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4.1.2 SIZING CRITERIA FOR INLET AND OUTLET NOZZLES

4.1.2.1 TWO PHASE AND THREE PHASE SEPARATORS / KOD

INLET NOZZLE CRITERIA

Inlet and outlet nozzles should be sized to meet the ρv^2 limitations outlined in Table 4.1.2.1-1.

Table 4.1.2.1-1 Vessel Inlet and Outlet nozzle sizing criteria

Nozzle	Type of inlet Device	Momentum (Pa)
Feed	No inlet device	≤ 1400
	Half-open pipe	≤ 2100
	Schoepentoeter	≤ 8000

GAS OUTLET NOZZLE

Gas outlet nozzle should be sized to meet the ρv^2 limitations outlined in Table 4.1.2.1-2.

Table 4.1.2.1-2 Gas outlet nozzle sizing criteria

Nozzle	Momentum (Pa)
Gas outlet	≤ 3750

LIQUID OUTLET NOZZLE

Liquid outlet nozzle should be sized to meet velocity limitations outlined in Table 9.1.2.1-3.

Table 4.1.2.1-3 Liquid outlet nozzle sizing criteria

Nozzle	Velocity (m/s)
Liquid outlet	≤ 1

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4.2 DESIGN MARGIN

The following table summarizes the design margin to be included in the design capacity mentioned in table 5.8.1 for piping and equipment:

Table 4.2-1 Design Margins for Surface Production Facilities (OCS) at Nadua

Description	Over Design (%) (Note-1)	
Equipment		
Inlet Manifold & Separation system	25 15	Surge factor Swell factor
Separators/KOD	10	on flowrate
Storage tanks		80% filled from LLLL to LLHH
Shell & Tube, Plate & Frame and Hairpin heat exchangers	10 10	on duty (or) flowrate + on surface area (Note-1&2)
Air-Coolers	10 10	on surface area + on duty (or) flowrate (Note-1&2)
Pumps	10	on flowrate
Compressors	10 5	on flowrate (or) duty + on polytropic efficiency
Crude Dehydrator	25	on flowrate
Filters	10	on flowrate
Flare and vent Lines	Sized for highest coincident relieving contingency without margin.	
Utility Systems		
IA/UA	25	on flowrate
Hot Oil	25	on flowrate (or) duty
Electric Power	20	
Fire Fighting	20	on flowrate
Other utilities	10	on flowrate (or) duty

Note:

1. 10% additional margin on either duty or flowrate is required, whichever is governing.

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2. A minimum of 10% additional surface area to be considered in excess of the calculation requirements for fouled condition in addition to the criteria given in Note-1.

4.3 TEMPERATURE APPROACH FOR EXCHANGERS

Table 4.3-1 Temperature approach for exchangers

Exchanger Type	Minimum Temperature Approach (°C)
Shell & Tube	5
Plate & Frame	3 - 5
Air Cooler *	10
Printed Circuit Exchanger	3 - 5

* Minimum temperature approach of air cooled exchangers shall be based on maximum ambient temperature of 41°C.

4.4 PRESSURE DROP GUIDELINES

Table 4.5-1 Recommended Minimum Pressure Drop

Exchanger	Recommended Minimum Allowable ΔP (kg/cm ²)	Remarks
Air Cooler	0.5	
Control Valve	0.5	
Filters / Strainers	0.7	Dirty Service

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4.5 DESIGN PRESSURE

The maximum internal or external pressure will be used in determining the minimum permissible wall thickness of equipment and piping. Note that the minimum permissible wall thickness may be derived from a lower operating pressure, but higher operating temperature. Relief is normally initiated at design pressure.

4.5.1 DESIGN PRESSURE OF PRESSURE VESSEL

- Design pressure criteria for systems with high pressure trip is given in the table below

Table 4.5.1-1 Design pressure criteria for pressurized systems

High trip pressure kg/cm ² g	Minimum margin between high trip pressure and PSV set pressure kg/cm ²
0 – 35 kg/cm ² g	3.5
Over 35 kg/cm ² g	10% of PSV set pressure

- For pressurized systems without a high pressure trip, the minimum margin will be applied between the maximum operating pressure and the PSV set pressure.

4.5.2 DESIGN PRESSURE OF COMPRESSOR SUCTION SCRUBBER / COOLERS

The Minimum design pressure of the compressor suction scrubbers and coolers shall be 1.05 times of compressor settle-out pressure. This provides an adequate differential between the operating pressure and set pressure of PSV for a compressor shutdown contingency.

4.5.3 DESIGN PRESSURE OF PIPING

Mechanical design codes for piping and equipment have different limitations with regard to maximum allowable overpressure. Hence the equipment maximum pressure is considered as design pressure of associated piping.

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4.5.4 DESIGN PRESSURE OF COMPRESSOR

For initial estimate, the shut-in pressure for centrifugal compressor should be determined as the maximum operating pressure + 1.3 times the normal differential pressure developed by the compressor, to include for pressure rise at surge condition and maximum speed.

The maximum operating suction pressure of compressor shall be determined by the high trip pressure from upstream separator or compressor. Reciprocating compressor should be designed as per Table 4.5.4-1.

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4.6 DESIGN TEMPERATURE

The design temperature is determined based on the temperature of the internal fluid. As margin of design temperature has great influence on the material thickness and flange rating for low and high temperature services, appropriate temperature limit is considered within which the material can be used.

Maximum design temperature

The maximum design temperature is normally determined by adding 30 °C to the maximum operating temperature.

For equipment operating at ambient conditions, the maximum design temperature is 80 °C.

Vessels and Instruments subject to steam-out shall be designed for temperature during steam-out operations (full vacuum condition).

For all heat exchangers, both shell and tube side of the exchanger shall have the same design temperature determined by the hottest of the fluids on either side.

Minimum design temperature

The minimum design temperature determines the requirements to the low temperature characteristics of the material, and shall be the more stringent of the following:

- Minimum operating temperature (obtained during normal operation, start-up, shutdown, plant blowdown or Process upsets) with a margin of 5 °C;
- Minimum ambient temperature, the lowest temperature should be based on available weather data, and safety factors should be selected based on the quality of such weather data.
- In general, MDMT value shall be specified in vessel design.

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4.7 LINE SIZING CRITERIA

4.7.1 GENERAL

SIZING BASIS

Piping will be sized for the controlling operating case determined by analysis of flow rates, operating pressures and temperatures for all identified normal operating modes.

Consideration will also be given to start-up conditions and off-design operation where these significantly impact line sizing. For gas and two phase lines, particular attention will be given to the effects of changes in operating pressures, temperatures and gas composition with time.

PIPING SIZES

Nominal piping sizes to be used in the project will be as per Piping Specifications. A minimum line size of NB 2" will be used for all main process piping. Piping smaller than NB 2" may be used in instrument air, fire water services and chemical injection services and where specified for auxiliary services such as pump cooling.

Minimum connection sizes on piping will be 1" for hazardous service and ¾" non-hazardous service. Drain and vent valves from process lines will be 1" for piping above 10" and ¾" for piping below 10".

Minimum size for the sewage and drain header shall be 4" and sub-headers shall be 3". Overflow from atmospheric tanks shall as a minimum be equal to the largest inlet pipe / outlet pipe.

Non-standard pipe sizes (2½", 3½", 5", 7", 9" and 22") will not be used except where equipment connections and drilling piping systems require these sizes. Transition to standard commercial pipe sizes will be made as close to the equipment as practical. The minimum nozzle size allowed on vessels will be 2" (except chemical injection tank and SS clad vessel). Smaller connection sizes shall be considered on utility vessels and vendor standard components. Tubing may be used for air and other non-combustible / non-hazardous fluids. Equivalent length of valves and fittings shall be as per API RP 14E.

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4.7.2 SIZING CRITERIA FOR SINGLE PHASE LIQUID LINES

In determining maximum allowable velocities, consideration will also be given to noise and erosion / corrosion aspects.

As per API RP-14E recommendation, the single phase liquid line flow velocity should not exceed 4.5 m/s (15 ft/s) at maximum flow rates to minimize the flashing and also the flow velocity should not be lower than 0.91 m/s (3 ft/s) to minimize sand deposition.

Velocity of firewater shall not exceed 5 m/s in fire water ring main.

4.7.2.1 GRAVITY FLOW LINES

Lines flowing by gravity include tank overflows, drains (closed and open drains), and other lines where the liquid flows due to gravity forces instead of pressure difference. The vertical gravity lines will be designed such that the Froude number is less than 0.3 to avoid air entrainment and ensure undisturbed flow without pulsations. The gravity flowlines shall be sloped towards the downstream equipment with no pockets. A minimum slope of 1:100 to be maintained.

4.7.3 SIZING CRITERIA FOR SINGLE PHASE GAS LINES

High velocity may create noise problem if it exceeds 18 m/s (60 ft/s). However velocity should not be interpreted as an absolute criterion.

Table 4.7.3-1 - Pressure drop criteria for process gas lines

Operating pressure kg/cm ²	Pressure drop kg/cm ² /100m
0 – 35	0.001 – 0.11
35 – 140	0.11 – 0.27
>140	P/500 (Note-1)

Note 1: P is operating pressure in kg/cm²g.

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4.7.4 SIZING CRITERIA FOR RELIEF LINES

- All flare lines shall be designed to keep the $qV^2 < 200,000 \text{ kg/ms}^2$ criteria

Where,

q is the fluid density or mixed density for two phase conditions in kg/m^3

V is the velocity in m/s

The PSV upstream and downstream line shall be sized based on the rated capacity of the PSV. The PSV inlet line shall be sized so that the pressure loss is below 3% of valve set pressure to avoid valve chattering. Pilot operated valves can tolerate higher inlet-pipe pressure losses when the pilot senses the system's pressure at a point that is not affected by inlet-pipe pressure drop. In any case the upstream line size should be at least equal to the PSV inlet nozzle size.

- Maximum flowing velocity in the lines downstream of the PSVs to the first sub-header shall in general be less than Mach 0.7.
- Flare header shall be designed for a maximum velocity of Mach 0.5.
- Flare lines downstream of control valve shall be designed for a maximum velocity of Mach 0.5.
- Maximum backpressure for vent line shall be $0.07 \text{ kg/cm}^2\text{g}$.

Table 4.7.4-1 Design basis for PSV Laterals and Disposal Systems headers

Device	Lateral / Tail Pipe	Main Header
Pop-action, pilot-operated PSV	PSV rated capacity	Required relieving rate
Modulating-action, pilot operated PSV	Required relieving rate	Required relieving rate
Spring loaded PSV - Blocked Discharge - Gas blowby/control valve failure	Required relieving rate Required relieving rate (100% valve opening)	Required relieving rate Required relieving rate
Rupture disk (stand-alone)	Required relieving rate	Required relieving rate
Buckling pin device (stand-alone)	Required relieving rate	Required relieving rate

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4.8 TURNDOWN REQUIREMENTS

A turndown of 25% with respect to design capacity will be considered.

In order to fix effective turndown, the number of identical items (e.g. 2 x 50%, 3 x 33%) required to achieve the final value shall be analyzed.

Internals, control valves, exchangers, filters, compressors, pump and all other equipment to be designed for turndown condition.

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4.9 SPARING PHILOSOPHY (INSTALLATION SPARES)

The provision of sparing shall ensure the proposed design meets the project availability requirement. However, the following general requirements are to be followed.

- Critical pumps shall be designed in accordance with an n+1 sparing philosophy.
However, this may not be required if the pump is part of a fully spared train/module.
- Critical equipment / piping without spare shall have n+1 PSV's installed.
- Control valve sparing:
 1. Critical service with unspared valve (with globe valve in bypass)
The globe valve shall be installed in the by-pass line.
 2. Critical service with spared valve
2 x 100% of control valve will be provided for critical services. When the control valve fails, the spare valve can be activated (automatically).
 3. Non – Critical service
For non – critical services, spare control valve is not required.
- NAG inlet heater-1 spare will be kept in warehouse.

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5.0 DIMENSION

Dimension	Units	Symbol
Area	Square Metre	m ²
Concentration	Mole Percentage	Mole %
Density	Kilogram per cubic metre	kg/m ³
Electric Current	Ampere	A
Energy	Kilowatt	kW
Flowrate (Liquid)	Kilo Litres Per Day	KLPD
Flowrate (gas)	Million Metric Standard Cubic Metre per day / Million Metric Standard Cubic feet per day	MMSCMD/MMSCFD
Length	Meter	m
Mass	Kilogram	kg
Momentum	Kilogram per metre square second	kg/ms ²
Power	Kilowatt	kW
Pressure	Kilogram per square centimetre	kg/cm ²
Specific Heat Capacity	Kilojoule per kilogram Celsius	kJ/kg °C
Thermal Conductivity	Watt per metre kelvin	W/ m K
Temperature	Celsius	° C
Time	Second	sec
Velocity	Metre per second	m/s
Viscosity	Centipoise	cP
Volume	Cubic Metre	m ³

CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN

Document Title : ISOLATION PHILOSOPHY

Kavin Document No. : 17039-EK-P-GD-1004

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PROJECT DOCUMENTS ARE CONTROLLED DOCUMENTS.
REVISIONS ARE DENOTED | IN RIGHT HAND MARGIN

COMPANY:

OIL INDIA LIMITED

EPCM CONSULTANT:

**KAVIN ENGINEERING AND SERVICES
PRIVATE LIMITED**

REVISION RECORD SHEET

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ABBREVIATION

ASME	American Society of Mechanical Engineers
BDV	Blowdown Valve
DBB	Double Block and Bleed
ESD	Emergency Shutdown
FB	Full Bore
FC	Fail Close
FO	Fail Open
LC	Locked closed
LO	Locked open
NC	Normally closed
PSV	Pressure Safety Valve
P & ID	Piping and Instrumentation Diagram
RO	Restriction Orifice
RS	Removable Spool
RTJ	Ring Type Joint
RF	Raised Face
RB	Reduced Bore
SBB	Single Block and Bleed

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1.0 INTRODUCTION

OIL INDIA LIMITED (OIL) a Government of India Enterprise, proposes to construct two number of Surface Production facilities primarily for separation of Oil, Gas & Water and processing of non-associated & associated gas in its producing field at Nadua and East Khagorijan. The installation will be constructed on Modular design concept with emphasis on skid mounted prefabricated facilities minimizing construction work at site to the extent possible as per functional specifications of various process/utility packages. Instead of permanent civil buildings, containerized offices/structures will be preferred.

KAVIN ENGINEERING AND SERVICES PRIVATE LIMITED is awarded a contract for Engineering Procurement Construction Management Contractor to conceptualize / finalize the requirements needed for the Oil Collecting Station (OCS) at Nadua and Group Gathering Station (GGS) at East Khagorijan.

The East Khagorijan (GGS) field is located near Dibrugarh town in Assam at a location approximately 200m south (aerial distance) of LoC# TAI at 27032'N 95009'E approx. elevation 121 M MSL. The field is presently producing from 02 Nos. of wells through a QPS (Quick Production Setup). Considering the potential of the field it is envisaged that Oil production is expected to rise to a level of 1000 KLPD from 06 HP wells, 06 LP wells and 06 Non Associated Gas wells. Associated Gas is expected to be around 0.1 MMSCMD. The East Khagorijan oil field also having the huge amount of non-associated gas potential and it is expected to produce about 1 MMSCMD of non-associated natural gas from this area. It is also expected that the field will produce about 800 KLPD of water along with the 1000 KLPD of crude, so the plant design will be for handling 1800KLPD of total well fluid. Oil India Limited proposes to construct a Group Gathering Station at East Khagorijan to cater to the production in that area.

Pipelines from Oil & Gas wells to the proposed plant and transfer lines for transporting Dry Crude, separated Gas, treated water from the proposed plant to outside are not in the Project scope.

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Procurement of LAND and construction of boundary wall in the land is not in the project scope and will be done / arranged by OIL separately.

2.0 OBJECTIVE

The isolation philosophy is intended primarily for use as a guide for the safe isolation of plant and equipment. The purpose of the document is to define safe and cost effective isolation methods to facilitate preparation of plant maintenance and inspection with minimum interruption to production.

3.0 DESIGN REQUIREMENT FOR SYSTEM AND EQUIPMENT ISOLATION

It shall be possible to isolate the equipment, instruments, valves and process sections during maintenance to obtain safe working conditions for the personnel. Isolation shall be accomplished by the use of block valves and/or the insertion of spectacle blinds or spades, or the removal of spool pieces and the installation of blind flanges. The minimum isolation level required shall be thoroughly considered for all systems where intervention during operation is required. This consideration shall be based on the risk associated with the intervention operation which includes,

- Requirement for equipment entry during operation
- Fluid category (level of hazard involved, e.g. flammability, toxicity)
- Operating pressure and temperature
- Pipe dimension and system volume
- Duration of operation
- Frequency of operation

Functions of Isolation device:

- To enable an entire system, comprising of a number of equipment and associated pipe and instruments, to be taken out of service safely while other systems continue to function normally.
- To provide local, physical proof that a single piece of equipment is safely isolated from all possible sources of inflow, prior to allowing maintenance and to permitting entry of personnel.

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- To provide the means to reinstate the equipment or system safely, following successful maintenance or inspection-testing and repair operation.

4.0 ISOLATION METHODS

Equipment/piping isolation shall be achieved using various techniques and methods. The following methods shall be used;

- Physical separation (or) positive isolation
- Valved isolation

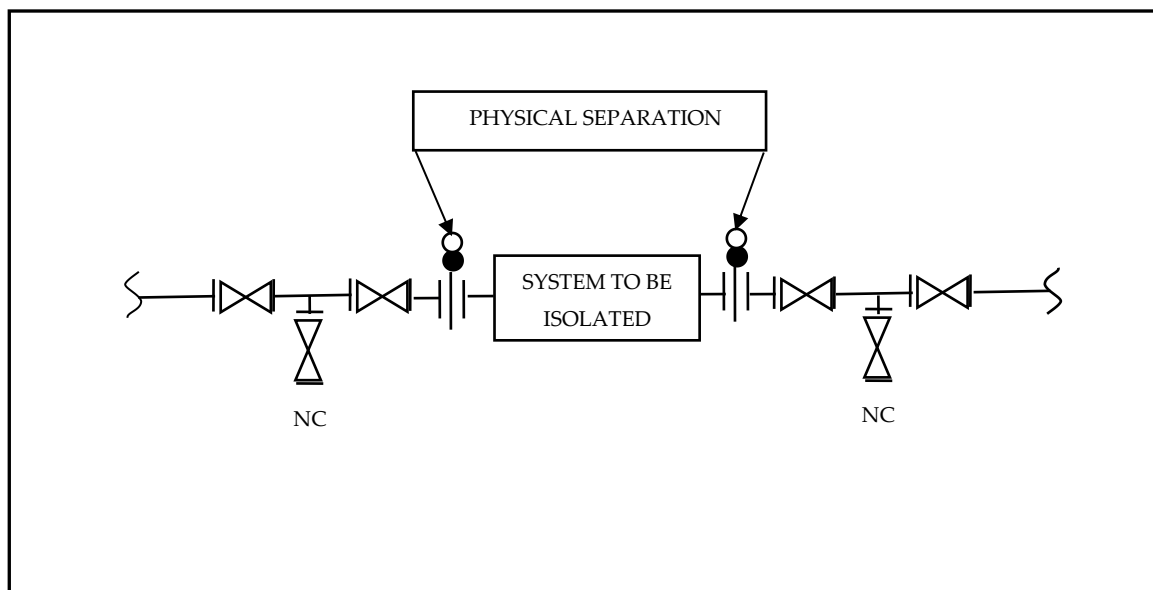
4.1 PHYSICAL SEPARATION (OR) POSITIVE ISOLATION

This method guarantees 100% physical segregation of a hazard or contamination source from a personnel and/or product inventory. It shall be accomplished through one of the following;

Physical Separation With Double Block and Bleed

This is the highest standard of isolation and provides a valve barrier by closing two block valves in series and using a bleed point in between to prove isolation point integrity. During installation or removal of the physical separation, it shall be possible to bleed down the trapped pressure by the bleed valve. The figure below illustrates the typical arrangement.

Figure 4.1-1 – Physical separation with double block and bleed

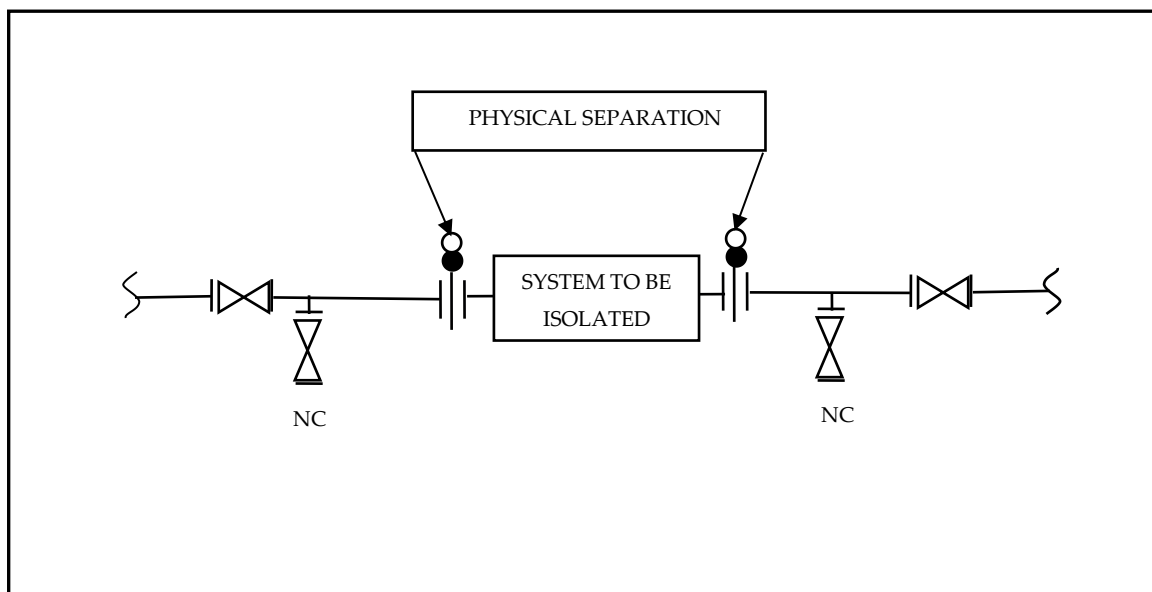


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Physical Separation With Single Block and Bleed

A single block isolation provides a valve barrier by closing a single block valve. The single block arrangement provides the initial isolation to install the physical separation. There shall be possibilities for testing the isolation point integrity by bleeding off the pressure and monitoring the pressure at the point to be isolated. The figure below illustrates the typical arrangement.

Figure 4.1-2 – Physical separation with single block and bleed



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Spectacle Blind / Spade and Spacer

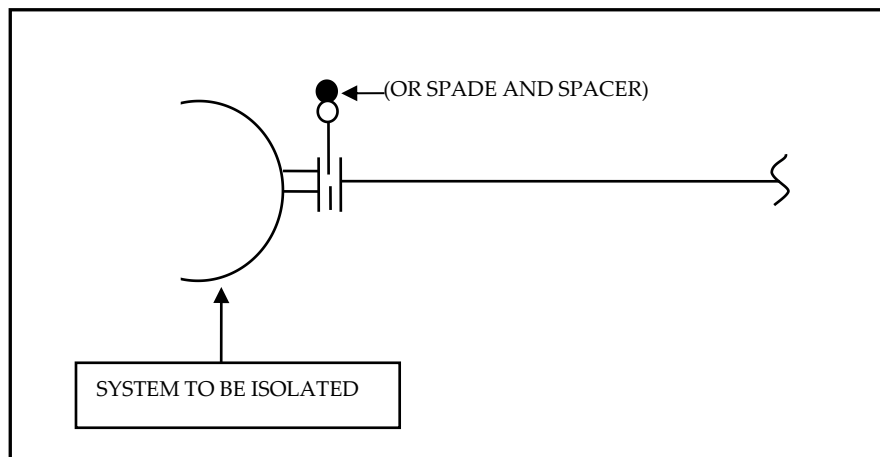
Insertion of blind flange (spade and spacer) or spectacle blind of the correct pressure rating between the flanges.

Where a spectacle blind with a ring type joint (RTJ) is used, the piping shall be arranged to include an elbow or spool to enable the blind to be swung. Alternatively, a removable spool piece may be used alone since this itself provides positive isolation. Where a spectacle blind with raised face (RF) is used, the piping shall be arranged to enable the flanges to be split apart by a sufficient distance to enable the blind to be swung without damaging the gasket.

Spade and spacer set is generally used on larger line sizes because of weight constraints based on pipe rating. Refer to Piping Material Specification - 17039-EK-M-SP-2001, for the selection of spectacle blind/spade and spacer.

The type of blind to be used in process and utility isolation points is shown in Table 5.1-1. The figure below illustrates the typical arrangement.

Figure 4.1-3 – Positive Isolation with Spectacle blind (or) Spade and Spacer



The type of blind to be used at all process and utility isolation points shall be as shown in Table 4.1-1

Table: 4.1-1 Spectacle blind and Spacers

Flange rating	Line diameter	
	Spectacle blinds	Spades
150#	16" & below	greater than 16"
300#	12" & below	greater than 12"
600#	10" & below	greater than 10"
900#	6" & below	greater than 6"

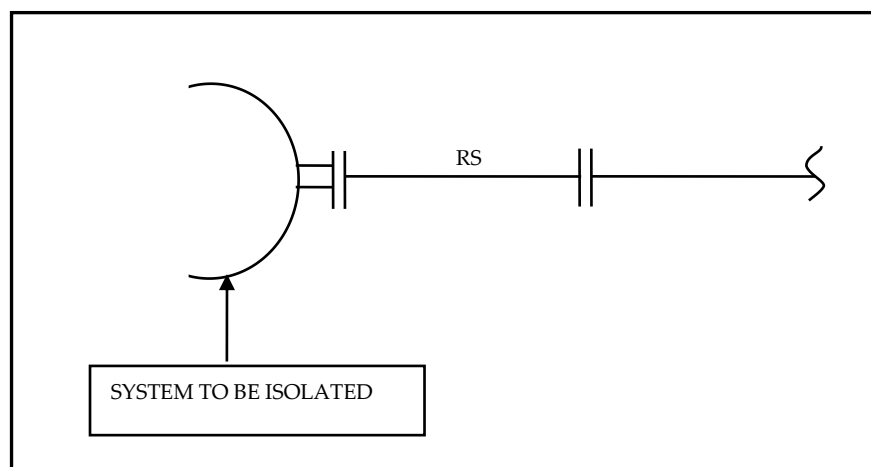
Removal Spool (RS)

The removal of a flanged spool piece and installation of a blind flange of the correct pressure rating. This type of isolation shall be required in the following area.

- For pump and compressor maintenance, spool pieces are required on the suction and discharge nozzles to provide positive isolation.
- For heat exchanger maintenance, spool pieces are required on the inlet and outlet nozzle (both process and utility side).

Piping shall be designed to permit practical removal and installation of spools via provision of sufficient pipe flexibility and appropriate material handling process. The figure below illustrates the typical arrangement.

Figure 4.1-4 – Physical separation with Removal Spool



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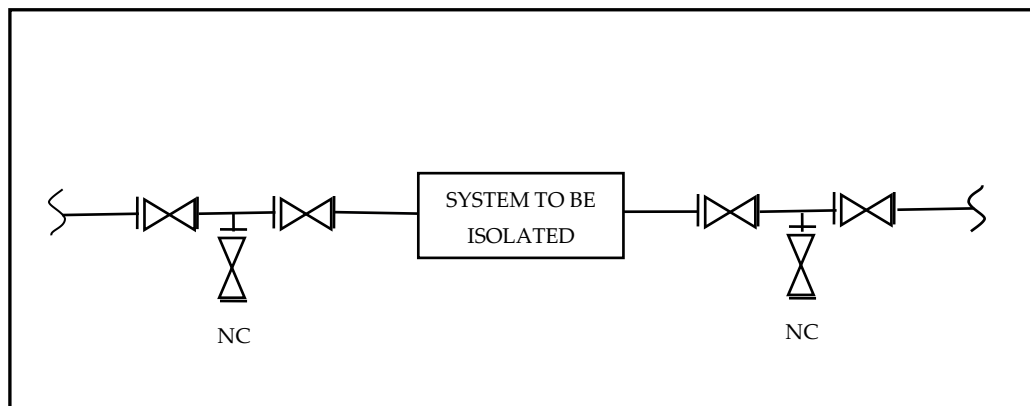
4.2 VALVED ISOLATION

This type of isolation generally comprises one (or) two in-line block valves in series with a bleed. The block valves provide the main isolation of the hazardous fluid from the designated area. Table 4.2-1 summarizes the valve isolation selection for equipment.

Double Block and Bleed (DBB)

Double block and bleed isolation provides a valve barrier by closing two block valves in series and using a bleed point in between to prove isolation point integrity. Manual block valves (or) actuated valves (emergency (or) process shutdown valves) are acceptable for use in double block and bleed isolation, except for fail open valves. Air/hydraulic/electric/ supply to the actuator shall also be isolated. The figure below illustrates the typical arrangement.

Figure 4.2-1 - Double block and bleed



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Single Block And Bleed (SBB)

Single block and bleed isolation provides a valve barrier by closing a single block valve. The shutdown side of the block and bleed assembly is then drained/vented/purged to make ready for maintenance. Single block and bleed valves are used for low pressure ratings. The figure below illustrates the typical arrangement.

Figure 4.2-2 - Single block and bleed

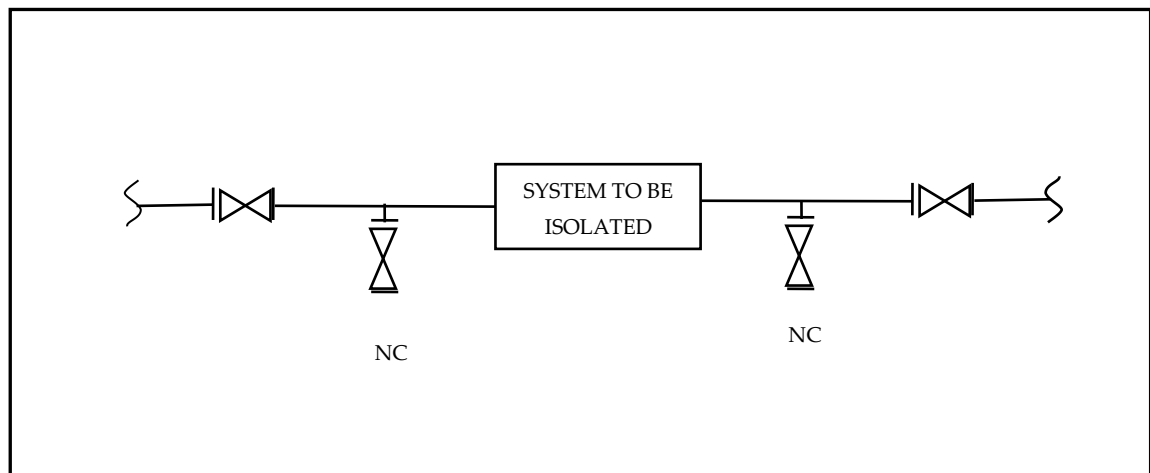


Table:4.2-1 Valve isolation selection

System Pressure Rating (ASME Class)	150#	300#	600#	900#	1500#	2500#
Isolation Method	SBB	SBB	DBB	DBB	DBB	DBB

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5.0 ISOLATION VALVES

To obtain a safe isolation, it is required to utilize valves which provides good isolation and keeps the integrity towards the live process. The following valve types shall be considered to give sufficient integrity as isolation valve in the facility

- Ball valves
- Gate valves
- Needle valves
- Butterfly valves

Butterfly (or) gate valves can be used as isolation valves in water system only. Produced water shall be considered as hydrocarbon system i.e. butterfly valves shall not be used as isolation valves. Butterfly valves shall also not be used as isolation valves in heating medium system (even if the heating medium is fresh water) or in steam system (even in the condensate return lines). For safety reasons, certain block valves shall be designated 'Locked open'(LO) or 'Locked closed'(LC) on the P & IDs. Isolation valves shall be locked in position only if inadvertent operation of the valve would lead to damage to equipment or an unsafe condition.

5.1 SECURING VALVE POSITION

Securing of valves in position is primarily a method of locking the valves to avoid inadvertent opening/closing. Securing of valve position shall be achieved by use of proprietary key locking devices (identified as LO/LC on P&ID's) together with written operating procedures.

The following application of valve position securing shall be followed.

- Within the protection system, valves on firewater distribution, and local foam distribution system shall be Locked open/closes as appropriate.
- Where blowdown valves are provided with block valves shall be locked open.
- Pump suction and discharge isolation valves shall be locked open and Full Bore type.
- Valve position of relief devices for vessels and systems is illustrated in Figure 6.3.1-1 and 6.3.1-2.

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6.0 SYSTEM ISOLATION REQUIREMENTS

6.1 EQUIPMENT ISOLATION

Proper design shall provide isolation valves, spools, and/or flanges as close as practical to the equipment or piping being isolated. When determining isolation points, the following factors shall be considered.

- Gas freeing requirements:
Purging for entry should minimize only unswept area and volumes of purge gas need to be made available.
- Potential hazard involved:
Personnel access and material handling for the isolation operation shall be considered.
- System liquid volume:
When draining vessels, the disposition of the liquids need to be available and appropriately sized for the rate being drained.
- Upstream and downstream conditions and influences:
Piping specification changes and location of relief devices may dictate where isolation can be placed, to avoid overpressure/ lack of protection issues.

6.1.1 PRESSURE VESSELS

Equipment isolation for vessel entry shall provide all process, utility, vent and drain connections with positive isolation. Direct instrument connections and flanges on vessels do not require a spectacle blind. Pressure vessels containing hydrocarbons shall be provided with a utility connection for general vessel flushing to purge with nitrogen.

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6.1.2 HEAT EXCHANGERS

Removal spool piece shall be installed for maintenance purpose. Vent and drain shall be located on the associated pipework, wherever possible, chemical cleaning connections of suitable size shall be provided between the exchanger nozzle and the isolation blind. The chemical connection will normally be located on the spool piece.

6.1.3 ATMOSPHERIC VESSEL/TANKS

Atmospheric vessels/tanks shall be provided with single block valve on inlet/outlet line. Drain connection shall be provided with spectacle blind in closed position to prevent loss of inventory due to leakage. In general, isolation for atmospheric vessels will be considered case to case basis, depending on the fluid being stored (hazardous/non-hazardous).

6.1.4 PUMPS

All pumps with sparing shall be provided with isolation facilities to enable process isolation and mechanical isolation. When pumps are installed in parallel, independent positive isolation of the inlet and outlet of each pump shall be provided to allow maintenance of one pump whilst the other remains operational.

Removable spool pieces shall be provided to allow access to the suction and discharge nozzles and enable removal of the pump for maintenance purposes. Installation of blind flange following the removal of spool piece may be used to achieve positive isolation of the pump.

Drain valves shall be fitted on all low points to ensure that the pump casing and all pipe work between isolation valves can be fully drained.

For pump with permanent suction strainers, the strainer shall be able to be isolated and closed without draining of any upstream vessels or tanks.

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6.1.5 COMPRESSORS

Removal spool piece shall be installed on the suction and discharge nozzles of all compressor stages. For Compressors with permanent screen/Filters, the screen shall be able to be isolated and cleaned. Temporary screens shall be removed after commissioning.

6.2 INSTRUMENT ISOLATION

6.2.1 CONTROL VALVES

Isolation of control valve shall follow typical arrangement shown in figure 6.2.1-1 and 6.2.1-2.

Figure 6.2.1-1 - Control Valve arrangement for Pressure rating below 600#

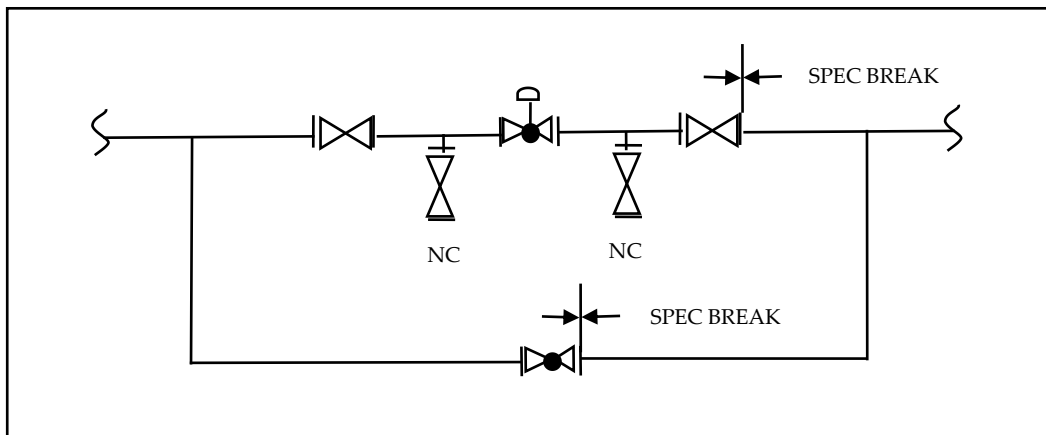
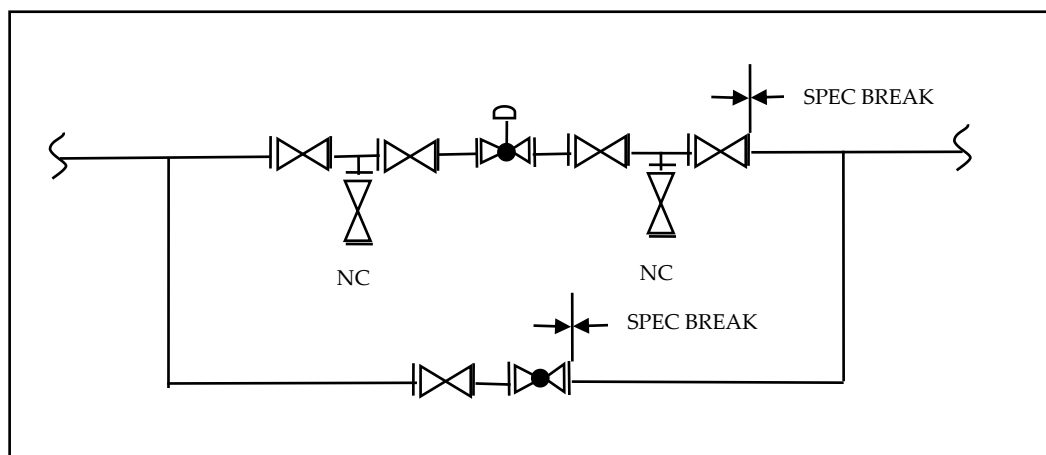


Figure 6.2.1-2 - Control Valve arrangement for Pressure rating 600# and above



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Requirement of draining of inventory upstream and downstream of the control valve is based on the type of control valve used for the service.

- For Failed Open (FO) Control Valve, single drain valve upstream or downstream of the control valve is sufficient.
- For Failed Close (FC) Control Valve, both upstream and downstream of the control valve is provided with a drain valve.

6.2.2 LEVEL/PRESSURE/FLOW INSTRUMENTS

All level, pressure and flow instruments shall be isolated from the process (Vessel/line) with a block valves. The document “Instrument/Electronic symbols - 17039-EK-P-DW-0301-03/04” defines the typical isolation assembly for instruments.

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6.3 CONNECTIONS TO FLARE, VENT AND DRAIN

6.3.1 CONNECTION TO FLARE

The following requirements shall apply;

Relief Valves / Rupture Discs

- Arrangement and location of PSVs and rupture discs shall be in accordance with the relevant pressure relieving design code and the corresponding mechanical design code. Relief valves shall be equipped with block valves. Isolation shall be in accordance with Table 5.2-1. The PSV in service shall have inlet and outlet block valve locked open, and the spare PSV shall have the inlet block valve locked close and outlet block valve locked open. All isolation valves for relief valves shall be full bore. Installations with more than 2 PSVs shall follow the same logic, i.e. all in-service valves shall have inlet and outlet block valves locked open and the spare shall have inlet locked close and outlet locked open.
- For multi train systems/equipments (N+1), if entire train or equipment is spared, single relief valve is acceptable. For systems/equipments with 'N' configuration, spare PSV shall be required.
- When PSV is removed for maintenance, its connection shall be fitted with adequately rated blind flanges. All PSVs, regardless of configuration, shall be isolated, removed or blinded. Blinds should be used on the header side of the connection to prevent gas blowback.
- When Shell & Tube Exchanger is protected with Rupture discs, it shall be mounted directly on the exchanger or immediately adjacent on the connected piping.

Figure 6.3.1-1 - Arrangement for Multiple Relief Valves

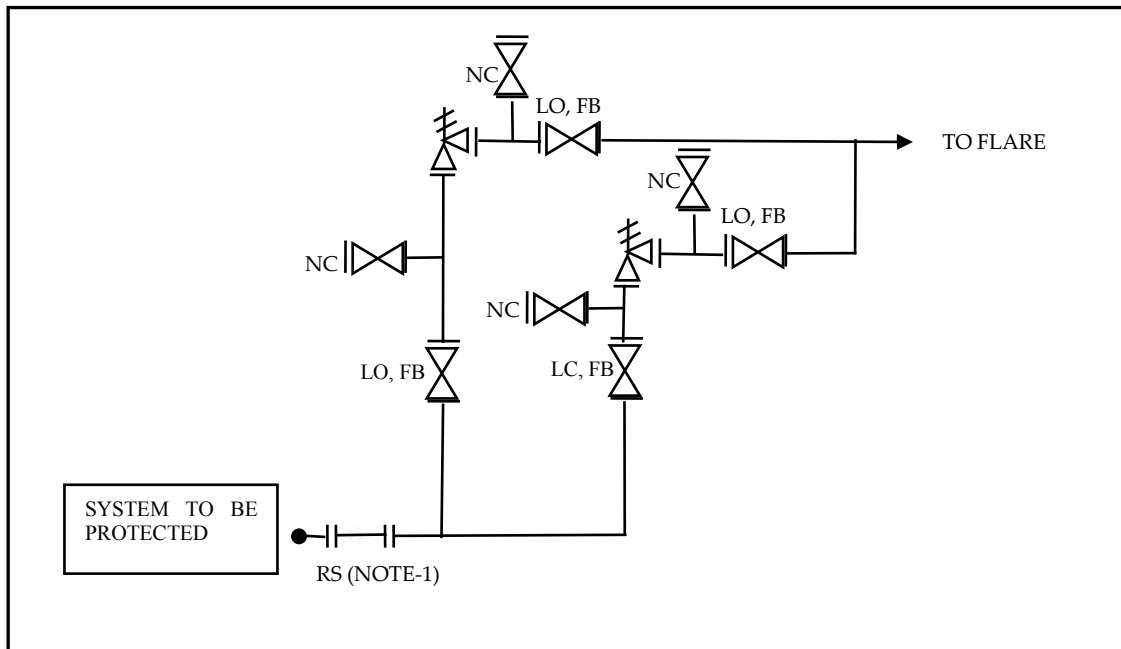
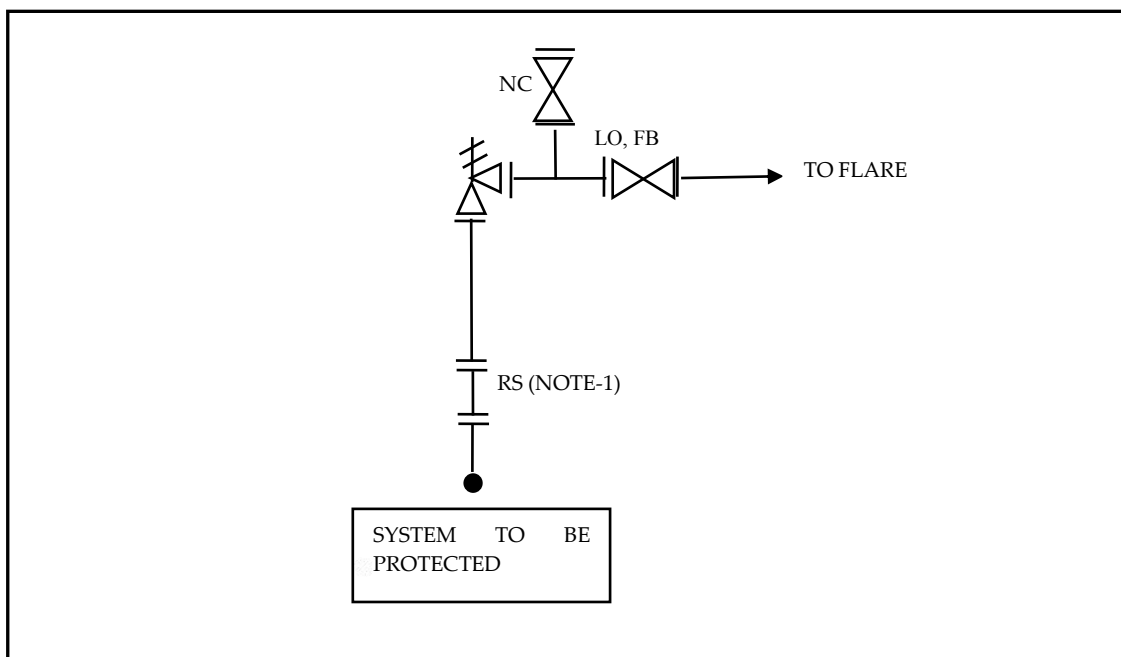
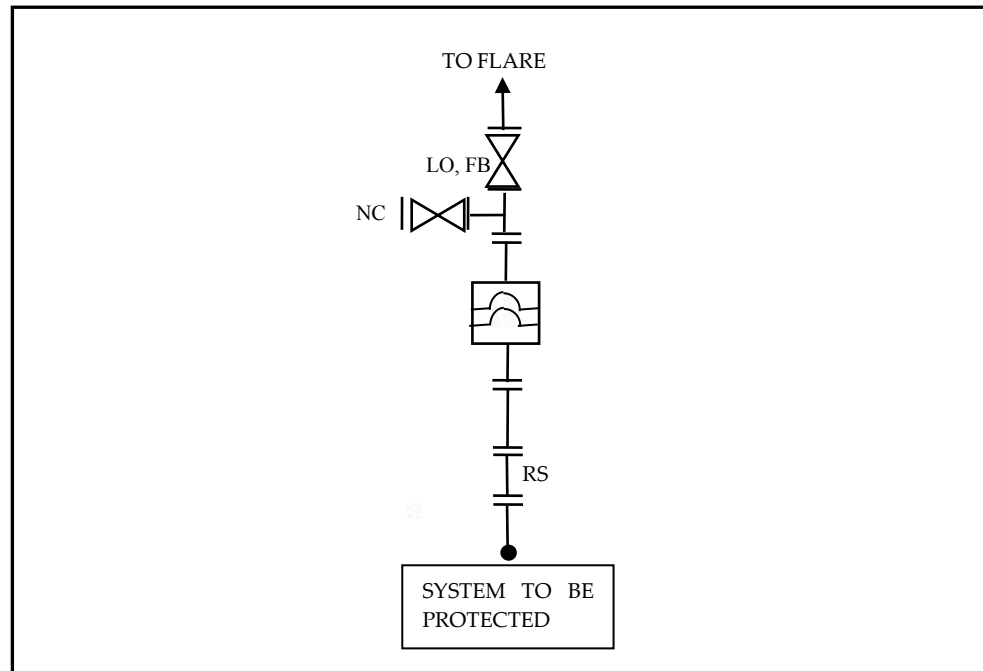


Figure 6.3.1-2 - Arrangement for Single Relief Valve



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Figure 6.3.1-3 - Arrangement for Rupture discs



Notes

1. Removable spool (RS) is required only when Relief device is installed on equipment and it is not required when installed on piping.

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Depressuring Valves (Blowdown Valves)

- Blowdown valves shall be located at high points in the piping system.
- Blowdown shall be arranged with one blowdown valve and an orifice. Blowdown valve shall have isolation towards downstream flare system to allow maintenance and functional testing of blowdown valve (i.e., opening of valve) without flaring.
- Manual depressurization to flare for maintenance purposes require block valve and a throttle valve. Refer Figure 6.3.1-5 for typical arrangement.
- For blowdown lines, design shall take into account the low temperature expected upstream of the orifice resulting from temperature creep-back.
- For blowdown lines, if there is a potential for solidification in upstream or downstream lines, adequate heat tracing or insulation shall be provided.

Figure 6.3.1-4 - Arrangement for Blowdown Valves

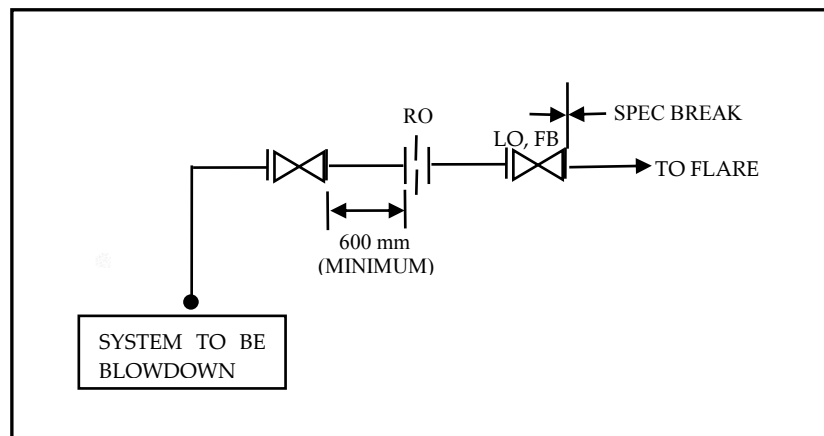
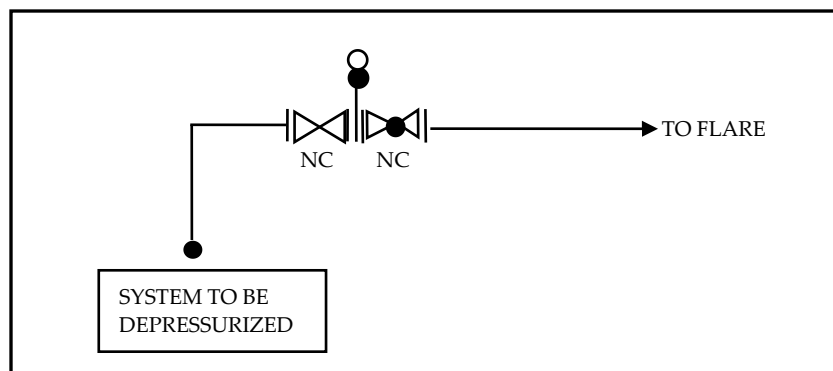


Figure 6.3.1-5 - Arrangement for Manual Depressurization



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6.3.2 CONNECTION TO VENT AND DRAINS

The following requirements shall apply;

- For venting to atmosphere during maintenance, a vent valve and blind shall be included.
- Connections to the closed drain system from equipment and piping shall be as shown in figure below.

Figure 6.3.2-1 - Arrangement for closed drain connections (pressurized)

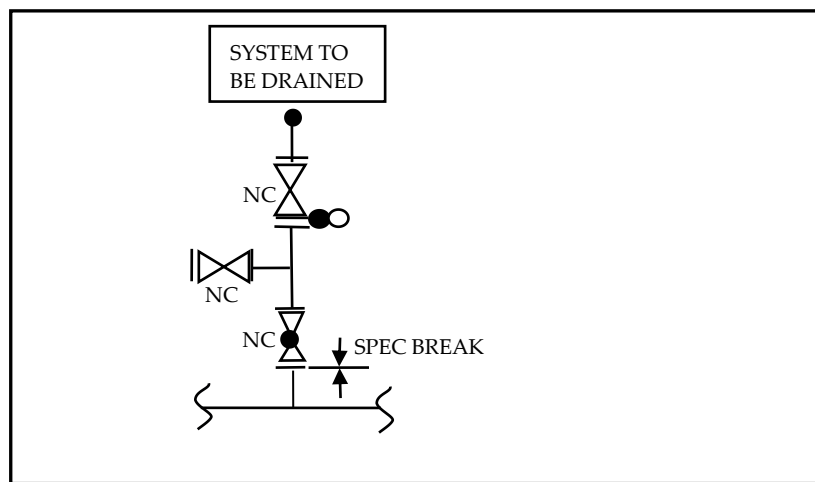
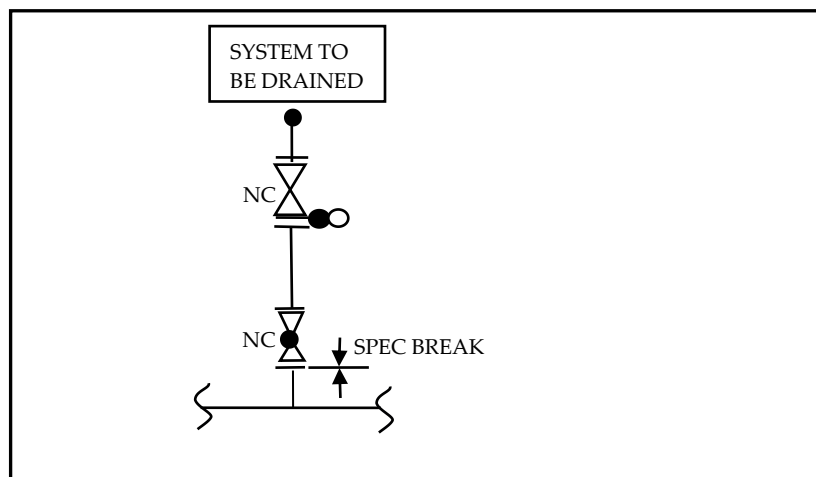


Figure 6.3.2-2 - Arrangement for closed drain connections (atmospheric)



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6.4 OPERATIONAL DRAIN, VENT AND FLUSHING REQUIREMENTS

- All equipment and piping shall be provided with high point vents and low point drains within isolation valves isolating equipment or process sections. All such vents and drains shall be fitted with valve and blind flange. For piping and headers low point drain and high point vent shall in general be provided.
- Utility connections shall be provided and located to ensure efficient flushing and cleaning required for inspection and maintenance.
- Where provision shall be made for chemical cleaning of heat exchangers with the tube bundle in place, blind flange connection shall be provided for chemical hose attachments. This connection shall be minimum 3", but not exceeding the line size and shall be located between the exchanger nozzles and the block valves/positive isolation.

CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN

Document Title : VENT AND DRAIN PHILOSOPHY

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REVISIONS ARE DENOTED | IN RIGHT HAND MARGIN

COMPANY:

OIL INDIA LIMITED

EPCM CONSULTANT:

**KAVIN ENGINEERING AND SERVICES
PRIVATE LIMITED**

	CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN	Doc No : 17039-EK-P-GD-1003
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ABBREVIATION

EK	East Khagorijan
EPCM	Engineering Procurement Construction Management
ETP	Effluent Treatment Plant
GGS	Group Gathering Station
HC	Hydrocarbon
KL	Kilo Litres
KLPD	Kilo Litres Per Day
MMSCMD	Million Metric Standard Cubic Meters per Day
MSL	Mean Sea Level
ND	Nadua
OCS	Oil Collecting Station
QPS	Quick Production Setup

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1.0 INTRODUCTION

OIL INDIA LIMITED (OIL) a Government of India Enterprise, proposes to construct two number of Surface Production facilities primarily for separation of Oil, Gas & Water and processing of non-associated & associated gas in its producing field at Nadua and East Khagorijan. The installation will be constructed on Modular design concept with emphasis on skid mounted prefabricated facilities minimizing construction work at site to the extent possible as per functional specifications of various process/utility packages. Instead of permanent civil buildings, containerized offices/structures will be preferred.

KAVIN ENGINEERING AND SERVICES PRIVATE LIMITED is awarded a contract for Engineering Procurement Construction Management Contractor to conceptualize/finalize the requirements needed for the Oil Collecting Station (OCS) at Nadua and Group Gathering Station (GGS) at East Khagorijan.

The East Khagorijan (GGS) field is located near Dibrugarh town in Assam at a location approximately 200m south (aerial distance) of LoC# TAI at 27032'N 95009'E approx. elevation 121 M MSL. The field is presently producing from 02 Nos. of wells through a QPS (Quick Production Setup). Considering the potential of the field it is envisaged that Oil production is expected to rise to a level of 1000 KLPD from 06 HP wells, 06 LP wells and 06 Non Associated Gas wells. Associated Gas is expected to be around 0.1 MMSCMD. The East Khagorijan oil field is also having the huge amount of non-associated gas potential and it is expected to produce about 1 MMSCMD of non-associated natural gas from this area. It is also expected that the field will produce about 800 KLPD of water along with the 1000 KLPD of crude, so the plant design will be for handling 1800 KLPD of total well fluid. Oil India Limited proposes to construct a Group Gathering Station at East Khagorijan to cater to the production in that area. Pipelines from Oil & Gas wells to the proposed plant and transfer lines for transporting Dry Crude, separated Gas, treated water from the proposed plant to outside are not in the Project scope.

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2.0 OBJECTIVE

The objective of this document is to specify the design/engineering requirements and selection of Vent and Drain System for Group Gathering Station at East Khagorijan. The vent and drain systems are needed for maintenance of equipment, piping and instruments. It shall safely collect and transport residual process fluids from various part of the facility to an appropriate disposal location giving consideration to protection of personnel, plant, equipment and environment. This specification does not cover domestic wash water or sewage drain system for accommodation areas, buildings and control room which shall separate from plant drain system.

3.0 DRAIN SYSTEM

Drain system shall be designed to cater for the following as a minimum:

- Meet statutory and regulatory discharge requirements.
- Drain minor spills and limit the potential and extent of pool fires.
- Effectively remove deluge water and rain water from plant areas.
- Prevent escalation of fire by minimizing drainage system interconnections

The Drain system normally comprises of fluid from the following streams:

- Equipment / skid drain
- Instrument drains
- Drainage of overflow, wash down , rain water, deluge water.

3.1 TYPE OF DRAIN SYSTEMS

The drain system can be classified as follows:

- Closed drain system
- Oily water collection system

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3.1.1 *CLOSED DRAIN SYSTEM*

The closed drain system shall be designed to drain the fluids from process equipment and it shall be considered as a low pressure hydrocarbon system. Draining activity normally takes place prior to entry or other maintenance operations such as long term shutdown. Before equipment is drained to the closed drain system, operating procedures shall ensure the following:

- Equipment shall be emptied to the lowest extent possible.
- Equipment that is drained into the closed drain system is to be fully depressurized to atmospheric pressure.

All the collected liquids shall be routed to Closed Drain Drum located in a pit (underground) where any flashed gas shall be routed to flare system. Liquid shall be pumped to Off-spec crude storage tank using Condensate Transfer Pumps. The pump capacity shall be higher than the maximum drainage rate. Closed Drain Drum shall be designed in accordance with criteria given in Process Design Basis (17039-EK-P-DB-1001). Heating coil requirement in closed drain drum will be confirmed based on wax appearance temperature.

All process drain connections shall be equipped with positive isolation to avoid accidental draining of pressurized liquids. Refer Isolation Philosophy (17039-EK-P-GD-1004) for typical arrangement. Drain piping shall be adequately and continuously sloped to eliminate the possibility of creating liquid pockets. A minimum 4" pipe size shall be provided in drain header and sufficient rodding points shall be provided. Operating procedures should take care of the possibility of over-pressurization of the drain header due to inadvertent opening of a drain valve in the plant system while the spectacle blind in Closed Drain Drum is closed.

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3.1.2 ***OILY WATER COLLECTION SYSTEM***

The Oily water collection system collects predominantly rain water and deluge water from bund wall area of the process systems and also from other process system. It also collects lube oil, diesel fuel spillage during normal operation or during other routine operations (e.g. maintenance). Check pit and valve pit shall be provided in each process systems as required. Rainwater or deluge water from process system shall be collected in respective check pit from where it shall be routed to valve pit through hard pipe and finally routed to guard pond through trenches. Oily water may be expected initially which shall be routed to Effluent treatment plant (ETP) for 15 minutes for further treatment. After 15 minutes, it shall be diverted to guard pond.

3.1.3 ***OTHER DRAINS***

3.1.3.1 ***HOT OIL DRAINS***

Hot oil drain system shall be provided to collect hot oil drained from the hot oil system. This system shall enable maintenance of the hot oil system. The hot oil drain tank shall be designed to hold the total hot oil system inventory and shall also be designed for the possibility of draining at elevated temperature. Hot oil drain tank shall be located in a pit to allow gravity draining.

There should be sufficient head available to generate flow by overcoming any back-pressure and piping system pressure losses. The contents of the Hot oil drain tank shall be pumped back to Hot oil Expansion drum and/or Off loading truck.

3.1.3.2 ***CHEMICAL DRAINS***

A separate chemical drain network is not considered. Drain from Chemical Injection system shall be routed to Closed Drain Drum.

3.1.3.3 ***LABORATORY DRAINS***

Laboratory drains are used for the disposal of samples, chemical solutions, solvents and chemicals. Laboratory drains are independent drain systems. Only oily water drain from the laboratory may be connected to closed drain system. All other drains shall be collected in drums for removal from the lab.

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3.2 SOURCES AND DESTINATION OF VARIOUS DRAINS

Table: 3.2-1 Sources and Destination of various Drains

Source	Expected Components	Destination		
		Closed Drain	Oily water collection system	Other drain systems
Process equipment and lines containing hydrocarbons for maintenance purpose	Oil, Condensate, Water	✓		
Compressor lube oil	Lube oil	✓		
Atmospheric oil storage tanks	Oil, Water	✓		
Deluge water/Rainwater	Contaminated oil-water		✓ (Note-1)	
Floor drains	Spilt oil, Wash water		✓	
Sample drains	Oil, Water	✓		
Instrument drains	Oil, Water	✓		
Flare Knock-out drum	Oil, Water	✓		
Discharge from thermal relief valve in oil system	Oil, Water	✓		
Laboratory drains	Oil, Water	✓		
Process chemicals drains	Chemicals	✓		
Hot oil drains	Hot oil			Hot oil drain tank

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Note:

1. During rainy or firefighting condition, contaminated water i.e. Oily water will be routed to Effluent water treatment plant for first 15 minutes, excess water will be routed to Guard bond after 15 minutes.

4.0 VENT SYSTEM

Vent acts to relieve positive pressure as well as potential negative pressure relative to atmospheric pressure. The sources of vents are as follows:

- Vent from Atmospheric Storage Tanks
- Maintenance Vents from equipment

The location of vent outlet shall be located such that in the event of accidental ignition of vent, it will not impinge upon adjacent equipment and heat radiation to equipment or personnel shall be within the limit specified in relevant codes.

For vents associated with flammable materials, the end of the discharge pipe shall be cut off squarely and rounded off to minimize the risk of ignition by static electricity and the pipe earthed. The vent velocity should be as high as practicable.

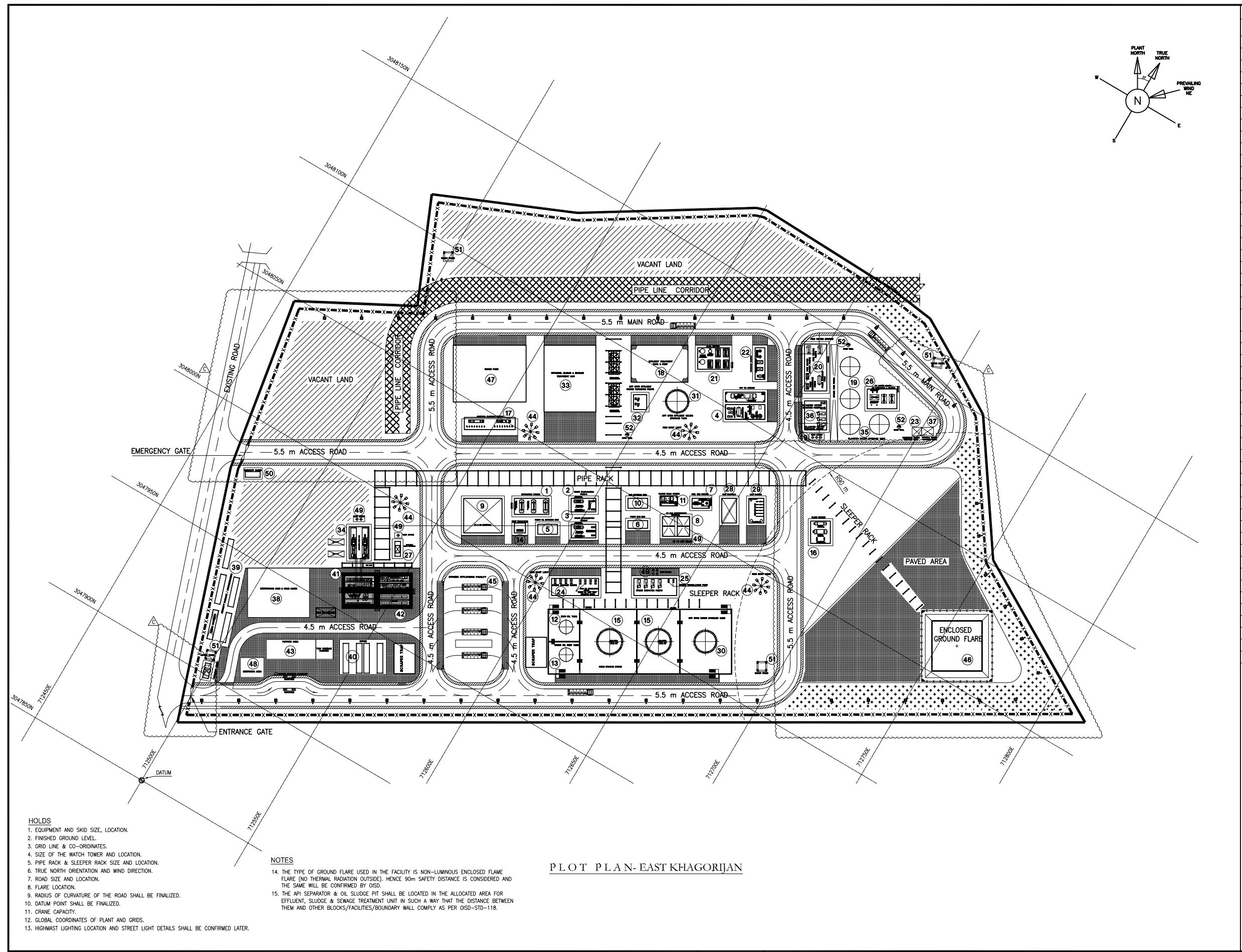
Chemical Injection tank vent shall be provided with suitable safety devices e.g. Flame Arrestors. When vessel is taken for maintenance, it shall be purged with nitrogen or other inert fluid and depressurized to atmosphere. Utilities connection shall be provided for purging to each vessel/equipment subject to venting operation.

For piping above 10", the vent , drain & bleed valve size shall be 1" with blind flange.

5.0 OPERATING / MAINTENANCE REQUIREMENTS

Drainage activities shall be performed in accordance with operating manuals. The following points shall be observed.

- Drainage shall never be done from live system. Systems need to be emptied as much as possible through the normal procedure.
- Proper house keeping is essential in avoiding blockage of drainage piping.



EQUIPMENT LEGEND					
ITEM NO.	DESCRIPTION	SIZE (mm)	CONTAINER (Y/N)	SHED (Y/N)	CRANE (CAPACITY)
1	SEPARATION SYSTEM	14000 L X 6500 W	N	N	-
2	CRUDE STABILIZATION TRAIN-A	10000 L X 5500 W	N	N	-
3	CRUDE STABILIZATION TRAIN-B	10000 L X 5500 W	N	N	-
4	HOT OIL SYSTEM (NOTE-11)	16000 L X 11000 W	N	Y	-
5	CRUDE OIL METERING SKID	8000 L X 4000 W	N	N	-
6	TRUNK LINE KOD	8000 L X 3100 W	N	N	-
7	FUEL GAS SYSTEM	7000 L X 4000 W	N	N	-
8	LP GAS COMPRESSION PACKAGE	11000 L X 8000 W	N	N	-
9	HP,LP MANFOLD SYSTEM	15500 L X 14000 W	N	N	-
10	GAS METERING SKID	8000 L X 4000 W	N	N	-
11	CLOSED DRAIN SYSTEM	7000 L X 4000 W	N	Y	H.O.T (HOLD-11)
12	SKIM OIL TANK	5500 (I/D) X 8000 (H)	N	N	-
13	CRUDE OIL TEST TANK	5500 (I/D) X 8300 (H)	N	N	-
14	TEST SEPARATOR	4500 L X 4000 W	N	N	-
15	TREATED CRUDE STORAGE TANK A/B	9500 (I/D) X 14250 (H)	N	N	-
16	FLARE SYSTEM	9000 L X 8000 W	N	N	-
17	CHEMICAL INJECTION SYSTEM	10000 L X 7500 W	N	N	-
18	EFFLUENT TREATMENT TANK & PUMP	23000 L X 15000 W X 4000 H	N	N	-
19	FIRE WATER TANKS A/B	7900 I/D X 10000 H	N	N	-
20	FIRE WATER & FOAM CONCENTRATE PUMPS	20000 L X 9000 W	N	Y	E.O.T (HOLD-11)
21	IA/UA SYSTEM	12800 L X 8700 W	N	N	-
22	NITROGEN SYSTEM	12800 L X 4000 W	N	N	-
23	INDUSTRIAL WATER STORAGE TANK	3800 L X 3500 W X 5000 H	N	N	-
24	CRUDE CHARGE PUMPS, CRUDE OIL TEST TANK, TRANSFER PUMP & SKIM OIL TRANSFER PUMP	19000 L X 7000 W	N	Y	E.O.T (HOLD-11)
25	CRUDE CIRCULATION PUMP & CRUDE DISPATCH PUMP	12800 L X 8000 W	N	N	-
26	RO WATER MAKER/UV STABILIZER & FILTERS	12000 L X 8000 W	N	N	-
27	EMERGENCY DIESEL GENERATOR	8000 L X 4400 W	Y	N	-
28	NAG MANIFOLD	10000 L X 6000 W	N	N	-
29	NAG SYSTEM	10000 L X 6000 W	N	N	-
30	OFF SPEC CRUDE STORAGE TANK	8230 I/D X 12100 H	N	N	-
31	OFF SPEC EFFLUENT WATER STORAGE TANK	8450 I/D X 12600 H	N	N	-
32	OFF SPEC EFFLUENT WATER TRANSFER PUMPS	6000 L X 5300 W	N	Y	H.O.T (HOLD-11)
33	EFFLUENT, SLUDGE & SEWAGE TREATMENT UNIT	27000 L X 21000 W	N	N	-
34	CAPTIVE POWER PLANT	13000 L X 8000 W	Y (QTY-2)	N	-
35	CLARIFIED WATER STORAGE TANK	8100 I/D X 12000 H	N	N	-
36	CLARIFIED & BOOSTER PUMPS	12000 L X 11800 W	N	Y	H.O.T (HOLD-11)
37	POTABLE WATER STORAGE TANK	4800 L X 3500 W X 5000 H	N	N	-
38	MAINTENANCE SHED & STORE ROOM	30000 L X 20000 W	N	Y	E.O.T (HOLD-11)
39	SECURITY BARRACK / ACCOMMODATION	-	Y (QTY-5)	N	-
40	OFFICE	-	Y (QTY-4)	N	-
41	CONTROL ROOM	-	Y (QTY-2)	N	-
42	SUBSTATION (SWITCH ROOM/MCC ROOM)	-	Y (QTY-6)	N	-
43	PARKING AREA	16000 L X 8000 W	N	Y	-
44	HIGH MAST LIGHT (QTY-3)	-	N	N	-
45	BOWSER OFFLOADING FACILITY	-	N	Y	-
46	ENCLOSED GROUND FLARE	-	N	N	-
47	GUARD POND	29500 L X 23000 W	N	N	-
48	MUSTERING AREA	9500 L X 8000 W	N	N	-
49	VENT STACK (QTY-6)	-	N	N	-
50	SECURITY CABIN (QTY-2)	-	Y	N	-
51	WATCH TOWER (QTY-4)	-	N	N	-
52	BORE WELL (QTY-3)	-	N	N	-

LEGEND:

- GREEN BELT
- ROAD
- FIRE WALL
- DYKE WALL
- FUTURE EXPANSION
- PAVED AREA
- CULVERT/BRIDGE
- BORE WELL
- UNDERGROUND TANK
- UTILITY STATION
- STORM WATER
- TREE
- HIGH MAST (LED FIXTURE)
- STREET LIGHT (LED FIXTURE)
- F.G.L - FINISHED GROUND LEVEL
- F.F.L - FINISHED FLOOR LEVEL
- CHAIN LINK FENCING
- BOUNDARY LINE

NOTES

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE SPECIFIED.

2. FINISHED GRADE LEVEL 0.000 ~ 115.00m MEAN SEA LEVEL.

3. THE GIVEN PACKAGE SIZE & LOCATIONS ARE PRELIMINARY WILL BE FINALIZED.

4. REF. ELEVATION SHALL BE FINISHED GROUND LEVEL EL+ 0.000.

5. MINIMUM INTER DISTANCES FOR VARIOUS STATION FACILITIES HAS BEEN MAINTAINED AS PER OMR 2017/OISD 118 REQUIREMENT.

6. FABRICATION SHED AND STORAGE SHED SHALL BE TEMPORARY SHED FOR THE CONSTRUCTION PURPOSE AND LOCATION SHALL BE SUIT AT SITE AS PER THE EPC CONTRACTOR.

7. STREET LIGHTING FIXTURE POLE SHALL BE OF 10m HEIGHT HAVING A PLANTING DEPTH OF MINIMUM 1.5m.

8. PCC/VDF FLOORING SHALL BE PROVIDED INSIDE SHEDS, OVER PCC/VDF FLOORING IRONITE(METALLIC HARDENER) FLOORING OF 52mm SHALL BE PROVIDED INCLUDING PARKING SHED.

NOTES

9. MENTIONED LIGHTING FIXTURES LOCATIONS ARE TENTATIVE ONLY, SAME SHALL BE CONFIRMED DURING DETAILED ENGINEERING.

10. FLASH POINT OF CRUDE OIL IS 37°C AND IT FALLS UNDER PETROLEUM CLASS B HOWEVER, OPERATING TEMPERATURE OF STORAGE TANKS IS 55°C AS PER OISD-117, IN THIS CASE CLASS B PRODUCT SHALL BE CONSIDERED AS CLASS A PRODUCT.

11. CENTRALIZED / COMMON API SEPARATORS, CORRUGATED PLATE INTERCEPTOR (CPI), OPEN OIL SEPARATORS SHALL BE CATEGORIZED UNDER THE SAME RISK AND SHALL BE LOCATED AT A DISTANCE OF 90M FROM HEATERS/BOILERS. HOWEVER, IF THESE ARE COVERED FROM THE TOP AND PROVIDED WITH ADEQUATE VENTING TO SAFE LOCATION, THE MINIMUM SEPARATION DISTANCE SHALL BE 30M.

12. HOT OIL DRAIN TANK & CLOSED DRAIN TANK SHALL BE SHED ARRANGEMENT.

13. ELEVATED TANKS FOR POTABLE & INDUSTRIAL WATER.

COMPANY:

Oil India Limited

EPCM CONSULTANT:

KAVIN™

PROJECT: CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN

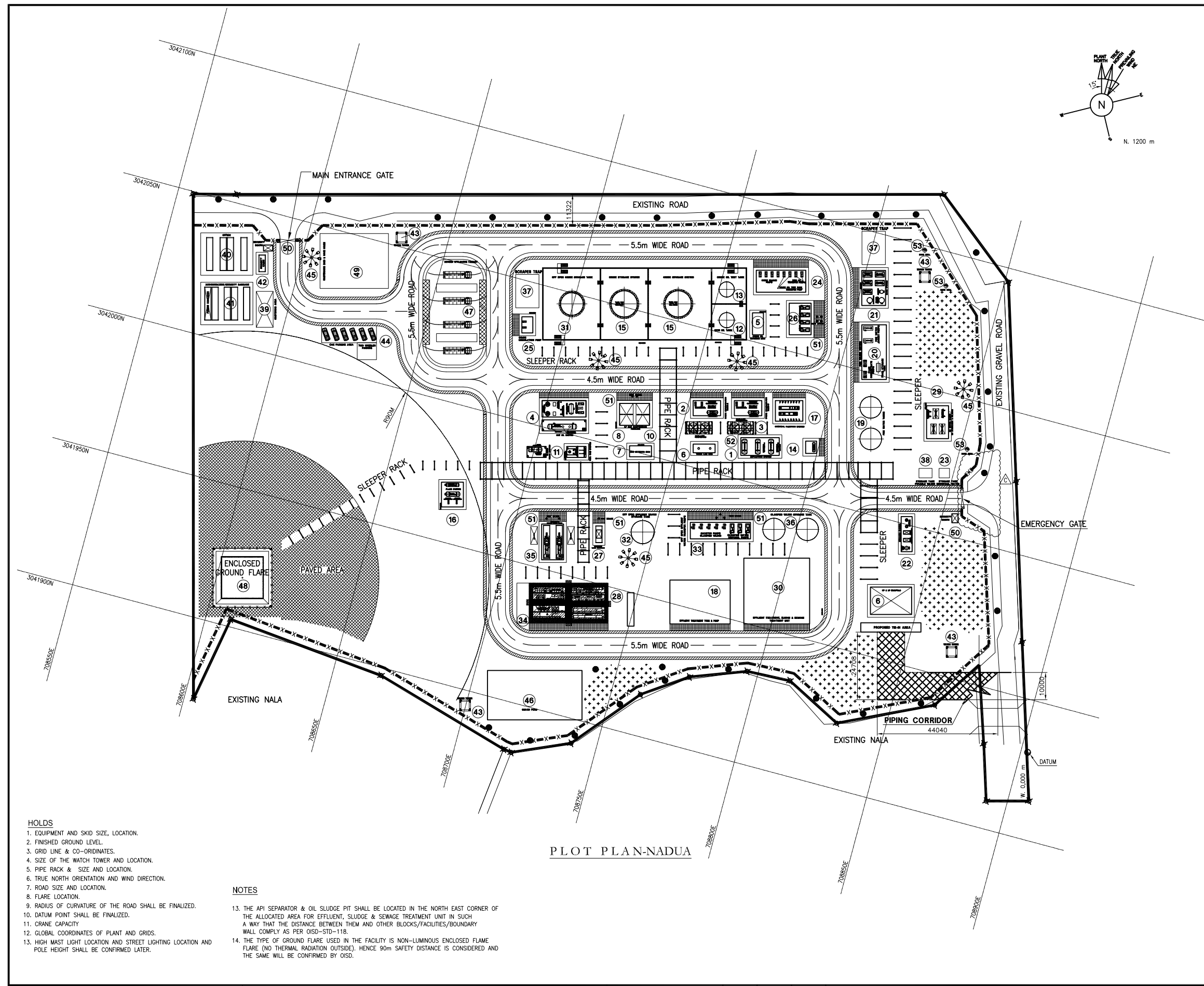
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DOC NAME : EAST KHAGORIJAN - OVERALL PLOT PLAN

PROJECT NO.: KIP-17039	PROJECT SITE: EAST KHAGORIJAN
DRAWING NO.: 17039-EK-I-DWG-4001	REV: C SHEET: 1 of 2 SCALE: 1:750

SAFETY DISTANCE					
SL. No.	DISTANCE FROM	DISTANCE TO	DISTANCE REQD. AS PER OISD 118 (M)	DISTANCE MAINTAINED IN PLOT PLAN (M)	COMPLIANCE
01	STORAGE TANK CLASS "A" NOTE-9	PROCESS UNIT	30	42	YES
		PROCESS CONTROL ROOM	60	92	YES
		ENCLOSED GROUND FLARE	150	88	NO
		BOUNDARY WALL	0.5 D OR MIN 20	27	YES
		SERVICE BUILDING	60	117	YES
		OIL SLUDGE PIT IN ETP/ API SEPARATOR	50	55	YES
		ELECTRICAL SUB STATION	60	77	YES
		BOWSER OFFLOADING FACILITY	15	39	YES
02	PROCESS UNIT (DEHYDRATOR + SEPARATOR + COMPRESSOR + HEAT EXCHANGER	PROCESS CONTROL ROOM	30	103	YES
		ENCLOSED GROUND FLARE	150	104	YES
		BOUNDARY WALL	60	120	YES
		SERVICE BUILDING	60	143	NO
		OIL SLUDGE PIT IN ETP/ API SEPARATOR	30 (NOTE-10)	46	YES
		ELECTRICAL SUB STATION	15	103	YES
03	PROCESS CONTROL ROOM	ENCLOSED GROUND FLARE	150	211	YES
		BOUNDARY WALL	30	54	YES
		SERVICE BUILDING	15	15	YES
		OIL SLUDGE PIT IN ETP/ API SEPARATOR	30	49	YES
		ELECTRICAL SUB STATION	00	23	YES
04	ENCLOSED GROUND FLARE	BOUNDARY WALL	150	30	NO
		SERVICE BUILDING	150	252	YES
		OIL SLUDGE PIT IN ETP/ API SEPARATOR	150	174	YES
		ELECTRICAL SUB STATION	150	222	YES
05	BOUNDARY WALL	SERVICE BUILDING	6	28	YES
		OIL SLUDGE PIT IN ETP/ API SEPARATOR	50	124	YES
		ELECTRICAL SUB STATION	15	47	YES
		BOWSER OFFLOADING FACILITY	15	41	YES
06	SERVICE BUILDING	OIL SLUDGE PIT IN ETP/ API SEPARATOR	50	106	YES
		ELECTRICAL SUB STATION	12	28	YES
07	OIL SLUDGE PIT IN ETP/ API SEPARATOR	ELECTRICAL SUB STATION	45	60	YES

							COMPANY:		PROJECT : CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN								
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									DOC NAME : EAST KHAGORIJAN - OVERALL PLOT PLAN								
									PROJECT NO.: KIP-17039PROJECT SITE: EAST KHAGORIJAN								
									DRAWING NO.: 17039-EK-L-DW-4001REV: C SHEET : 2 of 2SCALE : 1:600								
							EPCM CONSULTANT :										
	REV	DATE	DESCRIPTION	DRAWN	CHK.	APPR.											
	A	08 DEC 17	ISSUED FOR REVIEW	MNS	SHIV/ASH	MSB/MSR											
	B	02 APR 18	ISSUED FOR BID	M.P	G.K/ASH	MSB/MSR											
	C	13 APR 18	ISSUED FOR APPROVAL	M.P	G.K/ASH	MSB/MSR											



EQUIPMENT LEGEND					
ITEM NO	DESCRIPTION	SIZE (mm)	CONTAINER (Y/N)	SHED (Y/N)	CRANE (CAPACITY)
1	SEPARATION SYSTEM	14000 L X 6500 W	N	N	-
2	CRUDE STABILIZATION TRAIN-A	10000 L X 5500 W	N	N	-
3	CRUDE STABILIZATION TRAIN-B	10000 L X 5500 W	N	N	-
4	HOT OIL SYSTEM (NOTE-11)	16000 L X 11000 W	N	Y	-
5	CRUDE OIL METERING SKID	8000 L X 4000 W	N	N	-
6	TRUNK LINE KOD	8000 L X 3100 W	N	N	-
7	FUEL GAS SYSTEM	7000 L X 4000 W	N	N	-
8	LP GAS COMPRESSION PACKAGE	11000 L X 8000 W	N	N	-
9	HP,LP MANIFOLD SYSTEM	15000 L X 10000 W	N	N	-
10	GAS METERING SKID	8000 L X 4000 W	N	N	-
11	CLOSED DRAIN SYSTEM	7000 L X 4000 W	N	Y	H.O.T (HOLD-11)
12	SKIM OIL TANK	5500 I/D X 8000 H	N	N	-
13	CRUDE OIL TEST TANK	5550(I/D) x 8300(H)	N	N	-
14	CRUDE OIL TEST SEPARATOR	4500 L X 4000 W	N	N	-
15	TREATED CRUDE STORAGE TANK A/B	9500 I/D x 14250 H	N	N	-
16	FLARE SYSTEM	9000 L X 8000 W	N	N	-
17	CHEMICAL INJECTION SYSTEM	10000 L X 7500 W	N	N	-
18	EFFLUENT TREATMENT TANK & PUMP	22000 L X 16000 W X 4000 H	N	N	-
19	FIRE WATER TANKS A/B	7900 I/D x 10000 H	N	N	-
20	FIRE WATER/FOAM CONCENTRATE PUMPS & STORAGE TANK	20000 L X 9000 W	N	Y	E.O.T (HOLD-11)
21	IA/UA SYSTEM	12800 L X 8700 W	N	N	-
22	NITROGEN SYSTEM	12800 L X 4000 W	N	N	-
23	INDUSTRIAL WATER STORAGE TANK	3800 L X 3500 W X 5000 H	N	N	-
24	CRUDE OIL TEST TANK TRANSFER PUMP, SKIM OIL TRANSFER PUMP & CRUDE CHARGE PUMPS	18100 L X 8000 W	N	Y	E.O.T (HOLD-11)
25	CRUDE CIRCULATION PUMP	5900 L X 4000 W	N	Y	E.O.T (HOLD-11)
26	CRUDE DISPATCH PUMPS	11500 L X 8000 W	N	Y	H.O.T (HOLD-11)
27	EMERGENCY DIESEL GENERATOR	8000 L X 4400 W	Y (QTY-1)	N	-
28	SUBSTATION (SWITCH ROOM/MCC ROOM)	-	Y (QTY-2)	N	-
29	RO WATER MAKER / UV STABILIZER & FILTERS	12000 L X 8000 W	N	N	-
30	EFFLUENT,SLUDGE & SEWAGE TREATMENT UNIT	24000 L X 24000 W	N	N	-
31	OFF SPEC CRUDE STORAGE TANK	8710 (I/D) x 12900 (H)	N	N	-
32	OFF SPEC EFFLUENT WATER STORAGE TANK	8450 (I/D) x 12600 (H)	N	N	-
33	OFF SPEC EFFLUENT WATER TRANSFER PUMPS CLARIFIED WATER DISPOSAL & BOOSTER PUMPS	22000 L X 6000 W	N	Y	E.O.T (HOLD-11)
34	CONTROL ROOM	-	Y (QTY-2)	N	-
35	CAPTIVE POWER PLANT	13000 L X 8000 W	Y (QTY-2)	N	-
36	CLARIFIED WATER STORAGE TANK A/B	8100 I/D x 12000 H	N	N	-
37	SCRAPER TRAP (2 NOS.)	12200 L X 8500 W	N	Y	-
38	POTABLE WATER STORAGE TANK	4800 L X 3500 W X 5000 H	N	N	-
39	MUSTERING AREA	13100 L X 6200 W	N	N	-
40	OFFICE	19000 L X 15500 W	Y (QTY-4)	N	-
41	ACCOMMODATION/SECURITY BARRACK	19000 L X 15500 W	Y (QTY-5)	N	-
42	SECURITY CABIN (QTY-1)	-	Y	N	-
43	WATCH TOWER (QTY-4)	-	N	N	-
44	PARKING AREA	27000 L X 6200 W	N	Y	-
45	HIGH MAST LIGHT (QTY-5)	-	N	N	-
46	GUARD POND	34500 L x 18000 X 4000 H	N	N	-
47	BOWSER OFFLOADING	-	N	Y	-
48	ENCLOSED FLAME FLARE	-	N	N	-
49	MAINTENANCE SHED & WARE HOUSE	30000 L x 20000 W	N	Y	E.O.T (HOLD-11)
50	SECURITY BOOTH (QTY-2)	-	N	N	-
51	VENT STACK (QTY-2)	-	N	N	-
52	PRODUCED WATER COOLER	TBA	Y (QTY-2)	N	-
53	BORE WELL (QTY-3)	-	N	N	-

- HOLDS**
- EQUIPMENT AND SKID SIZE, LOCATION.
 - FINISHED GROUND LEVEL.
 - GRID LINE & CO-ORDINATES.
 - SIZE OF THE WATCH TOWER AND LOCATION.
 - PIPE RACK & SIZE AND LOCATION.
 - TRUE NORTH ORIENTATION AND WIND DIRECTION.
 - ROAD SIZE AND LOCATION.
 - FLARE LOCATION.
 - RADIUS OF CURVATURE OF THE ROAD SHALL BE FINALIZED.
 - DATUM POINT SHALL BE FINALIZED.
 - CRANE CAPACITY
 - GLOBAL COORDINATES OF PLANT AND GRIDS.
 - HIGH MAST LIGHT LOCATION AND STREET LIGHTING LOCATION AND POLE HEIGHT SHALL BE CONFIRMED LATER.

- NOTES**
- THE API SEPARATOR & OIL SLUDGE PIT SHALL BE LOCATED IN THE NORTH EAST CORNER OF THE ALLOCATED AREA FOR EFFLUENT, SLUDGE & SEWAGE TREATMENT UNIT IN SUCH A WAY THAT THE DISTANCE BETWEEN THEM AND OTHER BLOCKS/FACILITIES/BOUNDARY WALL COMPLY AS PER OISD-STD-118.
 - THE TYPE OF GROUND FLARE USED IN THE FACILITY IS NON-LUMINOUS ENCLOSED FLAME FLARE (NO THERMAL RADIATION OUTSIDE). HENCE 90m SAFETY DISTANCE IS CONSIDERED AND THE SAME WILL BE CONFIRMED BY OISD.

- NOTES**
- ALL DIMENSIONS ARE IN MM, UNLESS OTHERWISE SPECIFIED.
 - FINISHED GRADE LEVEL 0.000 = 113.00m MEAN SEA LEVEL.
 - THE GIVEN PACKAGE SIZE & LOCATIONS ARE PRELIMINARY.
 - REF. ELEVATION SHALL BE FINISHED GROUND LEVEL EL+ 0.000.
 - MINIMUM INTER DISTANCES FOR VARIOUS STATION FACILITIES HAVE BEEN MAINTAINED AS PER OMR 2017/OISD 118 REQUIREMENT.
 - FABRICATION SHED AND STORAGE SHED SHALL BE TEMPORARY SHED FOR THE CONSTRUCTION PURPOSE AND LOCATION SHALL BE SUIT AT SITE AS PER THE EPC CONTRACTOR.
 - PCC/VDF FLOORING SHALL BE PROVIDED INSIDE SHEDS. OVER PCC/VDF FLOORING IRONITE(METALLIC HARDENER) FLOORING OF 52mm SHALL BE PROVIDED INCLUDING PARKING SHED.

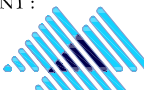
- MENTIONED LIGHTING FIXTURES LOCATIONS ARE TENTATIVE ONLY, SAME SHALL BE CONFIRMED DURING DETAILED ENGINEERING.
- FLASH POINT OF CRUDE OIL IS 29°C AND IT FALLS UNDER PETROLEUM CLASS B HOWEVER, OPERATING TEMPERATURE OF STORAGE TANKS IS 50°C. AS PER OISD-117, IN THIS CASE CLASS B PRODUCT SHALL BE CONSIDERED AS CLASS A PRODUCT.
- CENTRALIZED / COMMON API SEPARATORS, CORRUGATED PLATE INTERCEPTOR (CPI), OPEN OIL SEPARATORS SHALL BE CATEGORIZED UNDER THE SAME RISK AND SHALL BE LOCATED AT A DISTANCE OF 90M FROM HEATERS/BOILERS. HOWEVER, IF THESE ARE COVERED FROM THE TOP AND PROVIDED WITH ADEQUATE VENTING TO SAFE LOCATION, THE MINIMUM SEPARATION DISTANCE SHALL BE 30M.
- HOT OIL DRAIN TANK & CLOSED DRAIN TANK SHALL BE SHED ARRANGEMENT.
- ELEVATED TANKS FOR POTABLE & INDUSTRIAL WATER.

REV	DATE	DESCRIPTION	DRAWN	CHK.	APPR.
C	12 APR 18	ISSUED FOR APPROVAL	M.P	G.K/ASH	MSB/MSR
B	05 APR 18	ISSUED FOR BID	M.P	G.K/ASH	MSB/MSR
A	08 DEC 18	ISSUED FOR REVIEW	MNS	SHV/ASH	MSB/MSR

COMPANY:

 **ऑयल इंडिया लिमिटेड**
Oil India Limited

EPCM CONSULTANT:

 **KAVIN™**

PROJECT : CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN

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DOC NAME : NADUA - OVERALL PLOT PLAN

PROJECT NO.:	KIP-17039	PROJECT SITE:	
DRAWING NO.:	17039-ND-1-DW-4001	REV: C	SHEET : 1 of 2
		SCALE :	1:700

SAFETY DISTANCE					
SL. No.	DISTANCE FROM	DISTANCE TO	DISTANCE REQD. AS PER OISD-118 (M)	DISTANCE MAINTAINED IN PLOT PLAN (M)	COMPLIANCE
01	STORAGE TANK CLASS "A" NOTE-9	PROCESS UNIT	30	30	YES
		PROCESS CONTROL ROOM	60	105	YES
		ENCLOSED FLAME FLARE	150	175	YES
		BOUNDARY WALL	0.5 D OR MIN 20	23	YES
		SERVICE BUILDING	60	100	YES
		OIL SLUDGE PIT IN ETP/ API SEPARATOR	50	87	YES
		ELECTRICAL SUB STATION	60	97	YES
		BOWSER OFFLOADING FACILITY	15	29	YES
02	PROCESS UNIT (DEHYDRATOR + SEPARATOR + COMPRESSOR + HEAT EXCHANGER	PROCESS CONTROL ROOM	30	54	YES
		ENCLOSED GROUND FLARE	150	127	YES (NOTE-14)
		BOUNDARY WALL	60	60	YES
		SERVICE BUILDING	60	60	YES
		OIL SLUDGE PIT IN ETP/ API SEPARATOR	30 (NOTE-10)	37	YES
		ELECTRICAL SUB STATION	15	34	YES
03	PROCESS CONTROL ROOM	ENCLOSED GROUND FLARE	150	250	YES
		BOUNDARY WALL	30	32	YES
		SERVICE BUILDING	15	134	YES
		OIL SLUDGE PIT IN ETP/ API SEPARATOR	30	65	YES
		ELECTRICAL SUB STATION	00	03	YES
04	ENCLOSED FLAME FLARE	BOUNDARY WALL	150	15	NO
		SERVICE BUILDING	150	109	YES
		OIL SLUDGE PIT IN ETP/ API SEPARATOR	150	172	YES
		ELECTRICAL SUB STATION	150	109	YES
05	BOUNDARY WALL	SERVICE BUILDING	6	14	YES
		OIL SLUDGE PIT IN ETP/ API SEPARATOR (NOTE-13)	30 (NOTE-10)	30	YES
		ELECTRICAL SUB STATION	15	40	YES
		BOWSER OFFLOADING FACILITY	20	21	YES
06	SERVICE BUILDING	OIL SLUDGE PIT IN ETP/ API SEPARATOR	50	162	YES
		ELECTRICAL SUB STATION	12	126	YES
07	OIL SLUDGE PIT IN ETP/ API SEPARATOR	ELECTRICAL SUB STATION	45	50	YES

							COMPANY:		PROJECT : CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN			
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									DOC NAME : NADUA - OVERALL PLOT PLAN			
									PROJECT NO.: KIP-17039PROJECT SITE: NADUA			
									DRAWING NO.: 17039-ND-L-DW-4001REV: C SHEET : 2 of 2SCALE : 1:600			
	C	11 APR 18	ISSUED FOR APPROVAL	M.P	G.K/ASH	MSB/MSR	EPCM CONSULTANT :					
	B	05 APR 18	ISSUED FOR BID	M.P	G.K/ASH	MSB/MSR						
	A	08 DEC 17	ISSUED FOR REVIEW	MNS	SHV/ASH	MSB/MSR						
	REV	DATE	DESCRIPTION	DRAWN	CHK.	APPR.						

CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN

Document Title : PIPING MATERIAL SPECIFICATION

Kavin Document No : 17039-EK-M-SP-2001

B	06-Feb-18	ISSUED FOR BID	SN	APRK / JB	MSR/MSB
A	29-Nov-17	ISSUED FOR REVIEW	SN	APRK / JB	MSR/MSB
REV.	DATE	DESCRIPTION	BY	CHECKED	APPROVED

**PROJECT DOCUMENTS ARE CONTROLLED DOCUMENTS.
REVISION CHANGES ARE DENOTED AS Δ IN RIGHT HAND MARGIN**

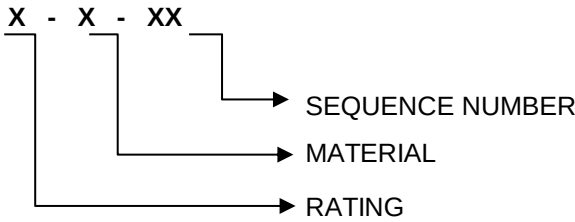
**CLIENT:
OIL INDIA LIMITED**

**EPCM
KAVIN ENGINEERING AND SERVICES PRIVATE
LIMITED**

TITLE	ऑयल इंडिया लिमिटेड Oil India Limited KAVIN™	KAVIN DOCUMENT No.	
PROJECT		SHEET No.	Rev.
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN		4 of 33	B

PIPING SPECIFICATION INDEX						
Sl. No.	Piping Class	Rating	Material Description	Services	Pressure Temperature Range	
					Temp (°C)	Press. (kg/cm ² g)
1	AC01	150 #	CS + 3mm CA	Fuel Gas (FG), Drain Open (DO), HP Flare (HF), Heating Medium(HM)- Hot Oil, Produced Water (PW), Process Hydrocarbon Vapor (PV), LP Flare (LF), Process Hydrocarbon Liquid (PL), Drain Closed (DC), Raw/Fresh Water (WP), Potable Water (WD), Atmospheric Vent (VA).	-29 to 38	19.9
					250	12.3
2	AS20	150 #	SS	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).	-29 to 38	19.3
					250	12.3
3	AG01	150 #	CS + Galvanized + 3mm CA	Instrument air (IA), Utility Air (UA), Atmospheric Air- Vent (VA), Fire Water (WF), Nitrogen Gas (GN).	-29 to 38	19.9
					200	14
4	BC01	300 #	CS + 3mm CA	Fuel Gas (FG), Drain Open (DO), HP Flare (HF), Heating Medium(HM)- Hot Oil, Produced Water (PW), Process Hydrocarbon Vapor (PV), LP Flare (LF), Process Hydrocarbon Liquid (PL), Drain Closed (DC), Raw/Fresh Water (WP), Potable Water (WD), Atmospheric Vent (VA).	-29 to 38	52.1
					250	42.7
5	BS20	300 #	SS	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).	-29 to 38	50.5
					250	34
6	CC01	600 #	CS + 3mm CA	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).	-29 to 38	104.1
					250	85.5
7	CS20	600 #	SS	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).	-29 to 38	101.2
					250	68.1
8	DC01	900#	CS + 3mm CA	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).	-29 to 38	156.2
					250	128.2
9	DS20	900#	SS	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).	-29 to 38	151.8
					250	102
10	EC01	1500#	CS + 3mm CA	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).	-29 to 38	260.3
					204	222.55
11	ES20	1500#	SS	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).	-29 to 38	253
					204	180.8
12	FC01	2500#	CS + 3mm CA	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).	-29 to 38	388.17
					130	388.17
					(DE-RATED)	
13	FS20	2500#	SS	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).	-29 to 38	378.63
					80	378.63
					(DE-RATED)	
15	GT20	3000 psi	SS 316 (TUBING)	Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Water Scale Inhibitor (CS).	-28 to 37	210.9
					93	210.9

LEGENDS:



RATING	MATERIAL	SEQUENCE NUMBER
A - 150 #	C - Carbon Steel (CS) S - Stainless Steel (SS) P - GRE G - Carbon Steel + Galvanized Y - Incoloy L - Inconel D - Duplex Stainless Steel (DSS) R - Super Duplex Stainless Steel (SDSS) T - SS 316 (Tubing)	01 - 3mm CA
B - 300 #		
C - 600 #		11 - Low Temp. + 6mm CA
D - 900 #		20 - No CA
E - 1500 #		21 - 6mm CA
F - 2500 #		
G - 3000 psi (Tubing)		

TITLE				ऑयल इंडिया लिमिटेड Oil India Limited KAVIN™												DOCUMENT. No. :					
PROJECT																17039-EK-M-SP-2001					
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJA																					
PIPING MATERIAL SPECIFICATION																					
Piping Class	Rating		Material					CA			Spec No			Rev No.		B					
AC01	#150		CS					3 mm			-			Sheet No.		6 of 33					
Design Code																					
Service		Fuel Gas (FG), Drain Open (DO), HP Flare (HF), Heating Medium(HM)- Hot Oil, Produced Water (PW), Process Hydrocarbon Vapor (PV), LP Flare (LF),																			
		Process Hydrocarbon Liquid (PL), Drain Closed (DC), Raw/Fresh Water (WP), Potable Water (WD), Atmospheric Vent (VA).																			
PIPE DATA																					
ASME B36.10M																					
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24					
O.D (mm)	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457.2	508	610					
Sch	160	160	160	160	XS	STD	STD	STD	20	20	20	20	20	20	20	20					
WT (mm)	4.78	5.56	6.35	7.14	5.54	5.49	6.02	7.11	6.35	6.35	6.35	7.92	7.92	7.92	9.53	9.53					
M.T (%)	12.5																				
Type	Seamless (Note-1)																				
MOC	ASTM A 106 Gr B (Note-1)																				
Ends	PE				BE																
FITTING DATA																					
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24					
Type	Socket Weld				Butt Weld																
Rating	# 3000				Schedule same as pipe																
MOC	ASTM A105				ASTM A234 Gr WPB, Seamless (Note-1)																
Elbow	ASME B 16.11				ASME B 16.9																
Tee	ASME B 16.11				ASME B 16.9																
Reducer	ASME B 16.11				ASME B 16.9																
Cap	ASME B 16.11				ASME B 16.9																
Coupling	ASME B 16.11				-																
Plug	ASME B 16.11				-																
Union	ASME B 16.11				-																
Elbowlet	-				-																
Sockolet	MSS-SP-97				-																
Weldolet	-				MSS-SP-97																
Nipple	Sch 160 (MOC Same as pipe)				-																
Swage	Sch 160				-																
FLANGE DATA																					
ASME B16.5																					
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24					
Type	Socket Weld, Blind				Weld Neck, Blind																
MOC	ASTM A105				ASTM A105																
RATING , FACE	150 # , RF				150 # , RF																
STD	ASME B 16.5				ASME B 16.5, Butt welding ends as per ASME B 16.25																
SPECTACLE BLIND/SPADE & SPACER DATA (NOTE-3)																					
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24					
MOC	ASTM A516 Gr 70																				
Type	Spectacle Blind										Spade & Spacer										
MECHANICAL JOINTS DATA (NOTE-2)																					
Stud Bolt	ASTM A 193 Gr. B7 / ASME B16.5 (Hot dip galvanized)																				
Hex Nuts	ASTM A 194 Gr. 2H / ASME B 16.5 (Hot dip galvanized)																				
Gasket	150# SPWND Gasket 4.5mm THK TO ASME B 16.20: Windings - SS316, Filler- CNAF, Inner Ring -SS316, Outer Ring- CS																				
PRESSURE - TEMPERATURE RATING										Maximum Hydrostatic Pressure											
Temp (°C)					Pressure (kg/cm ² g)					As per ASME B31.3											
-29 to 38					19.9																
250					12.3					Limited by flange considering flange as the weakest joint in piping system											
NOTES RELATED TO PIPE, FITTINGS, FLANGES, GASKETS AND STUD BOLTS & NUTS																					
1) As an alternative , for size ≥18", API 5L Gr.B Welded pipes / Fitting with 100% Radiography may be used.																					
2) All low Alloyed steel stud bolts, nuts and Washers shall be hot dipped galvanized according to ASTM A153..																					
3) Spectacle blind / Spade & spacer shall be in accordance with ASME B16.48.																					
4) Two jackscrew, 180 degree apart shall be provided in one of the flanges for all orifice flange and specified spectacle blind assemblies																					

TITLE		 										DOCUMENT. No. :																																																																																																																																																																																																																																																																																																																																																																	
PROJECT												17039-EK-M-SP-2001																																																																																																																																																																																																																																																																																																																																																																	
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Service		Fuel Gas (FG), Drain Open (DO), HP Flare (HF), Heating Medium(HM)- Hot Oil, Produced Water (PW), Process Hydrocarbon Vapor (PV), LP Flare (LF), Process Hydrocarbon Liquid (PL), Drain Closed (DC),																																																																																																																																																																																																																																																																																																																																																																											
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TITLE				 										DOCUMENT. No. :					
PROJECT														17039-EK-M-SP-2001					
PIPING MATERIAL SPECIFICATION				CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN															
PIPING MATERIAL SPECIFICATION																			
Piping Class		Rating		Material				CA				Spec No		Rev No.		B			
AS20		#150		SS				0 mm				-		Sheet No.		8 of 33			
Design Code		ASME B31.3																	
Service		Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL),																	
		Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).																	
PIPE DATA																			
ASME B36.19M																			
Size (in)		0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24		
O.D (mm)		21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457.2	508	610		
Sch		40S	40S	40S	40S	10S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	10S		
WT (mm)		2.77	2.87	3.38	3.68	2.77	2.11	2.11	2.77	2.77	3.4	3.96	3.96	4.19	4.19	4.78	6.35		
M.T (%)		12.5																	
Type		Seamless (Note-1)																	
MOC		ASTM A312 TP316 (Note-1)																	
Ends		PE						BE											
FITTING DATA																			
Size (in)		0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24		
Type		Socket Weld						Butt Weld											
Rating		# 3000						Schedule same as pipe											
MOC		ASTM A182 F316						ASTM A 403 Gr. WP 316, Seamless (Note-1)											
Elbow		ASME B 16.11						ASME B 16.9											
Tee		ASME B 16.11						ASME B 16.9											
Reducer		ASME B 16.11						ASME B 16.9											
Cap		ASME B 16.11						ASME B 16.9											
Coupling		ASME B 16.11						-											
Plug		ASME B 16.11						-											
Union		ASME B 16.11						-											
Elbowlet		-						-											
Sockolet		MSS-SP-97						-											
Weldolet		-						A182 F316 / MSS-SP-97											
Nipple		Sch 80S (MOC Same as pipe)						-											
Swage		Sch 80S						-											
FLANGE DATA																			
ASME B16.5																			
Size (in)		0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24		
Type		Socket Weld, Blind						Weld Neck, Blind											
MOC		ASTM A182 F316						ASTM A182 F316											
RATING , FACE		150 # , RF						150 # , RF											
STD		ASME B 16.5						ASME B 16.5, Butt welding ends as per ASME B 16.25											
SPECTACLE BLIND/SPADE & SPACER DATA (NOTE-2)																			
Size (in)		0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24		
MOC		ASTM A240 GR 316																	
Type		Spectacle Blind										Spade & Spacer							
MECHANICAL JOINTS DATA																			
Stud Bolt		ASTM A 193 Gr. B7 / ASME B 16.5 (Hot dip galvanized)																	
Hex Nuts		ASTM A 194 Gr. 2H / ASME B 16.5 (Hot dip galvanized)																	
Gasket		150# SPWND Gasket 4.5mm THK TO ASME B 16.20: Windings - SS316, Filler- CNAF, Inner Ring -SS316, Outer Ring- SS 316																	
PRESSURE - TEMPERATURE RATING												Maximum Hydrostatic Pressure							
Temp (°C)						Pressure (kg/cm²g)						As per ASME B31.3							
-29 to 38						19.3													
250						12.3						Limited by flange considering flange as the weakest joint in piping system							
NOTES RELATED TO PIPE, FITTINGS, FLANGES, GASKETS AND STUD BOLTS & NUTS																			
1) As an alternative , for size > 10", ASTM A 358 TP 316 Welded pipes / Fitting with 100% Radiography may be used.																			
2) Spectacle blind / Spade & spacer shall be in accordance with ASME B16.48.																			
3) Two jackscrew, 180 degree apart shall be provided in one of the flanges for all orifice flange and specified spectacle blind assemblies																			

TITLE	ऑयल इंडिया लिमिटेड Oil India Limited KAVIN™	DOCUMENT. No. :
PROJECT		17039-EK-M-SP-2001
CREATION OF SURFACE PRODUCTION FACILITY GGS AT EAST KHAGORIJAN		

PIPING MATERIAL SPECIFICATION						
Piping Class	Rating	Material	CA	Spec No	Rev No.	B
AS20	#150	SS	0 mm	-	Sheet No.	9 of 33
Design Code	ASME B31.3					
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).					

BRANCH TABLES AS PER API RP 14E

RUN PIPE	0.5	T																
	0.75	T	T															
	1	T	T	T														
	1.5	T	T	T	T													
	2	S	S	T	T	T												
	3	S	S	S	T	T	T											
	4	S	S	S	S	T	T	T										
	6	S	S	S	S	W	T	T	T									
	8	S	S	S	S	W	W	T	T	T								
	10	S	S	S	S	W	W	W	T	T	T							
	12	S	S	S	S	W	W	W	T	T	T	T						
	14	S	S	S	S	W	W	W	W	T	T	T	T					
	16	S	S	S	S	W	W	W	W	T	T	T	T	T				
	18	S	S	S	S	W	W	W	W	W	T	T	T	T	T			
	20	S	S	S	S	W	W	W	W	W	T	T	T	T	T	T		
	24	S	S	S	S	W	W	W	W	W	W	T	T	T	T	T	T	T
	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24		
BRANCH PIPE																		

VALVE DATA

Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-	-

BALL VALVE																				
Tag	BFAS20R				BRAS20R, BFAS20R												-			

GLOBE VALVE																				
Tag	GVAS20R																			

CHECK VALVE																				
Tag	CLAS20R				CDAS20R, CSAS20R												-			

TITLE					 ऑयल इंडिया लिमिटेड Oil India Limited  KAVIN™										DOCUMENT. No. :					
PROJECT															17039-EK-M-SP-2001					
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN																				
PIPING MATERIAL SPECIFICATION																				
Piping Class		Rating		Material				CA			Spec No			Rev No.		B				
AG01		#150		CS + GALVANIZED				3 mm			-			Sheet No.		10 of 33				
Design Code		ASME B31.3																		
Service		Instrument air (IA), Utility Air (UA), Atmospheric Air- Vent (VA), Fire Water (WF), Nitrogen Gas (GN).																		
PIPE DATA																				
ASME B36.10M																				
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24				
O.D (mm)	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457.2	508	610				
Sch	160	160	160	160	XS	STD	STD	STD	20	20	20	20	20	20	20	20				
WT (mm)	4.78	5.56	6.35	7.14	5.54	5.49	6.02	7.11	6.35	6.35	6.35	7.92	7.92	7.92	9.53	9.53				
M.T (%)	12.5				12.5															
Type	Seamless				Seamless (Note-1)															
MOC	ASTM A 53 Gr B (Galvanized) (Note-5)				ASTM A106 Gr.B (Galvanized) (Note-1,4)															
Ends	Threaded & Coupled (Note-5)				BE															
FITTING DATA																				
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24				
Type	Threaded				Butt Weld															
Rating	# 3000				Schedule same as pipe															
MOC	ASTM A105 (Galvanized) (Note-4)				ASTM A234 Gr WPB (Galvanized) (Note-1,4)															
Elbow	ASME B 16.11				ASME B 16.9															
Tee	ASME B 16.11				ASME B 16.9															
Reducer	ASME B 16.11				ASME B 16.9															
Cap	ASME B 16.11				ASME B 16.9															
Coupling	ASME B 16.11				-															
Plug	ASME B 16.11				-															
Union	ASME B 16.11				-															
Thredolet	MSS-SP-97				-															
Sockolet	-				-															
Weldolet	-				MSS-SP-97															
Nipple	Sch 160 (MOC Same as pipe)				-															
Swage	Sch 160				-															
FLANGE DATA																				
ASME B16.5																				
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24				
Type	Threaded, Blind				Weld Neck, Blind															
MOC	ASTM A105 (Note-4)				ASTM A105 (NOTE-4)															
RATING , FACE	150 # , RF				150 # , RF															
STD	ASME B16.5				ASME B 16.5, Butt welding ends as per ASME B 16.25															
SPECTACLE BLIND/SPADE & SPACER DATA (NOTE-2)																				
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24				
MOC	ASTM A516 Gr 70 (GALVANIZED) (Note-4)																			
Type	Spectacle Blind										Spade & Spacer									
MECHANICAL JOINTS DATA (NOTE-1)																				
Stud Bolt	ASTM A 193 Gr. B7 / ASME B16.5 (Hot dip galvanized) (Note-4)																			
Hex Nuts	ASTM A 194 Gr. 2H / ASME B16.5 (Hot dip galvanized) (Note-4)																			
Gasket	150# SPWND Gasket 4.5mm THK TO ASME B 16.20: Windings - SS316, Filler- CNAF, Inner Ring -SS316, Outer Ring- CS																			
PRESSURE - TEMPERATURE RATING										Maximum Hydrostatic Pressure										
Temp (°C)					Pressure (kg/cm ² g)					As per ASME B31.3										
-29 to 38					19.9															
200					14					Limited by flange considering flange as the weakest joint in piping system										
NOTES RELATED TO PIPE, FITTINGS, FLANGES, GASKETS AND STUD BOLTS & NUTS																				
1) As an alternative , for size > 18", API 5L Gr.B Welded pipes / Fitting with 100% Radiography may be used.																				
2) Spectacle blind / Spade & spacer shall be in accordance with ASME B16.48.																				
3) Two jackscrew, 180 degree apart shall be provided in one of the flanges for all orifice flange and specified spectacle blind assemblies																				
4) Hot dip galvanized according to ASTM A153.																				
5) Galvanized pipe shall be supplied threaded in random length with coupling at one end.																				

TITLE PIPING MATERIAL SPECIFICATION		 ऑयल इंडिया लिमिटेड Oil India Limited  KAVIN™												DOCUMENT. No. : 17039-EK-M-SP-2001																																																																																																																																																																																																																																																																																																																																																																													
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AG01	#150				CS + GALVANIZED				3 mm				-				Sheet No.		11 of 33																																																																																																																																																																																																																																																																																																																																																																								
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VALVE DATA																																																																																																																																																																																																																																																																																																																																																																																											
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-	-																																																																																																																																																																																																																																																																																																																																																																							
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Tag	BFAG01S				BRAG01R, BFAG01R																																																																																																																																																																																																																																																																																																																																																																																						
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Tag	GVAG01S				GVAG01R																																																																																																																																																																																																																																																																																																																																																																																						
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Tag	CLAG01S				CDAG01R, CSAG01R																																																																																																																																																																																																																																																																																																																																																																																						

TITLE					ऑयल इंडिया लिमिटेड Oil India Limited KAVIN™										DOCUMENT. No. :				
PROJECT															17039-EK-M-SP-2001				
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN																			
PIPING MATERIAL SPECIFICATION																			
Piping Class	Rating			Material				CA				Spec No			Rev No.		B		
BC01	#300			CS				3 mm				-			Sheet No.		12 of 33		
Design Code	ASME B31.3																		
Service	Fuel Gas (FG), Drain Open (DO), HP Flare (HF), Heating Medium(HM)- Hot Oil, Produced Water (PW), Process Hydrocarbon Vapor (PV), LP Flare (LF), Process Hydrocarbon																		
	Liquid (PL), Drain Closed (DC), Raw/Fresh Water (WP), Potable Water (WD), Atmospheric Vent (VA).																		
PIPE DATA																			
ASME B36.10M																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24			
O.D (mm)	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457.2	508	610			
Sch	160	160	160	160	XS	STD	STD	STD	60	XS	XS	XS	XS	40	40	40			
WT (mm)	4.78	5.56	6.35	7.14	5.54	5.49	6.02	7.11	10.31	12.7	12.7	12.7	12.7	14.3	15.09	17.5			
M.T (%)	12.5																		
Type	Seamless (Note-1)																		
MOC	ASTM A 106 Gr B (Note-1)																		
Ends	PE					BE													
FITTING DATA																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24			
Type	Socket Weld					Butt Weld													
Rating	# 6000					Schedule same as pipe													
MOC	ASTM A105					ASTM A234 Gr WPB, Seamless (Note-1)													
Elbow	ASME B 16.11					ASME B 16.9													
Tee	ASME B 16.11					ASME B 16.9													
Reducer	ASME B 16.11					ASME B 16.9													
Cap	ASME B 16.11					ASME B 16.9													
Coupling	ASME B 16.11					-													
Plug	ASME B 16.11					-													
Union	ASME B 16.11					-													
Elbowlet	-					-													
Sockolet	MSS-SP-97					-													
Weldolet	-					MSS-SP-97													
Nipple	Sch 160 (MOC Same as pipe)					-													
Swage	Sch 160					-													
FLANGE DATA																			
ASME B16.5																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24			
Type	Socket Weld, Blind					Weld Neck, Blind													
MOC	ASTM A105					ASTM A105													
RATING , FACE	300 # , RF					300 # , RF													
STD	ASME B 16.5					ASME B 16.5, Butt welding ends as per ASME B 16.25													
SPECTACLE BLIND/SPADE & SPACER DATA (NOTE-3)																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24			
MOC	ASTM A516 Gr 70																		
Type	Spectacle Blind										Spade & Spacer								
MECHANICAL JOINTS DATA (NOTE-2)																			
Stud Bolt	ASTM A 193 Gr. B7 / ASME B16.5 (Hot dip galvanized)																		
Hex Nuts	ASTM A 194 Gr. 2H / ASME B 16.5 (Hot dip galvanized)																		
Gasket	300# SPWND Gasket 4.5mm THK TO ASME B 16.20: Windings - SS316, Filler- CNAF, Inner Ring -SS316, Outer Ring- CS																		
PRESSURE - TEMPERATURE RATING											Maximum Hydrostatic Pressure								
Temp (°C)					Pressure (kg/cm ² g)					As per ASME B31.3									
-29 to 38					52.1														
250					42.7					Limited by flange considering flange as the weakest joint in piping system									
NOTES RELATED TO PIPE, FITTINGS, FLANGES, GASKETS AND STUD BOLTS & NUTS																			
1) As an alternative , for size ≥18", API 5L Gr.B Welded pipes / Fitting with 100% Radiography may be used.																			
2) All low Alloyed steel stud bolts, nuts and Washers shall be hot dipped galvanized according to ASTM A153..																			
3) Spectacle blind / Spade & spacer shall be in accordance with ASME B16.48.																			
4) Two jackscrew, 180 degree apart shall be provided in one of the flanges for all orifice flange and specified spectacle blind assemblies																			

TITLE		 												DOCUMENT. No. :																																																																																																																																																																																																																																																																																																								
PROJECT														17039-EK-M-SP-2001																																																																																																																																																																																																																																																																																																								
PIPING MATERIAL SPECIFICATION		CREATION OF SURFACE PRODUCTION FACILITY		GGS AT EAST KHAGORIJAN																																																																																																																																																																																																																																																																																																																		
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Piping Class	Rating					Material					CA			Spec No			Rev No.		B																																																																																																																																																																																																																																																																																																			
BC01	#300					CS					3 mm			-			Sheet No.		13 of 33																																																																																																																																																																																																																																																																																																			
Design Code		ASME B31.3																																																																																																																																																																																																																																																																																																																				
Service		Fuel Gas (FG), Drain Open (DO), HP Flare (HF), Heating Medium(HM)- Hot Oil, Produced Water (PW), Process Hydrocarbon Vapor (PV), LP Flare (LF), Process Hydrocarbon Liquid (PL), Drain Closed (DC),																																																																																																																																																																																																																																																																																																																				
		Raw/Fresh Water (WP), Potable Water (WD), Atmospheric Vent (VA).																																																																																																																																																																																																																																																																																																																				
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Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-	-																																																																																																																																																																																																																																																																																																		
BALL VALVE																																																																																																																																																																																																																																																																																																																						
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Tag	CLBC01R					CDBC01R, CSBC01R												-																																																																																																																																																																																																																																																																																																				
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TITLE				ऑयल इंडिया लिमिटेड Oil India Limited KAVIN™												DOCUMENT. No. :			
PROJECT																17039-EK-M-SP-2001			
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJA																			
PIPING MATERIAL SPECIFICATION																			
Piping Class	Rating		Material				CA			Spec No			Rev No.		B				
BS20	#300		SS				0 mm			-			Sheet No.		14 of 33				
Design Code	ASME B31.3																		
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL),																		
	Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).																		
PIPE DATA																			
ASME B36.19																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24			
O.D (mm)	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457.2	508	610			
Sch	40S	40S	40S	40S	10S	5S	10S	40S	40S	40S	40S	40S	40S	80S	80S	30			
WT (mm)	2.77	2.87	3.38	3.68	2.77	2.11	3.05	7.11	8.18	9.27	9.53	9.53	9.53	12.7	12.7	14.3			
M.T (%)	12.5																		
Type	Seamless (Note-1)																		
MOC	A312 TP316 (Note-1)																		
Ends	PE				BE														
FITTING DATA																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24			
Type	Socket Weld				Butt Weld														
Rating	# 3000				Schedule same as pipe														
MOC	ASTM A182 F316				ASTM A 403 Gr. WP 316, Seamless (Note-1)														
Elbow	ASME B 16.11				ASME B 16.9														
Tee	ASME B 16.11				ASME B 16.9														
Reducer	ASME B 16.11				ASME B 16.9														
Cap	ASME B 16.11				ASME B 16.9														
Coupling	ASME B 16.11				-														
Plug	ASME B 16.11				-														
Union	ASME B 16.11				-														
Elbowlet	-				-														
Sockolet	MSS-SP-97				-														
Weldolet	-				A182 F316 / MSS-SP-97														
Nipple	Sch 80S (MOC Same as pipe)				-														
Swage	Sch 80S				-														
FLANGE DATA																			
ASME B16.5																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24			
Type	Socket Weld, Blind				Weld Neck, Blind														
MOC	ASTM A182 F316				ASTM A182 F316														
RATING , FACE	300 # , RF				300 # , RF														
STD	ASME B 16.5				ASME B 16.5, Butt welding ends as per ASME B 16.25														
SPECTACLE BLIND / SPADE & SPACER DATA (NOTE-2)																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24			
MOC	ASTM A240 GR 316																		
Type	Spectacle Blind										Spade & Spacer								
MECHANICAL JOINTS DATA																			
Stud Bolt	ASTM A 193 Gr. B7 / ASME B 16.5 (Hot dip galvanized)																		
Hex Nuts	ASTM A 194 Gr. 2H / ASME B 16.5 (Hot dip galvanized)																		
Gasket	300# SPWND Gasket 4.5mm THK TO ASME B 16.20: Windings - SS316, Filler- CNAF, Inner Ring -SS316, Outer Ring- SS 316																		
PRESSURE - TEMPERATURE RATING										Maximum Hydrostatic Pressure									
Temp (°C)					Pressure (kg/cm²g)					As per ASME B31.3									
-29 to 38					50.5					Limited by flange considering flange as the weakest joint in piping system									
250					34														
NOTES RELATED TO PIPE, FITTINGS, FLANGES, GASKETS AND STUD BOLTS & NUTS																			
1) As an alternative , for size > 10", ASTM A 358 TP 316 Welded pipes / Fitting with 100% Radiography may be used.																			
2) Spectacle blind / Spade & spacer shall be in accordance with ASME B16.48.																			
3) Two jackscrew, 180 degree apart shall be provided in one of the flanges for all orifice flange and specified spectacle blind assemblies																			

TITLE	 ऑयल इंडिया लिमिटेड Oil India Limited  KAVIN™	DOCUMENT. No. :
PROJECT		17039-EK-M-SP-2001
CREATION OF SURFACE PRODUCTION FACILITY GGS AT EAST KHAGORIJAN		

PIPING MATERIAL SPECIFICATION						
Piping Class	Rating	Material	CA	Spec No	Rev No.	B
BS20	#300	SS	0 mm	-	Sheet No.	15 of 33
Design Code	ASME B31.3					
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV),					
	Deoiler (CD), Water Scale Inhibitor (CS).					

BRANCH TABLES AS PER API RP 14E

RUN PIPE	0.5	T																
	0.75	T	T															
	1	T	T	T														
	1.5	T	T	T	T													
	2	S	S	T	T	T												
	3	S	S	S	T	T	T											
	4	S	S	S	S	T	T	T										
	6	S	S	S	S	W	T	T	T									
	8	S	S	S	S	W	W	T	T	T								
	10	S	S	S	S	W	W	W	T	T	T							
	12	S	S	S	S	W	W	W	T	T	T	T						
	14	S	S	S	S	W	W	W	W	T	T	T	T					
	16	S	S	S	S	W	W	W	W	T	T	T	T	T				
	18	S	S	S	S	W	W	W	W	W	T	T	T	T	T			
	20	S	S	S	S	W	W	W	W	W	T	T	T	T	T	T		
	24	S	S	S	S	W	W	W	W	W	W	T	T	T	T	T	T	
	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24		
BRANCH PIPE																		

VALVE DATA

Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-	-

BALL VALVE

Tag	BFBS20R	BRBS20R, BFBS20R	-

GLOBE VALVE

Tag	-	GVBS20R	

CHECK VALVE

Tag	CLBS20R	CDBS20R, CSBS20R	-

TITLE				ऑयल इंडिया लिमिटेड Oil India Limited KAVIN™												DOCUMENT. No. :			
PROJECT																17039-EK-M-SP-2001			
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJJAN																			
PIPING MATERIAL SPECIFICATION																			
Piping Class	Rating		Material					CA			Spec No			Rev No.		B			
CC01	#600		CS					3 mm			-			Sheet No.		16 of 33			
Design Code	ASME B31.3																		
Service	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).																		
PIPE DATA																			
ASME B36.10M																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-
O.D (mm)	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457.2	508	610	-	-	-
Sch	160	160	160	160	160	80	80	80	100	100	80	80	80	80	80	80	-	-	-
WT (mm)	4.78	5.56	6.35	7.14	8.74	7.62	8.56	10.97	15.09	18.26	17.48	19.05	21.44	23.83	26.19	30.96	-	-	-
M.T (%)	12.5																		
Type	Seamless (Note-1)																		
MOC	ASTM A 106 Gr B (Note-1)																		
Ends	BE																		
FITTING DATA																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-
Type	Butt Weld																		
Sch	Same as pipe																		
MOC	ASTM A234 Gr WPB, Seamless (Note-1)																		
Elbow	ASME B 16.9																		
Tee	ASME B 16.9																		
Reducer	ASME B 16.9																		
Cap	ASME B 16.9																		
Coupling	-																		
Plug	-																		
Union	-																		
Elbowlet	-																		
Sockolet	-																		
Weldolet	ASTM A105 / MSS-SP-97																		
Nipple	Sch 160 (MOC Same as pipe)				-														
Swage	Sch 160				-														
FLANGE DATA																			
ASME B16.5																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-
Type	Weld Neck, Blind																		
MOC	ASTM A105																		
RATING , FACE	600 # , RTJ																		
STD	ASME B 16.5, Butt welding ends as per ASME B 16.25																		
SPECTACLE BLIND / SPADE & SPACER DATA (NOTE-3)																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-
MOC	ASTM A516 Gr 70																		
Type	Spectacle blind								Spade & Spacer										
MECHANICAL JOINTS DATA (NOTE-2)																			
Stud Bolt	ASTM A 193 Gr. B7 / ASME B 16.5 (Hot dip galvanized)																		
Hex Nuts	ASTM A 194 Gr. 2H / ASME B16.5 (Hot dip galvanized)																		
Gasket	600#, Type R(Oval)-Ring Joint, Soft iron - 90 BHN as per ASME B16.20																		
PRESSURE - TEMPERATURE RATING										Maximum Hydrostatic Pressure									
Temp (°c)					Pressure (kg/cm²g)					As per ASME B31.3									
-29 to 38					104.1														
250					85.5					Limited by flange considering flange as the weakest joint in piping system									
NOTES RELATED TO PIPE, FITTINGS, FLANGES, GASKETS AND STUD BOLTS & NUTS																			
1) As an alternative , for size ≥18", API 5L Gr.B Welded pipes / Fitting with 100% Radiography may be used.																			
2) All low Alloyed steel stud bolts, nuts and Washers shall be hot dipped galvanized according to ASTM A153..																			
3) Spectacle blind / Spade & spacer shall be in accordance with ASME B16.48.																			
4) Two jackscrew, 180 degree apart shall be provided in one of the flanges for all orifice flange and specified spectacle blind assemblies																			

TITLE		 										DOCUMENT. No. :																																																																																																																																																																																																																																																																																																																																																																																																		
PROJECT												17039-EK-M-SP-2001																																																																																																																																																																																																																																																																																																																																																																																																		
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Piping Class	Rating			Material			CA			Spec No			Rev No.		B																																																																																																																																																																																																																																																																																																																																																																																															
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Design Code		ASME B31.3																																																																																																																																																																																																																																																																																																																																																																																																												
Service		Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).																																																																																																																																																																																																																																																																																																																																																																																																												
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Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-	-																																																																																																																																																																																																																																																																																																																																																																																										
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TITLE				ऑयल इंडिया लिमिटेड Oil India Limited KAVIN™												DOCUMENT. No. :			
PROJECT																17039-EK-M-SP-2001			
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN																			
PIPING MATERIAL SPECIFICATION																			
Piping Class	Rating		Material					CA			Spec No			Rev No.		B			
CS20	#600		SS					0 mm			-			Sheet No.		18 of 33			
Design Code	ASME B31.3																		
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL),																		
	Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).																		
PIPE DATA																			
ASME B36.19M																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	
O.D (mm)	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457.2	508	610	-	-	
Sch	40S	40S	40S	40S	10S	40S	40S	80S	80S	80S	80	80	80	80	80	80	-	-	
WT (mm)	2.77	2.87	3.38	3.68	2.77	5.49	6.02	10.97	12.7	12.7	17.48	19.05	21.44	23.83	26.19	30.95	-	-	
M.T (%)	12.5																		
Type	Seamless																		
MOC	A312 TP316																		
Ends	BE																		
FITTING DATA																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	
Type	Butt Weld																		
Sch	Schedule same as pipe																		
MOC	ASTM A 403 Gr. WP 316, Seamless (Note-1)																		
Elbow	ASME B 16.9																		
Tee	ASME B 16.9																		
Reducer	ASME B 16.9																		
Cap	ASME B 16.9																		
Coupling	-																		
Plug	-																		
Union	-																		
Elbowlet	-																		
Sockolet	-																		
Weldolet	A182 F316 / MSS-SP-97																		
Nipple	Sch 80S (MOC Same as pipe)				-														
Swage	Sch 80S				-														
FLANGE DATA																			
ASME B16.5																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	
Type	Weld Neck, Blind																		
MOC	ASTM A182 F316																		
RATING , FACE	600 # , RTJ																		
STD	ASME B 16.5, Butt welding ends as per ASME B 16.25																		
SPECTACLE BLIND/SPADE & SPACER DATA (NOTE-2)																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	
MOC	ASTM A240 GR 316																		
Type	Spectacle blind									Spade & Spacer									
MECHANICAL JOINTS DATA (NOTE-2)																			
Stud Bolt	ASTM A 193 Gr. B7 / ASME B 16.5 (Hot dip galvanized)																		
Hex Nuts	ASTM A 194 Gr. 2H / ASME B 16.5 (Hot dip galvanized)																		
Gasket	600#, Type R(Oval)-Ring Joint, 316L SS - 160 BHN as per ASME B16.20																		
PRESSURE - TEMPERATURE RATING										Maximum Hydrostatic Pressure									
Temp (°C)					Pressure (kg/cm ² g)					As per ASME B31.3									
-29 to 38					101.2														
250					68.1					Limited by flange considering flange as the weakest joint in piping system									
NOTES RELATED TO PIPE, FITTINGS, FLANGES, GASKETS AND STUD BOLTS & NUTS																			
1) As an alternative , for size > 10", ASTM A 358 TP 316 Welded pipes / Fitting with 100% Radiography may be used.																			
2) Spectacle blind / Spade & spacer shall be in accordance with ASME B16.48.																			
3) Two jackscrew, 180 degree apart shall be provided in one of the flanges for all orifice flange and specified spectacle blind assemblies																			

TITLE		ऑयल इंडिया लिमिटेड Oil India Limited KAVIN™										DOCUMENT. No. :								
PROJECT												17039-EK-M-SP-2001								
PIPING MATERIAL SPECIFICATION																				
CREATION OF SURFACE PRODUCTION FACILITY GGS AT EAST KHAGORIJAN																				
PIPING MATERIAL SPECIFICATION																				
Piping Class	Rating	Material				CA		Spec No		Rev No.		B								
CS20	#600	SS				0 mm		-		Sheet No.		19 of 33								
Design Code	ASME B31.3																			
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV),																			
	Deoiler (CD), Water Scale Inhibitor (CS).																			
BRANCH TABLES AS PER API RP 14E																				
RUN PIPE	0.5	T																		
	0.75	T	T																	
	1	T	T	T																
	1.5	T	T	T	T															
	2	W	W	T	T	T														
	3	W	W	W	T	T	T													
	4	W	W	W	W	T	T	T												
	6	W	W	W	W	W	T	T	T											
	8	W	W	W	W	W	W	T	T	T										
	10	W	W	W	W	W	W	W	T	T	T									
	12	W	W	W	W	W	W	W	W	T	T	T	T							
	14	W	W	W	W	W	W	W	W	W	T	T	T	T	T					
	16	W	W	W	W	W	W	W	W	W	T	T	T	T	T	T				
	18	W	W	W	W	W	W	W	W	W	W	T	T	T	T	T	T			
	20	W	W	W	W	W	W	W	W	W	W	T	T	T	T	T	T	T		
	24	W	W	W	W	W	W	W	W	W	W	W	T	T	T	T	T	T	T	
			0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24		
	BRANCH PIPE																			
VALVE DATA																				
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-	-
BALL VALVE																				
Tag	BFCS20J				BFCS20J, BRCS20J												-			
GLOBE VALVE																				
Tag	GVCS20J																			
CHECK VALVE																				
Tag	-				CDCS20J, CSCS20J												-			
DOUBLE BLOCK AND BLEED VALVE																				
Tag	DBCS20C, DBCS20J																-			

TITLE					ऑयल इंडिया लिमिटेड Oil India Limited KAVIN™										DOCUMENT. No. :					
PROJECT															17039-EK-M-SP-2001					
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN																				
PIPING MATERIAL SPECIFICATION																				
Piping Class	Rating		Material					CA			Spec No		Rev No.		B					
DC01	#900		CS					3 mm			-		Sheet No.		20 of 33					
Design Code	ASME B31.3																			
Service	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).																			
PIPE DATA																				
ASME B36.10M																				
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24				
O.D (mm)	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457.2	508	610				
Sch	160	160	160	160	160	160	120	120	120	120	120	120	120	120	120	120				
WT (mm)	4.78	5.56	6.35	7.14	8.74	11.13	11.13	14.27	18.26	21.44	25.4	27.79	30.96	34.93	38.1	46.02				
M.T (%)	12.5																			
Type	Seamless (Note-1)																			
MOC	ASTM A106 Gr B (Note-1)																			
Ends	BE																			
FITTING DATA																				
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24				
Type	Butt Weld																			
Sch	Same as pipe																			
MOC	ASTM A234 Gr WPB, Seamless (Note-1)																			
Elbow	ASME B 16.9																			
Tee	ASME B 16.9																			
Reducer	ASME B 16.9																			
Cap	ASME B 16.9																			
Coupling	-																			
Plug	-																			
Union	-																			
Elbowlet	-																			
Sockolet	-																			
Weldolet	ASTM A105 / MSS-SP-97																			
Nipple	Sch 160 (MOC Same as pipe)				-															
Swage	Sch 160				-															
FLANGE DATA																				
ASME B16.5																				
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24				
Type	Weld Neck, Blind					Weld Neck, Blind														
MOC	ASTM A105					ASTM A105														
RATING , FACE	1500 # , RTJ					900 # , RTJ														
STD	ASME B 16.5, Butt welding ends as per ASME B 16.25																			
SPECTACLE BLIND / SPADE & SPACER DATA (NOTE-3)																				
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24				
MOC	ASTM A516 Gr 70																			
Type	Spectacle blind								Spade & Spacer											
MECHANICAL JOINTS DATA (NOTE-2)																				
Stud Bolt	ASTM A 193 Gr. B7 / ASME B16.5 (Hot dip galvanized)																			
Hex Nuts	ASTM A 194 Gr. 2H / ASME B16.5 (Hot dip galvanized)																			
Gasket	1500#, Type R(Oval)-Ring Joint, Soft iron - 90 BHN as per ASME B16.20					900#, Type R(Oval)-Ring Joint, Soft iron - 90 BHN as per ASME B16.20														
PRESSURE - TEMPERATURE RATING										Maximum Hydrostatic Pressure										
Temp (°C)					Pressure (kg/cm ² g)					As per ASME B31.3										
-29 to 38					156.2															
250					128.2					Limited by flange considering flange as the weakest joint in piping system										
NOTES RELATED TO PIPE, FITTINGS, FLANGES, GASKETS AND STUD BOLTS & NUTS																				
1) As an alternative , for size ≥18", API 5L Gr.B Welded pipes / Fitting with 100% Radiography may be used.																				
2) All low Alloyed steel stud bolts, nuts and Washers shall be hot dipped galvanized according to ASTM A153..																				
3) Spectacle blind / Spade & spacer shall be in accordance with ASME B16.48.																				
4) Two jackscrew, 180 degree apart shall be provided in one of the flanges for all orifice flange and specified spectacle blind assemblies																				

TITLE		 										DOCUMENT. No. :																																																																																																																																																																																																																																																																																																																																																																																		
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Service	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).																																																																																																																																																																																																																																																																																																																																																																																													
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Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-	-																																																																																																																																																																																																																																																																																																																																																																										
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TITLE	 ऑयल इंडिया लिमिटेड Oil India Limited  KAVIN™	DOCUMENT. No. :
PROJECT		17039-EK-M-SP-2001
CREATION OF SURFACE PRODUCTION FACILITY GGS AT EAST KHAGORIJAN		

PIPING MATERIAL SPECIFICATION						
Piping Class	Rating	Material	CA	Spec No	Rev No.	B
DS20	#900	SS	0 mm	-	Sheet No.	23 of 33
Design Code	ASMEB 31.3					
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).					

BRANCH TABLES AS PER API RP 14E

RUN PIPE	0.5	T																
	0.75	T	T															
	1	T	T	T														
	1.5	T	T	T	T													
	2	W	W	T	T	T												
	3	W	W	W	T	T	T											
	4	W	W	W	W	T	T	T										
	6	W	W	W	W	W	T	T	T									
	8	W	W	W	W	W	W	T	T	T								
	10	W	W	W	W	W	W	W	T	T	T							
	12	W	W	W	W	W	W	W	W	T	T	T	T					
	14	W	W	W	W	W	W	W	W	W	T	T	T	T				
	16	W	W	W	W	W	W	W	W	W	T	T	T	T	T			
	18	W	W	W	W	W	W	W	W	W	W	T	T	T	T	T		
	20	W	W	W	W	W	W	W	W	W	W	T	T	T	T	T	T	
	24	W	W	W	W	W	W	W	W	W	W	W	T	T	T	T	T	T
		0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	
BRANCH PIPE																		

VALVE DATA

Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-	-

BALL VALVE

Tag	BFDS20J	BFDS20J, BRDS20J	-

GLOBE VALVE

Tag	GVDS20J	

CHECK VALVE

Tag	-	CDDS20J, CSDS20J	-

DOUBLE BLOCK & BLEED VALVE

Tag	DBDS20C, DBDS20J	-

TITLE				ऑयल इंडिया लिमिटेड Oil India Limited KAVIN™												DOCUMENT. No. :			
PROJECT																17039-EK-M-SP-2001			
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN																			
PIPING MATERIAL SPECIFICATION																			
Piping Class	Rating		Material					CA			Spec No			Rev No.		B			
EC01	#1500		CS					3 mm			-			Sheet No.		24 of 33			
Design Code	ASME B31.3																		
Service	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).																		
PIPE DATA																			
ASME B36.10M																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	
O.D (mm)	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457.2	508	610	-	-	
Sch	XXS	XXS	XXS	XXS	XXS	XXS	XXS	XXS	Thk. 20.6	Thk. 25.4	Thk. 31.8	Thk. 31.8	Thk. 36	Thk. 40	Thk. 45	Thk. 56	-	-	
WT (mm)	7.47	7.82	9.09	10.15	11.07	15.24	17.12	21.95	20.6	25.4	31.8	31.8	36	40	45	56	-	-	
M.T (%)	12.5																		
Type	Seamless (Note-1)								Welded pipe with 100% Radiographed										
MOC	ASTM A 106 Gr B (Note-1)								API 5L X65 PSL-2										
Ends	BE																		
FITTING DATA																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24			
Type	Butt Weld																		
Sch	SAME AS PIPE																		
MOC	ASTM A234 Gr WPB, Seamless (Note-1)																		
Elbow	ASME B 16.9																		
Tee	ASME B 16.9																		
Reducer	ASME B 16.9																		
Cap	ASME B 16.9																		
Coupling	-																		
Plug	-																		
Union	-																		
Elbowlet	-																		
Sockolet	-																		
Weldolet	ASTM A105 / MSS-SP-97																		
Nipple	Sch 160 (MOC Same as pipe)				-														
Swage	Sch 160				-														
FLANGE DATA																			
ASME B16.5																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24			
Type	WELD NECK , BLIND																		
MOC	ASTM A105																		
RATING , FACE	1500 # , RTJ																		
STD	ASME B 16.5, Butt welding ends as per ASME B 16.25																		
SPECTACLE BLIND/SPADE & SPACER DATA (NOTE-3)																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24			
MOC	ASTM A516 Gr 70																		
Type	Spectacle Blind								Spade & Spacer										
MECHANICAL JOINTS DATA (NOTE-2)																			
Stud Bolt	ASTM A 193 Gr. B7 / ASME B16.5 (Hot dip galvanized)																		
Hex Nuts	ASTM A 194 Gr. 2H / ASME B16.5 (Hot dip galvanized)																		
Gasket	1500#, Type R(Oval)- Ring joint, soft iron - 90 BHN as per ASME B16.20																		
PRESSURE - TEMPERATURE RATING											Maximum Hydrostatic Pressure								
Temp (°C)					Pressure (kg/cm ² g)					As per ASME B31.3									
-29 to 38					260.3														
204					222.55					Limited by flange considering flange as the weakest joint in piping system									
NOTES RELATED TO PIPE, FITTINGS, FLANGES, GASKETS AND STUD BOLTS & NUTS																			
1) As an alternative , for size ≥18", API 5L Gr.B Welded pipes / Fitting with 100% Radiography may be used.																			
2) All low Alloyed steel stud bolts, nuts and Washers shall be hot dipped galvanized according to ASTM A153..																			
3) Spectacle blind / Spade & spacer shall be in accordance with ASME B16.48.																			
4) Two jackscrew, 180 degree apart shall be provided in one of the flanges for all orifice flange and specified spectacle blind assemblies																			

TITLE		 										DOCUMENT. No. :																																																																																																																																																																																																																																																																																																																											
PROJECT												17039-EK-M-SP-2001																																																																																																																																																																																																																																																																																																																											
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EC01	#1500			CS			3 mm			-			Sheet No.		25 of 33																																																																																																																																																																																																																																																																																																																								
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TITLE				ऑयल इंडिया लिमिटेड Oil India Limited KAVIN™												DOCUMENT. No. :			
PROJECT																17039-EK-M-SP-2001			
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN																			
PIPING MATERIAL SPECIFICATION																			
Piping Class	Rating		Material				CA		Spec No		Rev No.		B						
ES20	#1500		SS				0 mm		-		Sheet No.		26 of 33						
Design Code	ASME B31.3																		
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL),																		
	Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).																		
PIPE DATA																			
ASME B36.19M																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	
O.D (mm)	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457.2	508	610	-	-	
Sch	40S	40S	40S	80S	160	160	160	160	160	160	Thk. 36	Thk. 36	Thk. 45	Thk. 50	Thk. 56	Thk. 63	-	-	
WT (mm)	2.77	2.87	3.38	5.08	8.74	11.13	13.49	18.26	23.01	28.58	36	36	45	50	56	63	-	-	
M.T (%)	12.5																		
Type	Seamless									Welded pipe with 100% Radiographed									
MOC	A312 TP316									A358 Gr.316									
Ends	BE																		
FITTING DATA																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	
Type	Butt Weld																		
Sch	Same as pipe																		
MOC	ASTM A 403 Gr. WP 316, Seamless (Note-1)																		
Elbow	ASME B 16.9																		
Tee	ASME B 16.9																		
Reducer	ASME B 16.9																		
Cap	ASME B 16.9																		
Coupling	-																		
Plug	-																		
Union	-																		
Elbowlet	-																		
Sockolet	-																		
Weldolet	ASTM A182 F316 / MSS-SP-97																		
Nipple	Sch 80S (MOC Same as pipe)				-														
Swage	Sch 80S				-														
FLANGE DATA																			
ASME B16.5																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	
Type	WELD NECK , BLIND																		
MOC	ASTM A182 F316																		
RATING , FACE	1500 # , RTJ																		
STD	ASME B 16.5, Butt welding ends as per ASME B 16.25																		
SPECTACLE BLIND/SPADE & SPACER DATA (NOTE-2)																			
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	
MOC	ASTM A240 Gr.316																		
Type	Spectacle Blind							Spade & Spacer											
MECHANICAL JOINTS DATA (NOTE-2)																			
Stud Bolt	ASTM A 193 Gr. B7 / ASME B 16.5 (Hot dip galvanized)																		
Hex Nuts	ASTM A 194 Gr. 2H / ASME B 16.5 (Hot dip galvanized)																		
Gasket	1500#, Type R(Oval)- Ring joint, 316 SS - 160 BHN as per ASME B16.20																		
PRESSURE - TEMPERATURE RATING										Maximum Hydrostatic Pressure									
Temp (°C)					Pressure (kg/cm²g)					As per ASME B31.3									
-29 to 38					253														
204					180.8					Limited by flange considering flange as the weakest joint in piping system									
NOTES RELATED TO PIPE, FITTINGS, FLANGES, GASKETS AND STUD BOLTS & NUTS																			
1) As an alternative , for size > 10", ASTM A 358 TP 316 Welded pipes / Fitting with 100% Radiography may be used.																			
2) Spectacle blind / Spade & spacer shall be in accordance with ASME B16.48.																			
3) Two jackscrew, 180 degree apart shall be provided in one of the flanges for all orifice flange and specified spectacle blind assemblies																			

TITLE	ऑयल इंडिया लिमिटेड Oil India Limited KAVIN™	DOCUMENT. No. :
PROJECT		17039-EK-M-SP-2001
CREATION OF SURFACE PRODUCTION FACILITY GGS AT EAST KHAGORIJAN		

PIPING MATERIAL SPECIFICATION						
Piping Class	Rating	Material	CA	Spec No	Rev No.	B
ES20	#1500	SS	0 mm	-	Sheet No.	27 of 33
Design Code	ASME B31.3					
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).					

BRANCH TABLES AS PER API RP 14E

RUN PIPE	0.5	T																
	0.75	T	T															
	1	T	T	T														
	1.5	T	T	T	T													
	2	W	W	T	T	T												
	3	W	W	W	T	T	T											
	4	W	W	W	W	T	T	T										
	6	W	W	W	W	W	T	T	T									
	8	W	W	W	W	W	W	T	T	T								
	10	W	W	W	W	W	W	W	T	T	T							
	12	W	W	W	W	W	W	W	W	T	T	T	T					
	14	W	W	W	W	W	W	W	W	W	T	T	T	T	T			
	16	W	W	W	W	W	W	W	W	W	W	T	T	T	T	T		
	18	W	W	W	W	W	W	W	W	W	W	W	T	T	T	T	T	
	20	W	W	W	W	W	W	W	W	W	W	W	W	T	T	T	T	T
	24	W	W	W	W	W	W	W	W	W	W	W	W	W	T	T	T	T
		0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	
BRANCH PIPE																		

VALVE DATA

Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-	-

BALL VALVE

Tag	BFES20J	BFES20J, BRES20J	-

GLOBE VALVE

Tag	GVES20J	-

CHECK VALVE

Tag	-	CDES20J, CSES20J	-

DOUBLE BLOCK & BLEED VALVE

Tag	DBES20C, DBES20J	-

TITLE			ऑयल इंडिया लिमिटेड Oil India Limited KAVIN™														DOCUMENT. No. :			
PROJECT																	17039-EK-M-SP-2001			
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN																				
PIPING MATERIAL SPECIFICATION																				
Piping Class	Rating		Material					CA				Spec No			Rev No.		B			
FC01	#2500		CS					3 mm				-			Sheet No.		28 of 33			
Design Code	ASME B31.3																			
Service	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).																			
PIPE DATA																				
ASME B36.10M																				
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-	
O.D (mm)	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457.2	508	610	-	-	-	
Sch	XXS	XXS	XXS	XXS	XXS	XXS	XXS	Thk. 25	Thk. 32	Thk. 36	Thk. 45	Thk. 45	Thk. 50	Thk. 56	Thk. 63	Thk. 75	-	-	-	
WT (mm) - Note-5	7.47	7.82	9.09	10.15	11.07	15.24	17.12	25	32	36	45	45	50	56	63	75	-	-	-	
M.T (%)	12.5																			
Type	Seamless			Seamless / Welded pipe with 100% Radiographed																
MOC	ASTM A106 Gr B			API 5L X65 PSL-2																
Ends	BE																			
FITTING DATA																				
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-	
Type	Butt Weld																			
Sch	Same as pipe																			
MOC	ASTM A234 Gr WPB, Seamless (Note-1)																			
Elbow	ASME B 16.9																			
Tee	ASME B 16.9																			
Reducer	ASME B 16.9																			
Cap	ASME B 16.9																			
Coupling	-																			
Plug	-																			
Union	-																			
Nippolet	-																			
Sockolet	-																			
Weldolet	ASTM A105 / MSS-SP-97																			
Nipple	Sch 160 (MOC Same as pipe)				-															
Swage	Sch 160				-															
FLANGE DATA																				
ASME B16.5												TECHLOK CONNECTION (NOTE-6)								
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-	
Type	Weld Neck, Blind											Weld Neck, Blind								
MOC	ASTM A105											ASTM A105								
RATING , FACE	2500#, RTJ											As per TECHLOK catalogue								
STD	ASME B16.5, Butt welding ends as per ASME B16.25											As per manufacturer Standard								
SPECTACLE BLIND/SPADE & SPACER DATA (NOTE-3)																				
Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-	
MOC	ASTM A516 Gr 70																			
Type	Spectacle Blind, RTJ						Spade & Spacer, RTJ					NOTE-7								
MECHANICAL JOINTS DATA (NOTE-2)																				
Stud Bolt	ASTM A 193 Gr. B7 / ASME B16.5 (Hot dip galvanized)											As per manufacturer Standard								
Hex Nuts	ASTM A 194 Gr. 2H / ASME B16.5 (Hot dip galvanized)											As per manufacturer Standard								
Gasket	2500#, Type R (Oval) - Ring joint, soft iron - 90 BHN as per ASME B16.20											4140 (or) Equiv. PTFE coated Seal ring								
PRESSURE - TEMPERATURE RATING (NOTE-5)												Maximum Hydrostatic Pressure								
Temp (°c)					Pressure (kg/cm ² g)							As per ASME B31.3								
-29 to 38					388.17															
130					388.17							Limited by flange considering flange as the weakest joint in piping system								
NOTES RELATED TO PIPE, FITTINGS, FLANGES, GASKETS AND STUD BOLTS & NUTS																				
1) Welded fittings shall be 100% radiographed.									6) Hub Connector Assembly (Hub Connector,Seal Ring and clamp shall be of the same manufacturer 7) Spade & Spacer shall be used as per TECHLOK catalogue.											
2) All low Alloyed steel stud bolts, nuts and Washers shall be hot dipped galvanized according to ASTM A153..																				
3) Spectacle blind / Spade & spacer shall be in accordance with ASME B16.48.																				
4) Two jackscrew, 180 degree apart shall be provided in one of the flanges for all flangeS and specified spectacle blind assemblies																				
5) Pipe thickness has been selected for the DE-RATED condition.																				

TITLE		 										DOCUMENT. No. :																																																																																																																																																																																																																																																																																										
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Design Code		ASME B31.3																																																																																																																																																																																																																																																																																																				
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TITLE				PIPING MATERIAL SPECIFICATION												 ऑयल इंडिया लिमिटेड Oil India Limited  KAVIN™												DOCUMENT. No. : 17039-EK-M-SP-2001			
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN																															
PIPING MATERIAL SPECIFICATION																															
Piping Class		Rating		Material						CA				Spec No				Rev No.		B											
FS20		#2500		SS						0 mm				-				Sheet No.		30 of 33											
Design Code		ASME B31.3																													
Service		Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL),																													
		Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).																													
PIPE DATA																															
ASME B36.19M																															
Size (in)		0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-												
O.D (mm)		21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457.2	508	610	-	-												
Sch		80S	80S	160	160	160	XXS	XXS	Thk. 25	Thk. 32	Thk. 40	Thk. 45	Thk. 50	Thk. 63	Thk. 75	Thk. 75	Thk. 90	-	-												
WT (mm) (Note-4)		3.73	3.91	6.35	7.14	8.74	15.24	17.12	25	32	40	45	50	63	75	75	90	-	-												
M.T (%)		12.5																													
Type		Seamless								Welded pipe with 100% Radiographed																					
MOC		ASTM A312 TP 316								ASTM A358 Gr.316																					
Ends		BE																													
FITTING DATA																															
Size (in)		0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24														
Type		Butt Weld																													
Sch		Same as pipe																													
MOC		ASTM A 403 Gr. WP 316, Seamless (Note-1)																													
Elbow		ASME B 16.9																													
Tee		ASME B 16.9																													
Reducer		ASME B 16.9																													
Cap		ASME B 16.9																													
Coupling		-																													
Plug		-																													
Union		-																													
Nippolet		-																													
Sockolet		-																													
Weldolet		ASTM A182 F316 / MSS-SP-97																													
Nipple		Sch 80S (MOC Same as pipe)					-																								
Swage		Sch 80S					-																								
FLANGE DATA																															
ASME B16.5																															
TECHLOK CONNECTION (NOTE-5)																															
Size (in)		0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24														
Type		Weld neck, Blind												Weld neck, Blind																	
MOC		ASTM A182 F316												ASTM A182 F316																	
RATING , FACE		2500#, RTJ												As per TECHLOK catalogue																	
STD		ASME B 16.5, Butt welding ends as per ASME B 16.25												As per manufacturer Standard																	
SPECTACLE BLIND / SPADE & SPACER DATA (NOTE-2)																															
Size (in)		0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24														
MOC		A240 Gr.316																													
Type		Spectacle blind, RTJ								Spade & spacer, RTJ								Note-6													
MECHANICAL JOINTS DATA																															
Stud Bolt		A 193 Gr. B7 / ASME B16.5 (Hot dip galvanized)												As per manufacturer Standard																	
Hex Nuts		A 194 Gr. 2H / ASME B16.5 (Hot dip galvanized)												As per manufacturer Standard																	
Gasket		2500#, TYPE R(Oval) - Ring joint, 316 SS - 160 BHN as per ASME B16.20												4140 (or) Equiv. PTFE coated Seal ring																	
PRESSURE - TEMPERATURE RATING (NOTE-4)												Maximum Hydrostatic Pressure																			
Temp (°C)						Pressure (kg/cm ² g)						As per ASME B31.3																			
-29 to 38						378.63																									
80						378.63						Limited by flange considering flange as the weakest joint in piping system																			
NOTES RELATED TO PIPE, FITTINGS, FLANGES, GASKETS AND STUD BOLTS & NUTS																															
1) As an alternative , for size > 10", ASTM A 358 TP 316 Welded pipes / Fitting with 100% Radiography may be used.										5) Hub Connector Assembly (Hub Connector,Seal Ring and clamp shall be of the same manufacturer																					
2) Spectacle blind / Spade & spacer shall be in accordance with ASME B16.48.										6) Spade & Spacer shall be used as per TECHLOK catalogue.																					
3) Two jackscrew, 180 degree apart shall be provided in one of the flanges for all orifice flange and specified spectacle blind assemblies																															
4) Pipe thickness has been selected for the DE-RATED condition.																															

TITLE	ऑयल इंडिया लिमिटेड Oil India Limited KAVIN™	DOCUMENT. No. :
PROJECT		17039-EK-M-SP-2001
CREATION OF SURFACE PRODUCTION FACILITY GGS AT EAST KHAGORIJAN		

PIPING MATERIAL SPECIFICATION						
Piping Class	Rating	Material	CA	Spec No	Rev No.	B
FS20	#2500	SS	0 mm	-	Sheet No.	31 of 33
Design Code	ASME B31.3					
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).					

BRANCH TABLES AS PER API RP 14E

RUN PIPE	0.5	T																
	0.75	T	T															
	1	T	T	T														
	1.5	T	T	T	T													
	2	W	W	T	T	T												
	3	W	W	W	T	T	T											
	4	W	W	W	W	T	T	T										
	6	W	W	W	W	W	T	T	T									
	8	W	W	W	W	W	W	T	T	T								
	10	W	W	W	W	W	W	W	T	T	T							
	12	W	W	W	W	W	W	W	T	T	T	T						
	14	W	W	W	W	W	W	W	W	T	T	T	T					
	16	W	W	W	W	W	W	W	W	T	T	T	T	T				
	18	W	W	W	W	W	W	W	W	W	T	T	T	T	T			
	20	W	W	W	W	W	W	W	W	W	T	T	T	T	T	T		
	24	W	W	W	W	W	W	W	W	W	W	T	T	T	T	T	T	
	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24		
BRANCH PIPE																		

VALVE DATA

Size (in)	0.5	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	-	-	-	-

BALL VALVE

Tag	BFFS20J	BFFS20J, BRFS20J	BFFS20H, BRFS20H	-

GLOBE VALVE

Tag	GVFS20J	-

CHECK VALVE

Tag	-	CDFS20J, CSFS20J	-

DOUBLE BLOCK AND BLEED VALVE

Tag	DBFS20C, DBFS20J	-

TITLE PIPING MATERIAL SPECIFICATION							DOCUMENT. No. : 17039-EK-M-SP-2001			
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN										
PIPING MATERIAL SPECIFICATION										
Piping Class	Rating	Material			CA	Spec No	Rev No.	B		
GT20	3000 psi	SS TUBING			0 mm	-	Sheet No.	33 of 33		
Design Code	ASME B31.3									
Service	Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).									
BRANCH TABLES										
ALL BRANCH CONNECTIONS SHALL BE COMPRESSION FITTINGS ; INCLUDES TEE,CROSS,LATERAL , ETC.BY MANUFACTURER STANDARD.										
VALVE DATA										
ND(mm)	1/4	3/8	1/2	3/4	1	-	-	-	-	-
BALL VALVE										
Tag	BFGT20S				-					
CHECK VALVE										
Tag	CLGT20S				-					
NEEDLE VALVE										
Tag	NVGT20S				-					
GLOBE VALVE										
Tag	GVGT20S				-					

CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN

Document Title : VALVE MATERIAL SPECIFICATION

Kavin Document No : 17039-EK-M-SP-2002

B	06-Feb-18	ISSUED FOR BID	SN	APRK / JB	MSR/MSB
A	29-Nov-17	ISSUED FOR REVIEW	SN	APRK / JB	MSR/MSB
REV.	DATE	DESCRIPTION	BY	CHECKED	APPROVED

**PROJECT DOCUMENTS ARE CONTROLLED DOCUMENTS.
REVISION CHANGES ARE DENOTED AS Δ IN RIGHT HAND MARGIN**

COMPANY :

OIL INDIA LIMITED

EPCM CONSULTANT :

KAVIN ENGINEERING AND SERVICES PRIVATE LIMITED

TITLE	 	DOCUMENT No.
PROJECT		17039-EK-M-SP-2002
CREATION OF SURFACE PRODUCTION FACILITY GGS AT EAST KHAGORIJAN		Rev. B

GENERAL DESCRIPTION

EXECUTIVE SUMMARY

This specification defines the valve requirements for each valve designation identified on the piping material specification sheets.

BASIS

The valves shall be designed, fabricated and tested in accordance with EPCM approved industry codes and standards.

REFERENCES

Valves shall be in accordance with the latest edition of the codes and standards listed below. "Latest edition" meaning the edition published by the originating organization at the time of a contract or purchase order acceptance by the Supplier.

INDUSTRY CODES & STANDARDS

CODES & STANDARDS	DESCRIPTION
API 6A	Specification for Wellhead and Christmas Tree Equipment
API 6D	Pipeline Valves (Steel Gate, Plug, Ball and Check Valves)
API 6FA	Specification for fire test for valves
API 598	Valve Inspection and Testing
API Bull 6F1	Bulletin on Performance of API and ASME End Connections in a Fire Test According to API Spec 6FA
API Bull 6F2	Bulletin on Fire Resistance Improvements for API Flanges
API Std 607	Fire Test for Soft-Seated Quarter-Turn Valves
ASME B16.10	Face-to-Face and End-to-End Dimensions of Valves
ASME B16.20	Metallic Gaskets for Pipe Flanges
ASME B16.34	Valves – Flanged, Threaded, and Welding End
ASME B31.3	Process Piping inclusive of addenda
ASTM A123	Zinc (Hot Galvanized) Coating on Products Fabricated from Rolled Pressed and Forged Steel Shapes Plates Bars and Strips
API RP 14E	Recommended practice for design and installation of offshore production platform piping systems.
API 594	Check valves: Flanged, Lug, Wafer and Butt-welding
MSS SP-6	Standard finishes for contact faces of pipe flanges and connecting ends flanges of valves and fittings
ISO 17292	Metal ball valves for petroleum, petrochemicals and allied industries
API 600	Steel gate valves-Flange and butt-welding ends, bolted bonnets
API 602	Steel gate, globe and check valves for sizes NPS 4 (DN 100) and smaller for the petroleum and natural gas industries
API 609	Butterfly valves: Double flanged, Lug and Wafer type
ASME B16.5	Pipe flanges and flanged fittings NPS 1/2 through NPS 24
BS 1868	Specification for check valves (flanged and butt-welding ends) for the petroleum, petrochemical and allied industries
BS 1873	Specification for steel gate and globe stop and check valves (flanged and butt-welding ends) for the petroleum, petrochemical and allied industries

GENERAL

The Supplier shall select the seating materials suitable for the design service temperatures at full valve working pressure.

In special service applications if materials differ from the materials listed on the specification sheets are required, the Supplier shall select only approved, suitable valves, and notify the EPCM of the selection.

All valves shall be fitted with a locking device.

Unless otherwise approved by the company, small flanged valves shall not have bodies that screw apart.

Blasting and painting of valves shall comply with the following:

- 1) During blasting and painting of valves, suitable flange covers shall be installed to prevent internal valve damage.
- 2) Valve flange sealing surfaces and identification tags shall be suitably protected during blasting and painting.
- 3) Identification tags shall be clearly legible after blasting and painting.
- 4) Flange face surfaces shall be lightly buffed and greased after blasting and painting of valves and prior to flange mating.
- 5) Flange bolt holes shall be blasted and painted.

API valves, 5,000# and 10,000#, shall meet the requirements of API 6A and 6D.

API valves shall be of fire-safe design, properly certified for each size to API Bull 6F1 and 6F2, Spec. 6FA, or Std.

TITLE	 	DOCUMENT No.
VALVE MATERIAL SPECIFICATION		17039-EK-M-SP-2002
PROJECT		Rev.
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJA		B

GENERAL DESCRIPTION

607 fire test standards. Where pressure testing by the manufacturer is required by specification or purchase order, testing shall comply with API 598. Except for check valves, each valve shall come equipped with a compatible handle or gear operator.

BALL VALVES

- 1) Ball valves shall have bolted body with end or top entry. Ball valves shall be split body design.
- 2) Double block and bleed valves shall have a body cavity port equipped with a 316 stainless steel valve.
- 3) Ball shall be solid. Hollow and split two-piece balls are not acceptable
- 4) Stem shall be blowout proof
- 5) All ball valves should have bi-directional sealing
- 6) Valves shall be of a "Long pattern" face to face length per ASME B16.10, unless otherwise specified.
- 7) Valves shall be of fire-safe design, properly certified for each size to API Bull 6F1 and 6F2, Spec. 6FA, or Std. 607 fire test standards.
- 8) Ball valves shall be designed to seal in both directions against all pressure upto the maximum service pressure rating for the class, unless otherwise specified.
- 9) Uncertified valves shall not be allowed.
- 10) Ball valves used in Methanol service shall have Elast-o-Lion 101 seats and seals.
- 11) Body cavity shall be self-relieving to the low pressure side of the valve. Seal relief shall be provided in seal design, unless otherwise specified. Holes in obturator shall not be used to satisfy the self-relieving requirements.
- 12) Ball valves shall be fitted with anti-static device in accordance with API 6D to ensure electrical continuity between the ball, stem and body of the valve.
- 13) All ball valve 4" and greater shall be provided with sealant injection fixtures for both seal rings and the stem, sealant kit shall be provided for each valve type fitted with the injection ports.
- 14) Any valves subject to high differential pressure shall have Elast-o-Lion 101 seats and seals.

CHECK VALVES

Dual plate check valve (Lug type):

- 1) Dual plate check valves shall be retainerless design, heavy spring loaded and suitable for vertical (upward flow) and horizontal installation
- 2) Dual plate check valve shall have metal to metal seating surface.
- 3) Lug holes shall be drilled through (not threaded) to allow the stud bolts to slide through (except for valve centering holes, ie top, bottom or sides).

Swing check valves:

- 1) Check valve with swing type obturator shall be regular type, straight through port.
- 2) Swing check valve shall have metal to metal seating surface.
- 3) Swing check valve shall have in-line removable seat. Seat shall be press-fit and provided with welded seat stoppers. Supplier shall ensure that welding does not damage the seats.
- 4) Swing check valves in higher pressure (ASME 900 & above) service shall have a pressure seal bonnet.

Piston check valve:

- 1) Piston check valve (lift check) shall be regular type and be spring loaded.
- 2) Piston check valve shall have metal to metal seating surface.
- 3) Piston check valve shall not be used in erosive (sand) service.
- 4) Lift check valve shall only be used in horizontal installation.
- 5) Piston check valve in high pressure (ASME 900 & above) service shall have a pressure seal cover.

Nozzle (Axial flow) check valve:

- 1) Nozzle check (non-slam) valve shall be short pattern.
- 2) Nozzle check (non-slam) valve shall have metal to metal seating surfaces.
- 3) Nozzle check (non-slam) valve shall have a quick dynamic response to reduce reverse velocity, Supplier shall submit dynamic characteristics of valve together with quotation.
- 4) Nozzle check (non-slam) valve shall be suitable for vertical (upward flow) and horizontal installation.

General guidelines for selecting the check valve type:

In unusually erosive (sandy) service, check valves shall have removable seats. Seats and disc shall be stellite or stellite faced.

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VALVE MATERIAL SPECIFICATION		17039-EK-M-SP-2002
PROJECT		Rev.
CREATION OF SURFACE PRODUCTION FACILITY GGS AT EAST KHAGORIJAN		B

GENERAL DESCRIPTION

Low Pressure Drop	Dual plate lug type
2-inch and larger	Swing type
1-½-inch and smaller	Piston type
Centrifugal pumps	Swing type
Reciprocating pumps	Piston type / non-slamming type
Centrifugal compressors	Piston type / non-slamming type
Reciprocating compressors	Piston type / non-slamming type

GLOBE VALVES

- Globe valves shall be of Outside Screw and Yoke (OS&Y) design with provision for lubrication of stem threads.
- Stem shall be blowout proof.
- Globe valves shall have metal-to-metal seating surfaces. The seat shall be inline replaceable.
Seats shall be press-fit and provided with welded seat stoppers.
Supplier shall ensure that welding does not damage the seats.
- Globe valves in high pressure (ASME 900 and above) service shall have pressure seal bonnet
- Globe valves shall have back seated stem.
- Non-asbestos graphite packing with corrosion inhibitor shall be used, unless otherwise specified.
- Disc shall be swivel type.
- Globe valve stem design shall also allow for tightness at intermediate obturator position when the valve is intended for flow control.
- Globe valves shall be suitable for re-packing under pressure in the fully open position.
- Globe valve shall be provided with a lockable device.

GATE VALVES

If gate valves are to be actuated, only valves with slab gates shall be used.
Valves shall be of a “regular pattern” face to face length per ASME B16.10, unless otherwise specified.

BUTTERFLY VALVES

Butterfly valves shall be bi-directional. Where there is a preferred sealing direction this shall be indicated on the valve body. Butterfly valves shall be furnished with the following features:

- Bi-directional flow
- Suitable for dead-end service
- Through drilling bolt holes
- Lockable device (opened and closed)

Valve disks shall be positively secured to the shaft. Threaded fasteners shall be locked or tack welded.
The disk shall not interfere with the connecting piping at any shaft rotation.

Wrench operators shall be capable of holding the disc in at least five equally spaced intermediate positions between fully opened and fully closed.

NEEDLE VALVE

Needle Valve shall be hard seated valves.

VALVE OPERATION

Except for check valves, each valve shall come with a compatible handle or gear operator. However, the Supplier is to guarantee that the maximum force to operate the valve shall not exceed 350N under maximum differential pressure, (Note that the maximum lever length shall be 450mm, and maximum handwheel diameter shall be 750mm). The supplier shall confirm the operating force and recommend a geared operator when the maximum allowable force is exceeded with lever/hand wheel operation. Consideration should be given to the "Breakout" torque (the torque required to unseat a valve) required to open a valve under maximum differential pressure, to ensure that it is within the maximum forces allowed as stated above. Similarly the closing torque must be considered.

If levers are fitted they shall be parallel with pipeline with the valve in the open position. Note"square top" stem section shall not be used. The stem shall be a pattern to prevent mis-orientation.

As a general guide, valves in the following sizes and larger shall be gear operated.

TITLE	 	DOCUMENT No.
VALVE MATERIAL SPECIFICATION		17039-EK-M-SP-2002
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GENERAL DESCRIPTION

Class	150	300	600	900	1500	2500
Globe	8"	8"	4"	4"	3"	3"
Butterfly	6"	6"	-	-	-	-
Gate	8"	8"	6"	6'	4"	4"
Ball	6"	6"	4"	4"	4"	2"

Valves shall be capable of satisfactory operation with the valve stems in any position i.e. vertical, horizontal or inclined. The company will define any valves required to have stems below the horizontal. Valves shall be capable of operating in both the vertical and horizontal position unless stated . Where such designs have been agreed by the company, uni-directional valves, check valves, and any valves with a preferred flow direction, shall have a directional arrow integrally cast on the body. Where valves have a limit on flow direction, or valve orientation, details shall be provided in the bid-stage.

All valve operators shall be permanently marked with "Open" and "Closed" positions with an arrow to indicate the direction of rotation.

Wherver required extended stem shall be provided for the insulated valves by considering the insulation thickness.

GEARED OPERATORS

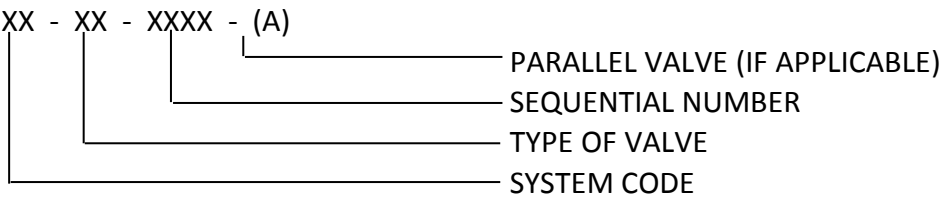
Bevel type gearing shall be supplied unless specified otherwise. The supplier shall include details of the proposed gearing at bid-stage.

Gear operators must be capable of being rotated through 90-degree increments.

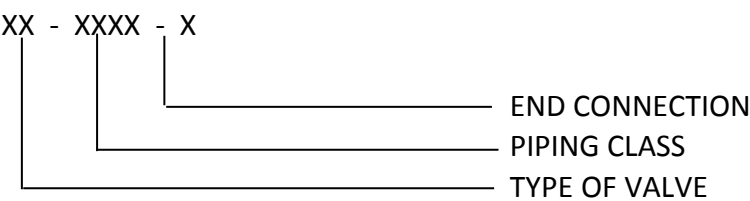
Components manufactured from grey cast iron or aluminium alloys are not acceptable.

Other grades of cast iron shall be subject to approval by the company.

MANUAL VALVE TAG NUMBERING (REFER P&ID LEGEND-PIPING AND VALVES-DWG NO: 17039-ND-P-DW-0200-01)



VALVE TAG IDENTIFICATION



TYPE OF VALVE	TYPE OF VALVE	PIPING CLASS	END CONNECTION
BF - BALL FULL BORE	FV - BUTTERFLY	AC01, AS20, AG01	R - RF FLANGED
BR - BALL REDUCED BORE	GT - GATE	BC01, BS20	Z - SOCKET WELD
CA - AXIAL CHECK (NON SLAM)	GV - GLOBE	CC01, CS20	J - RTJ FLANGED
CD - DUAL PLATE CHECK	PV - PLUG	DC01, DS20	S - NPTF
CL - PISTON CHECK	NV - NEEDLE	EC01, ES20	C - RTJ x NPTF
CS - SWING CHECK		FC01, FS20, FD20	H - HUB END
DB - DOUBLE BLOCK & BLEED		GT20	A - RF x NPTF

TITLE VALVE MATERIAL SPECIFICATION		 	DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJA			REV. B
VALVE MATERIAL SPECIFICATION			
Service	Fuel Gas (FG), Drain Open (DO), HP Flare (HF), Heating Medium(HM)- Hot Oil, Produced Water (PW), Process Hydrocarbon Vapor (PV), LP Flare (LF),		
	Process Hydrocarbon Liquid (PL), Drain Closed (DC), Raw/Fresh Water (WP), Potable Water (WD), Atmospheric Vent (VA).		
Piping Class	AC01		
	150#, RF, 3 mm Corrosion Allowance		
TAG NO.	SIZE	DESCRIPTION	
BALL VALVE			
BFAC01R	1/2"- 1 1/2"	Design code : ISO 17292, ASME 150 # RF, Split Body , Bolted , A105 Body , A182 F 316 Stem & ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 19.9 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
BFAC01R	2"- 4"	Design code : API 6D, ASME 150 # RF, Split Body , Bolted, A216 WCB / A105 Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 19.9 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
BFAC01R	6"-24"	Design code : API 6D, ASME 150 # RF, Split Body , Bolted, A216 WCB body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 19.9 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
BRAC01R	2"- 4"	Design code : API 6D, ASME 150 # RF, Split Body , Bolted, A216 WCB / A105 Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 19.9 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
BRAC01R	6"-24"	Design code : API 6D, ASME 150 # RF, Split Body , Bolted, A216 WCB body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 19.9 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
GLOBE VALVE			
GVAC01R	1/2"- 1 1/2"	Design code : API 602, ASME 150 # RF, Straight Pattern , Bolted, A105 Body , Rising Stem , Outside Screw and Yoke , A182 F316 Stem, Seats and Disc , Swivelling plug as disc, Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 19.9 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
GVAC01R	2"-24"	Design code : BS 1873, ASME 150 # RF, Straight Pattern , Bolted, A216 WCB Body , Rising Stem , Outside Screw and Yoke , A182 F316 Stem, Seats and disc, Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing, Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing, -29 °C @ 19.9 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
CHECK VALVE			
CLAC01R	1/2" - 1 1/2"	Design code : API 602, 150 # RF, Piston check, Bolted cover, Integral seats, A105 Body, A182 F316 piston and seats, Stellite hard faced seat-disc sealing surface, X-750 Spring, Non-graphite packing , -29 °C @ 19.9 kg/cm ² g & 200 °C @ 14 kg/cm ² g.	
CDAC01R	2"-24"	Design code : API 594, ASME 150 # RF (Solid lug), Dual plate (Lugged), Body with hinge and stop pin , Integral seat, A216 WCB / A105 Body , Metal to Metal Seating, A182 F 316 Plates, X-750 Spring, Stellite hard faced seat-plate sealing surface, Trim : API #12, End To End Standard as per API 594 , -29 °C @ 19.9 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
CSAC01R	2"-24"	Design code : API 594, ASME 150 # RF, Swing check, Bolted bonnet, Replaceable seats, A216 WCB / A105 Body , Metal to Metal Seating , A182 F 316 Disc and hinge , A182 F316 seats, Stellite hard faced seat-disc sealing surface, Trim : API #12, End To End Standard as per API 594 , -29 °C @ 19.9 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	

TITLE VALVE MATERIAL SPECIFICATION		 ऑयल इंडिया लिमिटेड Oil India Limited	 KAVIN™	DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJA				REV. B
VALVE MATERIAL SPECIFICATION				
Service	Fuel Gas (FG), Drain Open (DO), HP Flare (HF), Heating Medium(HM)- Hot Oil, Produced Water (PW), Process Hydrocarbon Vapor (PV), LP Flare (LF),			
	Process Hydrocarbon Liquid (PL), Drain Closed (DC), Raw/Fresh Water (WP), Potable Water (WD), Atmospheric Vent (VA).			
Piping Class	AC01			
	150#, RF, 3 mm Corrosion Allowance			
TAG NO.	SIZE	DESCRIPTION		
GATE VALVE				
GTAC01R	1/2"- 24"	Design code : API 602 (3/4" & less) / API 600 (1" & above), ASME 150 # RF, Bolted Bonnet, Flexible wedge, Rising & back seat stem, Replaceable seat, Outside screw and yoke, Expanded Graphite not less than 98% Purity as Stem Packing, , Packed gland for stem sealing, A216 WCB / A105 Body, A182 F316 stem. Trim shall be stellite coated, End To End Standard as per ASME B16.10, -29 °C @ 19.9 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.		
NEEDLE VALVE				
NVAC01R	1/2"- 1 1/2"	ASME 150# RF, A105 Body & Bonnet, A182 F316 trims, Graphite gland packing, End To End dimension as per manufacturer standard, -29 °C @ 19.9 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.		

TITLE		 ऑयल इंडिया लिमिटेड Oil India Limited  KAVIN™		DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJA				REV. B
VALVE MATERIAL SPECIFICATION				
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL),			
	Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).			
Piping Class	AS20			
	150#, RF, 0 mm Corrosion Allowance			
TAG NO.		SIZE	DESCRIPTION	
BALL VALVE				
BFAS20R		1/2"- 1 1/2"	Design code : ISO 17292, ASME 150 # RF, Split Body , Bolted ,A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 19.3 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
BFAS20R		2"- 4"	Design code : API 6D, ASME 150 # RF, Split Body , Bolted ,ASTM A351 CF8M / A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 19.3 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
BFAS20R		6"-24"	Design code : API 6D, ASME 150 # RF, Split Body , Bolted, ASTM A351 CF8M Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 19.3 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
BRAS20R		2"- 4"	Design code : API 6D, ASME 150 # RF, Split Body , Bolted ,ASTM A351 CF8M / A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 19.3 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
BRAS20R		6"-24"	Design code : API 6D, ASME 150 # RF, Split Body , Bolted, ASTM A351 CF8M Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 19.3 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
GLOBE VALVE				
GVAS20R		1/2"- 1 1/2"	Design code : API 602, ASME 150 # RF, Straight Pattern , Bolted, A182 F316 Body , Rising Stem , Outside Screw and Yoke , A182 F 316 Stem, Seats and disc , Swivelling plug as disc, Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 19.3 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
GVAS20R		2"-24"	Design code : BS 1873, ASME 150 # RF, Straight Pattern , Bolted, ASTM A351 CF8M Body , Rising Stem , Outside Screw and Yoke , A182 F 316 Stem, Seats and disc , Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 19.3 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
CHECK VALVE				
CLAS20R		1/2" - 1 1/2"	Design code : API 602, 300 # solid, Piston check, Bolted cover, Integral seats, A182 F316 Body, A182 F316 piston and seats, Stellite hard faced seat-disc sealing surface, X-750 Spring, Non-graphite packing , -29 °C @ 19.3 kg/cm ² g & 200 °C @ 14 kg/cm ² g.	
CDAS20R		2"-24"	Design code : API 594, ASME 150 # RF (Solid lug), Dual plate (Lugged) Body with hinge and stop pin , Integral seat, ASTM A351 CF8M / A182 F316 Body , Metal to Metal Seating, A182 F 316 Plates, X-750 Spring, Stellite hard faced seat-plate sealing surface, End To End Standard as per API 594 , -29 °C @ 19.3 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	
CSAS20R		2"-24"	Design code : API 594, ASME 150 # RF, Swing check, Bolted bonnet, Replaceable seats, ASTM A351 CF8M / A182 F316 Body , Metal to Metal Seating , A182 F 316 Disc and hinge , A182 F316 seats, Stellite hard faced seat-disc sealing surface, End To End Standard as per API 594 , -29 °C @ 19.3 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.	

TITLE VALVE MATERIAL SPECIFICATION		 	DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGS AT EAST KHAGORIJAN			REV. B
VALVE MATERIAL SPECIFICATION			
Service	Instrument air (IA), Utility Air (UA), Atmospheric Air- Vent (VA), Fire Water (WF), Nitrogen Gas (GN).		
Piping Class	AG01		
	150#, RF, 3 mm Corrosion Allowance		
TAG NO.	SIZE	DESCRIPTION	
BALL VALVE			
BFAG01S	1/2"- 1 1/2"	Design code : ISO 17292, 800 # Threaded (NPTF), Split Body , Bolted , A105 Body , A182 F316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per manufacturer standard , -29 °C @ 19.9 kg/cm ² g & 200 °C @ 14 kg/cm ² g.	
BFAG01R	2"- 4"	Design code : API 6D, ASME 150 # RF, Split Body , Bolted, A216 WCB / A105 Body , A182 F316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 19.9 kg/cm ² g & 200 °C @ 14 kg/cm ² g.	
BFAG01R	6"-24"	Design code : API 6D, ASME 150 # RF, Split Body , Bolted, A216 WCB Body , A182 F316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 19.9 kg/cm ² g & 200 °C @ 14 kg/cm ² g.	
BRAG01R	2"-4"	Design code : API 6D, ASME 150 # RF, Split Body , Bolted, A216 WCB / A105 Body , A182 F316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 19.9 kg/cm ² g & 200 °C @ 14 kg/cm ² g.	
BRAG01R	6"-24"	Design code : API 6D, ASME 150 # RF, Split Body , Bolted, A216 WCB Body , A182 F316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 19.9 kg/cm ² g & 200 °C @ 14 kg/cm ² g.	
GLOBE VALVE			
GVAG01S	1/2"- 1 1/2"	Design code : API 602, 800 # Threaded, Straight Pattern , Bolted, A105 Body , Rising Stem , Outside Screw and Yoke , A182 F316 Stem, Seats and disc , Swivelling Plug as Disc, Expanded Graphite not less than 98% Purity as Stem Packing , Packed Gland for stem sealing , Stellite hard faced seat-disc sealing surface, End to End dimension shall be as per manufacturer standard, -29 °C @ 19.9 kg/cm ² g & 200 °C @ 14 kg/cm ² g.	
GVAG01R	2"- 24"	Design code : BS 1873, ASME 150 # RF, Straight Pattern , Bolted, A216 WCB Body , Rising Stem , Outside Screw and Yoke , A182 F316 Stem, Seats and disc, Swivelling Plug as Disc, Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 19.9 kg/cm ² g & 200 °C @ 14 kg/cm ² g.	
CHECK VALVE			
CLAC01R	1/2" - 1 1/2"	Design code : API 602, 150 # RF, Piston check, Bolted cover, Integral seats, A105 Body, A182 F316 piston and seats, Stellite hard faced seat-disc sealing surface, X-750 Spring, Non-graphite packing , -29 °C @ 19.9 kg/cm ² g & 200 °C @ 14 kg/cm ² g.	
CDAG01R	2"- 24"	Design code : API 594, ASME 150 # RF (Solid lug), Dual plate (Lugged) Body with hinge and stop pin , Integral seat, ASTM A216 WCB / A105 Body , Metal to Metal Seating, A182 F 316 Plates, X-750 Spring, Stellite hard faced seat-plate sealing surface, Trim : API #12, End To End Standard as per API 594 , -29 °C @ 19.9 kg/cm ² g & 200 °C @ 14 kg/cm ² g.	
CSAG01R	2"-24"	Design code : API 594, ASME 150 # RF, Swing check, Bolted bonnet, Replaceable seats, ASTM A216 WCB / A105 Body , Metal to Metal Seating , A182 F 316 Disc and hinge , A182 F316 seats, Stellite hard faced seat-disc sealing surface, Trim : API #12, End To End Standard as per API 594 , -29 °C @ 19.9 kg/cm ² g & 200 °C @ 14 kg/cm ² g.	

TITLE VALVE MATERIAL SPECIFICATION		 	DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN			REV. B
VALVE MATERIAL SPECIFICATION			
Service	Fuel Gas (FG), Drain Open (DO), HP Flare (HF), Heating Medium(HM)- Hot Oil, Produced Water (PW), Process Hydrocarbon Vapor (PV), LP Flare (LF), Process Hydrocarbon Liquid (PL), Drain Closed (DC), Raw/Fresh Water (WP), Potable Water (WD), Atmospheric Vent (VA).		
Piping Class	BC01 300#, RF, 3 mm Corrosion Allowance		
TAG NO.	SIZE	DESCRIPTION	
BALL VALVE			
BFBC01R	1/2"- 1 1/2"	Design code : ISO 17292, ASME 300 # RF, Split Body , Bolted , A105 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 52.1 kg/cm ² g & 250 °C @ 42.7 kg/cm ² g.	
BFBC01R	2"- 4"	Design code : API 6D, ASME 300 # RF, Split Body , Bolted , A216 WCB / A105 Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 52.1 kg/cm ² g & 250 °C @ 42.7 kg/cm ² g.	
BFBC01R	6"-24"	Design code : API 6D, ASME 300 # RF, Split Body , Bolted, A216 WCB Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 52.1 kg/cm ² g & 250 °C @ 42.7 kg/cm ² g.	
BRBC01R	2"- 4"	Design code : API 6D, ASME 300 # RF, Split Body , Bolted , A216 WCB / A105 Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 52.1 kg/cm ² g & 250 °C @ 42.7 kg/cm ² g.	
BRBC01R	6"-24"	Design code : API 6D, ASME 300 # RF, Split Body , Bolted, A216 WCB Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 52.1 kg/cm ² g & 250 °C @ 42.7 kg/cm ² g.	
GLOBE VALVE			
GVBC01R	1/2"- 1 1/2"	Design code : API 602, ASME 300 # RF, Straight Pattern , Bolted, A105 Body , Rising Stem , Outside Screw and Yoke , A182 F316 Stem, Seats and Disc , Swivelling Plug as Disc, Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 52.1 kg/cm ² g & 250 °C @ 42.7 kg/cm ² g..	
GVBC01R	2"-24"	Design code : BS 1873, ASME 300 # RF, Straight Pattern , Bolted, A216 WCB Body , Rising Stem , Outside Screw and Yoke , A182 F316 Stem, Seats and Disc , Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 52.1 kg/cm ² g & 250 °C @ 42.7 kg/cm ² g.	
CHECK VALVE			
CLBC01R	1/2"- 1 1/2"	Design code : API 602, 300 # RF, Piston check, Bolted cover, Integral seats, A105 Body, A182 F316 piston and seats, Stellite hard faced seat-disc sealing surface, X-750 Spring, Non-graphite packing , -29 °C @ 52.1 kg/cm ² g & 250 °C @ 42.7 kg/cm ² g.	
CDBC01R	2"-24"	Design code : API 594, ASME 300 # RF (Solid lug), Dual plate (Lugged) Body with hinge and stop pin , Integral seat, A216 WCB / A105 Body , Metal to Metal Seating, A182 F 316 Plates, X-750 Spring, Stellite hard faced seat-plate sealing surface, Trim : API #12, End To End Standard as per API 594 , -29 °C @ 52.1 kg/cm ² g & 250 °C @ 42.7 kg/cm ² g.	
CSBC01R	2"-24"	Design code : API 594, ASME 300 # RF, Swing check, Bolted bonnet, Replaceable seats, A216 WCB / A105 Body , Metal to Metal Seating , A182 F 316 Disc and hinge , A182 F316 seats, Stellite hard faced seat-disc sealing surface, Trim : API #12, End To End Standard as per API 594 , -29 °C @ 52.1 kg/cm ² g & 250 °C @ 42.7 kg/cm ² g.	

TITLE VALVE MATERIAL SPECIFICATION		 ऑयल इंडिया लिमिटेड Oil India Limited  KAVIN™		DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGS AT EAST KHAGORIJAN				REV. B
VALVE MATERIAL SPECIFICATION				
Service	Fuel Gas (FG), Drain Open (DO), HP Flare (HF), Heating Medium(HM)- Hot Oil, Produced Water (PW), Process Hydrocarbon Vapor (PV), LP Flare (LF), Process Hydrocarbon			
	Liquid (PL), Drain Closed (DC), Raw/Fresh Water (WP), Potable Water (WD), Atmospheric Vent (VA).			
Piping Class	BC01			
	300#, RF, 3 mm Corrosion Allowance			
TAG NO.		SIZE	DESCRIPTION	
GATE VALVE				
GTBC01R	1/2"- 24"	Design code : API 602 (3/4" & less) / API 600 (1" & above), ASME 300 # RF, Bolted Bonnet, Flexible wedge, Rising & back seat stem, Replaceable seat, Outside screw and yoke, Expanded Graphite not less than 98% Purity as Stem Packing, , Packed gland for stem sealing, A216 WCB / A105 Body, A182 F316 stem. Trim shall be stellite coated, End To End Standard as per ASME B16.10, -29 °C @ 19.9 kg/cm ² g & 250 °C @ 12.3 kg/cm ² g.		
NEEDLE VALVE				
NVBC01R	1/2"- 1 1/2"	ASME 300# RF, A105 Body & Bonnet, A182 F316 trims, Graphite gland packing, End To End dimension as per manufacturer standard, -29 °C @ 52.1 kg/cm ² g & 250 °C @ 42.7 kg/cm ² g.		

TITLE VALVE MATERIAL SPECIFICATION		 Oil India Limited  KAVIN™	DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN			REV. B
VALVE MATERIAL SPECIFICATION			
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).		
Piping Class	BS20		
	300#, RF, 0 mm Corrosion Allowance		
TAG NO.	SIZE	DESCRIPTION	
BALL VALVE			
BFBS20R	1/2"- 1 1/2"	Design code : ISO 17292, ASME 300 # RF, Split Body , Bolted , A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 50.5 kg/cm ² g & 250 °C @ 34 kg/cm ² g.	
BFBS20R	2"- 4"	Design code : API 6D, ASME 300 # RF, Split Body , Bolted , ASTM A351 CF8M / A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 50.5 kg/cm ² g & 250 °C @ 34 kg/cm ² g.	
BFBS20R	6"-24"	Design code : API 6D, ASME 300 # RF, Split Body , Bolted, ASTM A351 CF8M Body , A182 F 316 Ball and Stem, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to end standard as per ASME B 16.10, -29 °C @ 50.5 kg/cm ² g & 250 °C @ 34 kg/cm ² g..	
BRBS20R	2"- 4"	Design code : API 6D, ASME 300 # RF, Split Body , Bolted , ASTM A351 CF8M / A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 50.5 kg/cm ² g & 250 °C @ 34 kg/cm ² g.	
BRBS20R	6"-24"	Design code : API 6D, ASME 300 # RF, Split Body , Bolted, ASTM A351 CF8M Body , A182 F 316 Ball and Stem, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to end standard as per ASME B 16.10, -29 °C @ 50.5 kg/cm ² g & 250 °C @ 34 kg/cm ² g..	
GLOBE VALVE			
GVBS20R	2"-24"	Design code : BS 1873, ASME 300 # RF, Straight Pattern , Bolted, ASTM A351 CF8M Body , Rising Stem , Outside Screw and Yoke , A182 F 316 Seats, Disc & Stem , Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 50.5 kg/cm ² g & 250 °C @ 34 kg/cm ² g.	
CHECK VALVE			
CLBS20R	1/2" - 1 1/2"	Design code : API 602, 300 # solid, Piston check, Bolted cover, Integral seats, A182 F316 Body, A182 F316 piston and seats, Stellite hard faced seat-disc sealing surface, X-750 Spring, Non-graphite packing , -29 °C @ 50.5 kg/cm ² g & 250 °C @ 34 kg/cm ² g.	
CDBS20R	2"-24"	Design code : API 594, ASME 300 # RF (Solid lug), Dual plate (Lugged) Body with hinge and stop pin, Integral seat, ASTM A351 CF8M / A182 F316 Body , Metal to Metal Seating, A182 F 316 Plates, X-750 Spring, Stellite hard faced seat-plate sealing surface, End To End Standard as per API 594 , -29 °C @ 50.5 kg/cm ² g & 250 °C @ 34 kg/cm ² g.	
CSBS20R	2"-24"	Design code : API 594, ASME 300 # RF, Swing check, Bolted bonnet, Replaceable seats, ASTM A351 CF8M / A182 F316 Body , Metal to Metal Seating , A182 F 316 Disc and hinge , A182 F316 seats, Stellite hard faced seat-disc sealing surface, End To End Standard as per API 594 , -29 °C @ 50.5 kg/cm ² g & 250 °C @ 34 kg/cm ² g.	

TITLE		 		DOC. No. : 17039-EK-M-SP-2002
VALVE MATERIAL SPECIFICATION				REV. B
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN				
VALVE MATERIAL SPECIFICATION				
Service	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).			
Piping Class	CC01			
	600#, RTJ, 3 mm Corrosion Allowance			
TAG NO.		SIZE	DESCRIPTION	
BALL VALVE				
BFCC01J		1/2"- 1 1/2"	Design code : ISO 17292, ASME 600 # RTJ, Split Body , Bolted, A105 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 104.1 kg/cm ² g & 250 °C @ 85.5 kg/cm ² g.	
BFCC01J		2"- 3"	Design code : API 6D, ASME 600 # RTJ, Split Body , Bolted , A216 WCB / A105 Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball, Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 104.1 kg/cm2g & 250 °C @ 85.5 kg/cm2g.	
BFCC01J		4"-24"	Design code : API 6D, ASME 600 # RTJ, Split Body , Bolted, A216 WCB Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 104.1 kg/cm2g & 250 °C @ 85.5 kg/cm2g.	
BRCC01J		2"- 3"	Design code : API 6D, ASME 600 # RTJ, Split Body , Bolted , A216 WCB / A105 Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball, Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 104.1 kg/cm2g & 250 °C @ 85.5 kg/cm2g.	
BRCC01J		4"-24"	Design code : API 6D, ASME 600 # RTJ, Split Body , Bolted, A216 WCB Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 104.1 kg/cm2g & 250 °C @ 85.5 kg/cm2g.	
GLOBE VALVE				
GVCC01J		1/2"- 1 1/2"	Design code : API 602, ASME 600 # RTJ, Straight Pattern , Bolted, A105 Body , Rising Stem , Outside Screw and Yoke , A182 F316 Disc, Seats and Stem , Swivelling Plug as Disc, Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to end standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 104.1 kg/cm2g & 250 °C @ 85.5 kg/cm2g.	
GVCC01J		2"-24"	Design code : BS 1873, ASME 600 # RTJ, Straight Pattern , Bolted, A216 WCB Body , Rising Stem , Outside Screw and Yoke , A182 F316 Stem, Seats and disc , Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to end standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 104.1 kg/cm2g & 250 °C @ 85.5 kg/cm2g.	
CHECK VALVE				
CACC01J		2"-24"	Design code : API 594, ASME 600 # RTJ, Non-slam (axial flow) check valve, Short pattern, A216 WCB Body, A182 F316 (or) carbon steel + 316 overlay disc, A182 F316 seats, Stellite hard faced seat-disc sealing surface, Alloy 718 spring, Trim : API #12, End To End Standard as per ASME B16.10 , -29 °C @ 104.1 kg/cm2g & 250 °C @ 85.5 kg/cm2g.	
CDCC01J		2"-24"	Design code : API 594, ASME 600 # RTJ (Solid lug), Dual plate (Lugged) Body with hinge and stop pin, Integral seat, A216 WCB / A105 Body , Metal to Metal Seating, A182 F 316 Plates, X-750 Spring, Stellite hard faced seat-plate sealing surface, Trim : API #12, End To End Standard as per API 594 , -29 °C @ 104.1 kg/cm2g & 250 °C @ 85.5 kg/cm2g.	

TITLE		 ऑयल इंडिया लिमिटेड Oil India Limited  KAVIN™		DOC. No. : 17039-EK-M-SP-2002
VALVE MATERIAL SPECIFICATION				REV. B
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN				
VALVE MATERIAL SPECIFICATION				
Service	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).			
Piping Class	CC01			
	600#, RTJ, 3 mm Corrosion Allowance			
TAG NO.		SIZE	DESCRIPTION	
CSCC01J		2"-24"	Design code : API 594, ASME 600 # RTJ, Swing check, Bolted bonnet, Replaceable seats, A216 WCB / A105 Body , Metal to Metal Seating , A182 F 316 Disc and hinge , A182 F316 seats, Stellite hard faced seat-disc sealing surface, Trim : API #12, End To End Standard as per API 594 , -29 °C @ 104.1 kg/cm2g & 250 °C @ 85.5 kg/cm2g.	
NEEDLE VALVE				
NVCC01J		1/2"-1 1/2"	ASME 600# RTJ, A105 Body & Bonnet, A182 F316 trims, Graphite gland packing, End To End dimension as per manufacturer standard, -29 °C @ 104.1 kg/cm ² g & 250 °C @ 85.5 kg/cm ² g.	
DOUBLE BLOCK AND BLEED VALVE				
DBCC01J		1/2"-24"	Design code : EEMUA 182, ASME 600 # RTJ on both sides, Isolation: Ball valve type (Full bore), Vent: Needle valve type, A216 WCB / A105 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , -29 °C @ 104.1 kg/cm2g & 250 °C @ 85.5 kg/cm2g.	
DBCC01C		1/2"-24"	Design code : EEMUA 182, ASME 600 # RTJ x 1/2" NPTF, Isolation: Ball valve type (Full bore), Vent: Needle valve type, A216 WCB / A105 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , -29 °C @ 104.1 kg/cm2g & 250 °C @ 85.5 kg/cm2g.	

TITLE VALVE MATERIAL SPECIFICATION		 ऑयल इंडिया लिमिटेड Oil India Limited	 KAVIN™	DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN				REV. B
VALVE MATERIAL SPECIFICATION				
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL),			
	Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).			
Piping Class	CS20			
	600#, RTJ, 0 mm Corrosion Allowance			
TAG NO.	SIZE	DESCRIPTION		
BALL VALVE				
BFCS20J	1/2"- 1 1/2"	Design code : ISO 17292, ASME 600 # RTJ, Split Body , Bolted, A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 101.2 kg/cm2g & 250 °C @ 68.1 kg/cm2g.		
BFCS20J	2"- 3"	Design code : API 6D, ASME 600 # RTJ, Split Body , Bolted , ASTM A351 CF8M / A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 101.2 kg/cm2g & 250 °C @ 68.1 kg/cm2g.		
BFCS20J	4"-24"	Design code : API 6D, ASME 600 # RTJ, Split Body , Bolted, ASTM A351 CF8M Body , A182 F316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 101.2 kg/cm2g & 250 °C @ 68.1 kg/cm2g.		
BRCS20J	2"- 3"	Design code : API 6D, ASME 600 # RTJ, Split Body , Bolted , ASTM A351 CF8M / A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 101.2 kg/cm2g & 250 °C @ 68.1 kg/cm2g.		
BRCS20J	4"-24"	Design code : API 6D, ASME 600 # RTJ, Split Body , Bolted, ASTM A351 CF8M Body , A182 F316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 101.2 kg/cm2g & 250 °C @ 68.1 kg/cm2g.		
GLOBE VALVE				
GVCS20J	1/2"- 1 1/2"	Design code : API 602, ASME 600 # RTJ, Straight Pattern , Bolted, A182 F316 Body , Rising Stem , Outside Screw and Yoke , A182 F316 Stem, Seats and disc , Swivelling Plug as Disc, Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 101.2 kg/cm2g & 250 °C @ 68.1 kg/cm2g.		
GVCS20J	2"-12"	Design code : BS 1873, ASME 600 # RTJ, Straight Pattern , Bolted, ASTM A351 CF8M Body , Rising Stem and disc , Outside Screw and Yoke , A182 F316 Stem, Seats and disc , Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 101.2 kg/cm2g & 250 °C @ 68.1 kg/cm2g.		
CHECK VALVE				
CDCS20J	2"-24"	Design code : API 594, ASME 600 # RTJ (Solid lug), Dual plate (Lugged) Body with hinge and stop pin , Integral seat, ASTM A351 CF8M / A182 F316 Body , Metal to Metal Seating, A182 F 316 Plates, X-750 Spring, Stellite hard faced seat-plate sealing surface, End To End Standard as per API 594 , -29 °C @ 101.2 kg/cm2g & 250 °C @ 68.1 kg/cm2g.		
CSCS20J	2"-24"	Design code : API 594, ASME 600 # RTJ, Swing check, Bolted bonnet, Replaceable seats, ASTM A351 CF8M / A182 F316 Body , Metal to Metal Seating , A182 F 316 Disc and hinge , A182 F316 seats, Stellite hard faced seat-disc sealing surface, End To End Standard as per API 594 , -29 °C @ 101.2 kg/cm2g & 250 °C @ 68.1 kg/cm2g.		

TITLE VALVE MATERIAL SPECIFICATION			DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN			REV. B
VALVE MATERIAL SPECIFICATION			
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL),		
	Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).		
Piping Class	CS20		
	600#, RTJ, 0 mm Corrosion Allowance		
TAG NO.	SIZE	DESCRIPTION	
DOUBLE BLOCK AND BLEED VALVE			
DBCS20J	1/2"-24"	Design code : EEMUA 182, ASME 600 # RTJ on both sides, Isolation: Ball valve type (Full bore), Vent: Needle valve type, A351 CF8M / A182 F316 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , -29 °C @ 101.2 kg/cm2g & 250 °C @ 68.1 kg/cm2g.	
DBCS20C	1/2"-24"	Design code : EEMUA 182, ASME 600 # RTJ x 1/2" NPTF, Isolation: Ball valve type (Full bore), Vent: Needle valve type, A351 CF8M / A182 F316 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , -29 °C @ 101.2 kg/cm2g & 250 °C @ 68.1 kg/cm2g.	

TITLE		 ऑयल इंडिया लिमिटेड Oil India Limited  KAVIN™		DOC. No. : 17039-EK-M-SP-2002
VALVE MATERIAL SPECIFICATION				REV. B
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN				
VALVE MATERIAL SPECIFICATION				
Service	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).			
Piping Class	DC01			
	900#, RTJ, 3 mm Corrosion Allowance			
TAG NO.	SIZE	DESCRIPTION		
BALL VALVE				
BFDC01J	1/2"- 1 1/2"	Design code : API 6D, ASME 1500 # RTJ, Split Body , Bolted, A105 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.		
BFDC01J	2"	Design code : API 6D, ASME 1500 # RTJ, Split Body , Bolted , A216 WCB / A105 Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.		
BFDC01J	3"	Design code : API 6D, ASME 900 # RTJ, Split Body , Bolted , A216 WCB / A105 Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.		
BFDC01J	4"-24"	Design code : API 6D, ASME 900 # RTJ, Split Body , Bolted, A216 WCB Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.		
BRDC01J	2"	Design code : API 6D, ASME 1500 # RTJ, Split Body , Bolted , A216 WCB / A105 Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.		
BRDC01J	3"	Design code : API 6D, ASME 900 # RTJ, Split Body , Bolted , A216 WCB / A105 Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.		
BRDC01J	4"-24"	Design code : API 6D, ASME 900 # RTJ, Split Body , Bolted, A216 WCB Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.		
GLOBE VALVE				
GVDC01J	1/2"- 2"	Design code : API 602, ASME 1500 # RTJ, Straight Pattern , Pressure seal bonnet, A105 / A216 WCB Body , Rising Stem , Outside Screw and Yoke , A182 F316 Disc, Seats and Stem , Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing ,Stellite hard faced seat-disc sealing surface, End to end standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.		
GVDC01J	3"-24"	Design code : BS 1873, ASME 900 # RTJ, Straight Pattern , Pressure seal bonnet, A216 WCB Body , Rising Stem , Outside Screw and Yoke , A182 F316 Stem, Seats and disc , Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to end standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.		

TITLE		 		DOC. No. : 17039-EK-M-SP-2002
VALVE MATERIAL SPECIFICATION				REV. B
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN				
VALVE MATERIAL SPECIFICATION				
Service	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).			
Piping Class	DC01			
	900#, RTJ, 3 mm Corrosion Allowance			
TAG NO.		SIZE	DESCRIPTION	
CHECK VALVE				
CADC01J		2"-24"	Design code : API 594, ASME 1500 # RTJ for 2" & ASME 900 # RTJ for above 2", Non-slam (axial flow) check valve, Short pattern, A216 WCB Body, A182 F316 (or) carbon steel + 316 overlay disc, A182 F316 seats, Stellite hard faced seat-disc sealing surface, Alloy 718 spring, Trim : API #12, End To End Standard as per ASME B16.10 , -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.	
CDDC01J		2"-24"	Design code : API 594, ASME 1500 # RTJ for 2" & ASME 900 # RTJ for above 2" (Solid lug), Dual plate (Lugged) Body with hinge and stop pin , Integral seat, A216 WCB / A105 Body , Metal to Metal Seating, A182 F 316 Plates, X-750 Spring, Stellite hard faced seat-plate sealing surface, Trim : API #12, End To End Standard as per API 594 , -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.	
CSDC01J		2"-24"	Design code : API 594, ASME 1500 # RTJ for 2" & ASME 900 # RTJ for above 2", Swing check, Pressure seal cover, Replaceable seats, A216 WCB / A105 Body , Metal to Metal Seating , A182 F 316 Disc and hinge , A182 F316 seats, Stellite hard faced seat-disc sealing surface, Trim : API #12, End To End Standard as per API 594 , -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.	
DOUBLE BLOCK AND BLEED VALVE				
DBDC01J		1/2"-24"	Design code : EEMUA 182, ASME 1500 # RTJ for upto 2" & ASME 900 # RTJ for above 2", Flanged on both sides, Isolation: Ball valve type (Full bore), Vent: Needle valve type, A216 WCB / A105 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.	
DBDC01C		1/2"-24"	Design code : EEMUA 182, ASME 1500 # RTJ for upto 2" & ASME 900 # RTJ for above 2", Flanged x 1/2" NPTF, Isolation: Ball valve type (Full bore), Vent: Needle valve type, A216 WCB / A105 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.	
NEEDLE VALVE				
NVDC01J		1/2"- 1 1/2"	ASME 1500# RTJ, A105 Body & Bonnet, A182 F316 trims, Graphite gland packing, End To End dimension as per manufacturer standard, -29 °C @ 156.2 kg/cm ² g & 250 °C @ 128.2 kg/cm ² g.	

TITLE		 Oil India Limited  KAVIN™		DOC. No. :
VALVE MATERIAL SPECIFICATION				17039-EK-M-SP-2002
PROJECT				REV.
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN				B
VALVE MATERIAL SPECIFICATION				
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL),			
	Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).			
Piping Class	DS20			
	900#, RTJ, 0 mm Corrosion Allowance			
TAG NO.		SIZE	DESCRIPTION	
BALL VALVE				
BFDS20J		1/2"- 1 1/2"	Design code : API 6D, ASME 1500 # RTJ, Split Body , Bolted, A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal, PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 151.8 kg/cm ² g & 250 °C @ 102 kg/cm ² g.	
BFDS20J		2"	Design code : API 6D, ASME 1500 # RTJ, Split Body , Bolted , ASTM A351 CF8M / A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 151.8 kg/cm ² g & 250 °C @ 102 kg/cm ² g.	
BFDS20J		3"	Design code : API 6D, ASME 900 # RTJ, Split Body , Bolted , ASTM A351 CF8M / A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 151.8 kg/cm ² g & 250 °C @ 102 kg/cm ² g.	
BFDS20J		4"-24"	Design code : API 6D, ASME 900 # RTJ, Split Body , Bolted, ASTM A351 CF8M Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 151.8 kg/cm ² g & 250 °C @ 102 kg/cm ² g.	
BRDS20J		2"	Design code : API 6D, ASME 1500 # RTJ, Split Body , Bolted , ASTM A351 CF8M / A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 151.8 kg/cm ² g & 250 °C @ 102 kg/cm ² g.	
BRDS20J		3"	Design code : API 6D, ASME 900 # RTJ, Split Body , Bolted , ASTM A351 CF8M / A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 151.8 kg/cm ² g & 250 °C @ 102 kg/cm ² g.	
BRDS20J		4"-24"	Design code : API 6D, ASME 900 # RTJ, Split Body , Bolted, ASTM A351 CF8M Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 151.8 kg/cm ² g & 250 °C @ 102 kg/cm ² g.	
GLOBE VALVE				
GVDS20J		1/2"- 2"	Design code : API 602, ASME 1500 # RTJ, Straight Pattern , Pressure seal bonnet, ASTM A351 CF8M / A182 F316 Body , Rising Stem , Outside Screw and Yoke , A182 F316 Stem, Seats and disc , Swivelling Plug as Disc, Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 151.8 kg/cm ² g & 250 °C @ 102 kg/cm ² g.	
GVDS20J		3"-8"	Design code : BS 1873, ASME 900 # RTJ, Straight Pattern , Pressure seal bonnet, ASTM A351 CF8M Body , Rising Stem and disc , Outside Screw and Yoke , A182 F316 Stem, Seats and disc , Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 151.8 kg/cm ² g & 250 °C @ 102 kg/cm ² g.	

TITLE VALVE MATERIAL SPECIFICATION		 	DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN			REV. B
VALVE MATERIAL SPECIFICATION			
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL),		
	Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).		
Piping Class	DS20		
	900#, RTJ, 0 mm Corrosion Allowance		
TAG NO.	SIZE	DESCRIPTION	
CHECK VALVE			
CDDS20J	2"-24"	Design code : API 594, ASME 1500 # RTJ for 2" & ASME 900 # RTJ for above 2" (Solid lug), Dual plate (Lugged) Body with hinge and stop pin , Integral seat, ASTM A351 CF8M / A182 F316 Body , Metal to Metal Seating, A182 F 316 Plates, X-750 Spring, Stellite hard faced seat-plate sealing surface, End To End Standard as per API 594 , -29 °C @ 151.8 kg/cm ² g & 250 °C @ 102 kg/cm ² g.	
CSDS20J	2"-24"	Design code : API 594, ASME 1500 # RTJ for 2" & ASME 900 # RTJ for above 2" , Swing check, Pressure seal cover, Replaceable seats, ASTM A351 CF8M / A182 F316 Body , Metal to Metal Seating , A182 F 316 Disc and hinge , A182 F316 seats, Stellite hard faced seat-disc sealing surface, End To End Standard as per API 594 , -29 °C @ 151.8 kg/cm ² g & 250 °C @ 102 kg/cm ² g.	
DOUBLE BLOCK AND BLEED VALVE			
DBDS20J	1/2"-24"	Design code : EEMUA 182, ASME 1500 # RTJ for upto 2" & ASME 900 # RTJ for above 2" , Flanged on both sides, Isolation: Ball valve type (Full bore), Vent: Needle valve type, ASTM A351 CF8M / A182 F316 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , -29 °C @ 151.8 kg/cm ² g & 250 °C @ 102 kg/cm ² g.	
DBDS20C	1/2"-24"	Design code : EEMUA 182, ASME 1500 # RTJ for upto 2" & ASME 900 # RTJ for above 2" , Flanged x 1/2" NPTF, Isolation: Ball valve type (Full bore), Vent: Needle valve type, ASTM A351 CF8M / A182 F316 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , -29 °C @ 151.8 kg/cm ² g & 250 °C @ 102 kg/cm ² g.	

TITLE VALVE MATERIAL SPECIFICATION		 	DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN			REV. B
VALVE MATERIAL SPECIFICATION			
Service	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).		
Piping Class	EC01		
	1500#, RTJ, 3 mm Corrosion Allowance		
TAG NO.	SIZE	DESCRIPTION	
BALL VALVE			
BFEC01J	1/2"- 1 1/2"	Design code : API 6D, ASME 1500 # RTJ, Split Body , Bolted, A105 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 260.3 kg/cm ² g & 204 °C @ 222.55 kg/cm ² g.	
BFEC01J	2"- 4"	Design code : API 6D, ASME 1500 # RTJ, Split Body , Bolted , A216 WCB / A105 Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 260.3 kg/cm ² g & 204 °C @ 222.55 kg/cm ² g.	
BFEC01J	6"-24"	Design code : API 6D, ASME 1500 # RTJ,, Split Body , Bolted, A216 WCB Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 260.3 kg/cm ² g & 204 °C @ 222.55 kg/cm ² g.	
BREC01J	2"- 4"	Design code : API 6D, ASME 1500 # RTJ, Split Body , Bolted , A216 WCB / A105 Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 260.3 kg/cm ² g & 204 °C @ 222.55 kg/cm ² g.	
BREC01J	6"-24"	Design code : API 6D, ASME 1500 # RTJ,, Split Body , Bolted, A216 WCB Body , A182 F 316 Stem , F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 260.3 kg/cm ² g & 204 °C @ 222.55 kg/cm ² g.	
GLOBE VALVE			
GVEC01J	1/2"- 1 1/2"	Design code : API 602, ASME 1500 # RTJ, Straight Pattern , Pressure seal bonnet, A105 Body , Rising Stem , Outside Screw and Yoke , A182 F316 Disc, Seats and Stem , Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing ,Stellite hard faced seat-disc sealing surface, End to end standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 260.3 kg/cm ² g & 204 °C @ 222.55 kg/cm ² g.	
GVEC01J	2"-4"	Design code : BS 1873, ASME 1500 # RTJ, Straight Pattern , Pressure seal bonnet, A216 WCB Body , Rising Stem , Outside Screw and Yoke , A182 F316 Stem, Seats and disc , Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to end standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 260.3 kg/cm ² g & 204 °C @ 222.55 kg/cm ² g.	
CHECK VALVE			
CDEC01J	2"-24"	Design code : API 594, ASME 1500 # RTJ (Solid lug), Dual plate (Lugged) Body with hinge and stop pin , Integral seat, A216 WCB / A105 Body , Metal to Metal Seating, A182 F 316 Plates, X-750 Spring, Stellite hard faced seat-plate sealing surface, Trim : API #12, End To End Standard as per API 594 , -29 °C @ 260.3 kg/cm ² g & 204 °C @ 222.55 kg/cm ² g.	
CSEC01J	2"-24"	Design code : API 594, ASME 1500 # RTJ , Swing check, Pressure seal cover, Replaceable seats, A216 WCB / A105 Body , Metal to Metal Seating , A182 F 316 Disc and hinge , A182 F316 seats, Stellite hard faced seat-disc sealing surface, Trim : API #12, End To End Standard as per API 594 , -29 °C @ 260.3 kg/cm ² g & 204 °C @ 222.55 kg/cm ² g.	

TITLE				DOC. No. :
VALVE MATERIAL SPECIFICATION				17039-EK-M-SP-2002
PROJECT				REV.
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN				B
VALVE MATERIAL SPECIFICATION				
Service	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).			
Piping Class	EC01			
	1500#, RTJ, 3 mm Corrosion Allowance			
TAG NO.		SIZE	DESCRIPTION	
DOUBLE BLOCK AND BLEED VALVE				
DBEC01J		1/2"-24"	Design code : EEMUA 182, ASME 1500 # RTJ, Flanged on both sides, Isolation: Ball valve type (Full bore), Vent: Needle valve type, A216 WCB / A105 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , -29 °C @ 260.3 kg/cm ² g & 204 °C @ 222.55 kg/cm ² g.	
DBEC01C		1/2"-24"	Design code : EEMUA 182, ASME 1500 # RTJ, Flanged x 1/2" NPTF, Isolation: Ball valve type (Full bore), Vent: Needle valve type, A216 WCB / A105 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , -29 °C @ 260.3 kg/cm ² g & 204 °C @ 222.55 kg/cm ² g.	
NEEDLE VALVE				
NVEC01J		1/2"- 1 1/2"	ASME 1500# RTJ, A105 Body & Bonnet, A182 F316 trims, Graphite gland packing, End To End dimension as per manufacturer standard, -29 °C @ 260.3 kg/cm ² g & 204 °C @ 222.55 kg/cm ² g.	

TITLE VALVE MATERIAL SPECIFICATION		 	DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJA			REV. B
VALVE MATERIAL SPECIFICATION			
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL),		
	Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).		
Piping Class	ES20		
	1500 #, RTJ, 0 mm Corrosion Allowance		
TAG NO.	SIZE	DESCRIPTION	
BALL VALVE			
BFES20J	1/2"- 1 1/2"	Design code : API 6D, ASME 1500 # RTJ, Split Body , Bolted, A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10 , -29 °C @ 253 kg/cm2g & 204 °C @ 180.8 kg/cm2g.	
BFES20J	2"- 4"	Design code : API 6D, ASME 1500 # RTJ, Split Body , Bolted , ASTM A351 CF8M / A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 253 kg/cm2g & 204 °C @ 180.8 kg/cm2g.	
BFES20J	6"-24"	Design code : API 6D, ASME 1500 # RTJ,, Split Body , Bolted, ASTM A351 CF8M Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 253 kg/cm2g & 204 °C @ 180.8 kg/cm2g.	
BRES20J	2"- 4"	Design code : API 6D, ASME 1500 # RTJ, Split Body , Bolted , ASTM A351 CF8M / A182 F316 Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 253 kg/cm2g & 204 °C @ 180.8 kg/cm2g.	
BRES20J	6"-24"	Design code : API 6D, ASME 1500 # RTJ,, Split Body , Bolted, ASTM A351 CF8M Body , A182 F 316 Ball and Stem , Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunnion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B 16.10, -29 °C @ 253 kg/cm2g & 204 °C @ 180.8 kg/cm2g.	
GLOBE VALVE			
GVES20J	1/2"- 1 1/2"	Design code : API 602, ASME 1500 # RTJ, Straight Pattern , Pressure seal bonnet, A182 F316 Body , Rising Stem , Outside Screw and Yoke , A182 F316 Stem, Seats and disc , Swivelling Plug as Disc, Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 253 kg/cm2g & 204 °C @ 180.8 kg/cm2g.	
GVES20J	2"-4"	Design code : BS 1873, ASME 1500 # RTJ, Straight Pattern , Pressure seal bonnet, ASTM A351 CF8M Body , Rising Stem and disc , Outside Screw and Yoke , A182 F316 Stem, Seats and disc , Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , -29 °C @ 253 kg/cm2g & 204 °C @ 180.8 kg/cm2g.	
CHECK VALVE			
CDES20J	2"-24"	Design code : API 594, ASME 1500 # RTJ (Solid lug), Dual plate (Lugged) Body with hinge and stop pin , Integral seat, ASTM A351 CF8M / A182 F316 Body , Metal to Metal Seating, A182 F 316 Plates, X-750 Spring, Stellite hard faced seat-plate sealing surface, End To End Standard as per API 594 , -29 °C @ 253 kg/cm2g & 204 °C @ 180.8 kg/cm2g.	
CSES20J	2"-24"	Design code : API 594, ASME 1500 # RTJ, Swing check, Pressure seal cover, Replaceable seats, ASTM A351 CF8M / A182 F316 Body , Metal to Metal Seating , A182 F 316 Disc and hinge , A182 F316 seats, Stellite hard faced seat-disc sealing surface, End To End Standard as per API 594 , -29 °C @ 253 kg/cm2g & 204 °C @ 180.8 kg/cm2g.	

TITLE VALVE MATERIAL SPECIFICATION		 ऑयल इंडिया लिमिटेड Oil India Limited  KAVIN™	DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN			REV. B
VALVE MATERIAL SPECIFICATION			
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL),		
	Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).		
Piping Class	ES20		
	1500 #, RTJ, 0 mm Corrosion Allowance		
TAG NO.	SIZE	DESCRIPTION	
DOUBLE BLOCK AND BLEED VALVE			
DBES20J	1/2"-24"	Design code : EEMUA 182, ASME 1500 # RTJ, Flanged on both sides, Isolation: Ball valve type (Full bore), Vent: Needle valve type, ASTM A351 CF8M / A182 F316 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , -29 °C @ 253 kg/cm2g & 204 °C @ 180.8 kg/cm2g.	
DBES20C	1/2"-24"	Design code : EEMUA 182, ASME 1500 # RTJ, Flanged x 1/2" NPTF, Isolation: Ball valve type (Full bore), Vent: Needle valve type, ASTM A351 CF8M / A182 F316 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , -29 °C @ 253 kg/cm2g & 204 °C @ 180.8 kg/cm2g.	

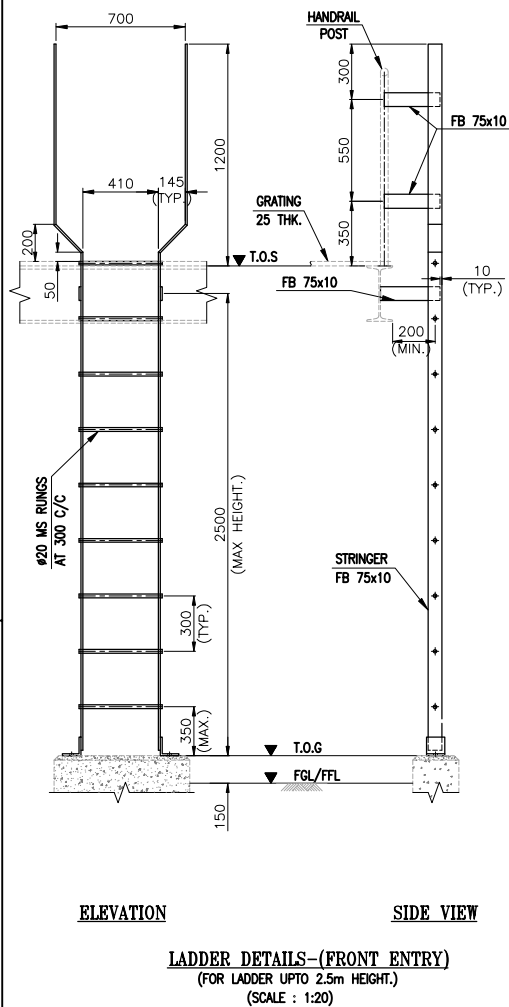
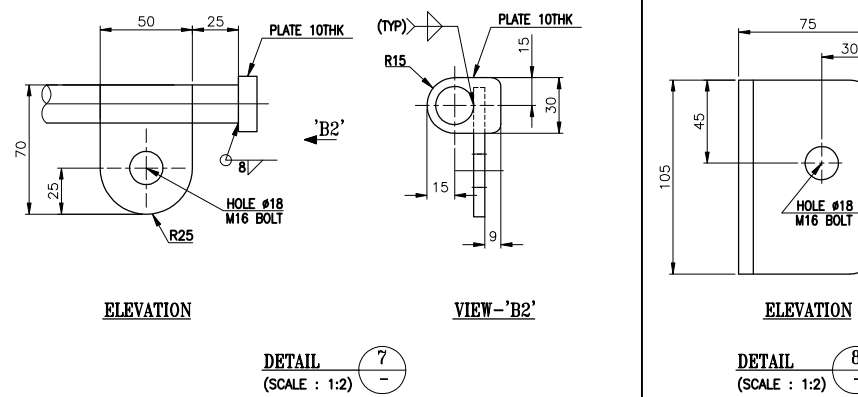
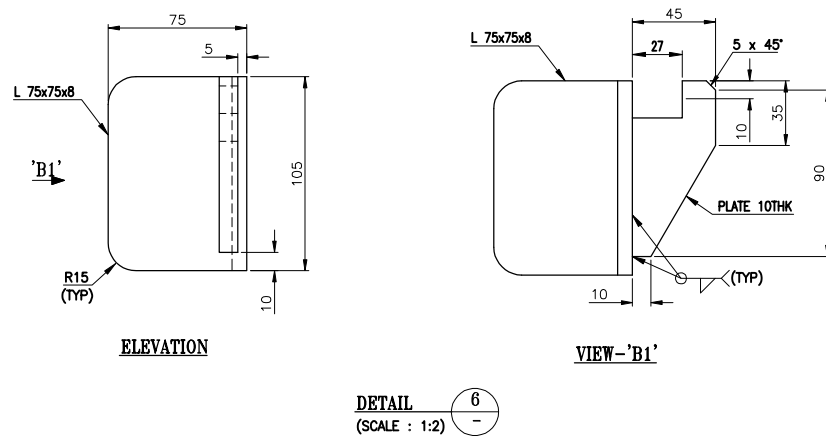
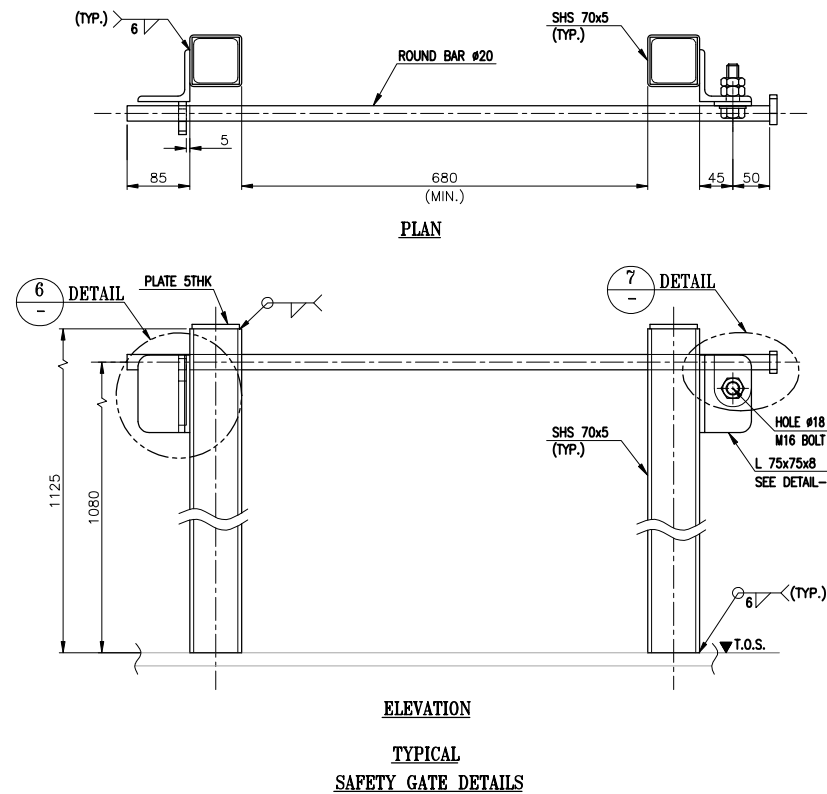
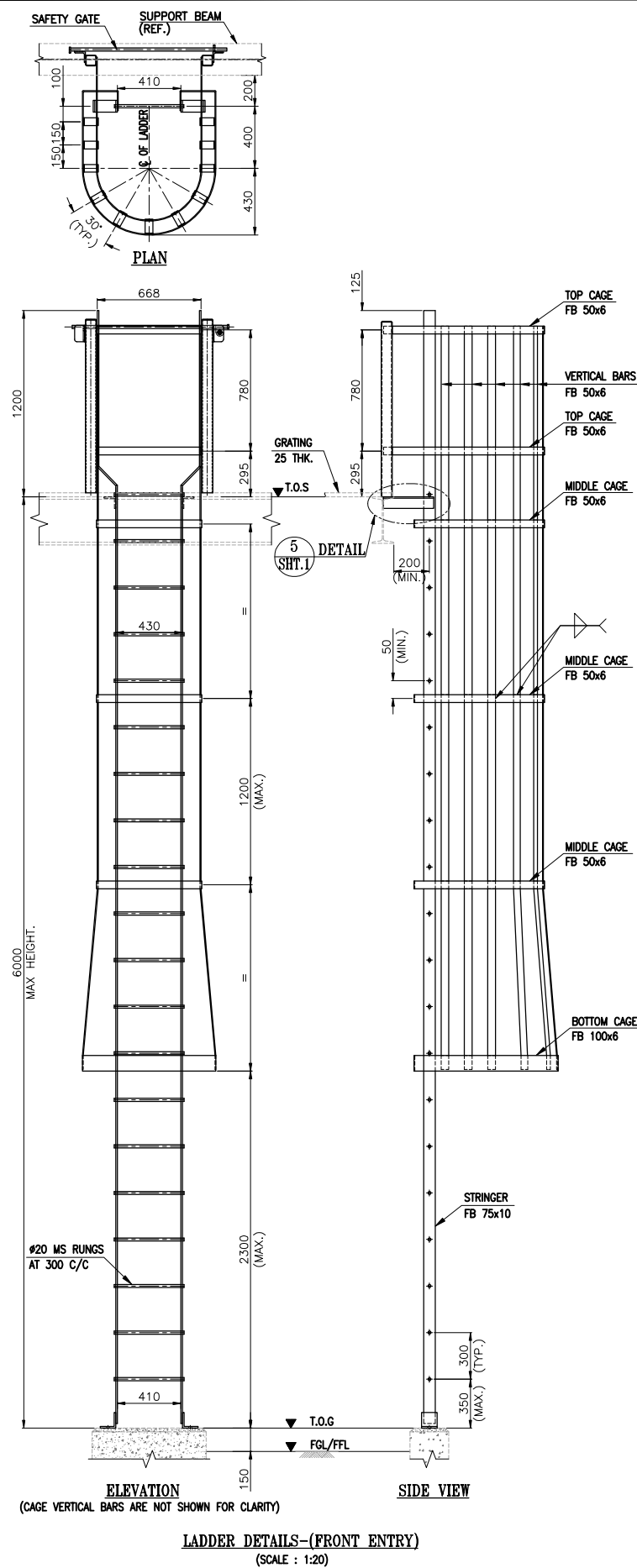
TITLE		 Oil India Limited  KAVIN™		DOC. No. :
VALVE MATERIAL SPECIFICATION				17039-EK-M-SP-2002
PROJECT				REV.
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN				B
VALVE MATERIAL SPECIFICATION				
Service	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).			
Piping Class	FC01			
	2500# RTJ (or) HUB ENDS, 3 mm Corrosion Allowance			
TAG NO.	SIZE	DESCRIPTION		
BALL VALVE				
BFFC01J	1/2" - 1 1/2"	Design code : API 6D, ASME 2500# RTJ , Split Body , A105 Body , A182 F316 Ball and Stem, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA, End to End standard as per ASME B16.10 , 130 °C @ 388.17 kg/cm ² g		
BFFC01J	2" - 12"	Design code : API 6D, ASME 2500# RTJ, Split Body, A216 WCB Body, A182 F316 Stem, F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B16.10 , 130 °C @ 388.17 kg/cm ² g		
BFFC01H	14" - 24"	Design code : API 6D, Hub ends, Split Body, A216 WCB Body, A182 F316 Stem, F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunion Mounted Ball , Fire test as per API 6FA , End to End standard as per Manufacturers standard , 130 °C @ 388.17 kg/cm ² g		
BRFC01J	2" - 12"	Design code : API 6D, ASME 2500# RTJ, Split Body, A216 WCB Body, A182 F316 Stem, F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B16.10 , 130 °C @ 388.17 kg/cm ² g		
BRFC01H	14" - 24"	Design code : API 6D, Hub ends, Split Body, A216 WCB Body, A182 F316 Stem, F316 SS (or) ENP A105 carbon steel ball, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunion Mounted Ball , Fire test as per API 6FA , End to End standard as per Manufacturers standard , 130 °C @ 388.17 kg/cm ² g		
GLOBE VALVE				
GVFC01J	1/2" - 1 1/2"	Design code : ASME B16.34, ASME 2500 # RTJ, Straight Pattern , Pressure seal bonnet, A105 Body , Rising Stem , Outside Screw and Yoke , A182 F316 Disc, Seats and Stem , Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing ,Stellite hard faced seat-disc sealing surface, End to end standard as per ASME B 16.10 , Packed Gland for stem sealing , 130 °C @ 388.17 kg/cm ² g.		
GVFC01J	2" - 12"	Design code : BS 1873, ASME 2500 # RTJ, Straight Pattern , Pressure seal bonnet, A216 WCB Body , Rising Stem , Outside Screw and Yoke , A182 F316 Stem, Seats and disc , Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to end standard as per ASME B 16.10 , Packed Gland for stem sealing , 130 °C @ 388.17 kg/cm ² g.		
CHECK VALVE				
CDFC01J	2" - 12"	Design code : API 594, ASME 2500 # RTJ (Solid lug), Dual plate (Lugged) Body with hinge and stop pin , Integral seat, A216 WCB / A105 Body , Metal to Metal Seating, A182 F 316 Plates, X-750 Spring, Stellite hard faced seat-plate sealing surface, Trim : API #12, End To End Standard as per API 594 , 130 °C @ 388.17 kg/cm ² g.		
CSFC01J	2" - 12"	Design code : API 594, ASME 2500 # RTJ , Swing check, Pressure seal cover, Replaceable seats, A216 WCB / A105 Body , Metal to Metal Seating , A182 F 316 Disc and hinge , A182 F316 seats, Stellite hard faced seat-disc sealing surface, Trim : API #12, End To End Standard as per API 594 , 130 °C @ 388.17 kg/cm ² g.		

TITLE VALVE MATERIAL SPECIFICATION		 ऑयल इंडिया लिमिटेड Oil India Limited  KAVIN™	DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGS AT EAST KHAGORIJAN			REV. B
VALVE MATERIAL SPECIFICATION			
Service	Produced Water (PW), Process Two Phase (PT), Process Hydrocarbon Vapor (PV), Process Hydrocarbon Liquid (PL).		
Piping Class	FC01 2500# RTJ (or) HUB ENDS, 3 mm Corrosion Allowance		
TAG NO.	SIZE	DESCRIPTION	
DOUBLE BLOCK AND BLEED			
DBFC01J	1/2" - 12"	Design code : EEMUA 182, ASME 2500 # RTJ, Flanged on both sides, Isolation: Ball valve type (Full bore), Vent: Needle valve type, A216 WCB / A105 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , 130 °C @ 388.17 kg/cm ² g.	
DBFC01C	1/2" - 12"	Design code : EEMUA 182, ASME 2500 # RTJ, Flanged x 1/2" NPTF, Isolation: Ball valve type (Full bore), Vent: Needle valve type, A216 WCB / A105 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , 130 °C @ 388.17 kg/cm ² g.	
NEEDLE VALVE			
NVFC01J	1/2" - 1 1/2"	ASME 2500# RTJ, A105 Body & Bonnet, A182 F316 trims, Graphite gland packing, End To End dimension as per manufacturer standard, 130 °C @ 388.17 kg/cm ² g.	

TITLE VALVE MATERIAL SPECIFICATION		 	DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJA			REV. B
VALVE MATERIAL SPECIFICATION			
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL),		
	Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).		
Piping Class	FS20		
	2500#, RTJ (or) HUB ENDS, 0 mm Corrosion Allowance		
TAG NO.	SIZE (inch)	DESCRIPTION	
BALL VALVE			
BFFS20J	1/2" - 1 1/2"	Design code : API 6D, ASME 2500# RTJ , Split Body , A182 F316 Body , A182 F316 Ball and Stem, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Floating Ball , Fire test as per API 6FA, End to End standard as per ASME B16.10 , 80 °C @ 378.63 kg/cm ² g	
BFFS20J	2" - 12"	Design code : API 6D, ASME 2500# RTJ, Split Body, ASTM A351 CF8M Body, A182 F316 Ball and Stem, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B16.10 , 80 °C @ 378.63 kg/cm ² g	
BFFS20H	14" - 24"	Design code : API 6D, Hub ends, Split Body, ASTM A351 CF8M Body, A182 F316 Ball and Stem, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Full Bore , Trunion Mounted Ball , Fire test as per API 6FA , End to End standard as per Manufacturers standard , 80 °C @ 378.63 kg/cm ² g	
BRFS20J	2" - 12"	Design code : API 6D, ASME 2500# RTJ, Split Body, ASTM A351 CF8M Body, A182 F316 Ball and Stem, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunion Mounted Ball , Fire test as per API 6FA , End to End standard as per ASME B16.10 , 80 °C @ 378.63 kg/cm ² g	
BRFS20H	14" - 24"	Design code : API 6D, Hub ends, Split Body, ASTM A351 CF8M Body, A182 F316 Ball and Stem, Expanded Graphite not less than 98% Purity as Fire seal , PEEK seats, Reduced Bore , Trunion Mounted Ball , Fire test as per API 6FA , End to End standard as per Manufacturers standard , 80 °C @ 378.63 kg/cm ² g	
GLOBE VALVE			
GVFS20J	1/2" - 1 1/2"	Design code : ASME B16.34, ASME 2500 # RTJ, Straight Pattern , Pressure seal bonnet, A182 F316 Body , Rising Stem , Outside Screw and Yoke , A182 F316 Stem, Seats and disc , Swivelling Plug as Disc, Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , 80 °C @ 378.63 kg/cm ² g.	
GVFS20J	2" - 12"	Design code : BS 1873, ASME 2500 # RTJ, Straight Pattern , Pressure seal bonnet, ASTM A351 CF8M Body , Rising Stem and disc , Outside Screw and Yoke , A182 F316 Stem, Seats and disc , Swivelling Plug as Disc , Expanded Graphite not less than 98% Purity as Stem Packing , Stellite hard faced seat-disc sealing surface, End to End standard as per ASME B 16.10 , Packed Gland for stem sealing , 80 °C @ 378.63 kg/cm ² g.	
CHECK VALVE			
CDFS20J	2" - 12"	Design code : API 594, ASME 2500 # RTJ (Solid lug), Dual plate (Lugged) Body with hinge and stop pin , Integral seat, ASTM A351 CF8M / A182 F316 Body , Metal to Metal Seating, A182 F 316 Plates, X-750 Spring, Stellite hard faced seat-plate sealing surface, End To End Standard as per API 594 , 80 °C @ 378.63 kg/cm ² g.	
CSFS20J	2" - 12"	Design code : API 594, ASME 2500 # RTJ, Swing check, Pressure seal cover, Replaceable seats, ASTM A351 CF8M / A182 F316 Body , Metal to Metal Seating , A182 F 316 Disc and hinge , A182 F316 seats, Stellite hard faced seat-disc sealing surface, End To End Standard as per API 594 , 80 °C @ 378.63 kg/cm ² g.	

TITLE VALVE MATERIAL SPECIFICATION		 ऑयल इंडिया लिमिटेड Oil India Limited  KAVIN™	DOC. No. : 17039-EK-M-SP-2002
PROJECT CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN			REV. B
VALVE MATERIAL SPECIFICATION			
Service	Potable water (WD), Nitrogen gas (GN), Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL),		
	Process Hydrocarbon Vapor (PV), Deoiler (CD), Water Scale Inhibitor (CS).		
Piping Class	FS20		
	2500#, RTJ (or) HUB ENDS, 0 mm Corrosion Allowance		
TAG NO.	SIZE (inch)	DESCRIPTION	
DOUBLE BLOCK AND BLEED			
DBFS20J	1/2" - 12"	Design code : EEMUA 182, ASME 2500 # RTJ, Flanged on both sides, Isolation: Ball valve type (Full bore), Vent: Needle valve type, ASTM A351 CF8M / A182 F316 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , 80 °C @ 378.63 kg/cm ² g.	
DBFS20C	1/2" - 12"	Design code : EEMUA 182, ASME 2500 # RTJ, Flanged x 1/2" NPTF, Isolation: Ball valve type (Full bore), Vent: Needle valve type, ASTM A351 CF8M / A182 F316 Body , A182 F316 Trims, PEEK seats , Fire Test as per API 6FA , End to End standard as per Manufacturers Standard , Expanded graphite not less than 98% purity as per stuffing box, Lip seal and fire seal for stem sealing , Valves 2" and above shall be trunnion mounted type , 80 °C @ 378.63 kg/cm ² g.	

TITLE		 		DOC. No. :
VALVE MATERIAL SPECIFICATION				17039-EK-M-SP-2002
PROJECT				REV.
CREATION OF SURFACE PRODUCTION FACILITY GGs AT EAST KHAGORIJAN				B
VALVE MATERIAL SPECIFICATION				
Service	Demulsifier (CE), Oil Scale Inhibitor (CO), Corrosion Inhibitor (CK), Wax Inhibitor (CV), Flow Improver (CF), Process HC Liquid (PL), Process Hydrocarbon Vapor (PV),			
	Deoiler (CD), Water Scale Inhibitor (CS).			
Piping Class	GT20			
	3000 PSI, 0 mm Corrosion Allowance			
TAG NO.		SIZE	DESCRIPTION	
BALL VALVE				
BFGT20S		1/4" - 1"	Full bore, ASTM A182 F316 swagelok valves. Elastomers seals shall be Elast-O-Lion 101 or approved equal.	
CHECK VALVE				
CLGT20S		1/4" - 1"	Piston check, ASTM A182 F316 Swagelok valves.	
NEEDLE VALVE				
NVGT20S		1/4" - 1"	ASTM A182 F316 Swagelok Valves.	
GLOBE VALVE				
GVGT20S		1/4" - 1"	ASTM A182 F316 Swagelok valves. Elastomers seals shall be Elast-O-Lion 101 or approved equal.	



NOTES:

1. FOR NOTES & REFERENCE DRAWINGS PLEASE REFER SHEET-1 OF 2.

REV	DATE	DESCRIPTION	DRAWN	CHK.	APPR.
A	28 FEB 18	ISSUED FOR REVIEW	SE	WK/IFL	MSB/MSR

COMPANY:



EPCM CONSULTANT:

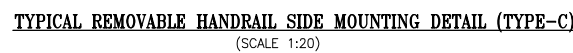
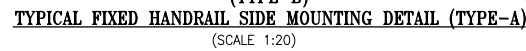


PROJECT : CREATION OF SURFACE PRODUCTION FACILITIES
(OCS & GGS) AT NADUA & EAST KHAGORIJAN

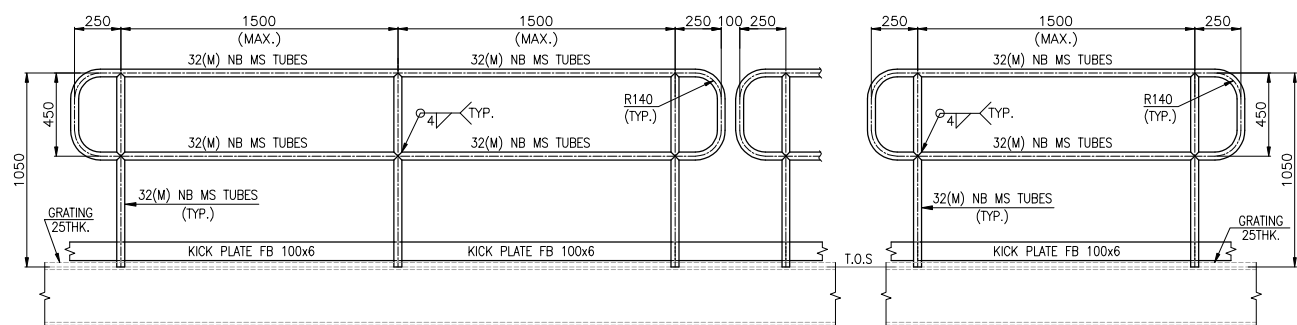
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DOC NAME : STRUCTURAL STEEL STANDARD DETAILS FOR LADDER

PROJECT NO.: KIP-17039 PROJECT SITE: EAST KHAGORIJAN SIZE : A1
DRAWING NO.: 17039-EK-S-DW-6088 REV: A SHEET : 2 OF 2 SCALE : AS SHOWN

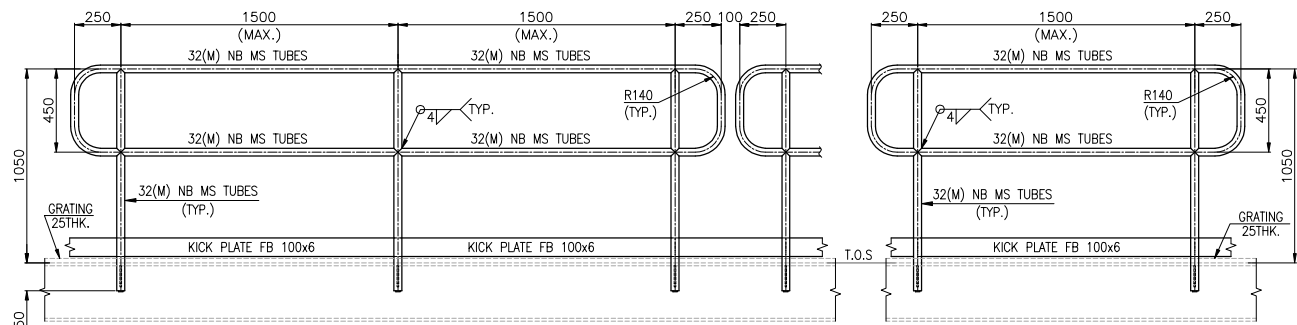


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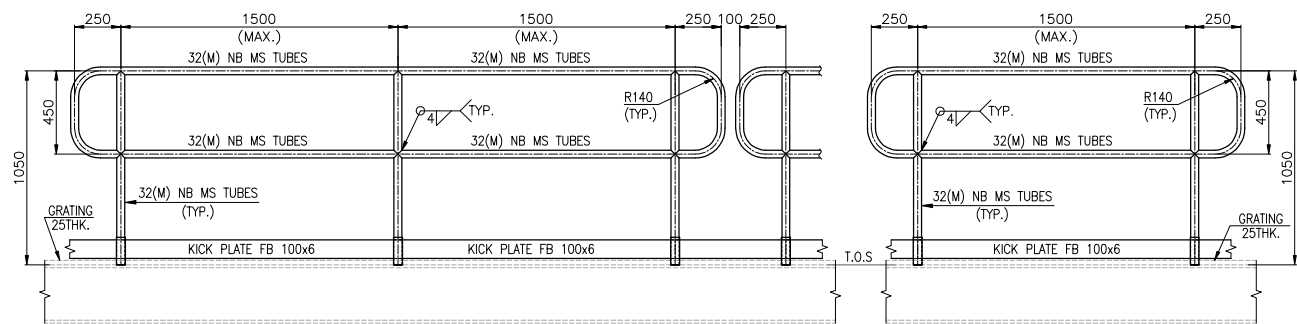
ELEVATION
(SINGLE PANEL WITH WINGS)

PANEL WITH WINGS - (TYPE-A)
TYPICAL FIXED HANDRAIL TOP MOUNTING DETAIL
(SCALE 1:20)



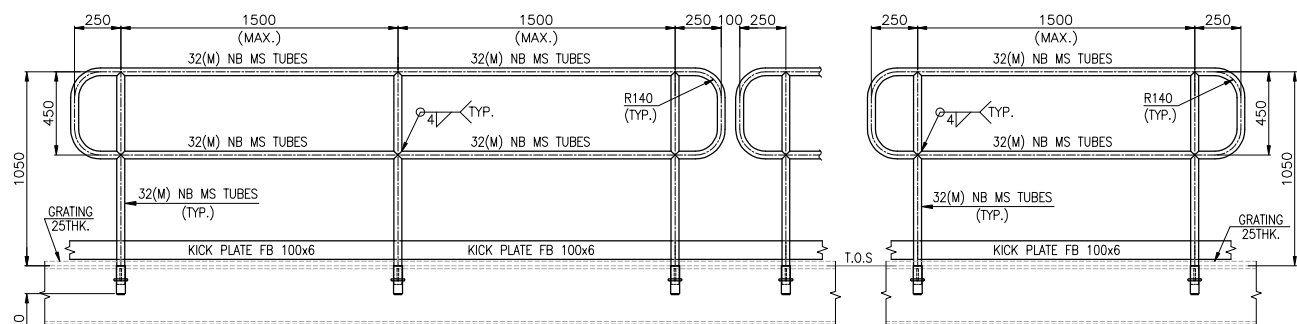
ELEVATION
(SINGLE PANEL WITH WINGS)

PANEL WITH WINGS - (TYPE-B)
TYPICAL FIXED HANDRAIL SIDE MOUNTING DETAIL
(SCALE 1:20)



ELEVATION
(SINGLE PANEL WITH WINGS)

PANEL WITH WINGS - (TYPE-C)
TYPICAL REMOVABLE HANDRAIL TOP MOUNTING DETAIL
(SCALE 1:20)



ELEVATION
(SINGLE PANEL WITH WINGS)

PANEL WITH WINGS - (TYPE-D)
TYPICAL REMOVABLE HANDRAIL SIDE MOUNTING DETAIL
(SCALE 1:20)

A	28 FEB 18	ISSUED FOR REVIEW	SE	WK/TP/L	MSB/MSR
REV	DATE	DESCRIPTION	DRAWN	CHK.	APPR.

COMPANY:



EPCM CONSULTANT:

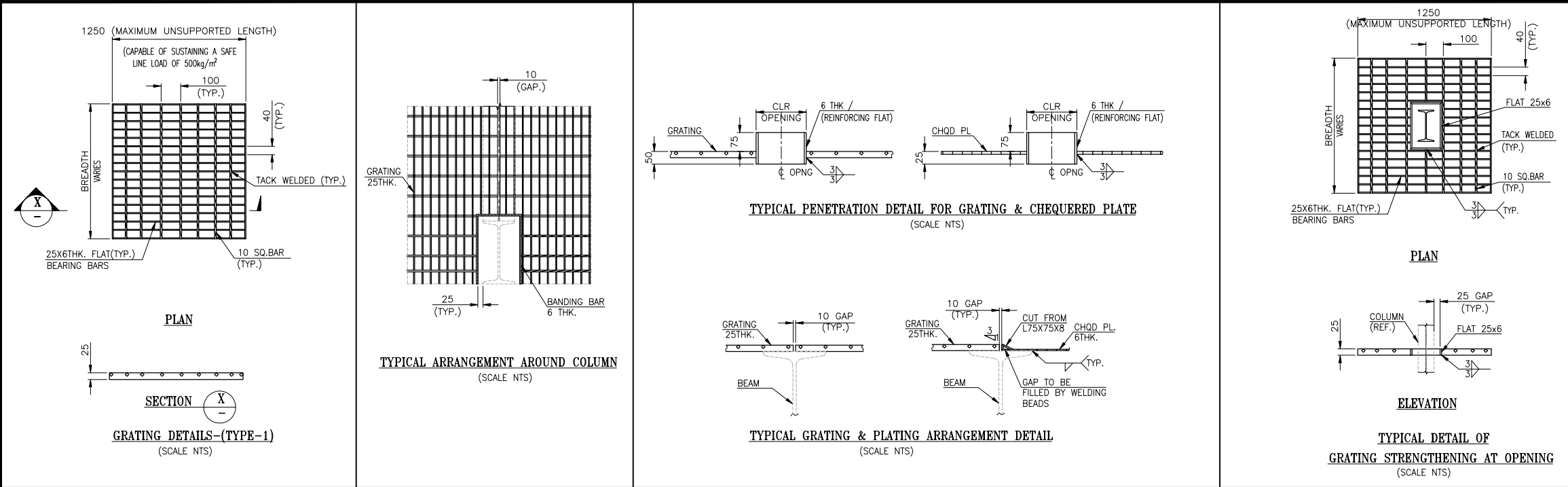


PROJECT :	CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJAN

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DOC NAME :	STRUCTURAL STEEL STANDARD DETAILS FOR HANDRAIL

PROJECT NO.: KIP-17039		PROJECT SITE: EAST KHAGORIJAN		SIZE : A1
DRAWING NO.:	17039-EK-S-DW-6089	REV: A	SHEET : 2 OF 2	SCALE : AS SHOWN

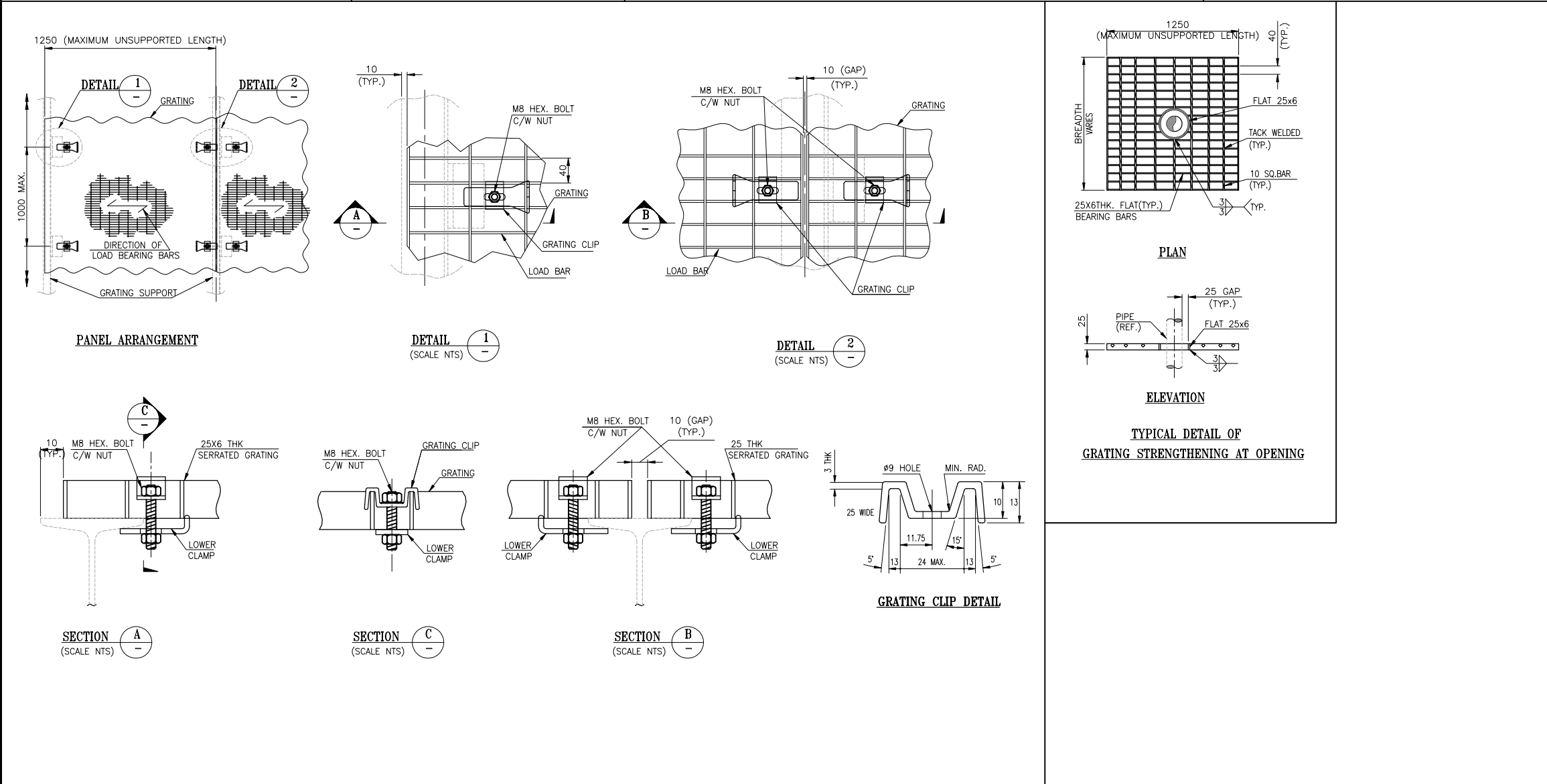


NOTES:

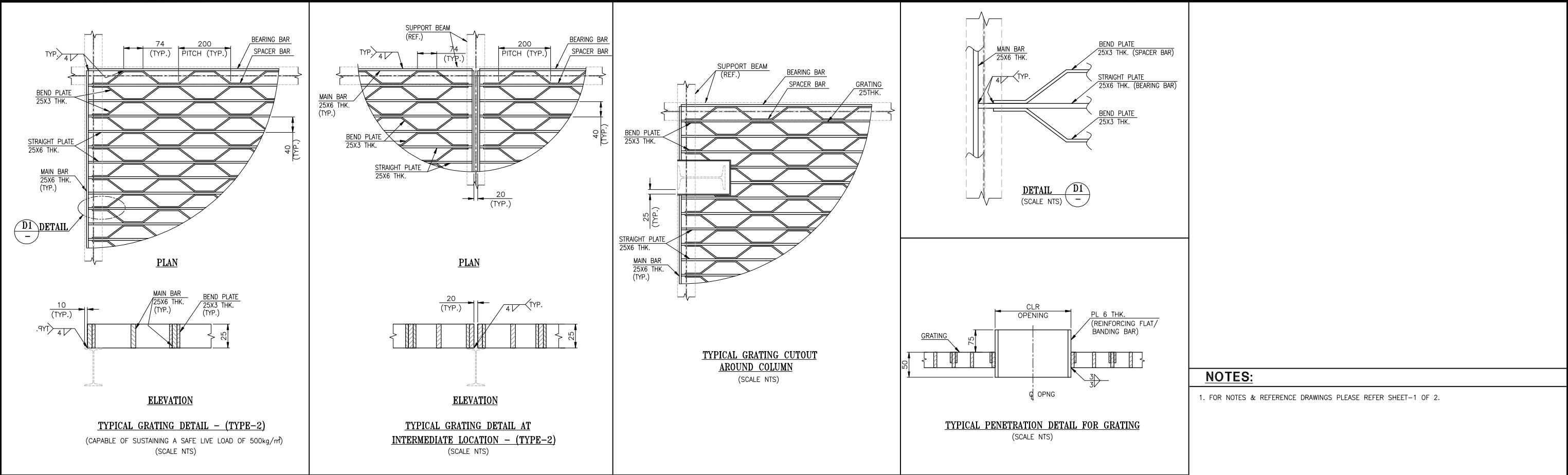
1. ALL DIMENSIONS ARE IN mm U.N.O
2. REMOVABLE GRATING PANEL SHALL BE FIXED WITH THE SUPPORTING MEMBERS BY CLAMPS ONLY.
3. FOR GRATING PANEL WITH CUTOUTS/OPENING STRENGTHENING SHALL BE CARRIED OUT TO SUIT AS SITE CONDITION.

LEGEND:

1. T.O.S - TOP OF STEEL
2. THK - THICKNESS
3. NTS - NOT TO SCALE
4. TYP - TYPICAL
5. MAX. - MAXIMUM
6. FB. - FLAT BAR
7. PL. - PLATE
8. FGL - FINISHED GROUND LEVEL
9. NB - NOMINAL BORE
10. (M) - MEDIUM(CLASS)
11. MS - MILD STEEL
12. MIN - MINIMUM
13. CHOD - CHEQUERED
14. OPNG - OPENING



							COMPANY:  ऑयल इंडिया लिमिटेड Oil India Limited
						EPCM CONSULTANT :  KAVIN TM	
A	28 FEB 18	ISSUED FOR REVIEW	SE	WK/TPL	MSB/MSR		
REV	DATE	DESCRIPTION	DRAWN	CHK.	APPR.		



NOTES:

1. FOR NOTES & REFERENCE DRAWINGS PLEASE REFER SHEET-1 OF 2.

						COMPANY:		PROJECT : CREATION OF SURFACE PRODUCTION FACILITIES (OCS & GGS) AT NADUA & EAST KHAGORIJJAN	
						EPCM CONSULTANT :		THIS DRAWING AND ALL DESIGN DETAILS AND DATA SHOWN HEREON, IS THE SOLE PROPERTY OF OIL INDIA LTD AND SHALL NOT BE REPRODUCED IN ANY MANNER OR USED FOR ANY PURPOSE WHATSOEVER, EXCEPT BY WRITTEN PERMISSION OF OIL INDIA LTD.	
								DOC NAME : STRUCTURAL STEEL STANDARD DETAILS FOR GRATING (TYPE-2)	
								PROJECT NO.: KIP-17039	
								DRAWING NO.: 17039-EK-S-DW-6090	
								REV: A SHEET : 2 OF 2	
								SCALE : AS SHOWN	