OIL INDIA LIMITED
(A Govt. of India Enterprise)
P.O. DULIAJAN, DIST - DIBRUGARH
ASSAM, INDIA, PIN-786602

CONTRACTS DEPARTMENT
TEL: 0374-2800548
E-mail: *contracts@oilindia.in*
Website: www.oil-india.com
FAX: 0374-2803549

FORWARDING LETTER

Sub: WORKS CONTRACTS IFB No. CDI2352P23 – Hiring Services for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning of Pontoon Type Raw Water in-take Plant including cross country Raw Water Pipeline, Plant Piping and all Electrical and Instrumentation jobs on EPC-LSTK Basis at Oil India Limited, Duliajan, Assam.

Dear Sir(S),

1.0 OIL INDIA LIMITED (OIL), a "Navaratna" Category, Government of India Enterprise, 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.

2.0 In connection with its operations, OIL invites Local Competitive Bids (LCB) from competent and experienced/approved Contractors/Firms for the mentioned work/service under **OPEN E-TENDER SINGLE-STAGE TWO BID SYSTEM** through OIL's E-Procurement Portal: "https://etender.srm.oilindia.in/irj/portal" for **'Hiring Services for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning of Pontoon Type Raw Water in-take Plant including cross country Raw Water Pipeline, Plant Piping and all Electrical and Instrumentation jobs on EPC-LSTK Basis at Oil India Limited, Duliajan, Assam'.** One complete set of Bid Document covering OIL's IFB for hiring of above services 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:

(i)	IFB No./E-Tender No.	:	**CDI2352P23**
(ii)	Type of Bid	:	**Open Indigenous E-Tender, Single-Stage Two Bid System**
(iii)	Bid Closing Date & Time	:	As mentioned in the E-procurement portal.
(iv)	Technical Bid Opening Date & Time	:	As mentioned in the E-procurement portal.
(v)	Price Bid Opening Date & Time	:	Will be intimated to the eligible/qualified bidders nearer the time.
(vi)	Bid Submission Mode	:	Bids must be uploaded online in OIL's E-Procurement Portal.
(vii)	Bid Opening Place	:	Office of GM-Contracts (HoD) Contracts Department, Oil India Limited, Duliajan-786602, Assam, India.

(viii)	Bid Validity	:	**120 days** from date of Bid Closing. Note: In exceptional circumstances, OIL 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 (or by Fax). A Bidder may refuse the request. A Bidder granting the request will neither be required nor permitted to modify their bid.
(ix)	Mobilization Period	:	**Fifteen (15) days** from the date of issue of Letter of Award (LOA). Note: The Contractor shall report to Field Engineering Department within 15 days from date of issue of LOA for a Kick-off Meeting for obtaining necessary information and instructions for commencement of work. Date of Kick Off Meeting shall be deemed as completion of mobilization.
(x)	Bid Security/EMD Amount	:	**₹ 39,94,000.00** (Rupees Thirty-Nine Lakh Ninety-Four Thousand) only. **Refer Clause No. 9.0 of Instruction to Bidder (ITB)**
(xi)	Bid Security/EMD Validity	:	As mentioned in the E-procurement portal. (Minimum 150 days from original bid closing date).
(xii)	Original Bid Security to be submitted	:	Office of GM-Contracts (HoD), Contracts Department, Oil India Limited, Duliajan, Assam-786602, India
(xiii)	Amount of Performance Security	:	**3%** of Contract value. **Refer Clause No. 24.0** of Instruction to Bidder (ITB)
(xiv)	Validity of Performance Security	:	**15 (Fifteen) Months** beyond contract duration.
(xv)	Location of job		Duliajan, Assam
(xvi)	Duration of the Contract	:	The total duration of the contract will be for a period of **21 Months and 15 Days** from date of issue of LoA. Break-up of Contract Duration is as under: • Mobilization – 15 Days. • Main LSTK-EPC work: Eighteen (18) Months for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning on LSTK Basis of Pontoon Type Raw Water in-take Plant at Duliajan, Assam, India inclusive of

			cross country Raw Water Pipeline, Plant Piping, and all Electrical and Instrumentation jobs. • Reliability Run/Site Acceptance Test: Contractor shall be responsible for Initial Operation of the Plant for a period of 03 (Three) Months from the Date of Commissioning of the Plant is all aspects.
(xvii)	Quantum of Liquidated Damage for Default in Timely Mobilization/ Completion	:	**Refer Clause No. 30** of General Conditions of Contract (GCC) and Clause No. 15.0 of SCC.
(xviii)	Bids to be addressed to	:	GM-Contracts (HoD), Contracts Department, Oil India Limited, Duliajan-786602, Assam, India.
(xix)	Pre-Bid conference	:	**NOT APPLICABLE**
(xx)	Last Date of receipt of Queries	:	**NOT APPLICABLE**
(xxi)	Whether tendered quantities are splitable	:	**No**

3.0 GUIDELINES FOR PARTICIPATING IN OIL'S E-PROCUREMENT

3.1 Bids are to be submitted online through OIL's E-Procurement Portal with digital signature. To participate in OIL's E-Procurement tender, bidders should have a legally valid digital certificate **of Class 3 with Organizations 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 other than **Bidder's Name** are not acceptable. However, aforesaid Digital Signature Certificates having Bidder's Name in the "Organization Name" field are acceptable.

Encryption certificate is mandatorily required for submission of bid. In case bidder creates response with one certificate (using encryption key) and then the bidder changes his Digital Signature Certificate, then the old certificate (used for encryption) is required in order to decrypt his encrypted response for getting the edit mode of the response. Once decryption is done, bidder may use new DSC certificate for uploading and submission of their offer. It is the sole responsibility of the bidder to keep their DSC certificate properly. In case of loss of the certificate, OIL INDIA LTD. is not responsible.

The authenticity of above digital signature shall be verified through authorized CA after bid opening and in case the digital signature used for signing is not of "**Class 3 with Organizations Name** and **Encryption Certificate**", the bid will be rejected.

Only in case of sole proprietorship firms, Digital Signature Certificates issued in the name of the proprietor is also acceptable provided the bid is submitted in the capacity of a proprietorship firm.

Bidder is responsible for ensuring the validity of digital signature and its proper usage by their employee.

The bid including all uploaded documents shall be digitally signed by duly authorized representative of the Bidder / Bidding Company to bind the Bidder / Bidding Company to the contract.

3.2 For participation, applicants already having User ID & Password for OIL'sE-Procurement Portal need to register against the IFB. New vendors / existing vendors not having User ID & Password for OIL's E-Procurement Portal shall obtain User ID & password through online vendor registration system in E-Portal.

3.2.1 Bidders without having E-Tender Login ID and password should complete their online registration at least 07 (Seven) days prior to the scheduled Bid Closing Date and time of the tender. For online registration, bidder may visit OIL's E-Tender site https://etender.srm.oilindia.in/irj/portal.

3.2.2 Necessary Login ID & Password will be issued by OIL only after submitting the complete online registration by the Bidder. In the event of late registration / incomplete registration by Bidder, OIL INDIA LIMITED shall not be responsible for late allotment of User ID & Password and request for bid closing date extension on that plea shall not be entertained by Company.

3.3 Parties, who do not have a User ID, can click on **Guest** login button in the E-portal to view and download the tender. **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.

3.4 Details of process for submission of Bid Security (EMD) through the online payment gateway are available in Vendor User Manual under E-Procurement Portal. (**Note:** Important Points for on-line Payment can be viewed at Oil India's website at **URL**: http://oil-india.com/pdf/ETenderNotification.pdf). **NOT APPLICABLE FOR THIS TENDER.**

3.5 The link to OIL's E-Procurement Portal has been provided through OIL's web site (www.oil-india.com).

4.0 Bid should be submitted online in OIL's E-Procurement site up to **11.00 AM (IST) (Server Time)** on the date as mentioned and will be opened on the same day at **2.00 PM (IST) (Server Time)** at the office of the CGM-Contracts in presence of the authorized representatives of the bidders.

5.0 The rates shall be quoted per unit as specified in the **"PRICE BIDDING FORMAT"** attached under **"Notes and Attachments"** tab. Bidder should note that no pricing information is furnished in the "**Technical Attachment**" (Un-priced Techno-Commercial Bid) otherwise the bid will be rejected.

6.0 (a) No Bidder can withdraw his bid within the validity or extended validity of the bid. In the event of withdrawal of any bid within validity period, Oil India Limited will suspend the bidder for a period of two years without conducting any enquiry.

b) Once a withdrawal letter is received from any bidder, the offer will be treated as withdrawn and no further claim / correspondence will be entertained in this regard.

7.0 Conditional bids are liable to be rejected at the discretion of the Company.

8.0 The bidders are required to furnish the composition and status of ownership of the firm in whose name bid documents have been purchased / issued along with one or more of the following documentary evidences (which are applicable to the bidder) in support of the same and scanned copies of the same should be uploaded along with the Un-priced Techno-Commercial Bid documents.

8.1 In case of Sole Proprietorship Firm, Copies of Telephone / Electricity / Mobile Bill, PAN card, latest Income Tax Return form indicating therein the name, business and residential address, E-mail and telephone numbers of the owner and GSTIN number.

8.2 In case of HUF, Copies of Telephone / Electricity / Mobile Bill, PAN card, latest Income Tax Return form, Family Arrangement indicating therein the name, residential address, E-mail and telephone numbers of the owners in general and Karta in particular and GSTIN number.

8.3 In case of Partnership Firm, Copies of Telephone / Electricity / Mobile Bill, PAN card, latest Income Tax Return form indicating therein the name, residential address, E-mail and telephone numbers of all the partners (including the Managing Partner), registered partnership agreement / deed and GSTIN number.

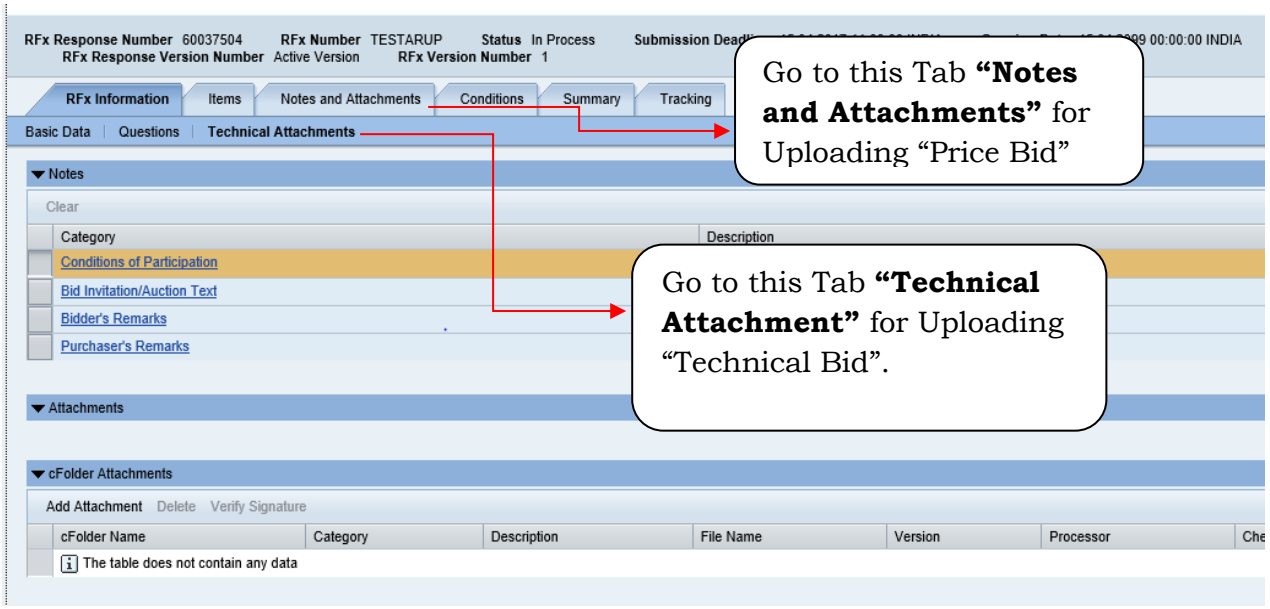
8.4 In case of Co-Operative Societies, Copies of Telephone / Electricity / Mobile Bill, PAN card, latest Income Tax Return form indicating therein the name, residential address, E-mail, and telephone numbers of all the Directors or persons who are at the helm of affairs, registration certificate from Registrar of Co-Operative Societies and GSTIN number.

8.5 In case of Societies registered under the Societies Registration Act, Copies of Telephone / Electricity / Mobile Bill, PAN card, latest Income Tax Return form indicating therein the name, residential address, E-mail and telephone numbers of all the Directors or persons who are at the helm of affairs, registration certificate from the Registrar of the state and GSTIN number.

8.6 In case of Joint Stock Companies registered under the Indian Companies Act, Copies of Telephone / Electricity / Mobile Bill, PAN card, latest Income Tax Return form indicating therein the name, residential address, E-mail and telephone numbers of all the Directors or persons who are at the helm of affairs, Certificate of Incorporation from the Registrar of Companies, Memorandum and Articles and GSTIN number.

8.7 In case of Trusts registered under the Indian Trust Act, Copies of Telephone / Electricity / Mobile Bill, PAN card, latest Income Tax Return form indicating therein the name, residential address, E-mail and telephone numbers of all the Trustee or persons who are at the helm of affairs, registration certificate from the Registrar of the state, Trust Deed and GSTIN number.

9.0 SCREEN SHOTS



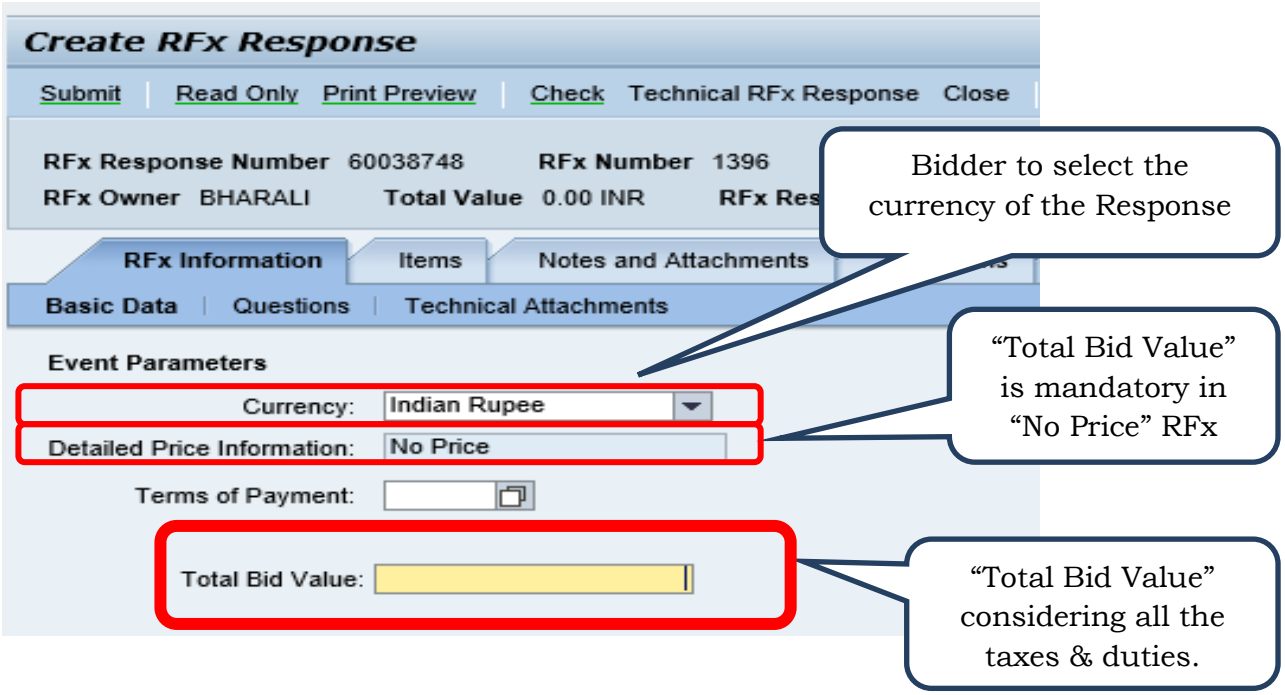
On "**EDIT**" Mode, bidders are advised to upload "**Technical Bid**" and "**Priced Bid**" in the respective places as indicated above:

Note:

* The "**Technical Bid**" shall contain all techno-commercial details **except the prices**.

** The "**Priced bid**" must contain the price schedule and the bidder's commercial terms and conditions, if any. For uploading Priced Bid, first 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.

10.0 **Maintenance of Total bid value in the Response:** For convenience of the Bidders and to improve transparency, the rates/costs quoted by bidders against the E-tender shall be available for online viewing after price bid opening to those bidders whose price bids have been opened in the system. For tenders where **Detailed Price Information under RFx Information Tab is "No price"**, the Price Bid is invited through attachment form under "Notes & Attachment". As per the existing process, Bidders must upload their pricing as per the "Price Bidding Format" under **"Notes & Attachment"**. Additionally, the bidders must fill up the **on-line field "Total Bid Value"** under Tab Page **"RFx Information"** with the Total Cost (Including the GST component) as per the amount of the Price Bid in attachment form.



The "Total Bid Value" as entered by the Bidder in the on-line response shall be displayed in the e-tender portal amongst the Techno-Commercially qualified bidders and Company will not take any responsibility whatsoever towards incorrect information furnished by the bidders in the "Total Bid Value" field.

It is to be noted that Amount mentioned in the "Total Bid Value" field will not be considered for bid evaluation and evaluation will be purely based on the "Price bidding Format".

11.0 The selected bidder will be required to enter into a formal contract, which will be based on their bid and OIL's Standard Form of Contract.

12.0 The successful bidder shall furnish a Performance Security Deposit for the amount as mentioned under **Clause 2.0 (xiii)** above and as indicated under **Para 24.0 of ITB/10.0 of GCC** before signing the formal contract. The Performance Security Deposit will be refunded to

the Contractor after satisfactory completion of the work, but a part or whole of which shall be used by the Company in realization of liquidated damages or claims, if any or for adjustment of compensation or loss due to the Company for any reason. This Security Money shall not earn any interest.

13.0 BACKING OUT BY L1 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.

14.0 FURNISHING FRAUDULENT INFORMATION/DOCUMENT: The information and documents furnish 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. The bidder has to submit an undertaking in this regard as per attached **PROFORMA-IX.**

15.0 PROVISION FOR ACTION IN CASE OF 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.

16.0 Time will be regarded as the essence of the Contract and the failure on the part of the Contractor to complete the work within the stipulated time shall entitle the Company to recover liquidated damages and/or penalty from the Contractor as per terms of the tender/contract.

17.0 The contractor will be required to allow OIL officials to inspect the work site and documents in respect of the workers' payment.

18.0 RESTRICTIONS ON PROCUREMENT FROM A BIDDER OF A COUNTRY WHICH SHARES LAND BORDER WITH INDIA: Subject to Order No. F. No. 6/18/2019-PPD dated 23.07.2020 issued by Ministry of Finance, Department of Expenditure, Public Procurement Division, Govt. of India, Bidders should take note of the following:

18.1 Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority [Registration Committee constituted by the Department for Promotion of Industry and Internal Trade (DPIIT)].

18.2 "Bidder" (including the term 'tenderer', 'consultant' or 'service provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency branch or office controlled by such person, participating in a procurement process.

18.3 "Bidder from a country which shares a land border with India" for the purpose of this Order means:

a. An entity incorporated, established or registered in such a country; or
b. A subsidiary of an entity incorporated, established or registered in such a country; or

c. An entity substantially controlled through entities incorporated, established or registered in such a country; or
d. An entity whose beneficial owner is situated in such a country; or
e. An Indian (or other) agent of such an entity; or
f. A natural person who is a citizen of such a country; or
g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above

18.4 The beneficial owner for the purpose of para 18.3 above will be as under:

18.4.1 In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has a controlling ownership interest or who exercises control through other means.

Explanation:

a. "Controlling ownership interest" means ownership of or entitlement to more than twenty-five per cent. of shares or capital or profits of the company;

b. "Control" shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;

18.4.2 In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;

18.4.3 In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;

18.4.4 Where no natural person is identified under (18.4.1) or (18.4.2) or (18.4.3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;

18.4.5 In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

18.5 An Agent is a person employed to do any act for another, or to represent another in dealings with third person.

18.6 The successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority. A declaration as per **Exhibit-I** in this respect to be submitted by the bidder.

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

18.8 The bidders to provide an undertaking as per **Exhibit-II** along with their bid complying with Clause No. 18.1 above. If such certificate given by a bidder whose bid is accepted is found to be false, this would be a ground for immediate termination and further legal action in accordance with law.

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

Thanking you.

Yours faithfully,
OIL INDIA LIMITED

(RITURAJ SARMAH)
Sr. MANAGER-CONTRACTS (S)
For **GM-CONTRACTS(HoD)**
For **RESIDENT CHIEF EXECUTIVE**

Date: 27.12.2022

INSTRUCTIONS TO BIDDERS (ITB)

1.0 ELIGIBILITY OF THE BIDDER:

1.1 The eligibility criteria of the bidder are listed under BID EVALUATION CRITERIA – BID REJECTION CRITERIA (BEC-BRC) of the tender document.

1.2 Bidder shall bear all costs associated with the preparation and submission of bid. Oil India Limited, hereinafter referred to as Company, will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

2.0 BID DOCUMENTS:

2.1 The services required, bidding procedures and contract terms are prescribed in the Bid Document. This Bid Document includes the following:

i. A Tender Forwarding Letter.
ii. Instructions to Bidders (ITB)
iii. Bid Evaluation Criteria - Bid Rejection Criteria (BEC-BRC) & ANNEXURE'S 1 to 4 of BEC-BRC
iv. General Conditions of Contract (GCC): PART-I
v. Schedule of Rate (SOR): PART-II
vi. Special Conditions of Contract (SCC) & : PART-III
vii. Section-I - Preamble Document
viii. Section-II - Civil and Structural Engineering
ix. Section-III - Mechanical Engineering and Plant Piping
x. Section IV - 813 MM Cross Country Underground Raw Water Pipeline (Length: 2.0 Km, Approx)
xi. Section V - Electrical Engineering
xii. Section VI – Instrumentation
xiii. Schedule of Company's Plants, Materials and Equipment (SCPME): PART-IV **[Not applicable for this Tender]**
xiv. Safety Measures (SM): PART–V
xv. Integrity Pact (IP): PART-VI
xvi. Bid Form: PROFORMA-I
xvii. Statement of Non-Compliance: PROFORMA-II
xviii. Authorisation for Attending Bid Opening: PROFORMA-III
xix. PROFORMA of Letter of Authority: PROFORMA-IV
xx. Bid Security (Bank Guarantee Format)-PROFORMA-V
xxi. PROFORMA for E-Remittance: PROFORMA-VI
xxii. Format of Performance Security: PROFORMA-VII
xxiii. Agreement Form: PROFORMA-VIII
xxiv. Format of undertaking by Bidders towards submission of authentic information / documents: PROFORMA–IX
xxv. Certificate of Compliance of Financial Criteria: PROFORMA–X
xxvi. Certificate of Annual Turnover & Net Worth: PROFORMA–XI
xxvii. Undertaking by vendor on submission of bank guarantee: PROFORMA–XII
xxviii. Format of BG towards Purchase Preference-Local Content: PROFORMA–XIII
xxix. Undertaking For Local Content- PROFORMA–XIV
xxx. Format for Hindrance Register: PROFORMA–XV
xxxi. Format For Undertaking from Third Party Inspection Agency – PROFORMA-XVI

xxxii. EXHIBIT – I & II
xxxiii. Price Bidding Format (Attached under "**Notes and Attachments**" tab in the main bidding engine of OIL's E-Tender portal)
xxxiv. Technical Evaluation Sheet for BEC-BRC & others
xxxv. Commercial check List

2.2 The bidder is expected to examine all instructions, forms, terms and specifications in the Bid Documents. Failure to furnish all information required in the Bid Documents or submission of a bid not substantially responsive to the Bid Documents in every respect will be at the Bidder's risk & responsibility and may result in the rejection of its bid.

2.3 Bidders shall be deemed, prior to submitting their bids, to have satisfied themselves about the weather conditions, working culture in the area, socio-political environment, safety & security aspects, law & order situation and law of the land, and obtain for themselves all necessary information as to the risks, contingencies and all other circumstances, which may influence or affect the various obligations under the Contract.

3.0 TRANSFERABILITY OF BID DOCUMENTS:

3.1 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.

3.2 In case of e-Tender, Bidder must submit the bid using Organizational Class-3 Digital Signature issued by the Competent Authority in favour of the bidder. Bid submitted using Digital Signature other than the Digital Signature of the bidder shall be summarily rejected.

3.3 Unsolicited bids will not be considered and will be rejected straightway.

4.0 AMENDMENT OF BID DOCUMENTS:

4.1 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(s) / Corrigendum(s) / Amendment(s).

4.2 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.**

5.0 PREPARATION OF BIDS:

5.1 Language of Bids: The bid prepared by the bidder and all correspondence and documents relating to the bid exchanged by the Bidder and the OIL shall be written in English language. Supporting documents and printed literature furnished by the Bidder may be in another language provided they are accompanied by an accurate translation of the relevant passages in English, duly authenticated by local chamber of Commerce of bidder's country, in which case, for purposes of interpretation of the bid, the translation shall prevail.

5.2 Bidder's / Agent's Name & Address: Bidders should indicate in their bids their detailed postal address including the Fax / Telephone / Cell Phone Nos. and E-mail address.

Similar information should also be provided in respect of their authorized Agents in India, if any.

5.3 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 of the following components:

(A) Technical Bid (to be uploaded in "Technical Attachments" tab):

a) Complete technical details of the services offered.
b) Documentary evidence established in accordance with Clause No. 8.0.
c) Bid Security (scanned) in accordance with Clause No. 9.0 hereunder. Original Bid Security should be sent as per Clause No. 9.2 (c) below.
d) Bid Form as per **PROFORMA-I**.
e) Statement of Non-compliance as per **PROFORMA–II**.
f) Integrity Pact, digitally signed by OIL's competent personnel as PART-VI.
g) **PROFORMA-IV** attached with the bid document to be signed by the bidder's authorized representative.
h) All other relevant Undertakings and PROFORMAS as applicable as part of Bid.

Note: No price should be mentioned in the Technical Bid being uploaded in "Technical Attachments" tab. If any price is mentioned by the bidder in their Technical bid, then their bid will be rejected straightway.

(B) Price Bid (to be uploaded in "Notes and Attachments" tab)

The Price Bid Format containing the prices along with the currency quoted and any other commercial information pertaining to the service offered.

6.0 BID FORM: The bidder shall complete the Bid Form and upload the same along with their technical bid.

7.0 BID PRICE:

7.1 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 Price Bidding format.

7.2 Prices quoted by the successful bidder must remain firm during performance of the Contract and must not be subject to variation on any account, except as otherwise mentioned in the bid document.

7.3 All duties (except customs duty which will be borne by the Company) and taxes (excluding GST) including Corporate Income Tax, Personal Tax, Assam Entry Tax etc. and other Cess / levies payable by the successful bidder under the Contract for which this Bid Document is being issued, shall be included in the rates, prices and total Bid Price submitted by the bidder and the evaluation and comparison of bids shall be made considering the quoted GST in the Price Bid Format. For example, personal taxes and / or any corporate taxes arising out of the profits on the contract as per rules of the country shall be borne by the bidder.

8.0 DOCUMENTS ESTABLISHING BIDDER'S ELIGIBILITY AND QUALIFICATIONS: These are listed in BEC-BRC of the tender documents.

9.0 BID SECURITY

9.1 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 9.8.

9.2 All the bids must be accompanied by Bid Security in Original as prescribed under, for the amount as mentioned in the "Forwarding Letter" of the tender documents:

a. The Bid Security may be submitted in the form of irrevocable Bank Guarantee (as per **PROFORMA-V**) issued by Nationalized or Scheduled Bank in favour of M/s Oil India Limited and payable at DULIAJAN. The Bank Guarantee must be on Non-Judicial Stamp Paper of requisite value as per Indian Stamp Act purchased in the name of Banker.

b. Alternately Bid Security can also be paid through Bank Draft/Cashier's Cheque/ Banker's Cheque/Fixed Deposit Receipt (Account OIL INDIA LIMITED)/irrevocable Letter of Credit/NEFT/RTGS/Electronic Fund Transfer through Online Payment Gateway of OIL's e-tender portal (subject to credit in OIL's account within prescribed time) to designated account of OIL.

i. If the Bid Security is submitted in the form of Bank Draft, Banker's Cheque, Cashier's Cheque, Fixed Deposit Receipt or Letter of Credit, the same should be in favour of "Oil India Limited" payable at Duliajan.

ii. Bid Security amount through NEFT or RTGS mode may be deposited on or before bid closing date and time to the following designated OIL's bank account:

	Bank Details of Beneficiary: OIL INDIA LIMITED	
a	Bank Name	STATE BANK OF INDIA
b	Branch Name	Duliajan
c	Branch Address	Duliajan, Dist.-Dibrugarh
d	Bank Account No.	**10494832599**
e	Type of Account	Current Account
f	IFSC Code	**SBIN0002053**
g	MICR Code	786002302
h	SWIFT Code	SBININBB479

iii. If the bid security is submitted through NEFT or RTGS mode, details such as **UTR No., Tender No., Bidder's name & Deposited Amount etc.** must be uploaded with the Unpriced Techno-Commercial Bid documents.

c. In case of Bidders submitting Bid Security in the form of Bank Guarantee/ Bank Draft/Cashier's Cheque/Banker's Cheque/Fixed Deposit Receipt/Letter of Credit, the original hard copy of Bid Security should reach the office of GM-CONTRACTS on or before **12.45 p.m. (IST)** on the bid closing / opening date otherwise bid will be rejected.

d. A scanned copy of Bid Security document should also be uploaded along with the Unpriced Techno-Commercial Bid documents.

e. This Bid Security Deposit shall be refunded to all unsuccessful bidders but is liable to be forfeited in full or part, at Company's discretion, as per **Clause No. 9.8** below. Bids without Bid Security Deposit in the manner specified above will be summarily rejected.

f. No other mode of payment will be accepted by the Company. The Bid Security shall not earn any interest to the bidder from the Company.

Note:

i. Bidders claiming waiver of Bid Security shall upload supporting documents as mentioned in **Para No. 10.0** below along with technical bid.

ii. Any offer not accompanied with the Bid Security shall be treated as invalid and summarily rejected unless the bidder is exempted from submission of Bid Security as per Bid Security Exemption Criteria of this tender and proper proof towards this exemption is submitted by the bidder. Any subsequent deposit of Bid Security after the bid closing date shall not be permitted. Also, adjustment of Bid Security due against the instant tender, against dues from the Company or on any account shall not be permitted.

9.3 Any bid not secured in accordance with sub-clause 9.2 above shall be rejected by the Company as non-responsive.

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

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

9.6 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 No. 24.0 below is furnished.

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

9.8 The Bid Security may be forfeited:

a. If the bidder withdraws the bid within its original / extended validity.

b. If the bidder modifies / revises their bid suo-moto within its original / extended validity.

c. If the bidder does not accept the contract.

d. If the bidder does not furnish Performance Security Deposit within the stipulated time as per tender / contract.

e. 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.

9.9 In case any bidder withdraws their bid during the period of bid validity, Bid Security will be forfeited, and the party shall be debarred as per the prevailing Banning Policy of the Company (OIL).

9.10 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.

9.11 The Bank Guarantee issuing bank branch must ensure the following:

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

(i) MT 760 / MT 760 COV for issuance of bank guarantee.

(ii) MT 760 / MT 767 COV for amendment of bank guarantee.

[Tender Number should reflect in the SFMS text under MT 760 / MT 760 COV]

The above message / intimation shall be sent through SFMS (indicating the Contract Number) by the BG issuing bank branch to ICICI BANK LTD., Duliajan Branch; IFS Code – ICIC0000213; SWIFT Code – ICICINBBXXX; Branch Address: Kunja Bhavan, Daily Bazaar, Duliajan, Dibrugarh, Assam – 786602.

	Bank Details of Beneficiary	
A	Bank Name	ICICI Bank Ltd.
B	Branch Name	Duliajan
C	Branch Address	Kunja Bhavan, Daily Bazaar, Duliajan, Dibrugarh, Assam – 786602
D	IFSC Code	ICIC0000213
E	Unique identifier code (Field 7037)	OIL503988890
F	Company name	Oil India Limited
H	SWIFT Code	ICICINBBXXX

10.0 EXEMPTION FROM SUBMISSION OF BID SECURITY: In case any bidder is exempted from paying the Bid security, they should upload the supporting documents along with their technical bid. The detailed guidelines for exemption of the Bid security are given below.

a) MSEs Units (manufacturers / Service Providers only and not their dealers / distributors) are eligible for exemption of Bid Security.

b) Central Government Departments and Central Public Sector Undertakings (CPSUs) are also exempted from submitting bid security.

Note: Bids without EMD shall be rejected, if the technical offer does not include a valid copy of relevant Document/Certificate towards exemption of EMD, issued by appropriate authority.

c) Documentation required to be submitted by MSEs: **Refer Clause No. 32.0 below.**

11.0 PERIOD OF VALIDITY OF BIDS

11.1 Bids shall remain valid as per the requirement mentioned in forwarding letter 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.

11.2 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. A Bidder may refuse the request. A Bidder granting the request will neither be required nor permitted to modify their Bid.

12.0 SIGNING & SUBMISSION OF BIDS:

12.1 Signing of bids:

12.1.1 Bids are to be submitted online through OIL's E-procurement 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)] 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 Bidder's Name in the "Organization Name" field are only acceptable. Digital Signature Certificate having "Organization Name" field other than Bidder's Name shall be rejected summarily.

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.

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.

12.1.2 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 Authority (as per **PROFORMA-IV**) shall be indicated by written Power of Attorney accompanying the Bid.

12.1.3 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 initialed by the person or persons who has / have digitally signed the Bid.

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

12.2 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-procurement 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 is available in "User Manual" 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 Price Bid Format and should be uploaded as 'Attachment' under "Notes & Attachments" Tab. No price should be given in the "Technical Attachment", otherwise bid shall be rejected. The priced bid submitted in physical form shall not be considered. However, the following documents in one set should necessarily be submitted in physical form in sealed envelope super-scribing the Tender no., Brief Description of services and Bid Closing/Opening date & Time along with the bidder's name and should be submitted to GM-Contracts, Oil India Ltd., Duliajan-786602 (Assam) on or before 12.45 Hrs (IST) on the bid closing date indicated in the IFB:

a) Printed catalogue and literature if called for in the bid document.

b) Any other document required to be submitted in original as per bid document.

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

12.2.1 All the conditions of the contract to be made with the successful bidder are given in various Sections of the Bid Document. Bidders are requested to state their non-compliance to each clause as per PROFORMA-II of the bid document and the same should be uploaded along with the Technical Bid.

12.2.2 Timely delivery of the documents in physical form as stated in Para 12.2 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.

12.2.3 Bids received through the e-procurement portal shall only be accepted. Bids received in any other form shall not be accepted.

13.0 DEADLINE FOR SUBMISSION OF BIDS:

13.1 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.

13.2 No bid can be submitted after the submission deadline is reached. The system time displayed on the e-procurement web page shall decide the submission deadline.

13.3 The documents in physical form as stated in Para 12.2 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.

14.0 LATE BIDS: Bidders are advised in their own interest to ensure that their bids are uploaded in system much 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.

15.0 MODIFICATION AND WITHDRAWAL OF BIDS:

15.1 The Bidder after submission of Bid may modify or withdraw its Bid prior to Bid Closing Date & Time in the e-portal using Digital Signature by the person or persons who has /

have digitally signed the Bid. Withdrawal or modification of bid through physical correspondence shall not be considered and accepted.

15.2 No Bid can be modified or withdrawn subsequent to the deadline for submission of Bids.

15.3 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 by a Bidder shall be debarred from participation in future tenders of OIL.

16.0 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.

17.0 BID OPENING AND EVALUATION:

17.1 Company will open the Bids, including submission made pursuant to Clause 12.2, in presence of Bidder's representatives who choose to attend at the date, time and place mentioned in the Forwarding Letter. However, an authorization letter (as per **PROFORMA-III**) 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.

17.2 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.

17.3 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.

17.4 Bids which have been withdrawn pursuant to **Clause 15.0** 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.

17.5 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.

17.6 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.

17.7 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.

17.8 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.

17.9 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.

18.0 OPENING OF PRICED BIDS:

18.1 In case of composite bid system, Price bids will be opened on the scheduled bid closing date itself.

18.2 In case of two-bid system, 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.

18.3 In case of any unscheduled holiday or Bandh on the Priced Bid Opening Date, the Bids will be opened on the next working day.

18.4 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.

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.

19.0 EVALUATION AND COMPARISON OF BIDS: The Company will evaluate and compare the bids as per BEC-BRC of the Tender Documents.

19.1 Discounts / rebates:

19.1.1 Unconditional discounts / rebates, if any, given in the bid will be considered for evaluation.

19.1.2 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.

20.0 CONTACTING THE COMPANY:

20.1 Except as otherwise provided in **Clause 17.0** above, 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 except as required by Company vide sub-clause 17.6.

20.2 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.

21.0 AWARD OF CONTRACT:

21.1 **Award criteria:** The Company will award the Contract to the successful Bidder as per the evaluation criteria mentioned under BEC-BRC of the tender document, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.

22.0 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 thereby incurring any liability to the affected bidder, or bidders or any obligation to inform the affected bidder of the grounds for Company's action.

23.0 NOTIFICATION OF AWARD:

23.1 Prior to the expiry of the period of bid validity or extended validity, Company will notify the successful Bidder in writing by registered letter or by fax or E-mail (to be confirmed in writing by registered / couriered letter) that its Bid has been accepted.

23.2 The notification of award will constitute the formation of the Contract.

23.3 Upon the successful Bidder's furnishing of Performance Security pursuant to Clause 24.0 below, the Company will promptly notify each un-successful Bidder.

24.0 PERFORMANCE SECURITY: Successful bidder has to submit Performance Security amount as mentioned in Forwarding Letter, within fifteen (15) days from the date of issue of Letter of Award (LOA).

24.1 a. The Performance Security should be submitted in the form of irrevocable Bank Guarantee (as per **PROFORMA-VII**) issued by Nationalized or Scheduled Bank in favour of M/s Oil India Limited and payable at DULIAJAN. The Bank Guarantee must be on Non-Judicial Stamp Paper of requisite value as per Indian Stamp Act purchased in the name of Banker. A duly filled undertaking towards details of the BG (as per **PROFORMA-XII**) must also be submitted along with the original BG.

b. Alternately, the Performance Security can also be paid through Bank Draft / Cashier's Cheque / Banker's Cheque / Fixed Deposit Receipt (Account OIL INDIA LIMITED) / irrevocable Letter of Credit / NEFT / RTGS (subject to credit in OIL's account within prescribed time) to designated account of OIL.

i. If the Performance Security is submitted in the form of Bank Draft, Banker's Cheque, Cashier's Cheque, Fixed Deposit Receipt or Letter of Credit, the same should be in favour of "Oil India Limited" payable at Duliajan.

ii. Performance Security amount through NEFT or RTGS mode may be deposited on or before bid closing date and time to the following designated OIL's bank account:

Bank Details of Beneficiary: OIL INDIA LIMITED		
a	Bank Name	STATE BANK OF INDIA
b	Branch Name	Duliajan
c	Branch Address	Duliajan, Dist-Dibrugarh
d	Bank Account No.	**10494832599**
e	Type of Account	Current Account
f	IFSC Code	**SBIN0002053**
g	MICR Code	786002302
h	SWIFT Code	SBININBB479

iii. If the Performance security is submitted through NEFT or RTGS mode, the bidder shall submit details such as **UTR No., Contract No., Bidder's name & Deposited Amount etc.**

c. In case of Bidders submitting Performance Security in the form of Bank Guarantee/Bank Draft/Cashier's Cheque/Banker's Cheque/Fixed Deposit Receipt/Letter of Credit, the original hard copy of Performance Security shall be submitted within the time frame as stipulated in the LOA.

d. No other mode of payment other than the mode covered under Point Nos. a. & b. will be accepted by the Company.

24.2 Performance Security shall not accrue any interest during its period of validity or extended validity.

24.3 The Bank Guarantee issuing bank branch must ensure the following:

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

(i) MT 760/MT 760 COV for issuance of bank guarantee.
(ii) MT 760/MT 767 COV for amendment of bank guarantee.
[Tender Number should reflect in the SFMS text under MT 760/MT 760 COV]

The above message/intimation shall be sent through SFMS by the BG issuing Bank branch to ICICI BANK LTD., Duliajan Branch; IFS Code – ICIC0000213; SWIFT Code – ICICINBBXXX; Branch Address: Kunja Bhavan, Daily Bazaar, Duliajan, Dibrugarh, Assam – 786602. The Bank details are as under:

	Bank Details of Beneficiary	
A	Bank Name	ICICI Bank Ltd.
B	Branch Name	Duliajan
C	Branch Address	Kunja Bhavan, Daily Bazaar, Duliajan, Dibrugarh, Assam – 786602
D	IFSC Code	ICIC0000213
E	Unique identifier code (Field 7037)	OIL503988890
F	Company name	Oil India Limited
H	SWIFT Code	ICICINBBXXX

24.4 This Performance Security must be valid for **90 (Ninety) days** after the date of expiry of the contract period / defect liability period (if any). In the event of contract being extended within the provisions of the contract agreement, the contractor will have to extend suitably the validity of the "Security Deposit" for the extended period.

24.5 The Performance Security Deposit will be refunded to the Contractor after **90 (Ninety) days** of satisfactory completion of works / defect liability period (if any) under the contract (including extension, if any), but a part or whole of which shall be used by the Company in realization of liquidated damages or claims, if any or for adjustment of compensation or loss due to the Company for any reason.

25.0 SIGNING OF CONTRACT:

25.1 At the same time as the Company notifies the successful Bidder that its Bid has been accepted, the Company will either call the successful Bidder for signing of the agreement or send the Contract Form provided in the Bid Documents, along with the General & Special Conditions of Contract, Technical Specifications, Schedule of Rates incorporating all agreements agreed between the two parties.

25.2 The successful Bidder shall sign and date the contract and return it to the Company after receipt of LOA. Till the contract is signed, the LOA issued to the successful bidder shall remain binding amongst the two parties.

25.3 In the event of failure on the part of the successful Bidder to sign the contract, OIL reserves the right to terminate the LOA issued to the successful Bidder and invoke the Performance Security if submitted by the successful Bidder. In case the Bidder fails to sign the contract or submit the Performance Security within the stipulated time as defined in the tender document, Oil India Limited will suspend the Bidder for a period of two years without conducting any enquiry.

26.0 CREDIT FACILITY: Bidders should indicate clearly in the Bid about availability of any credit facility inclusive of Government to Government credits indicating the applicable terms and conditions of such credit.

27.0 MOBILIZATION AND ADVANCE PAYMENT:

27.1 Request for advance payment shall not be normally considered. However, depending on the merit and at the discretion of the Company, advance against mobilization charge may be given at an interest rate of 1% above the prevailing Bank rate (CC rate) of SBI from the date of payment of the advance till recovery / refund.

27.2 Advance payment 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 covering the period of advance. Bank guarantee shall be valid for 2 months beyond completion of mobilization and the same may be invoked in the event of Contractor's failure to mobilize as per agreement.

27.3 In the event of any extension to the mobilization period, Contractor shall have to enhance the value of the bank guarantee to cover the interest for the extended period and also to extend the validity of bank guarantee accordingly.

28.0 GOODS AND SERVICES TAX:

28.1 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.

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

28.2 Bidder should also mention the **Harmonised System of Nomenclature (HSN)** and **Service Accounting Codes (SAC)** at the designated place in the Price Bid Format.

28.3 **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.

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

28.4 **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. 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.

The bids will be evaluated based on total price including **GST**.

28.5 It is the responsibility of the bidder to quote the correct GST rate. The classification of goods / services 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 the OIL on account of any error on the part of the contractor.

28.6 Further, it is the responsibility of the bidders to make all possible efforts to make their accounting / IT system GST compliant in order to ensure availability of Input Tax Credit (ITC) to Oil India Ltd.

28.7 GST liability, if any, on account of supply of free samples against any tender shall be to bidder's account.

28.8 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.

28.9 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.

28.10 Procurement of Specific Goods: Earlier, there is no tax incidence in case of import of specified goods (i.e. the goods covered under List-34 of Customs Notification no. 12/2012-Cus dated. 17.03.2012 as amended). Customs duty is not payable as per the

policy. However, under GST regime, IGST Plus GST compensation cess (if applicable) would be leviable on such imports. Bidders should quote GST as inclusive considering IGST component for the imported Materials portion while quoting their prices on destination basis. However, GST rate to be specified in the price bid format.

28.11 The Supplier of Goods / Services may note the Anti-profiteering Clause (Clause No. 12.5) of Part-I GCC and quote their prices accordingly.

28.12 In case the GST rating of bidder on the GST portal / Govt. official website is negative / black listed, then the bid may be rejected by OIL.

29.0 INTEGRITY PACT:

29.1 OIL shall be entering into an Integrity Pact with the Bidders as per format enclosed vide PART-VI of the Bid Document. The Integrity Pact has been duly signed digitally by OIL's competent signatory and uploaded in the OIL's e-portal. The Integrity Pact shall be returned by the bidder (along with the technical Bid) duly signed by the same signatory who signed the Bid i.e. who is duly authorized to sign the Bid. Uploading the Integrity Pact in the OIL's E-portal with digital signature will be construed that all pages of the Integrity Pact has been signed by the bidder's authorized signatory who has signed the bid. If any bidder refuses to sign Integrity Pact or declines to submit the Integrity Pact, their bid shall be rejected straightway.

29.2 In case of a joint venture, all the partners of the joint venture should sign the Integrity pact;

29.3 In the event of any dispute between the management and the contractor relating to those contracts where Integrity Pact is applicable, in case, both the parties are agreeable, they may try to settle dispute through mediation before the panel of Independent External Monitors (IEMs) in a time bound manner. If required, the organizations may adopt any mediation rules for this purpose. In case, the dispute remains unresolved even after mediation by the panel of IEMs, the organization may take further action as per the terms and conditions of the contract

29.4 OIL has appointed Shri Sutanu Behuria, IAS (Retd.), Shri Om Prakash Singh, IPS (Retd.) and Dr. Tejendra Mohan Bhasin, Former Vigilance Commissioner, CVC as Independent External Monitors (IEM) for a period of 03 (Three) years to oversee implementation of Integrity Pact in OIL. Bidders may contact the Independent External Monitors for any matter relating to the Integrity Pact at the following addresses:

a. Shri Sutanu Behuria, IAS (Retd.),
E-mail ID: sutanu2911@gmaiI.com

b. Shri Om Prakash Singh, IPS (Retd.), Former DGP, Uttar Pradesh,
E-Mail ID: Ops2020@rediffmail.com

c. Shri Dr. Tejendra Mohan Bhasin, Former Vigilance Commissioner, CVC
Email ID: tmbhasin@gmail.com

30.0 LOCAL CONDITIONS:

It is imperative for each Bidder to be fully informed themselves of all Indian as well as local conditions, factors and legislation which may have any effect on the execution of the work covered under the Bidding Document. The bidders shall be deemed, prior to submitting their bids to have satisfied themselves of all the aspects covering the nature

of the work as stipulated in the Bidding Document and obtain for themselves all necessary information as to the risks, contingencies and all other circumstances, which may influence or affect the various obligations under the Contract.

No request will be considered for clarifications from the Company (OIL) regarding such conditions, factors and legislation. It is understood and agreed that such conditions, factors and legislation have been properly investigated and considered by the Bidders while submitting the Bids. Failure to do so shall not relieve the Bidders from responsibility to estimate properly the cost of performing the work within the provided timeframe. Company (OIL) will assume no responsibility for any understandings or representations concerning conditions made by any of their officers prior to award of the Contract. Company (OIL) shall not permit any Changes to the time schedule of the Contract or any financial adjustments arising from the Bidder's lack of knowledge and its effect on the cost of execution of the Contract.

31.0 SPECIFICATIONS: Before submission of Bids, Bidders are requested to make themselves fully conversant with all Conditions of the Bid Document and other relevant information related to the works / services to be executed under the contract.

32.0 DOCUMENTS REQUIRED TO BE SUBMITTED BY MSE BIDDERS:

Categorization and various criteria applicable to MSE bidders shall be guided by the Gazette Notification No. CG-DL-E-26062020-220191 dated 26.06.2020.

The bidder claiming the MSE status (MSE-General, MSE-SC/ST, MSE-Woman) against this tender must submit the following documents along with the technical bid for availing the benefits applicable to MSEs.

i. Udyam Registration Number with Udyam Registration Certificate.

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

*****END OF ITB*****

BID EVALUATION CRITERIA (BEC)/BID REJECTION CRITERIA (BRC)

BID EVALUATION CRITERIA (BEC):

The bid shall conform to the specifications and terms and conditions given in the Bidding Documents. Bids will be rejected in case material and services offered do not conform to the required parameters stipulated in the technical specifications. Notwithstanding the general conformity of the bid to the stipulated specifications, the following requirements will have to be particularly met by the Bidders without which the same will be considered as non-responsive and will not be considered for evaluation. All the documents related to BEC shall be submitted along with the Technical Bid.

1.0 ELIGIBILITY CRITERIA

The bidder must be incorporated/constituted in India and must maintain equal to or more than 20% local content (LC) for the offered services to be eligible to bid against this tender. Regarding calculation of local content and submission of documents during bidding & execution of contracts, provision of Purchase preference under Public Procurement (Preference to Make in India) Order, 2017 of Department for Promotion of Industry and Internal Trade (DPIIT), Govt. of India and as amended time to time with modifications as notified vide MoPNG Order No. FP-20013/2/2017-FP-PNG-Part (4) (E-41432) dated 26th April 2022 (including subsequent amendments thereof, if any) shall be applicable.

If such local content is not maintained during execution of contract, OIL reserves the right to invoke the Performance Securities submitted by the bidding and supporting companies, in addition to resorting to other options as may be deemed appropriate.

Whether or not the bidders want to avail PPP-MII benefit against this tender, it is mandatory for them to meet the following at the bidding stage:

(a) Without specifying the unit rates and bid amount in the technical bid, the bidder must specify the **percentage (%) of local content** in their bid as per format prescribed in **PROFORMA-XIV (duly signed & sealed by the Power of Attorney holder),** without which the bid may be rejected being non-compliant. Such undertaking shall become a part of the contract, if awarded.

(b) The aforesaid undertaking of the bidder shall also be supported by a certificate from the statutory auditor or cost auditor of the company (in case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of other than companies) giving the percentage of local content as mandated under Public Procurement (Preference to Make in India) Order, 2017 (as amended time to time).

(c) Alongwith the technical bid, bidder must submit a copy of their Certificate of Incorporation/Registration or any other valid document(s) which substantially establishes its constitution in India.

2.0 TECHNICAL EVALUATION CRITERIA:

2.1 Experience: The bidder should have experience of successful completion of at least One (01) '**SIMILAR WORK'** of minimum capacity 2.5 MGD (Million Gallons per Day) for Potable Water/ Water Distribution/ Irrigation /Water Management Projects in India in previous 10 (Ten) years to be reckoned from the original bid closing date.

The Unit of Measurement is Imperial Gallons, i.e.: 1 Gallon = 4.54 Liters.

Note to BEC-BRC Clause No. 2.1

(a) **'SIMILAR WORK'** mentioned above means "Construction, Installation, Commissioning of Water Sourcing/Intake Plant executed in EPC/LSTK Mode. The job experience should involve execution of all the requisite jobs for Construction, Installation, Commissioning of the Water Sourcing /Intake Plant."

(b) If the experience of the Bidder involves Multiple Sources contributing to a single Water Sourcing /Intake Plant and the same conforms to the definition of the '**SIMILAR WORK**' as defined above, the same shall also be considered.

2.2 **Engineering And Design Capability:** The bidder should have their in-house Engineering and Design Team, or they may hire/outsource the Engineering and Design part of the Project.

Note:

(i) If the bidder has in-house Engineering and Design Team, then the Key Personnel/ Domain Experts of the team should have minimum 02 Years of Experience or should have associated with minimum 03 Projects involving Engineering and Design. The CVs of Key Personnel/ Domain Experts of the in-house Engineering and Design Team, endorsed by the authorized signatory, must be submitted along with the bid.

(ii) If the bidder proposes to hire/outsource the Engineering and Design part of the Project, then an agreement in this regard between the bidder and proposed Design Agency/Firm/Party must be submitted alongwith the bid. Furthermore, the proposed Design Agency/Firm/Party should have executed projects involving Engineering and Design. Documentary evidence in this regard must be submitted alongwith the bid.

2.3 Bidders must provide an undertaking **(as per Annexure-1 to BEC-BRC)** along with their bid confirming that they shall comply to the requirement 'EPC Contractor's Personnel and Office' as detailed under Clause No: 12 of Section -I: Preamble Document. The CVs of key personnel, endorsed by authorized signatory, as mentioned in the said clause should also be submitted alongwith the bid.

2.4 Contractor will have to provide an undertaking **(as per Annexure-2 to BEC-BRC)** that the list of manpower earmarked for the project will be associated with the project till project completion and in case of inevitable situation the replacement shall be made by personnel of equivalent experience or more, with approval of client (OIL).

2.5 Completion period for the Main LSTK-EPC work is 18 months from completion of mobilization period. Offers without confirmation of Completion period for the Main LSTK-EPC work of 18 Months or with Completion period for the Main LSTK-EPC work more than 18 Months shall NOT be accepted. An undertaking in this regard **(as per Annexure-3 to BEC-BRC)** to be submitted by the Bidder along with the Bid.

2.6 During the tenure of main LSTK-EPC work of 18 Months from completion of mobilization period, OIL will be engaging a PMC contractor for assisting OIL in project execution and monitoring the project. Since PMC Contractor will be engaged by OIL for the entire duration of main LSTK-EPC work, therefore in the event of failure on the part of EPC contractor to complete the main LSTK-EPC work on time i.e., 18 months from completion of mobilization period, the extra expenditure on PMC Contractor towards the extended period [attributable to EPC Contractor] will be recovered from the EPC Contractor. Bidders must provide an undertaking **(as per Annexure-4 to BEC-BRC)** along with their bid confirming the same.

3.0 BID FROM JOINT VENTURE COMPANY

3.1 In case the bidder is a Joint Venture Company, must be registered in India and incorporated under the Companies Act 1956 and any amendment there under and complying to **Clause No. 1.0**, can participate in the tender and should meet the technical qualification requirements as under:

(i) The JV on its own shall meet the experience criteria as per Clause No. 2.1

or

(ii) Any member of the JV having a stake of at least 26% in the JV on its own shall meet experience requirement as per Clause No. 2.1.

Note:

a. In case of (ii) above, **an undertaking** from the Joint Venture partner, based on whose experience the JV seek qualification, shall be submitted with the techno commercial bid stating that they shall maintain minimum 26% shareholding in the JV till the execution of the contract.

b. The JV or its member (as the case may be) shall not rely on the experience of its supporting company/ subsidiary/ co-subsidiary/ sister subsidiary/parent/ holding/ affiliating/ associate company or through any other arrangement like technical collaborator for meeting the technical criteria.

3.2 **Constitution of Joint Venture**: The members of the JV should not be more than three. If during evaluation of bid, a JV leader proposes any alterations/changes in the constitution or replacement or inclusion or expulsion of any partner(s)/member(s) of the Joint Venture which had originally submitted the bid, to drive some advantages/benefits based on any development(s) having come to his knowledge at any time, the bid of such a JV shall be liable for rejection.

3.3 **Indian companies/ Joint Venture companies (Incorporated JV): -** Indian bidders whose proposal for Joint Venture involves foreign equity participation or payment of royalty and/ or lumpsum for technical know-how and wherever Govt. approval is necessary, are required to submit copy of Govt. approval, on their application submitted to Secretariat for Industrial Assistance (SIA) (Government of India, Ministry of Industry, prior to the date price bid opening. Confirm to this effect and declaration on the same to be provided as part of their technical offer.

3.4 Members of the JV are not allowed to quote separately/independently against this tender. All the bids received in such case shall be summarily rejected. Further, all bids from parties with technical support from the same Principal shall be rejected.

4.0 DOCUMENTS TO BE SUBMITTED BIDDER FOR PROOF EXPERIENCE

1. For proof of requisite Experience (refer Clause No. 2.1), the following documents must be submitted along with the bid:

   A. Contract document or LoA or Workorder showing details of work.

   B. Completion certificate(s) or Final Payment certificate(s) or any other document(s) for the above contract, which substantiate the successful execution of work.

   The submitted document(s) must contain the following:

   (i) Nature of job done
   (ii) Contract No. / Workorder No.
   (iii) Gross Value/quantity of Work Done.
   (iv) Contract period and date of completion.

C. The Bidder must furnish the Complete Communication details of the End User (Owner of the Plant) (w.r.t. Clause No. 2.1.) comprising of the followings:

(i) Postal Address.
(ii) Contact e-mail ID
(iii) Mobile Phone No

General Notes:

(i) OIL reserves the right to ask the bidder to furnish exact Geographical Co-Ordinates (Longitude & Latitude) and Site Photographs of the location of the job submitted as requisite Experience (w.r.t. Clause No. 2.1) duly endorsed by the End User (Owner of the Plant) for further evaluation.

(ii) OIL might depute representative (either OIL's own personnel or any other party authorized by OIL) for site visit of the location of the job submitted as requisite Experience (w.r.t. Clause No. 2.1).

2. Only Letter of Intent (LOI)/Letter of Award (LOA) or Work Order(s) shall not be accepted as evidence i.e., mere award of contract(s) will not be counted towards experience. Successful completion of the awarded contract(s) to the extent of value/volume, as stipulated respectively under Clause No. 2.1 will only be treated as acceptable experience.

3. In case requisite experience is against OIL's Contract, bidder shall only be required to categorically specify OIL's Contract Number and date to consider the experience.

4. If the prospective bidder has executed a contract in which similar work is a component of the contract, then such work experience will also be taken into consideration.

- In case the document submitted as per Point No. 1 above, are not sufficient to establish the value and/or quantity and period of the similar work against Point No. 5, above the bidder shall also have to submit the breakup of the works executed under such contract(s) clearly indicating the value and/or quantity and period of SIMILAR work which should be certified by the end user or a certificate issued by a practicing Chartered/ Cost Accountant Firm (with Membership Number & Firm Registration Number).

5. SIMILAR work executed by a bidder for its own organization/subsidiary cannot be considered as experience for the purpose of meeting BEC.

6. The documents establishing experience of the JV or its member (as the case may be) shall be submitted as per Point No. 1/4 above.

NB: Any documents submitted in languages other than English must have to be accompanied by a Notarized translation of the same to English.

5.0 FINANCIAL EVALUATION CRITERIA: The following financial parameters shall have to be met by the bidder

Sl. No	**Parameter**	**Financial Criteria**
1	Annual Financial Turnover	**Annual Financial Turnover** of the bidder from operations during any of preceding 03 (Three) financial/accounting years from the original bid closing date should be minimum **₹ 9,96,10,300.00** (Rupees Nine Crore Ninety-Six Lakh Ten Thousand and Three Hundred) only as per the Audited Annual Reports.

		Note: **Annual Financial Turnover** of the bidder from operations shall mean: "Aggregate value of the realisation of amount made from the sale, supply or distribution of goods or on account of services rendered, or both, by the company (i.e., bidding entity, as the case may be) during a financial year" as per the Companies Act, 2013 Section 2 (91).
2	Net worth	Net Worth of the bidder should be minimum **₹ 2,98,83,100.00** (Rupees Two Crore Ninety-Eight Lakh Eighty-Three Thousand and One Hundred) only as per immediate preceding audited financial year result. Net worth shall mean: " the aggregate value of the paid-up share capital and all reserves created out of the profits and securities premium account, after deducting the aggregate value of the accumulated losses, deferred expenditure and miscellaneous expenditure not written off, as per the audited balance sheet, but does not include reserves created out of revaluation of assets, write-back of depreciation and amalgamation."
3	Working Capital	The Bidder should have minimum working capital equal to **₹ 2,98,83,100.00** (Rupees Two Crore Ninety-Eight Lakh Eighty-Three Thousand and One Hundred) only as per immediate preceding audited financial year result. Note: Working Capital shall mean "Current Assets minus Current liabilities" as per latest year's audited consolidated annual Financial Statements.
4	Bid Capacity	The bidding capacity of the contractor should be equal to or more than **₹ 19,92,20,600.00** (Rupees Nineteen Crore Ninety-Two Lakh Twenty Thousand and Six Hundred) only. The bidding capacity shall be worked out by the following formula: Bidding Capacity = [A x 1.5] - B Where, A = Maximum annual turnover in any one of the preceding three financial years B = Commitments in next twelve months from the date of expiry of the bid validity as per enclosed format for **ANNEXURE-7.**
5	Debt equity Ratio	Debt equity ratio of the bidder should not be more than 2:1. Debt equity ratio shall mean long term borrowings/ Net-worth.

Notes to BEC-BRC Clause No. 5.0

1) For proof of Annual Turnover & Net worth any one of the following documents must be submitted along with the bid:

(i) A certificate* issued by a practicing Chartered / Cost Accountant (with Membership Number and Firm Registration Number), certifying the Annual turnover & Net worth as per format prescribed in **PROFORMA-XI**

Or

(ii) Audited Balance Sheet along with Profit & Loss account.

*Note:

- Mention of UDIN (Unique Document Identification Number) is mandatory for all Certificates issued w.e.f. February 1, 2019 by Chartered Accountant in Practice.
- 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 of India and the Central Government, their certificates may be accepted even though FRN is not available. However, bidder to provide documentary evidence for the same.

2) Considering the time required for preparation of Financial Statements, if the last date of preceding financial / accounting year falls within the preceding six months/ within the due date for furnishing of audit report as per Section 139(1) of IT Act, 1961 (read along with latest circulars/notifications issued by CBDT from time to time) 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 must submit an affidavit / undertaking certifying that the balance sheet / Financial Statements for the financial year _____ have actually not been audited so far, as per format prescribed in **PROFORMA-X**

3) In case the bidder is a Government Department, they are exempted from submission of documents mentioned under Para **1** and **2** above.

4) For proof of Working capital and Debt equity ratio bidder must submit Audited Balance Sheet along with Profit & Loss account of immediate preceding audited financial year result alongwith the bid.

5) In case the working capital is short the bidder can supplement the same through line of credit from a scheduled commercial bank having net worth more than 100 Crores as per enclosed format. **[ANNEXURE-6.]**

6) **In case of Incorporated Joint Venture:** In case the bidder is an Incorporated Joint Venture company**,** who does not meet financial criteria by itself, in that case they can submit bid based on the financial strength of its member having more than 50% stake (supporting company) in the JV. In such case the bidder shall have to submit the following documents along with the technical bid:

(i) **Corporate Guarantee (as per Annexure-5)** on the letter head of the member having more than 50% stake in the JV signed by an authorized official undertaking that they would financially support the Joint Venture for executing the project / job in case the same is awarded to them, and

(ii) Documents to substantiate that the member has more than 50% stake in the JV company.

a) A certificate from the statutory Auditor of the bidding company as well as of the supporting company to establish the relationship and equity percentage holding between bidding company and the supporting company. The certificates should be duly certified by the Company Secretary or one of the Directors of the company concerned.

b) The above certificate should not be more than 30 days old as on the original bid closing date.

7) OIL reserves the right to ask for any Original or other relevant document to verify the certification.

6.0 COMMERCIAL EVALUATION CRITERIA

6.1 Bids are to be submitted under Single-Stage Two-Bid System i.e., Un-priced Techno-Commercial Bid and Price Bid in their respective fields in e-tender portal. Only the Price Bid should contain the quoted price.

6.2 The price quoted by the successful bidder must be firm during the performance of the contract and not subject to variation on any account except as mentioned in the bid document. Any bid submitted with adjustable price quotation other than the above will be treated as non-responsive and rejected.

6.3 **Bid security** shall be furnished as a part of the Techno Commercial Un-priced Bid. The amount of bid security should be as specified in the forwarding letter. Any bid not accompanied by a proper bid security will be rejected

6.4 Bid Documents / User Id & Password for OIL's E-Tender portal are not transferable.

6.5 Any bid received in the form of Physical document/ Telex/ Cable/ Fax/ E-mail will not be accepted.

6.6 Bids shall be typed or written in indelible ink. The bidder or his authorized representative shall sign the bid digitally, failing which the bid will be rejected.

6.7 Bids shall contain no interlineations, erasures or overwriting except as necessary to correct errors made by bidder, in which case such corrections shall be initiated by the persons(s) signing (digitally) the bid. However, white fluid should not be used for making corrections. Any bid not meeting this requirement shall be rejected.

6.8 Any bid containing false statement will be rejected and action will be taken by Company as per Bid Document.

6.9 Bids are invited under **Single-Stage Two-Bid System**. Bidders must submit both "Technical" and "Price" Bids in electronic form through online OIL's e-Tender portal accordingly within the Bid Closing Date and time stipulated in the e-Tender. The Technical Bid is to be submitted as per Scope of Work & Technical Specifications of the tender under **"Technical Attachment"** Tab and the Priced Bid as per the PRICE BID FORMAT attached under **"Notes and Attachments".**

6.10 Bidder must accept and comply with the following provisions as given in the Tender Document in toto, failing which offer will be rejected:

(i) Firm price
(ii) EMD/Bid Security/Bid Bond
(iii) Period of validity of Bid
(iv) Price Schedule
(v) Performance Bank Guarantee / Security deposit
(vi) Delivery / Completion Schedule
(vii) Scope of work
(viii) Guarantee of material / work
(ix) Liquidated Damages clause
(x) Tax liabilities

(xi) Arbitration / Resolution of Dispute Clause
(xii) Force Majeure
(xiii) Applicable Laws
(xiv) Specifications
(xv) Integrity Pact

6.11 There should not be any indication of price in the Un-priced Techno-Commercial Bid. A bid will be straightway rejected if this is given in the Un-priced Techno-Commercial Bid.

6.12 Bid received with validity of offer less than **120 (One Hundred Twenty) days** from Bid Closing Date.

6.13 The Integrity Pact is applicable against this tender. OIL shall be entering into an Integrity Pact with the bidders as per format enclosed vide **PART-VI** of the tender document. This Integrity Pact Proforma has been duly signed digitally by OIL's competent signatory. The Proforma has to be returned by the bidder (along with the Un-priced Techno-Commercial 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 have been signed by the bidder's authorized signatory who sign the Bid.

7.0 PRICE EVALUATION CRITERIA

7.1 Price bids shall be opened in respect of only the techno-commercially acceptable bidders whose bids have been found to be substantially responsive. A substantially responsive bid is one that meets the terms and conditions of the Tender and / or the acceptance of which bid will not result in indeterminate liability on OIL.

7.2 The bidders must quote their prices in the manner as called for vide Part-II, Schedule of Rates (SOR) i.e.

SOR-1 for Design and Detailed Engineering
SOR-2 for Procurement and Supply
SOR-3 for Construction / Installation
SOR-4 for Pre-Commissioning, Mechanical Completion, Commissioning & Reliability Run/ Site Acceptance Test.
SOR-Summary - Total of SOR-1, SOR-2, SOR-3, and SOR-4

7.3 Bidder needs to mandatorily quote for all the items in Price Bid Format as called for vide SOR i.e., Schedule of Rates (SOR) – 1, 2, 3 & 4, else the bid will be rejected. The bid will not be evaluated if bidder fails to quote against all the items mentioned in the SOR– 1, 2, 3 & 4. The SOR-Summary should reflect the total of SOR's – 1, 2, 3 & 4.

7.4 Bidder must include all liabilities and taxes including statutory liabilities but excluding GST. **Applicable GST must be quoted separately in all SOR's – 1, 2, 3 & 4, which will be considered for evaluation of the bid.**

7.5 **Price Bids will be evaluated on overall lowest cost basis (L-1 offer) i.e., considering total quoted prices for all SOR's inclusive of all liabilities and GST as per SOR-Summary.**

7.6 Based on the evaluation of techno-commercially qualified bidders, the job will be awarded to the L-1 bidder.

7.7 The bidders are advised not to offer any discount / rebate separately and to offer their prices in the Price Bid Format after considering discount / rebate, if any.

7.8 Conditional and unsolicited discount will not be considered in evaluation. However, if such bidder happens to be the lowest recommended bidder, unsolicited discount without any

condition will be considered for computing the contract price.

7.9 In case of identical overall lowest offered rate by more than 1 (one) bidder, the selection will be made by draw of lot between the parties offering the same overall lowest price.

7.10 OIL will prefer to deal with registered bidder 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.

7.11 Input Tax Credit on GST (Goods & Service Tax) for this service is NOT available to OIL & the bids will be evaluated based on total price including GST.

8.0 GENERAL

8.1 In case bidder takes exception to any clause of bidding document not covered under BEC/BRC, then the Company 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 company. The loading so done by the company will be final and binding on the bidders. No deviation will however be accepted in the clauses covered under BEC/BRC.

8.2 To ascertain the substantial responsiveness of the bid the Company reserves the right to ask the bidder for clarification in respect of clauses covered under BEC/BRC also and such clarifications fulfilling the BEC/BRC clauses in toto must be received on or before the deadline given by the company, failing which the offer will be evaluated based on the submission. However, mere submission of such clarification shall not make the offer responsive, unless company is satisfied with the substantial responsiveness of the offer.

8.3 If any of the clauses in the BEC/BRC contradict with other clauses of bidding document elsewhere, the clauses in the BEC/BRC shall prevail.

8.4 Bidder(s) must note that requisite information(s)/financial values etc. as required in the BEC/BRC & Tender are clearly understandable from the supporting documents submitted by the Bidder(s); otherwise, Bids shall be rejected.

8.5 OIL will not be responsible for delay, loss, or non-receipt of applications for participating in the bid sent by mail and will not entertain any correspondence in this regard.

8.6 The originals of such documents [furnished by bidder(s)] shall have to be produced by bidder(s) to OIL as and when asked for.

9.0 PURCHASE PREFERENCE CLAUSE

9.1 **PURCHASE PREFERENCE POLICY (PPP-MII):** Purchase preference under Public Procurement (Preference to Make in India) Order, 2017 of Department for Promotion of Industry and Internal Trade (DPIIT), Govt. of India and as amended time to time with modifications as notified vide MoPNG Order No. FP-20013/2/2017-FP-PNG-Part (4) (E-41432) dated 26th April 2022 (including subsequent amendments thereof, if any) shall be applicable for this Tender. Bidders to check the provisions of the Notifications for their eligibility to bid and seek benefits for Purchase preference, accordingly.

9.2 Upon award of Contract based on PPP-MII policy, the bidder shall have to submit additional Bank Guarantee (format enclosed as **PROFORMA-XIII)** equivalent to 10% of the Contract Value towards fulfilment of conditions pertaining to Local Contents in accordance with the value mentioned in the certificate of LC.

10.0 THIRD PARTY INSPECTION

10.1 Oil India Limited (OIL) has engaged the following 09 (Nine) Independent Inspection Agencies for a period of 04 (four) years with effect from 06.05.2020 to verify and certify various documents required against BEC/BRC of the tender:

Sl. No.	Name of Independent Inspection Agency	Contact E-mail ID
i.	M/s. RINA India Pvt. Ltd.	a. ssd@rina.org b. Andrea.Vattuone@rina.org
ii.	M/s. Dr. Amin Controllers Pvt. Ltd.	a. rkjain@rcaindia.net b. info@rcaindia.net
iii.	M/s. Germanischer Llyod Industrial Services GmbH (DNV- Oil & Gas)	a. mangesh.gaonkar@dnv.com
iv.	M/s. TÜV SÜD South Asia Pvt. Ltd.	a. Jaimin.Bhatt@tuv-sud.in b. sanjaykumar.singh@tuv-sud.in c. Pankaj.Narkhede@tuv-sud.in d. Ajit.Yadav@tuv-sud.in
v.	M/s. IRCLASS Systems and Solutions Private Limited	a. abhishek.singh@irclass.org b. pradeep.bansal@irclass.org c. Asim.Hajwani@irclass.org d. Amit.Ketkar@irclass.org e. industrial_services@irclass.org
vi.	M/s. Gulf Llyods Industrial Services (India) Pvt. Ltd.	a. contact@gulflloyds.com b. bbhavsar@gulfllyods.com c. inspection@gulflloyds.com d. gulflloyds.india@gmail.com
vii.	M/s. TUV India Private Limited	a. salim@tuv-nord.com b. delhi@tuv_nord.com
viii.	M/s. TÜV Rheinland (India) Pvt. Ltd.	a. Shailesh.Deotale@ind.tuv.com b. ravi.kumar@ind.tuv.com c. rupeshkumar.singh@ind.tuv.com d. Neeraj.Chaturvedi@ind.tuv.com
ix.	M/s. Bureau Veritas (India) Private Limited	a. udit.chopra@bureauveritas.com b. vishal.sapale@bureauveritas.com c. dinesh.sukhramani@bureauveritas.com d. p.sridhar@bureauveritas.com e. hariprasad.jhawar@bureauveritas.com f. amit.shaw@bureauveritas.com g. business.support@bureauveritas.com h. labhanshu.sharma@bureauveritas.com i. pramodkumar.yadav@bureauveritas.com j. sonal.lad@bureauveritas.com k. bvindia.corporate@in.bureauveritas.com

10.2 The Bidders have to get verified and certified the various documents required against BEC/BRC of the tender by any one of the above Independent Inspection Agencies and submit the duly certified Inspection Certificate **(as per Proforma XVI)** issued by the Inspection Agencies along with the Technical Bid of the Tender. All Charges of the Third-Party Independent Inspection Agencies towards verification of bidder's documents and certification thereof shall be borne by the respective bidders and payments on account of above inspection, verification and

certification shall be made directly by the Bidder to the Inspection Agency(s). OIL will not be responsible for any payment dispute between Bidders and Third Party Inspection Agencies.

10.3 As mentioned above, Bidder(s) have to submit the verified documents and the duly certified Inspection Certificate by the Inspection Agencies along with the Technical Bids. Bid submitted with un-verified supporting documents shall not be normally considered. **However, in case a bidder submits its bid along with all relevant supporting documents against BEC / BRC without getting all / some of them verified by the designated Independent Inspection agency, such bid can be provisionally considered provided it is accompanied by an Undertaking by the Bidder on their official letterhead to submit the duly verified copies/ verification certificate within 07 (seven) days of actual bid opening. Company will neither send any reminder nor seek any clarification in this regard from such bidders, and the bid will be rejected outright if the bidder fails to submit the verified copies / verification certificate within 07 (seven) days of actual bid opening at its own risk and responsibility. If a bidder does not submit the undertaking towards submission of third party certification within 07 (seven) days from date of Bid Closing date, but certified document reaches us within the cut-off date of above 07 (seven) days, then such bids shall be considered.**

10.4 The methodology of inspection/verification of documents is broadly as under but not limited to:

(a) It is obligatory on the part of the interested Bidders, who choose to participate against the tender, to understand the tender requirements in entirety and the requisite documents sought for in support of the Bid Evaluation Criteria/Bid Rejection Criteria (BEC/BRC) mentioned in the tender in particular. The Bidder must produce all the appropriate documents before any of the OIL's empaneled third party certifying agencies for verification/certification. Neither OIL nor the third party certifying agency shall be held accountable in any manner regarding the choice of documents by the bidder for verification. Therefore, getting the appropriate documents inspected/verified by the agency in support of BEC/BRC clauses is the sole responsibility of the Bidder.

(b) The prospective bidder shall contact any of the empaneled inspection agencies. The agency shall go through the Tender Document, especially the requirements of BEC/BRC and list the documents to be verified. They shall depute their qualified/competent inspector to the Bidder's premises to check the original documents and certify the copies which the bidder shall submit along with their bids. OIL will reserve the right to ask the inspection agencies to verify the documents with source, if required at no extra cost to OIL. Verification of documents by OIL's empaneled third party agency shall not automatically make the bidder eligible for award of contract.

(c) Verification of documents (but not limited to) are normally categorized as under:

- **General Requirement:**
  - Bidder's PAN Card
  - Bidder's GST Certificate
  - ITR of company
  - Bidder's Certificate of Incorporation – Domestic Bidder.
- **Additional Documents: (If applicable against the tender)**
  - Joint Ventures Agreements, with share holding pattern.

- **Technical Criteria**
  - Experience documentation - Completion Certificates, Reference contact verification, Original Work Order/Contract Copy
  - Any other document(s), if called for vide BEC/BRC of the Tender.
- **Financial Criteria**
  - Audited Balance Sheet/CA certificate
  - Line of Credit, Concurrent Commitment etc., if incorporated in the tender.

Note: If any documents submitted towards compliance of BEC/BRC experience criteria is issued by Oil India Limited, then such documents need not be verified by TPI agency.

11.0 COMPLIANCE OF THE COMPETITION ACT, 2002: The bidder shall strictly comply with the provisions of the Competition Act, 2002, more particularly, Section-3 of the Act. Any violation the provisions of the Act shall attract penal action under the Act.

*****End of BEC-BRC*****

Annexure-1 to BEC-BRC

To
GM-Contracts (HoD)
Oil India Limited
Duliajan

Sub: Undertaking/ Declaration by the bidder as per Clause No: 2.3 of BEC-BRC of OIL's Tender No._____

Dear Sirs,

This is in connection with the Bid submitted by me/us, _____ (Name of Bidder), against Tender No. _____ for Hiring Services for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning of Pontoon Type Raw Water in-take Plant including cross country Raw Water Pipeline, Plant Piping and all Electrical and Instrumentation jobs on LSTK Basis at Oil India Limited, Duliajan, Assam.

2.0 I/We, the bidder against the subject tender, hereby declare to comply to the requirements of 'EPC Contractor's Personnel and Office' as detailed under Clause No: 12 of SECTION -I: Preamble Document of the aforesaid Tender.

Yours faithfully,

For (type name of the firm here)

Signature of Authorized Signatory
Name:
Designation:
Phone No.
Place:
Date:
(Affix Seal of the Organization here, if applicable

Annexure-2 to BEC-BRC

To
GM-Contracts (HoD)
Oil India Limited
Duliajan

Sub: Undertaking/ Declaration by the bidder as per Clause No: 2.4 of BEC-BRC of OIL's Tender No._____

Dear Sirs,

This is in connection with the Bid submitted by me/us, _____ (Name of Bidder), against Tender No. _____ for Hiring Services for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning of Pontoon Type Raw Water in-take Plant including cross country Raw Water Pipeline, Plant Piping and all Electrical and Instrumentation jobs on LSTK Basis at Oil India Limited, Duliajan, Assam.

2.0 I/We, the bidder against the subject tender, hereby declare that the list of manpower earmarked for the project will be associated with the project till project completion and in case of inevitable situation the replacement shall be made by personnel of equivalent experience or more, with approval of client (OIL).

Yours faithfully,

For (type name of the firm here)

Signature of Authorized Signatory
Name:
Designation:
Phone No.
Place:
Date:
(Affix Seal of the Organization here, if applicable)

Annexure-3 to BEC-BRC

To
GM-Contracts (HoD)
Oil India Limited
Duliajan

Sub: Undertaking/ Declaration by the bidder as per Clause No: 2.5 of BEC-BRC of OIL's Tender No._____

Dear Sirs,

This is in connection with the Bid submitted by me/us, _____ (Name of Bidder), against Tender No. _____ for Hiring Services for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning of Pontoon Type Raw Water in-take Plant including cross country Raw Water Pipeline, Plant Piping and all Electrical and Instrumentation jobs on LSTK Basis at Oil India Limited, Duliajan, Assam.

2.0 I/We, the bidder against the subject tender, understand that the Completion period for the Main LSTK/EPC work covered under the aforesaid Tender is 18 Months from completion of mobilization period and agree to comply with the same.

Yours faithfully,

For (type name of the firm here)

Signature of Authorized Signatory
Name:
Designation:
Phone No.
Place:
Date:
(Affix Seal of the Organization here, if applicable)

Annexure-4 to BEC-BRC

To
GM-Contracts (HoD)
Oil India Limited
Duliajan

Sub: Undertaking/ Declaration by the bidder as per Clause No: 2.6 of BEC-BRC of OIL's Tender No._____

Dear Sirs,

This is in connection with the Bid submitted by me/us, _____ (Name of Bidder), against Tender No. _____ for Hiring Services for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning of Pontoon Type Raw Water in-take Plant including cross country Raw Water Pipeline, Plant Piping, and all Electrical and Instrumentation jobs on LSTK Basis at Oil India Limited, Duliajan, Assam.

2.0 I/We, the bidder against the subject tender, hereby undertake that the in the event of failure on our part to complete the main LSTK-EPC work on time i.e., 18 Months from completion of mobilization period, the extra expenditure of PMC Contractor towards the extended period [attributable to EPC Contractor] will be recovered from us by OIL.

Yours faithfully,

For (type name of the firm here)

Signature of Authorized Signatory
Name:
Designation:
Phone No.
Place:
Date:
(Affix Seal of the Organization here, if applicable)

Annexure-5 to BEC-BRC

JOINT VENTURE COMPANY'S CORPORATE GUARANTEE TOWARDS FINANCIAL STANDING

(TO BE EXECUTED ON COMPANY'S LETTER HEAD)

DEED OF GUARANTEE

THIS DEED OF GUARANTEE executed at ……. this ……. day of ……. by M/s ……. [Name of JV member with more than 50% stake] a company duly organized and existing under the laws of ……. (Insert jurisdiction/country), having its Registered Office at ……. hereinafter called "the Guarantor" which expression shall, unless excluded by or repugnant to the subject or context thereof, be deemed to include its successors and permitted assigns.

WHEREAS

M/s. Oil India Limited (hereinafter referred to as OIL) has invited offers vide their Tender No. _____ for _____ and M/s _____[Name of the incorporated Joint Venture Company] intends to bid against the said tender based on the financial strength of M/s _____ [Complete Name of JV member with more than 50% stake] and whereas M/s _____ [Complete Name of JV member with more than 50% stake] represents that they have gone through and understood the requirements of subject tender and are capable and committed to provide the Financial support as required by the bidder for qualifying and successful execution of the contract, if awarded to the bidder.

Now, it is hereby agreed by the Guarantor to give this Guarantee and undertakes as follows:

1. The Guarantor confirms it hold ……. (in percentage, should be more than 50%) stake in the M/s _____ [Name of the incorporated Joint Venture Company].
2. The Guarantor agrees and confirms to provide the Audited Annual Reports of any of the preceding 03(three) financial/accounting years reckoned from the original bid closing date.
3. The Guarantor have an annual financial turnover of minimum INR …….. during any of the preceding 03(three) financial/accounting years reckoned from the original bid closing date.
4. **Net worth** of the Guarantor is minimum INR ……. for the accounting year preceding the original bid closing date.
5. The Guarantor undertakes to provide financial support to ……. [Name (s) of other JV members] for executing the project/job, in case the same is awarded to the M/s _____ [Name of the incorporated Joint Venture Company].

   The Guarantor represents that:

(a) This Guarantee herein contained shall remain valid and enforceable till the satisfactory execution and completion of the work (including discharge of the warranty obligations) awarded to …… [Name of the incorporated Joint Venture Company].

(b) The liability of the Guarantor, under the Guarantee, is limited to the 100% of the contract price entered between the M/s _____ [Name of the incorporated Joint Venture Company] and OIL. This will, however, be in addition to the forfeiture of the Performance Guarantee furnished by the Bidder.

(c) This Guarantee has been issued after due observance of the appropriate laws in force in India.

(d) This Guarantee shall be governed and construed in accordance with the laws in force in India and subject to the exclusive jurisdiction of the courts of New Delhi, India.

(e) This Guarantee has been given without any undue influence or coercion, and that the Guarantor has fully understood the implications of the same.

(f) The Guarantor has the legal capacity, power, and authority to issue this Guarantee and that giving of this Guarantee and the performance and observations of the obligations hereunder do not contravene any existing laws.

For and on behalf of M/s …… [Name (s) of other JV members]	For and on behalf of M/s …… (Name of JV member with more than 50% stake)
Witness: 1. 2.	Witness: 1. 2.

Annexure-6 to BEC-BRC

Format for Line of Credit from Scheduled Commercial Bank Confirmation from the Bank for the availability of unutilized line of credit:

We ..... (Name of bank) having our registered office at ..... hereby confirm the company M/s ..... (Bidder/Parent Company) having registered office at ..... is having account with our bank. Presently the credit limits of the company are as under:

Item	INR / Currency
Sanctioned Line of Credit	
Utilized Line of Credit	
Balance Line of Credit	

2.0 We further confirm that we are Scheduled Commercial Bank having Net Worth more than INR 100 Crore.

Authorized Signatory of Bank

Annexure-7 to BEC-BRC

DECLARATION BY BIDDER REGARDING CONCURRENT COMMITMENT

I/We ---------- age------- son of---------- ------ do hereby solemnly affirm and declare as follows for and on behalf of the Firm					
LIST OF EXISTING COMMITMENT AND ONGOING WORKS					
Sr. No.	Name of Works	Client Name & Address	Work Order Value (INR)	Work executed till date of submission of bid (INR)	Amount of balance work which may fall for execution during the period of 12 months from the date of expiry of the bid validity INR)
1	2	3	4	5	6 (4-5)
	Balance commitments in 12 months from the date of expiry of the bid validity				(INR)
	It is certified that the above particulars furnished are true and correct. If any information given is found to be misleading at a later date OIL will have the authority to take necessary action as per provision of the Contract and as per laid down procedure of the Company (OIL).				
SIGN AND STAMP OF BIDDER (AUTHORISED SIGNATORY HAVING POWER OF ATTORNEY)					

Note: Accuracy level of balance commitments as per total of column 6 above should be within +/- 10

PART-I

GENERAL CONDITIONS OF CONTRACT (GCC)

1.0 APPLICABILITY, DEFINITION & INTERPRETATION:

1.1 Applicability

All clauses in the General Conditions of Contract [GCC] shall apply to all transactions except as otherwise stated in the Special Conditions of Contract [SCC] and/or BEC-BRC. Furthermore, in the event if there is any conflict between the Principal text of the Agreement and the Appendixes, the Principal text will prevail.

1.2 Definition & Interpretation

In the contract (as hereinafter defined) the following words and expressions shall have the meaning hereby assigned to them except where the context otherwise requires:

1.2.1 COMPANY / OIL / Operator:

Shall mean Oil India Limited [OIL] a public sector undertaking, incorporated under COMPANY's Act 1956 having its registered office at Duliajan-786602, Assam, India and includes its successor and permitted assigns.

1.2.2 CONTRACTOR:

Shall mean the person or persons, firm or COMPANY or corporation incorporated in India or abroad, who has been awarded with the contract and includes contractor's legal representatives, his successors and permitted assigns.

1.2.3 Contract:

Shall mean a written agreement between the COMPANY and the CONTRACTOR for execution of the services / works including all contract documents and subsequent amendments, if any.

1.2.4 Site:

Shall mean the place in which the operations / services are to be carried out or places approved by OIL for the purposes of the CONTRACT together with any other places designated in the CONTRACT as forming part of the site.

1.2.5 COMPANY's Site Representative / Engineer:

Shall mean the person or the persons appointed by the COMPANY from time to time to act on its behalf at the site for overall co-ordination, supervision and project management at site.

1.2.6 Sub-Contract:

Shall mean order / contract placed by the CONTRACTOR for any portion of the CONTRACT or work sublet with necessary written consent of COMPANY on third party. Such sub-letting shall not relieve the CONTRACTOR from any obligation, duty or responsibility under the CONTRACT.

1.2.7 Sub-Contractor:

Shall mean any person or firm or COMPANY (other than CONTRACTOR) to whom any part of the work has been entrusted by CONTRACTOR, with written consent of OIL or the persons appointed by OIL, successors and permitted assigns of such persons, firm, or COMPANY).

1.2.8 Contractor's Representative:

Shall mean such person / or persons duly appointed representative at the site and base as the CONTRACTOR may designate in writing to the COMPANY as having authority to act for the CONTRACTOR in matters affecting the work and to provide the requisite services.

1.2.9 Contract Price / Value*:*

Shall mean the sum accepted or the sum calculated in accordance with the rates accepted in tender and / or the contract rates as payable to the CONTRACTOR for the entire execution and completion of the services / works, including amendments / modification / change order issued by the COMPANY.

1.2.10 Firm price:

The prices will remain unchanged, except for statutory changes, during currency of the CONTRACT unless specifically agreed to in writing by COMPANY.

1.2.11 Service / Works / Operations:

Shall mean and include all items and things to be supplied / done and all work / Service to be performed by the CONTRACTOR as specified in the Scope of Work under this CONTRACT and shall also include all extra, additional, altered or substituted works / services as required for the purpose of successful execution of the Contract.

1.2.12 Equipment / Materials / Goods:

Shall mean and include any equipment, machinery, instruments, stores, goods which CONTRACTOR is required to provide to the COMPANY for / under the CONTRACT and amendments thereto.

1.2.13 Drawings:

Shall mean and include all Engineering sketches, general arrangements / layout drawings, sectional plans, all elevations, photographs, etc. related to the CONTRACT together with modification and revision thereto.

1.2.14 Specifications:

Means and includes all technical specifications, provision attached and referred to in the tender / contract document regarding method and manner of performing the services and qualities of the service / materials to be provided under the contract and also as modified by the COMPANY / its site representative during the execution of contract in the best interest of service.

1.2.15 Engineer In-charge (EIC):

Shall mean the person designated from time to time by the COMPANY and shall include those who are expressly authorized by the COMPANY to act for and on its behalf for operation of the contract.

1.2.16 Inspectors:

Shall mean any person or outside Agency nominated by COMPANY to inspect equipment, materials and services, if any, in the CONTRACT (stage wise as well as final) as per the terms of the CONTRACT.

1.2.17 Tests:

Shall mean such process or processes to be carried out by the CONTRACTOR as are

prescribed in the CONTRACT, considered necessary by the COMPANY or their representative to ascertain quality, workmanship, performance and efficiency of equipment or services thereof.

1.2.18 Approval:

Shall mean and include the written consent duly signed by COMPANY or their authorized official in respect of all documents, drawings or other particulars in relation to the CONTRACT

1.2.19 Day:

Shall mean a calendar day of twenty–four (24) consecutive hours beginning at 00:00 hours with reference to local time at the site.

1.2.20 Month:

Shall mean a calendar month as per Gregorian calendar.

1.2.21 Year:

Shall mean calendar year as per Gregorian calendar.

1.2.22 Working day:

Means any day which is not declared to be holiday by the COMPANY.

1.2.23 Bid / offer:

Shall mean the proposal / Offer along with supporting documents submitted by the bidder in response to the tender or enquiry in accordance with the terms of Tender or Enquiry, for consideration by COMPANY, prior to award of contract.

1.2.24 Guarantee:

Shall mean the period and other conditions governing the warranty / guarantee of the services as provided in the CONTRACT.

1.2.25 Mobilization:

Shall mean rendering the equipment fully manned and equipped as per CONTRACT and ready to begin work at site designated by the COMPANY and accepted by the COMPANY after inspection.

1.2.26 De-mobilization:

Shall mean the removal of all items forming part of the Mobilization from the site of the COMPANY and inspection and acceptance thereafter by the COMPANY including compliance of requirement in relation to re-export of imported equipment/materials under concessional duty scheme in accordance with relevant notification from Customs Authorities.

1.2.27 Willful Misconduct:

Shall mean intentional disregard of good and prudent standards of performance or proper conduct under the Contract with knowledge that it is likely to result in any injury to any person or persons or loss or damage of property of the Company or Third Party.

1.2.28 Gross Negligence:

Shall mean any act or failure to act (whether sole, joint or concurrent) by a person or entity which was intended to cause, or which was in reckless disregard of or unjustifiable indifference to, avoidable and harmful consequences such person or entity knew, or should have known, would result from such act or failure to act. Notwithstanding the foregoing, Gross negligence shall not include any action taken in good faith for the safeguard of life or property.

1.2.29 Criminal Negligence:

Shall mean that the crime happened negligently, there was duty of care upon the Person but inadvertently due to his negligence, the duty was breached, which causes harm to the people in the form of death or serious injury.

1.2.30 GST Legislations:

'GST legislations' means 'any or all of the following legislations as may be applicable to the CONTRACTOR and OIL:

(A) The Central Goods & Services Tax Act, 2017;
(B) The Integrated Goods & Services Act, 2017;
(C) The Union Territory Goods & Services Tax Act, 2017;
(D) The respective State Goods & Service Tax Acts'
(E) The Goods and Services (Compensation to States) Act, 2017
(F) The Customs Act and the Customs Tariff Act.
(G) Any other applicable Act related to GST

2.0 CONTRACT DOCUMENT:

2.1 Governing language: The governing language for the CONTRACT shall be English. All CONTRACT documents and all correspondence and communication to be given and all other documentation to be prepared and supplied under the CONTRACT shall be written in English and the CONTRACT shall be construed and interpreted in accordance with English language.

2.2 Entire Agreement: The CONTRACT constitutes the entire agreement between OIL and the CONTRACTOR with respect to the subject matter of the CONTRACT and supersedes all communication, negotiations and agreement (whether written or oral) of the parties with respect thereto made prior to the date of this agreement, unless such communication(s) expressly forms part of the contract or included by reference.

2.3 Amendment in CONTRACT: No Amendment of the Contract shall be valid unless it is in writing, is dated, expressly refers to the Contract, and is signed by a duly authorized representative of each party thereto. OIL shall not be bound by any printed conditions, provisions in the CONTRACTOR's BID, forms of acknowledgement of CONTRACT, invoice and other documents which purport to impose any condition at variance with or supplement to CONTRACT.

3.0 WAIVERS AND AMENDMENTS:

3.1 Waivers: It is fully understood and agreed that none of the terms and conditions of this contract shall be deemed waived by either party unless such waiver is executed in writing only by the duly authorized representatives of both the parties. The failure of either party to execute any right shall not act as a waiver of such right by such party.

3.2 Change Program: It is agreed that CONTRACTOR shall carry out work in accordance with the completion program (e.g. Drilling programme) to be furnished by the COMPANY, which may be changed from time to time by reasonable modifications in the program as COMPANY sees fit. COMPANY's instruction in this regard shall be final

and binding.

4.0 CONTRACT TIMELINE:

4.1 Effective Date of Contract: The contract shall become effective as on the date COMPANY notifies the CONTRACTOR in writing that it has been awarded the contract. This date of issuance of Letter of Award (LOA) by the COMPANY will be the Effective Date of Contract. All terms and conditions of the contract shall come into force with the date of issuance of LOA.

4.2 Date of Commencement of Operation:

The date on which the mobilization is completed in all respects and CONTRACTOR is ready to commence operation as per the contract provision [Certified by the COMPANY's representative] will be treated as the date of Commencement of Operation.

4.3 Duration of the contract:

The contract shall be valid for a period as defined in the LOA and Special Conditions of Contract [SCC].

5.0 SCOPE OF WORK / CONTRACT:

Scope of the CONTRACT shall be as defined in the CONTRACT, specifications, drawings and Appendices.

6.0 GENERAL OBLIGATION OF CONTRACTOR:

CONTRACTOR shall, in accordance with and subject to the terms and conditions of this Contract:

6.1 Perform the work described in the Terms of Reference / Scope of Work. The CONTRACTOR shall execute the work with professional competence and in an efficient and workman like manner.

6.2 Except as otherwise provided in the Terms of Reference and the special Conditions of the contract, employ all labours / personnel as required to perform the work.

6.3 Perform all other obligations, work and services which are required by the terms of this contract or which reasonably can be implied from such terms as being necessary for the successful and timely completion of the work.

6.4 Comply with all applicable statutory obligations specified in the contract.

6.5 CONTRACTOR shall be deemed to have satisfied himself before submitting their bid as to the correctness and sufficiency of its bid for the services required and of the rates and prices quoted, which rates and prices shall, except insofar as otherwise provided, cover all its obligations under the contract.

6.6 CONTRACTOR shall be deemed, prior to submitting their bids, to have satisfied themselves about the weather conditions, working culture in the area, socio-political environment, safety & security aspects, law & order situation and law of the land, and obtain for themselves all necessary information as to the risks, contingencies and all other circumstances, which may influence or affect the various obligations under the Contract.

6.7 CONTRACTOR shall give or provide all necessary supervision during the performance of the services and as long thereafter within the warranty period as COMPANY may consider necessary for the proper fulfilling of CONTRACTOR's obligations under the contract.

7.0 GENERAL OBLIGATION OF COMPANY:

COMPANY shall, in accordance with and subject to the terms and conditions of this contract:

7.1 Pay CONTRACTOR in accordance with terms and conditions of the contract.

7.2 Allow CONTRACTOR access, subject to normal security and safety procedures, to all areas as required for orderly performance of the work as specified in the Scope of Works of the contract or work connected therewith.

7.3 Perform all other obligations required of COMPANY by the terms of this contract.

8.0 DUTIES AND POWER / AUTHORITY:

8.1 OIL's site representative / engineer:

The duties and authorities of OIL's site representative / engineer are to act on behalf of OIL for:

i. Overall supervision, co-ordination and Project Management at site

ii. Proper and optimum utilization of equipment and services.

iii. Monitoring of performance and progress

iv. Commenting / countersigning on reports made by the CONTRACTOR's representative at site in respect of works, receipts, consumption etc. after satisfying himself with the facts of the respective cases.

v. He shall have the authority, but not obligation at all times and any time to inspect / test / examine / verify any equipment machinery, instruments, tools, materials, personnel, procedures and reports etc. directly or indirectly pertaining to the execution of the work. However this shall not construe to imply an acceptance by the inspector.

Hence, the overall responsibility of quality of work shall rest solely with the CONTRACTOR.

vi. Each and every document emerging from site in support of any claim by the CONTRACTOR has to have the countersignature / comments of the OIL's representative / engineer without which no claim shall be entertained by the OIL.

8.2 CONTRACTOR's representative:

(a) The CONTRACTOR's representative shall have all the powers requisite for the performance of the Service/Works, subject to holding due authorization from the CONTRACTOR.

(b) Representative(s) shall liaise with OIL's representative / engineer for the proper co-ordination and timely completion of the works and on any matter pertaining to the works.

(c) Representative(s) shall extend full co-operation to OIL's representative / inspector / engineer in the manner required by them for supervision / inspection / observation of equipment, material, procedures, performance, reports and records pertaining to works.

(d) To have complete charge of CONTRACTOR's personnel engaged in the

performance of the work and to ensure compliance of rules and regulations and safety practice.

9.0 PERSONNEL TO BE DEPLOYED BY CONTRACTOR:

CONTRACTOR warrants that it shall provide competent, qualified and sufficiently experienced personnel to perform the work correctly and efficiently.

9.1 The CONTRACTOR should ensure that their personnel observe all statutory safety requirement including those prescribed by the COMPANY. Upon COMPANY's written request, CONTRACTOR, entirely at its own expense, shall remove immediately any personnel of the CONTRACTOR determined by the COMPANY to be unsuitable and shall promptly replace such personnel with personnel acceptable to the COMPANY. Replacement personnel should be mobilized within 15 days from the date of issuance of notice without affecting the operation of the COMPANY.

9.2 The CONTRACTOR shall be solely responsible throughout the period of the contract for providing all requirements of their personnel including but not limited to, their transportation to & fro from Duliajan / field site, enroute / local boarding, lodging, personal protective gear & medical attention etc. COMPANY shall have no responsibility or liability in this regard.

9.3 However, COMPANY shall provide available medical assistance/facilities to CONTRACTOR's Personnel in case of emergency at its own establishment on chargeable basis.

9.4 CONTRACTOR's key personnel shall be fluent in English language (both writing and speaking).

10.0 PERFORMANCE SECURITY:

10.1 On receipt of notification of award from the COMPANY, the CONTRACTOR shall furnish the Performance Security to COMPANY within 15 (fifteen) days from the date of issue of LOA for an amount specified in the Forwarding Letter and Letter of Award (LOA) as per Proforma-Form and must be in the form of a Bank Draft / Cashier's Cheque / Banker's Cheque* / NEFT / RTGS / Electronic fund transfer to designated account of OIL# or Fixed Deposit Receipt (account OIL INDIA LIMITED) or irrevocable Bank Guarantee or irrevocable Letter of Credit (LC) from:

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 in case of domestic CONTRACTOR / service provider.

OR

b. Any scheduled bank in India or from International bank which has its branch in India registered with Reserve Bank of India, in case of foreign CONTRACTOR / service provider.

OR

c. Any foreign Bank which is not a Scheduled Bank in India, provided the Bank Guarantee issued by such Bank is counter-guaranteed by any Branch situated in India of any Scheduled Bank incorporated in India.

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

10.2 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.

10.3 The domestic CONTRACTOR / Service Provider(s) 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.

10.4 The foreign CONTRACTOR / Service Provider(s) will submit the Bank Guarantee from Banks of Indian origin situated in their country. In case no such bank of Indian origin is situated in their country, the Bank Guarantee may be submitted from the bankers as specified above.

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

10.6 The Performance Security specified above must be valid for the entire duration of the Contract and claim period should be valid for a minimum of **03 (three) months** beyond the contract period. The Performance Security will be discharged by COMPANY not later than 30 days following its expiry of claim period. 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.

10.7 The Performance Security shall be encashed by COMPANY on account of CONTRACTOR's failure to fulfil its obligations under the Contract and / or non-performance / un-satisfactory performance of the Contractor. Company shall not be required to proof any loss or damage on account of Contractor's non-performance / un-satisfactory performance.

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

10.9 Failure of the successful Bidder to comply with the requirements of clause 10.0 shall constitute sufficient grounds for annulment of the award and forfeiture of the Bid Security. In such an eventuality, action will be initiated as per the Banning Policy of OIL in vogue.

Subject to credit in OIL's account within prescribed time

* The validity of Bank Draft / Cashier's / Banker's Cheque (as applicable) should not be less than **03 (three) months**.

In the event CONTRACTOR fails to honour any of the commitments entered into under this agreement, and / or in the event of termination of the contract under provisions of Integrity Pact and / or in respect of any amount due from the CONTRACTOR to OIL, OIL shall have unconditional option under the guarantee to invoke the above bank guarantee and claim the amount from the bank. The bank shall be obliged to pay the amount to OIL on demand.

11.0 SIGNING OF CONTRACT:

11.1 The successful bidder is required to sign a formal detailed contract with OIL within a maximum period of 60 days of date of LOA. Until the contract is signed, **the LOA as well as GCC & SCC as prescribed in the Tender, shall remain binding amongst the two parties**. In the event of failure on the part of the successful Bidder to sign the contract, OIL reserves the right to terminate the LOA issued to the successful Bidder and invoke the Bid Security or the Performance Security if submitted by the successful Bidder. Such CONTRACTOR shall be put on holiday as per the Banning Policy of OIL [available at www.oil-india.in].

12.0 CLAIMS, TAXES & DUTIES:

12.1 **Claims:** CONTRACTOR agrees to pay all claims, taxes and fees for equipment, labour, materials, services and supplies to be furnished by it hereunder and agrees to allow no lien or charge resulting from such claims to be fixed upon any property of COMPANY. COMPANY may, at its option, pay and discharge any liens or overdue charges for CONTRACTOR's equipment, labour, materials, services and supplies under this CONTRACT and may thereupon deduct the amount or amounts so paid from any sum due, or thereafter become due, to CONTRACTOR hereunder.

12.2 **Notice of claims:** CONTRACTOR or COMPANY, as the case may be, shall promptly give the other, notice in writing of any claim made or proceeding commenced for which that party is entitled to indemnification under the CONTRACT. Each party shall confer with the other concerning the defense of any such claims or proceeding, shall permit the other to be represented by counsel in defense thereof, and shall not affect settlement of or compromise any such claim or proceeding without the other's written consent.

12.3 **Taxes:**

12.3.1 CONTRACTOR, unless specified otherwise in the CONTRACT, shall bear all tax liabilities, duties, Govt. levies etc. including GST and customs duty, Corporate and personnel taxes levied or imposed on the CONTRACTOR on account of payments received by it from the COMPNAY for the work done under this CONTRACT. It shall be the responsibility of CONTRACTOR to submit to the concerned Indian authorities, the returns and all other concerned documents required for this purpose and to comply in all respects with the requirements of the laws in this regard, in time.

12.3.2 Tax levied on CONTRACTOR as per the provisions of Indian Income Tax Act and any other enactment/rules on income derived/payments received under the contract will be on CONTRACTOR's account.

12.3.3 CONTRACTOR shall be responsible for payment of personal taxes, if any, for all the personnel deployed in India by CONTRACTOR.

12.3.4 The CONTRACTOR shall furnish to the COMPANY, if and when called upon to do so, relevant statement of accounts or any other information pertaining to work done under the contract for submitting the same to the Tax authorities, on specific request from them in accordance with provisions under the law. CONTRACTOR shall be responsible for preparing and filing the return of income etc. within the prescribed time limit to the appropriate authority.

12.3.5 Prior to start of operations under the contract, the CONTRACTOR shall furnish the COMPANY with the necessary documents, as asked for by the COMPANY and/ or any other information pertaining to the contract, which may be required to be submitted to the Income Tax authorities at the time of obtaining "No Objection Certificate" for releasing payments to the CONTRACTOR.

12.3.6 Corporate income tax will be deducted at source from the invoice at the specified rate of income tax as per the provisions of Indian Income Tax Act as may be in force from time to time and COMPANY will issue TDS Certificate to the CONTRACTOR as per the provisions of Income Tax Act.

12.3.7 Corporate and personnel taxes on CONTRACTOR shall be the liability of the CONTRACTOR and the COMPANY shall not assume any responsibility on this account.

12.3.8 All local taxes, levies and duties, sales tax, octroi, etc. on purchases and sales made by CONTRACTOR shall be borne by the CONTRACTOR.

12.3.9 CONTRACTOR shall provide all the necessary compliances/ invoice/documents for enabling OIL to avail Input tax credit benefits in respect of the payments of GST which are payable against the CONTRACT. The CONTRACTOR should provide tax invoice issued under GST legislations for the goods and Services (indicating GST). Payment towards the components of GST shall be released by OIL only against appropriate documents i.e.: Tax Invoice/Bill of entry for availing input tax credit (as applicable).

12.3.10 The tax invoices as per above provisions should contain all the particulars as required under the invoicing rules under the GST legislations, including, but not limited to the following:

i. Name, Address and the GST Registration Number (under the relevant Tax Rules) of the Service Provider (CONTRACTOR)

ii. Name and Address and GST Registration Number of the Service Receiver (Address of OIL)

iii. Description, Classification and Value of taxable service/goods and the amount of applicable tax (CGST, SGST, IGST, UTGST and cess)

12.3.11 In case of imported goods, CONTRACTOR/supplier is required to provide original Bill of Entry or copy of Bill of Entry duly attested by Custom authority.

12.3.12 The CONTRACTOR should mention the Place of supply in the invoice raised under GST Law.

12.3.13 OIL would not accept any invoice without its GSTIN mentioned on the invoice

Note: CONTRACTOR who is under composition levy of the GST legislation would raise Bill of supply instead of Tax invoice, which will have GSTIN of supplier as well as OIL.

12.4 Goods and Services Tax:

12.4.1 "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.

12.4.2 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.

12.4.3 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. 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.

12.4.4 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. Any error of interpretation of applicability of taxes/ duties by the CONTRACTOR shall be to CONTRACTOR's account.

12.4.5 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.

12.4.6 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.

12.4.7 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.

12.4.8 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.

12.4.9 The base date for the purpose of applying statutory variation shall be the Bid Opening Date.

12.4.10 The CONTRACTOR will be liable to ensure to have registered with the respective tax authorities, wherever applicable 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.

12.5 Anti-profiteering clause

12.5.1 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.

12.5.2 In case rating of Contractor 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 / Contractor and shall also be entitled to deduct / recover such GST along with all penalties/interest, if any, incurred by OIL.

13.0 CUSTOMS DUTY, IF APPLICABLE:

13.1.1 CONTRACTOR shall be responsible to import the equipment / tools / spares / consumables etc. required for execution of the contract. The CONTRACTOR shall undertake to complete all the formalities as required under the Customs Act/Foreign Trade Policy (FTP) and indemnify OIL from all the liabilities of Customs in this regard.

13.1.2 CONTRACTOR will be solely responsible for payment of all applicable Customs Duty and to comply all Rules and Regulations. Total Contract Price/Value is inclusive of all Customs Duty, if not mentioned otherwise elsewhere in the Contract.

13.1.3 Above clause is to be read with Customs Duty Clause in SCC, if any.

14.0 INSURANCE:

14.1 CONTRACTOR shall at his own expense arrange secure and maintain insurance with

reputed insurance companies to the satisfaction of the Company as follows:

Contractor at his cost shall arrange, secure and maintain insurance as may be necessary and to its full value for all such amounts to protect the works in progress from time to time and the interest of Company against all risks as detailed herein. The form and the limit of such insurance, as defined here in together with the under works thereof in each case should be as acceptable to the Company. However, irrespective of work acceptance the responsibility to maintain adequate insurance coverage at all times during the period of Contract shall be that of Contractor alone. Contractor's failure in this regard shall not relieve him of any of his responsibilities & obligations under Contract. All costs on account of insurance liabilities covered under Contract will be to Contractor's account and will be included in Value of Contract. However, the Company may from time to time, during the currency of the Contract, ask the Contractor in writing to limit the insurance coverage risk and in such a case, the parties to the Contract will agree for a mutual settlement, for reduction in value of Contract to the extent of reduced premium amounts. Contractor shall cover insurance with Indian Insurance Companies.

14.2 Any deductible set forth in any of the above insurance shall be borne by Contractor.

14.3 CONTRACTOR shall require all of his sub-Contractor to provide such of the foregoing insurance coverage as Contractor is obliged to provide under this Contract and inform the Company about the coverage prior to the commencement of agreements with its sub-Contractors.

14.4 All insurance taken out by Contractor or their sub-contractor shall be endorsed to provide that the underwriters waive their rights of recourse on the Company and to the extent of the liabilities assumed by Contractor under this Contract.

14.5 Certificate of Insurance:

Before commencing performance of the CONTRACT, CONTRACTOR shall furnish OIL with certificates of insurance indicating:

a) Kinds and amounts of insurance as required herein
b) Details of coverage
c) Insurance corporation or companies carrying the aforesaid coverage
d) Effective and expiry dates of policies
e) That OIL shall be given thirty (30) days written advance notice of any material change in the policy
f) Waiver of subrogation endorsement has been attached to all policies and
g) The territorial limits of all policies.

14.6 Contractor shall also inform the Company at least 60 days in advance regarding the expiry cancellation and / or changes in any of such documents & ensure revalidation / renewal, etc., as may be necessary well in time.

14.7 If any of the above policy expire or/are cancelled during the term of this CONTRACT and CONTRACTOR fails for any reason to renew such policies, OIL in no case shall be liable for any loss/damage occurred during the term when the policy is not effective. Furthermore, a penal interest @ 1% of the Total contract value shall be charged towards not fulfilling of the contractual obligations. Notwithstanding above, should there be a lapse in any insurance required to be taken by the Contractor for any reason whatsoever, loss / damage claims resulting therefrom shall be to the sole account of Contractor.

14.8 Contractor on demand from Company shall furnish the Insurance Policy having detail terms and conditions, with respect to any Certificate of Insurance submitted to the Company.

CONTRACTOR shall, at his own expense, arrange appropriate comprehensive insurance to cover all risks assumed by the CONTRACTOR under this CONTRACT in respect of CONTRACTOR's equipment, tools and any other belongings of the CONTRACTOR and its personnel as well deputed under this CONTRACT during the entire period of their engagement in connection with this CONTRACT including extensions if any. The CONTRACTOR shall also carry adequate insurance cover against damage/loss to third party person/property. OIL will have no liability on this account.

14.9 Principal Assured:

The following are to be included as Principal Assured(s) in the Insurance Policies (except in case of Workmen's Compensation / Employer's Liability insurance):

"Oil India Limited, and CONTRACTOR's name (as appearing in the Contract/LOA)"

14.10 Waiver of subrogation:

All insurance policies of the CONTRACTOR with respect to the operations conducted hereunder as set forth in clauses hereof, shall be endorsed by the underwriter in accordance with the following policy wording:

"The insurers hereby waive their rights of subrogation against Oil India Limited or any of their employees or their affiliates and assignees".

14.11 Deductible:

The CONTRACTOR shall take policy with minimum deductible as per IRDA prescribed for the policy(ies). That portion of any loss not covered by insurance provided for in this article solely by reason of deductible provision in such insurance policies shall be to the account of the CONTRACTOR.

14.12 Compliance with Sec 25(1), of "The General Insurance Business (Nationalization) Act 1972"

Section 25(1) of "The General Insurance Business (Nationalization) Act 1972" is reproduced below:

"No person shall take out or renew any policy of insurance in respect of any property in India or any ship or other vessel or aircraft registered in India with an insurer whose principal place of business is outside India save with the prior permission of the Central Government".

The above requirement of aforesaid Act needs to be complied with by the CONTRACTOR wherever the aforesaid provisions of Act apply, and compliance confirmations submitted.

14.13 Loss Payee Clause:

The Insurance Policies should mention the following in Loss Payee Clause:

"In respect of Insurance claims in which OIL's interest is involved, written consent of OIL will be required".

14.14 On account payment to OIL in case of claim

In case any loss or damage happen and where OIL's interest is involved, OIL reserves the right to recover the loss amount from the CONTRACTOR prior to final settlement of the claim.

14.15 CONTRACTOR shall require all of its SUB-CONTRACTORs to provide such of the

foregoing insurance cover as the CONTRACTOR is obligated to provide under this CONTRACT.

14.16 CONTRACTOR shall at all time during the currency of the contract provide, pay for and maintain the following insurance amongst others:

i) **Workman Compensation and / Employers' Liability Insurance**: Workmen's compensation and employer's liability insurance as required by the laws of the country of origin of the employee.

ii) **Commercial General Liability Insurance:** Commercial General Public Liability Insurance covering liabilities including contractual liability for bodily injury, including death of persons, and liabilities for damage of property. This insurance must cover all operations of CONTRACTOR required to fulfil the provisions under this Contract.

iii) **Comprehensive General Automotive Liability:** Automobile Public Liability Insurance covering owned, non-owned and hired automobiles used in the performance of the work hereunder, with bodily injury limits and property damage limits shall be governed by Indian Insurance Regulations.

iv) **Carrier's Legal Liability Insurance:** Carrier's Legal Liability Insurance in respect of **all CONTRACTOR's items** to be transported by the CONTRACTOR to the site of work, for physical loss or destruction of or damage to goods or merchandise, while in transit.

v) **Public Liability Act Policy:** Public Liability Act Policy covering the statutory liability arising out of accidents occurring during the currency of the contract due to handling hazardous substances as provided in the Public Liability Insurance Act 1991 and the Rules framed there under.

vi) **Pradhan Mantri Suraksha Bima Yojana (PMSBY) and Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY):** CONTRACTOR shall, ensure that all his/ its personnel deployed under this contract have obtained additional insurance coverage under the Pradhan Mantri Suraksha Bima Yojana (PMSBY) and Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY) through the participating banks and submit the proof of such insurance coverage to the satisfaction of OIL.

vii) CONTRACTOR's equipment used for execution of the work hereunder shall have an insurance cover with a suitable limit (as per international standards).

viii) Any other insurance policy set forth in the SCC

Note: An undertaking by the service provider has to be mandatorily provided during the Mobilization time that they have taken all the Insurance provisions as per the contract and as the Law and Insurance Regulation.

15.0 LIABILITY:

15.1 Except as otherwise expressly provided herein, neither COMPANY nor its servants, agents, nominees, CONTRACTORs, or sub- CONTRACTORs shall have any liability or responsibility whatsoever to whomsoever for loss of or damage to the equipment and/or loss of or damage to the property of the CONTRACTOR and/or their CONTRACTORs or sub-CONTRACTORs, irrespective of how such loss or damage is caused and even if caused by the negligence of COMPANY and/or its servants, agent, nominees, assignees, CONTRACTORs and sub-CONTRACTORs.

15.2 The CONTRACTOR shall protect, defend, indemnify and hold harmless COMPANY from and against such loss or damage and any suit, claim or expense resulting there from. Neither COMPANY nor its servants, agents, nominees, assignees, CONTRACTORs, sub-CONTRACTORs shall have any liability or responsibility whatsoever for injury to, illness, or death of any employee of the CONTRACTOR

and/or of its CONTRACTORs or sub-CONTRACTOR irrespective of how such injury, illness or death is caused and even if caused by the negligence of COMPANY and/or its servants, agents nominees, assignees, CONTRACTORs and sub-CONTRACTORs. CONTRACTOR shall protect, defend, indemnify and hold harmless COMPANY from and against such liabilities and any suit, claim or expense resulting there from.

15.3 The CONTRACTOR hereby agrees to waive its right of recourse and further agrees to cause its underwriters to waive their right of subrogation against COMPANY and/or its underwriters, servants, agents, nominees, assignees, CONTRACTORs and sub-CONTRACTORs for loss or damage to the equipment of the CONTRACTOR and/or its sub-CONTRACTORs and/or their employees when such loss or damage or liabilities arises out of or in connection with the performance of the contract limited to the CONTRACTOR's liabilities agreed to under this Contract.

15.4 The CONTRACTOR hereby further agrees to waive its right of recourse and agrees to cause its underwriters to waive their right of subrogation against COMPANY and/or its underwriters, servants, agents, nominees, assignees, CONTRACTORs and sub-CONTRACTORs for injury to, illness or death of any employee of the CONTRACTOR and of its CONTRACTORs, sub-CONTRACTORs and/or their employees when such injury, illness or death arises out of or in connection with the performance of the contract limited to the CONTRACTOR's liabilities agreed to under this Contract.

15.5 Except as otherwise expressly provided herein, neither CONTRACTOR nor its servants, agents, nominees, CONTRACTORs or sub- CONTRACTORs shall have any liability or responsibility whatsoever to whomsoever for loss of or damage to the equipment and/or loss or damage to the property of the COMPANY and/or their CONTRACTORs or sub-CONTRACTORs, irrespective of how such loss or damage is caused and even if caused by the negligence of CONTRACTOR and/or its servants, agents, nominees, assignees, CONTRACTORs and sub- CONTRACTORs. The COMPANY shall protect, defend, indemnify and hold harmless CONTRACTOR from and against such loss or damage and any suit, claim or expense resulting there from.

15.6 Except as otherwise expressly provided herein, neither CONTRACTOR nor its servants, agents, nominees, assignees, CONTRACTORs, sub- CONTRACTORs shall have any liability or responsibility whatsoever to whomsoever for injury or illness, or death of any employee of the COMPANY and/or of its CONTRACTORs or sub-CONTRACTORs irrespective of how such injury, illness or death is caused and even if caused by the negligence of CONTRACTOR and/or its servants, agents, nominees, assignees, CONTRACTORs and sub- CONTRACTORs. COMPANY shall protect, defend indemnify and hold harmless CONTRACTOR from and against such liabilities and any suit, claim or expense resulting there from.

15.7 The COMPANY agrees to waive its right of recourse and further agrees to cause its underwriters to waive their right of subrogation against CONTRACTOR and/or its underwriters, servants, agents, nominees, assignees, CONTRACTORs and sub-CONTRACTORs for loss or damage to the equipment of COMPANY and/or its CONTRACTORs or sub-CONTRACTORs when such loss or damage or liabilities arises out of or in connection with the performance of the contract.

15.8 The COMPANY hereby further agrees to waive its right of recourse and agrees to cause it underwriters to waive their right of subrogation against CONTRACTOR and/or its underwriters, servants, agents, nominees, assignees, CONTRACTORs and sub-CONTRACTORs for injury to, illness or death of any employee of the COMPANY and of its CONTRACTORs, sub-CONTRACTORs and/or their employees when such injury, illness or death arises out of or in connection with the performance of the Contract.

16.0 LIMITATION OF LIABILITY:

a) Notwithstanding any other provisions herein to the contrary, except only in cases of Wilful misconduct and/or criminal acts and/or criminal negligence, neither the

CONTRACTOR nor the COMPANY (OIL) 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, provided however that this exclusion shall not apply to any obligation of the CONTRACTOR to pay Liquidated Damages to the COMPANY and/or COMPANY's right to forfeit the Performance Bank Guarantee(s) in terms of the contract.

b) Notwithstanding any other provisions incorporated elsewhere in the contract, the aggregate liability of the CONTRACTOR in respect of this contract, whether under Contract, in tort or otherwise, shall not exceed 100% of the Contract Price (if not specified otherwise in SCC), 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.

c) COMPANY shall indemnify and keep indemnified 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.

17.0 LIABILITY OF UNION GOVERNMENT OF INDIA:

It is expressly understood and agreed upon by and between CONTRACTOR and OIL INDIA LIMITED, and that OIL INDIA LIMITED 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 Union of India is not a party to this agreement and has no liabilities, obligations or rights, whatsoever hereunder. It is expressly understood and agreed that OIL INDIA LIMITED is an independent legal entity with power and authority to enter into contracts solely on its own behalf under the applicable laws of India and general principles of the Contract law. The bidder/ CONTRACTOR expressly agrees, acknowledges and understands that OIL INDIA LIMITED is not an agent, representative or delegate of the Union of India. It is further understood and agreed that Union of India is not and shall not be liable for any acts, omissions, commissions, breaches or other wrongs arising out of the contract. Accordingly, bidder/ CONTRACTOR hereby expressly waives, releases and foregoes any and all actions or claims, including cross claims, impleader claims or counter claims against the Union of India arising out of this contract and covenants not to sue the Union of India as to any manner, claim, cause of action or thing whatsoever arising of or under this agreement.

18.0 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.

19.0 RISK PURCHASE:

In the event, CONTRACTOR's failure to provide the services as per the Contractual scope, terms and conditions, COMPANY (OIL) reserves the right to hire the services from any other source at the CONTRACTOR's risk & cost and the difference in cost shall be borne by the CONTRACTOR. Further, OIL shall retain the right of forfeiture of Performance Bank Guarantee and any other action as deemed fit. In certain operational situations OIL reserves the right to take over the site including the service equipment at the risk and cost of the CONTRACTOR.

20.0 INDEMNITY AGREEMENT:

20.1 Except as provided hereof CONTRACTOR agrees to protect, defend, indemnify and hold COMPANY harmless from and against all claims, suits, demands and causes of action, liabilities, expenses, cost, liens and judgments of every kind and character, without limit, which may arise in favour of CONTRACTOR's employees, agents, CONTRACTORs and sub-CONTRACTORs or their employees or in favour of any third party(is) on account of bodily injury or death, or damage to personnel/property as a result of the operations contemplated hereby, regardless of whether or not said claims, demands or causes of action arise out of the negligence or otherwise, in whole or in part or other faults.

20.2 Except as provided hereof COMPANY agrees to protect, defend, indemnify and hold CONTRACTOR harmless from and against all claims, suits, demands and causes of action, liabilities, expenses, cost, liens and judgments of every kind and character, without limit, which may arise in favour of COMPANY's employees, agents, CONTRACTORs and sub-CONTRACTORs or their employees or in favour of any third party(is) on account of bodily injury or death, or damage to personnel/property as a result of the operations contemplated hereby, regardless of whether or not said claims, demands or causes of action arise out of the negligence or otherwise, in whole or in part or other faults.

21.0 INDEMNITY APPLICATION:

The indemnities given herein above, whether given by COMPANY or CONTRACTOR shall be without regard to fault or to the negligence of either party even though said loss, damage, liability, claim, demand, expense, cost or cause of action may be caused, occasioned by or contributed to by the negligence, either sole or concurrent of either party.

22.0 ROYALTY 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 forming part thereof.

23.0 WARRANTY AND REMEDY OF DEFECTS:

23.1 CONTRACTOR warrants that they shall perform the work in a first class, workmanlike, and professional manner and in accordance with their highest degree of quality, efficiency and current state of the art technology/industry practices and in conformity with all specifications, standards and drawings set forth or referred to in the Terms of Reference and with instructions and guidance, which COMPANY may, from time to time, furnish to the CONTRACTOR.

23.2 Should COMPANY discover at any time during the tenure of the Contract or till the Unit / equipment / tools are demobilised from site or base camp (if applicable) that the work does not conform to the foregoing warranty, CONTRACTOR shall after receipt of notice from COMPANY, promptly perform any and all corrective work required to make the services conform to the Warranty. Such corrective Work shall be performed entirely at CONTRACTOR's own expenses. If such corrective Work is not performed within a reasonable time, the COMPANY, at its option may have such remedial Work performed by others and charge the cost thereof to CONTRACTOR subject to a maximum of the contract value payable for the defective work which needs corrective action which the CONTRACTOR must pay promptly. In case CONTRACTOR fails to perform remedial work, or pay promptly in respect thereof, the performance security shall be forfeited.

24.0 SUBCONTRACTING / ASSIGNMENT:

24.1 CONTRACTOR shall not subcontract, transfer or assign the contract, or any part under this contract, to any third party(ies). Except for the main services under this contract, CONTRACTOR may sub-contract the petty support services subject to COMPANY's prior written approval. However, CONTRACTOR shall be fully responsible for complete execution and performance of the services under the Contract.

24.2 Consequent upon of placement of contract, if successful bidder(s)(other than Micro / Small Enterprise) is procuring materials/services from their sub-vendor, who is a Micro or Small Enterprise 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 any other body specified by Ministry of MSME with prior consent in writing of the purchasing authority/Engineer in Charge the details like Name, Registration No., Address, Contact No., details of material and value of procurement made, etc. of such enterprises shall be furnished by the CONTRACTOR at the time of submission of invoice/bill.

25.0 RECORDS, REPORTS AND INSPECTION:

The CONTRACTOR shall, at all times during the currency of the contract, permit the COMPANY and its authorized employees and representatives to inspect all the Work performed and to witness and check all the measurements and tests made in connection with the said work. The CONTRACTOR shall keep an authentic, accurate history and logs including safety records of each service item with major items consumed, which shall be open at all reasonable times for inspection by the COMPANY's designated representatives and its authorized employees. The CONTRACTOR shall provide the COMPANY's designated representatives with a daily written report, on form prescribed by the COMPANY showing details of operations during the preceding 24 hours and any other information related to the said services requested by the COMPANY whenever so requested. The CONTRACTOR shall not, without COMPANY's written consent allow any third person(s) access to the said information or give out to any third person information in connection therewith.

26.0 CONFIDENTIALITY, USE OF CONTRACT DOCUMENTS AND INFORMATION:

26.1 CONTRACTOR shall not, without COMPANY's prior written consent, disclose the contract, or any provision thereof, or any specification, plan, drawing pattern, sample or information furnished by or on behalf of COMPANY in connection therewith, to any person other than a person employed by CONTRACTOR in the performance of the contract. Disclosure to any such employed person shall be made in confidence and shall extend only, as may be necessary for purposes of such performance with prior permission from COMPANY. However, nothing hereinabove contained shall deprive the CONTRACTOR of the right to use or disclose any information which is:

a) possessed by the CONTRACTOR, as evidenced by the CONTRACTOR's written records, before receipt thereof from the COMPANY which however the CONTRACTOR shall immediately inform to COMPANY ; or

b) required to be disclosed by the CONTRACTOR pursuant to an order of a court of competent jurisdiction or other governmental agency having the power to order such disclosure, provided the CONTRACTOR uses its best efforts to provide timely notice to COMPANY of such order to permit COMPANY an opportunity to contest such order subject to prior permission from COMPANY.

26.2 CONTRACTOR shall not, without COMPANY's prior written consent, make use of any document or information except for purposes of performing the contract.

26.3 Any document supplied to the CONTRACTOR in relation to the contract other than the Contract itself remain the property of COMPANY and shall be returned (in all copies) to COMPANY on completion of CONTRACTOR's performance under the Contract if so required by COMPANY.

26.4 During the currency of the Contract, COMPANY and its employees, agents, other CONTRACTORs, sub-CONTRACTORs (of any tier) and their employees etc. may be exposed to certain confidential information and data of the CONTRACTOR. Such information and data held by the COMPANY, its employees, agents, other CONTRACTORs, sub-CONTRACTORs (of any tier) and their employees in the strictest Confidence and shall not be disclosed to any other party except on a need to know basis.

However, the above obligation shall not extend to information which:

i) is, at the time of disclosure, known to the public which CONTRACTOR shall immediately inform COMPANY ;

ii) is lawfully becomes at a later date known to the public through no fault of CONTRACTOR subject to CONTRACTOR's undertaking that no information has been divulged by them to the public;

iii) is lawfully possessed by CONTRACTOR before receipt thereof from COMPANY which should be immediately informed to COMPANY;

iv) is developed by CONTRACTOR independently of the information disclosed by COMPANY which should be shared with the COMPANY;

v) CONTRACTOR is required to produce before competent authorities or by court order subject to prior permission from COMPANY;

27.0 REMUNERATION AND TERMS OF PAYMENT:

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

27.2 Request for payment/part payment to third party i.e. other than the party on whom the contract has been awarded will not be entertained by OIL under any circumstances.

27.3 MANNER OF PAYMENT: All payments due by COMPANY to CONTRACTOR hereunder shall be made at CONTRACTOR's designated bank. Bank charges, if any will be on account of the CONTRACTOR.

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

27.5 INVOICES: Mobilization charges will be invoiced only upon completion of mobilization as certified by COMPANY representative and CONTRACTOR is ready at site for starting the services / operation. Payment of mobilization charges shall be made within 45 days following the date of receipt of undisputed invoices by COMPANY.

27.6 CONTRACTOR shall send invoice to COMPANY on the day following the end of each month for all daily or monthly charges due to the CONTRACTOR.

27.7 CONTRACTOR will submit 02 (two) sets of all invoices duly super scribed `Original' and `copy' as applicable to the COMPANY for processing payment. Separate invoices for the charges payable under the contract shall be submitted by the CONTRACTOR for foreign currency and Indian currency.

27.8 Payment of monthly invoices, if undisputed, shall be made within 30 days following the date of receipt of invoice by COMPANY.

27.9 COMPANY shall within 30 days of receipt of the invoice notify the CONTRACTOR of any item under dispute, specifying the reasons thereof, in which event, and payment of the disputed amount may be withheld until settlement of the dispute, but payment shall be made of any undisputed portion on or before the due date. This will not prejudice the COMPANY's right to question the validity of the payment at a later date as envisaged in clause no. **27.4** above.

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

27.11 Payment of Final demobilization charges shall be made if applicable within 45 days on receipt of invoice by COMPANY accompanied by the following documents from the CONTRACTOR:

a) Audited account up to completion of the Contract.

b) Tax audit report for the above period as required under the Indian Tax Laws.

c) Documentary evidence regarding the submission of returns and payment to taxes for the expatriate personnel engaged by the CONTRACTOR or by its sub-CONTRACTOR.

d) Proof of re-export of all items including the unutilized spares and consumables (excepting consumables consumed during the contract period) and also cancellation of re-export bond if any.

e) Any other documents as required by applicable Indian Laws.

In case, no demobilization charges are payable, the documents mentioned above will have to be submitted by the CONTRACTOR before release of the final payment by the COMPANY. A certificate from Chartered Accountant on (a), (b) & (c) above will suffice

27.12 CONTRACTOR shall maintain complete and correct records of all information on which CONTRACTOR's invoice are based up to 02 (two) years 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.

28.0 PAYMENT OF COMMISSION / FEE / REMUNERATION OF INDIAN AGENT / CONSULTANT / REPRESENTATIVE / RETAINER / ASSOCIATE OF FOREIGN PRINCIPAL (APPLICABLE IN ICB TENDERS ONLY):

The Commission/Fee/remuneration of the Indian agent/consultant/associate/ representative/retainer, if any, will be paid within 30 days of the payment of invoice made to the CONTRACTOR, The amount of commission/fee/remuneration as a percentage of invoice value as per contract provisions will be deducted by COMPANY/OIL from the monthly invoices of the CONTRACTOR and paid to the Indian agent/consultant/representative/retainer/associate.

29.0 DETAILS OF STATUTORY PAYMENTS LIKE EPF AND ESI, ETC:

Wherever applicable, the CONTRACTOR (including those engaging 'International Workers') shall have itself registered under Employees' Provident Fund and Miscellaneous Provisions Act, 1952 and Employees' State Insurance Act, 1948 and follow the relevant statutory provisions including Rules made there-under concerning contractual workers.

The CONTRACTOR shall be required to submit the following documents/details to the Corporation:

(i) Copy of PF-ECR duly stamped by the designated Bank, along with a print of the digitally signed PDF data sheet of the ECR, as proof of payment, each month, details of this PDF data sheet shall be verified by the appropriate authority (i.e. Payment Making Authority) in the COMPANY from the official website of EPFO (http://www.epfindia.gov.in).

(ii) (a) Copy of the online challan endorsed/stamped by the designated bank as proof of receipt of payment towards monthly contribution of ESI contribution.

(b) Copy of Return of contribution in respect of ESI for each contribution period of the six months i.e. for the contribution period ended 30th Sept and the contribution period ended 31st March.

(iii) As an Annexure to each EPF-ECR and ESI Challan(s), CONTRACTOR shall also furnish the following Certificates:

1) The furnished information is correct to the best of his knowledge.

2) In case any discrepancies or irregularities is / are noticed in this undertaking, then OIL is free to inform the PF / ESIC Authorities.

3) Before the completion of contract, CONTRACTOR shall serve one-month notice to all his contractual workers, informing that their services will be terminated.

4) Within one month on completion / expiry of the contract, CONTRACTOR shall pay all the dues / terminal dues such as leave with wages, bonus (if applicable), Gratuity (if applicable), to all his contractual workmen, failing which CONTRACTOR's Bank Guarantee / Security Deposit may be withheld by OIL.

COMPANY may verify the deposit of statutory contribution made by the CONTRACTOR~~s~~ with the EPFO / ESI authorities, where deemed necessary. However, before making payment of the last bill / invoice of the CONTRACTOR, the COMPANY may verify the details / status of the payment towards EPF / ESI made by the CONTRACTOR from the authorities / official website of EPF / ESI (i.e. http://www.epfindia.gov.in and http://www.esic.in). In case the information furnished by the CONTRACTOR is found to be incorrect the COMPANY shall take appropriate action against the CONTRACTOR in accordance with law.

The CONTRACTOR agrees and undertakes to indemnify OIL for any liabilities arising out of declarations made by him in future on violation or provisions of the EPF Act 1952 and ESI Act 1948.

30.0 TIMELY MOBILIZATION AND LIQUIDATED DAMAGES:

a) Time is the essence of this Contract. If the CONTRACTOR fails to mobilize and deploy the required manpower / equipment and / or fails to commence the operation within the period specified as specified under mobilization clause under SCC, OIL shall have, without prejudice to any other right or remedy in law or contract including sub clause (b) below, the right to terminate the contract.

b) If the contractor is unable to mobilize / deploy and commence the operation within the period specified in sub clause (a) above, it may request OIL for extension of the time with unconditionally agreeing for levy and recovery of LD. Upon receipt of such a request, OIL may at its discretion, extend the period of mobilization and shall recover from the CONTRACTOR, as an ascertained and agreed Liquidated Damages, a sum equivalent to @ 0.5% of contract value including mobilization cost, per week or part thereof of delay subject to maximum of 7.5% of the Contract Price.

c) 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 on the part of the CONTRACTOR and the said amount will be payable without proof of actual loss or damage caused by such delay.

d) LD will be calculated on the basis of Total Contract value [(if not specified otherwise in SCC] excluding duties and taxes, where such duties / taxes have been shown separately in the contract. However, the applicable GST on the LD shall have to be borne by the CONTRACTOR. Accordingly, the liquidated damages shall be recovered from the CONTRACTOR along with applicable GST.

31.0 FORCE MAJEURE:

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 as provided herein. The term force majeure as employed herein shall mean Acts of God such as earthquake, hurricane, typhoon, flood, volcanic activity etc.; war (declared / undeclared); riot, revolts, rebellion, terrorism, sabotage by persons other than the CONTRACTOR's Personnel; fires, explosions, ionising radiation or contamination by radio-activity or noxious gas, if not caused by CONTRACTOR's fault; declared epidemic or disaster; acts and regulations of respective Govt. of the two parties, namely the COMPANY and the CONTRACTOR and civil commotions, lockout not attributable to the CONTRACTOR.

Upon occurrence of such cause, the party claiming that it has been rendered unable as aforesaid thereby, shall notify the other party in writing within 72 (Seventy Two) hours of the alleged beginning and ending thereof, giving full particulars and satisfactory evidence in support of its claim.

Should 'force majeure' condition as stated above occurs and should the same be notified within 72 (Seventy two) hours after its occurrence the `force majeure' rate (if specified in the SCC of the Contract) shall apply for the first 15 (fifteen) days for each such occasion.

Either party shall have the right to terminate the Contract if such `force majeure' conditions continue beyond successive 60 (Sixty) days [or exclusively mentioned in the SCC of the Contract] with prior written notice of 15 days, provided termination of the Contract does not result into safety hazard to the life and property on account of withdrawal of operations or the operation is at critical stage. COMPANY shall have the absolute right to decide whether any safety hazard exists or operation is at critical position and decision of the COMPANY shall binding upon the CONTRACTOR.

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**.** [or exclusively mentioned in the SCC of the Contract]

Time for performance of the relative obligation suspended by Force Majeure shall then stand extended by the period for which such cause lasts.

If however, relative obligation of the party affected by such 'Force Majeure' is limited to part of the obligation(s), the contract shall not be terminated and the parties shall

continue to perform their respective obligations, which are not affected by the 'force majeure' condition, provided the obligations affected by the 'force majeure' do not preclude the parties in performing the obligations not affected by such conditions.

32.0 SET-OFF:

Any sum of money due and payable to the CONTRACTOR (including Performance Security refundable to them) under this or any other Contract, whether in progress or in future, may be appropriated by OIL and set-off against any claim of OIL (or such other person or persons contracting through OIL) for payment of a sum of money arising out of this contract or under any other contract made by the CONTRACTOR with OIL (or such other person or persons contracting through OIL).

33.0 WITHHOLDING:

COMPANY may withhold or nullify the whole or any part of the amount due to CONTRACTOR, after informing the CONTRACTOR of the reasons in writing, on account of subsequently discovered evidence in order to protect COMPANY from loss on account of :

33.1 For non-completion of jobs assigned as per Scope of Work/Terms of Reference.

33.2 Defective work not remedied by CONTRACTOR.

33.3 Claims by COMPANY's recognized sub-CONTRACTOR of CONTRACTOR or others filed or on the basis of reasonable evidence indicating probable filing of such claims against CONTRACTOR.

33.4 Failure of CONTRACTOR to pay or provide for the payment of salaries/ wages, contributions, taxes or enforced savings with-held from wages etc with respect to personnel engaged by the CONTRACTOR.

33.5 Failure of CONTRACTOR to pay the cost of removal of unnecessary debris, materials, tools, or machinery.

33.6 Any failure by CONTRACTOR to fully reimburse COMPANY under any of the indemnification provisions of this Contract. If, during the progress of the work CONTRACTOR shall allow any indebtedness to accrue for which CONTRACTOR, under any circumstances in the opinion of COMPANY, may be primarily or contingently liable or ultimately responsible and CONTRACTOR shall, within five days after demand is made by COMPANY, fail to pay and discharge such indebtedness, then COMPANY may during the period for which such indebtedness shall remain unpaid, with-hold from the amounts due to CONTRACTOR, a sum equal to the amount of such unpaid indebtedness.

33.7 Withholding will also be effected on account of the following:

i) Order issued by a Court of Law or statutory authority in India.

ii) Income-tax deductible at source according to law prevalent from time to time in the country.

iii) Any obligation of CONTRACTOR which by any law prevalent from time to time to be discharged by COMPANY in the event of CONTRACTOR's failure to adhere to such laws.

iv) Any payment due from CONTRACTOR in respect of unauthorised imports.

When all the above grounds for withholding payments are removed, payment shall thereafter be made for amounts so with-held.

33.8 COMPANY reserves the right to disburse or deposit the amount so withheld to the concerned person(s) or agency or government authority, as the case may be, besides nullifying such amount on account of loss suffered by the COMPANY against **33.2, 33.3, 33.6** & **33.7** above.

34.0 APPLICABLE LAWS:

The Contract shall be deemed to be a Contract made under, governed by and construed in accordance with the laws of India for the time being in force and shall be subject to the sole and exclusive jurisdiction of Courts situated in Dibrugarh (or the Place where the contract is executed) and Principal Bench of Gauhati High Court (or the High Court under whose territorial jurisdiction, the place of execution of contract falls).

This Agreement including all matter connected with this Agreement, shall be governed by the laws of India (both substantive and procedural) for the time being in force and shall be subject to exclusive jurisdiction of Courts, mentioned hereinabove. Foreign companies, operating in India or entering into Joint ventures in India, shall also be governed by the laws of India and shall be subject to sole and exclusive jurisdiction of above Courts.

The CONTRACTOR shall ensure full compliance of various Indian Laws and Statutory Regulations, as stated below, to the extent applicable, as stated below, but not limited to, in force from time to time and obtain necessary permits/ licenses etc. from appropriate authorities for conducting operations under the Contract:

a) The Mines Act 1952
b) The Oil Mines Regulations, 1984
c) The Employees' Compensation Act, 1923
d) The Code of Wages, 2019
e) The Contract Labour (Regulation & Abolition) Act, 1970 and the rules framed there under
f) The Employees' Pension Scheme, 1995
g) The Interstate Migrant Workmen Act., 1979 (Regulation of employment and conditions of service).
h) The Employees Provident Fund and Miscellaneous Provisions Act, 1952
i) Goods and Service Tax Act
j) Customs & Excise Act & Rules
k) Factories Act, 1948
l) Industrial Disputes Act, 1947
m) Payment of Gratuity Act, 1972
n) Environmental Protection Act, 1986 & other pollution control Acts.

Note: The above Acts are only indicative and not exhaustive. The Acts shall include the rules and regulations framed thereunder.

35.0 LABOUR LAWS:

i) CONTRACTOR shall comply with the provisions of various labour related laws, including but not limited to the Code of Wages, 2019, Employee Provident Fund and Miscellaneous Provisions Act 1952, COMPANY's Liability Act 1938, Employees' Compensation Act 1923, Industrial Disputes Act 1947, the Maternity Benefit Act 1961 and Contract Labour (Regulation and Abolition) Act 1970, Employment of Children Act 1938, Employees' State Insurance Act, 1948 or any modifications / amendment thereof or any other law relating thereto and rules made there under from time to time.

ii) No Labour below the age of eighteen [18] years shall be employed on the work.

iii) CONTRACTOR shall not pay less than what is provided under law to labourers

engaged by him on the work.

iv) CONTRACTOR shall at his expense comply with all labour laws and keep the COMPANY indemnified in respect thereof.

v) CONTRACTOR shall pay equal wages for men and women in accordance with applicable Labour laws.

vi) If the CONTRACTOR is covered under the Contract Labour (Regulation and Abolition) Act, he shall obtain a license from licensing authority [i.e. office of the Labour Commissioner] by payment of necessary prescribed fee and the deposit, if any, before starting the work under the Contract. Such fee / deposit shall be borne by the CONTRACTOR.

vii) CONTRACTOR must obtain the PF Code from the concerned PF Authority under Employees Provident Fund and Miscellaneous Provisions Act, 1952. Similarly, CONTRACTOR must obtain ESI Code under Employees State Insurance Act.

viii) CONTRACTOR being the employer of the labours / personnel to be engaged under the contract shall be liable to pay gratuity to the labours / personnel as per the provision of the Payment of Gratuity Act, 1972 and accordingly, shall keep the COMPANY indemnified in respect thereof. If however, COMPANY requires to pay gratuity to such labour(s) as per the direction of the competent authority under the Act, COMPANY shall recover such amount from the outstanding dues payable to the CONTRACTOR under the contract or any other contract(s).

ix) CONTRACTOR shall furnish to Engineer in Charge the distribution return of the number & description, by trades of the work people employed on the works. CONTRACTOR shall also submit on the 4th & 19th of every month to Engineer in Charge a true statement showing in respect of the 2nd half of the preceding month & the 1st half of the current month (1) the accidents that occurred during the said fortnight showing the circumstances under which they happened and the extent of damage and injury caused by them and (2) the number of female workers who have been allowed Maternity Benefit as provided in the Maternity Benefit Act 1961 on Rules made there under and the amount paid to them.

x) Engineer in Charge shall on a report having been made by an inspecting officer as defined in Contract Labour (Regulation and Abolition) Act 1970 have the power to deduct from the money due to the CONTRACTOR any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfillment of the conditions of the Contract for the benefit of workers, non-payment of wages or of deductions made from his or their wages which are not justified by the terms of the Contract or non-observance of the said regulations.

xi) The CONTRACTOR shall indemnify the COMPANY against any payments to be made under and for the observance of the provisions of the aforesaid acts without prejudice to his right to obtain indemnity from his sub-CONTRACTOR.

36.0 STATUTORY REQUIREMENTS:

During the tenure of this CONTRACT nothing shall be done by the CONTRACTOR in contravention of any law, act and/or rules/regulations, thereunder or any amendment

37.0 GENERAL HEALTH, SAFETY & ENVIRONMENT (HSE) GUIDELINES:

37.1 It will be solely the CONTRACTOR's responsibility to fulfil all the legal formalities with respect to the Health, Safety and Environmental aspects of the entire job (namely; the person employed by him, the equipment, the environment, etc.) under the jurisdiction of the district of that state where it is operating. Ensure that all sub-CONTRACTORs hired by CONTRACTOR comply with the same requirement as the CONTRACTOR

himself and shall be liable for ensuring compliance all HSE laws.

37.2 It will be entirely the responsibility of the Contractor/his Supervisor/representative to ensure strict adherence to all HSE measures and statutory rules during operation in OIL's installations and safety of workers engaged by him. The crew members will not refuse to follow any instruction given by company's Installation Manager/Safety Officer/Engineer/Official/ Supervisor/Junior Engineer for safe operation.

37.3 Any compensation arising out of the job carried out by the Contractor whether related to pollution, Safety or Health will be paid by the contractor only.

37.4 Any compensation arising due to accident of the Contractor's personnel while carrying out the job, will be payable by the contractor.

37.5 When there is a significant risk to health, environment or safety of a person or place arising because of a non-compliance of HSE Measures Company shall have the right to direct the contractor to cease work until the non-compliance is corrected.

38.0 POLLUTION AND CONTAMINATION:

The CONTRACTOR shall be liable for all surface and sub-surface pollution to the extent caused by CONTRACTOR and resulting from CONTRACTOR's operation/service or spillage or dumping of solvents/additive substances or pollutants, which the CONTRACTOR brings to the Site for use in connection with Work to be performed under this Contract.

Notwithstanding anything to the contrary contained herein, it is agreed that except on the ground of willful misconduct or criminal misconduct, COMPANY shall release, indemnify and hold CONTRACTOR and its sub-CONTRACTORs harmless from any and all claims, judgments, losses, expenses and any costs related thereto (including but not limited to Court costs and "Attorney's fees") for:

a) Damage to or loss of any reservoir or producing formation; and/ or

b) Damage to or loss of any well; and/ or

c) Any other subsurface damage or loss; and/ or

d) Any property damage or loss or personal injury or death arising out of or in connection with a blowout, fire explosion and loss of well control regardless of cause.

39.0 STATUTORY VARIATION / NEWLY ENACTED LAW:

39.1 All duties, taxes except otherwise specified in the Contract as applicable on the closing date of bid submission as per relevant acts and rules shall be in CONTRACTOR's account. Variation in case of custom duty on CIF value declared by the bidder shall be to COMPANY account.

39.2 In the event of introduction of any new legislation or any amendment or enforcement of any Act or Law, rules or regulations of Government of India or State Government(s) or Public Body, which becomes effective after the date of submission of Price Bid or revised price bid, if any, for this CONTRACT and which results in increased / decreased cost of the works under the CONTRACT through increased / decreased liability of taxes and / or duties, required to be paid by the CONTRACTOR, (other than personnel and Corporate taxes), the Parties shall agree to a revision in pricing to reflect such change subject to the production of documentary proof to the satisfaction of the COMPANY / CONTRACTOR as applicable to the extent which directly is attributable to such introduction of new legislation or change or amendment as mentioned above and adjudication by the competent authority (applicable when disputed by COMPANY) & the courts wherever levy of such taxes / duties are disputed

by COMPANY / CONTRACTOR.

39.3 Any increase in net amount of the duties and taxes (i.e. the amount of taxes/duties payable minus eligible credit of taxes/duties paid on input services/inputs) after the contractual completion/mobilization date during the extended period will be to the CONTRACTOR's account, where delay in completion /mobilization period is attributable to the CONTRACTOR. However, any decrease in net amount of the duties and taxes (i.e. the amount of taxes/duties payable minus eligible credit of taxes/duties paid on input services/inputs) after the contractual completion/mobilization date will be to COMPANY's account.

39.4 The Contract Price and other prices given in the Schedule of Prices are based on the applicable tariff as indicated by the CONTRACTOR in the Schedule of Prices. In case this information subsequently proves to be wrong, incorrect or misleading, COMPANY will have no liability to reimburse/pay to the CONTRACTOR the excess duties, taxes, fees, if any finally levied/imposed by the concerned authorities. However, in such an event, COMPANY will have the right to recover the difference in case the rate of duty/tax finally assessed is on the lower side.

39.5 Notwithstanding the provision contained in Clause-39.1 to 39.4 above, the COMPANY shall not bear any liability in respect of:

i. Personal taxes on the personnel deployed by CONTRACTOR, his sub-CONTRACTOR/sub-sub-CONTRACTORs and Agents etc.

ii. Corporate taxes and Fringe benefit tax in respect of CONTRACTOR and all of their sub-CONTRACTORs, agents etc.

iii. Other taxes & duties including Customs Duty and GST in addition to new taxes etc. in respect of sub-CONTRACTORs, vendors, agents etc. of the CONTRACTOR.

iv. Any liability on the CONTRACTOR, which was accrued under the old law or contract, which the CONTRACTOR is obligated to pay either to the COMPANY or to the Government Authority.

39.6 In order to ascertain the net impact of the amendment/ revisions/enactment of various provisions of taxes/duties, the CONTRACTOR is liable to provide following disclosure to COMPANY:

i. Details of each of the input services used in relation to providing service to COMPANY including estimated monthly value of input service and GST tax amount.

ii. Details of Inputs (material/consumable) used/required for providing service to COMPANY including estimated monthly value of input and GST paid/payable on purchase of inputs.

39.7 The above provisions would be applicable only in case of variation in rate of taxes and duties on supply of services to OIL and not applicable on taxes and duties on input (goods and services) towards such services.

39.8 Any claim or reduction on account of change in law shall be accompanied with undertaking that the provisions of anti- profiteering clause under GST Act have been complied with.

40.0 SEVERABILITY:

Should any provision of this agreement be found to be invalid, illegal or otherwise not enforceable by any court of law, such finding shall not affect the remaining provisions hereto and they shall remain binding on the parties hereto.

41.0 COMMISSION OF MISCONDUCT / SUBMISSION OF FRAUDULENT DOCUMENT BY THE BIDDER/CONTRACTOR AND BANNING THEREOF:

The information and documents furnished by the bidder/CONTRACTOR in respect of the tender/contract are accepted by COMPANY to be true and genuine. However, if it comes to the notice of the COMPANY anytime either during the pendency of the tender or after award of the contract or after completion the contract that a Bidder/CONTRACTOR furnished fraudulent document/false information in relation to the subject tender/contract or committed any misconduct, appropriate action shall be taken against the Bidder/CONTRACTOR for debarment/banning of the bidder/CONTRACTOR from participating in any future tender of the COMPANY in terms of the COMPANY's Banning Policy, 2017 besides making the CONTRACTOR liable for other penal action including termination of ongoing contract(s) at his/her risk and peril. In such event, the Bid Security/Performance Security in respect of ongoing contract(s) shall be forfeited by the COMPANY.

42.0 SETTLEMENT OF DISPUTES:

42.1 Arbitration (Applicable for Suppliers/CONTRACTORs other than PSU and MSME):

1) 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:

2) 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.

3) It is agreed and undertaken by the Parties that irrespective of country of origin of the CONTRACTOR, the arbitration proceedings shall be governed by the Arbitration and Conciliation Act, 1996 and under no circumstances, the proceedings shall be construed as International Arbitration.

4) 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
Up to Rs. 25.00 Lakh	Not applicable	Not applicable
Above Rs. 25.00 Lakh Up to Rs. 25 Crore	Sole Arbitrator	OIL
Above Rs. 25 Crore	3 Arbitrators	One Arbitrator by each party and the 3rd Arbitrator, who shall be the presiding Arbitrator, by the two Arbitrators.

5) 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.

6) 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.

7) Parties agree and undertake 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.

8) The arbitral tribunal shall complete the proceedings, make and publish the award within time stipulated in the Arbitration and Conciliation Act, 1996(as amended)

9) 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. Where the proceedings are put in abeyance or terminated on account of mutual settlement of dispute by the parties, the fees payable to the arbitrators shall be determined as under:

(i) 20% of the fees if the claimant has not submitted statement of claim.

(ii) 40% of the fees if the pleadings are complete

(iii) 60% of the fees if the hearing has commenced.

(iv) 80% of the fees if the hearing is concluded but the award is yet to be passed.

10) Each party shall be responsible to make arrangements for the travel and stay etc. of the arbitrator appointed 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, both parties shall equally share all expenditures that may be required to be incurred.

11) The fees and other administrative/secretarial expenses of the arbitrator(s) shall not exceed the model fee as stipulated in Schedule of the Act and such expenses shall be equally borne by the parties.

12) The Place/Seat of Arbitration shall be Guwahati or the place where the contract is executed. The venue of the arbitration shall be decided by the Arbitrator(s) in discussion with the parties. The cost of arbitration sittings shall be equally borne by the parties.

13) The Arbitrator(s) shall give reasoned and speaking award and it shall be final and binding on the parties.

14) 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.

42.2 Arbitration (applicable in case of Contract awarded on Public Sector Enterprise):

a) In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract (s) between Central Public Sector Enterprises (CPSEs) and also between CPSEs and Government Departments/Organizations (excluding disputes -concerning Railways, Income Tax, Customs & Excise

Departments), such dispute or difference shall be taken up by either party for resolution through AMRCD as mentioned in OPE OM No. 4(1)/2013-DPE(GM)/FTS-1835 dated 22-05-2018.

b) A party wishing to commence arbitration proceeding shall invoke Arbitration Clause and refer the dispute(s) to AMRCD with a copy 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

c) Upon such reference, the dispute shall be decided by the Competent Authority appointed under the AMRCD, whose decision shall bind the parties finally and conclusively. The parties in the dispute will share equally the cost of the arbitration as intimated by the Arbitrator.

42.3 Arbitration (Applicable to Micro, Small and Medium Enterprise)

In the event of any dispute or difference relating to, arising from or connected with the Contract, efforts shall be made to resolve the dispute(s) amicably by mutual consultation and in case such dispute(s) cannot be resolved through mutual consultation, then same shall be resolved through the procedure as prescribed in Section-18 of the Micro, Small and Medium Enterprises Development Act, 2006

42.4 Resolution of disputes through conciliation by OEC

(Not Applicable in cases where value of dispute is less than Rs. 25 Lakhs and more than 2 Crore)

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, Company at its discretion, on its own or on the request of the CONTRACTOR, may refer the dispute to Outside Expert Committee ("OEC") to be constituted by Corporate Business Committee (CBC), OIL as provided hereunder:

a) The party desirous of resorting to conciliation shall send a notice of 30 (thirty) days to the other party of its intention of referring the dispute for resolution through OEC. The notice invoking conciliation shall specify all the points of disputes with details of the amount claimed to be referred to OEC and the party concerned shall not raise any new issue thereafter.

b) OIL shall nominate three outside experts, one each from Financial/commercial, Technical and Legal fields from the Panel of Outside Experts maintained by OIL who shall together be referred to as OEC (Outside Experts Committee).

c) Parties shall not claim any interest on claims/counterclaims from the date of notice invoking conciliation till execution of settlement agreement, if so arrived at. In case, parties are unable to reach a settlement, no interest shall be claimed by either party for the period from the date of notice invoking conciliation till the date of OEC recommendations in any further proceeding.

d) The Proceedings of the OEC shall be broadly governed by Part III of the Arbitration and Conciliation Act, 1996 including any modifications thereof. Notwithstanding above, the proceedings shall be summary in nature and Parties agree to rely only upon documentary evidence in support of their claims and not to bring any oral evidence in the OEC proceedings.

e) OEC shall hear both the parties and recommend possible terms of settlement between the parties. The recommendations of OEC shall be non-binding and the parties may decide to accept or not to accept the same. Parties shall be at liberty to

accept the OEC recommendation with any modification they may deem fit.

f) Where recommendations are acceptable to both the parties, a settlement agreement will be drawn up in terms of the OEC recommendations or with such modifications as may be agreed upon by the parties. The settlement agreement shall be signed by both the parties and authenticated by all the OEC members either in person or through circulation. This settlement agreement shall have the same legal status and effect as that of an arbitration award on agreed terms on the substance of the dispute rendered by an arbitral tribunal under Section 30 of the Arbitration and Conciliation Act, 1996.

g) OIL will share all other guidelines regarding reconciliation through OEC with the CONTRACTOR when it resorts to settlement through OEC. Both parties agree to adhere to these guidelines.

h) All the expenditure incurred in the OEC proceedings shall be shared by the parties in equal proportion. The parties shall maintain account of expenditure and present to the other for the purpose of sharing on conclusion of the OEC proceedings.

i) The OEC proceedings must be completed within a period of 03 (three) months from the date of constitution of the OEC with a provision of extension of one months, subject to mutual agreement. The Place of OEC shall be either at New Delhi or Guwahati.

j) If the parties are not able to resolve the dispute through OEC or do not opt for conciliation through OEC, the party may invoke arbitration clause as provided in the contract.

k) The parties shall be represented by their in-house employees/executives. No party shall bring any advocate or outside consultant/advisor/agent. Ex-officers of OIL who have handled the matter in any capacity directly or indirectly shall not be allowed to attend and present the case before OEC on behalf of Contractor. However, ex-employees of parties may represent their respective organizations.

l) Solicitation or any attempt to bring influence of any kind on either OEC Members or OIL is completely prohibited in conciliation proceedings and OIL reserves the absolute right to close the conciliation proceedings at its sole discretion if it apprehends any kind of such attempt made by the Contractor or its representatives.

42.5 Exclusions

Parties agree that following matters shall not be referred to conciliation or arbitration:

i) Any claim, difference or dispute relating to, connected with or arising out of OIL's decision to initiate any proceedings for suspension or debarment or banning, or decision to suspend or to ban or to debar business dealings with the bidder/CONTRACTOR and/or with any other person involved or connected or dealing with bid/contract/bidder/CONTRACTOR.

ii) Any claim, difference or dispute relating to, connected with or arising out of OIL's decision under the provisions of Integrity Pact executed between OIL and the Bidder/CONTRACTOR.

iii) Any claim, difference or dispute relating to, connected with or arising out of OIL's decision to comply with any order or directive of any statutory or government authority.

iv) Any claim which is less than Rs. 25 Lakh.

43.0 COMPLETION OF CONTRACT:

Unless otherwise terminated under the provisions of any other relevant Clause or extended through written communication, this Contract shall be deemed to have been completed at the expiry of the Period specified in the contract or period of defect liability, as provided for under the Contract, whichever is later.

44.0 TERMINATION:

44.1 Termination on expiry of the contract: This Agreement shall be deemed to have been automatically terminated on the expiry of the contract period unless OIL has exercised its option to extend this contract in accordance with the provisions, if any, of this contract.

44.2 Termination of contract for death: If the CONTRACTOR is an individual or a proprietary concern and the individual or the proprietor dies or if the CONTRACTOR is a partnership concern and one of the partners dies then unless, the COMPANY is satisfied that the legal heir of the individual or the proprietary concern or the surviving partners are capable of carrying out and completing Contract, the COMPANY is entitled to cancel the Contract for the uncompleted part without being in any way liable for any compensation payment to the estate of the deceased CONTRACTOR and/or to the surviving partners of the CONTRACTOR's firm on account of the cancellation of Contract. The decision of the COMPANY in such assessment shall be final & binding on the parties. In the event of such cancellation, the COMPANY shall not hold the estate of the deceased CONTRACTOR and/or the surviving partners of CONTRACTOR's firm liable for any damages for non-completion of the Contract.

44.3 Termination on account of Force Majeure: Unless the contract provides otherwise, either party shall have the right to terminate this Contract on account of Force Majeure as set forth in Article-31.0 above.

44.4 Termination on account of insolvency: In the event that the CONTRACTOR or its collaborator or its guarantor 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 or under the process of insolvency or liquidation, 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.

However, COMPANY shall be at liberty to give the Receiver or Liquidator or Insolvency Professional Manager, as appointed by the Competent Court/Tribunal, the option of carrying out the Contract subject to its technical & financial competence and his providing a guarantee for due and faithful performance of the Contract.

44.5 Termination for Unsatisfactory Performance: If the COMPANY considers that, the performance of the CONTRACTOR is unsatisfactory, or not as per the provision of the Contract, the COMPANY shall notify the CONTRACTOR in writing and specify in details the cause of 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. In the event CONTRACTOR rectifies its non-performance to the satisfaction of the COMPANY, the option of termination may not be exercised by the COMPANY. If however CONTRACTOR repeats non-performance subsequently, COMPANY shall exercise the option to terminate contract by giving 07 days notice. Such CONTRACTOR shall be put on holiday as per the Banning Policy of OIL [available at www.oil-india.in].

44.6 Termination due to change of ownership and 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 written consent, the COMPANY may at its option,

terminate this Contract. COMPANY shall not be however under any obligation to accord consent to the CONTRACTOR for change of ownership & assignment of the contract.

44.7 If at any time during the term of this Contract, breakdown of CONTRACTOR's equipment results in CONTRACTORs being unable to perform their obligations hereunder for a period of 15 successive days, COMPANY at its option, may terminate this Contract in its entirety or partially to the extent of non-performance, without any further right or obligation on the part of the COMPANY, except for the payment of money then due. No notice shall be served by the COMPANY under the condition stated above.

44.8 **Termination for delay in mobilization:** CONTRACTOR is required to mobilize complete equipment along with crew for commencement of services at the specified site within the maximum allowed number of days from the date of LOA/Notice for Mobilization as specified in the special conditions of contract. If the CONTRACTOR (successful bidder) fails to complete the mobilization as above, OIL shall have, without prejudice to any other clause of the CONTRACT, the right to terminate the contract.

44.9 Notwithstanding any provisions herein to the contrary, the Contract may be terminated at any time by the COMPANY on giving 30 (thirty) days written notice to the CONTRACTOR due to any other reason not covered under the above Article from **44.1 to 44.8** and in the event of such termination the COMPANY shall not be liable to pay any cost or damage to the CONTRACTOR except for payment of services as per the Contract upto the date of termination.

44.10 **Consequence 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.

Upon termination of this Contract, CONTRACTOR shall return to COMPANY all of COMPANY's properties, which are at the time in CONTRACTOR's possession.

In the event of termination of contract, COMPANY will issue Notice of termination of the contract with date or event after which the contract will be terminated. The contract shall then stand terminated and the CONTRACTOR shall demobilize their personnel & materials.

Demobilization charges shall not be payable by COMPANY in case of Article from **44.4 to 44.7**

45.0 TO DETERMINE THE CONTRACT:

In such an event (i.e. termination under Article No. 44.4 to 44.9 above), the contract shall stand terminated and shall cease to be in force from the date of such notification by the COMPANY. Thereafter the CONTRACTOR shall stop forthwith any of the work then in progress, except those work which the COMPANY may, in writing, require to be done to safeguard any property or work, or installations from damages, and the COMPANY may take over the remaining unfinished work of 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 its 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 rate / cost specified in the schedule of quantities and rates / prices.

46.0 WITHOUT DETERMINING THE CONTRACT:

In such an event (i.e. termination under Article No. 44.4 to 44.9 above), the COMPANY

may 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 its sureties are liable to the COMPANY for any excess cost over and above the cost at the rates specified in the schedule of quantities and rates/prices, occasioned by such work having been taken over and completed by the COMPANY.

47.0 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. Moreover, OIL reserves the right to take legal or any other action on the basis of merit of the case.

48.0 MISCELLANEOUS PROVISIONS:

CONTRACTOR shall give notices and pay all fees at their own cost required to be given or paid by any National or State Statute, Ordinance, or other Law or any regulation, or bye-law of any local or other duly constituted authority as may be in force from time to time in India, in relation to the performance of the services and by the rules & regulations of all public bodies and companies whose property or rights are affected or may be affected in any way by the services.

CONTRACTOR shall conform in all respects with the provisions of any Statute, Ordinance of Law as aforesaid and the regulations or bye-law of any local or other duly constituted authority which may be applicable to the services and with such rules and regulation, public bodies and Companies as aforesaid and shall keep COMPANY indemnified against all penalties and liability of every kind for breach of any such Statute, Ordinance or Law, regulation or bye-law.

During the tenure of the Contract, CONTRACTOR shall keep the site where the services are being performed reasonably free from all unnecessary obstruction and shall store or dispose of any equipment and surplus materials and clear away and remove from the site any wreckage, rubbish or temporary works no longer required. On the completion of the services, CONTRACTOR shall clear away and remove from the site any surplus materials; rubbish or temporary works of every kind and leave the whole of the site clean and in workmanlike condition to the satisfaction of the COMPANY.

Key personnel cannot be changed during the tenure of the Contract except due to sickness/death/resignation of the personnel or any other justified situation in which case the replaced person should have equal experience and qualification, which will be again subject to prior approval, by the COMPANY.

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PART-II

SCHEDULE OF RATES

PREAMBLE

1. The price quoted shall be LUMPSUM PRICE on turnkey basis. Unless the basic parameter changes or additional/ extra requirements are made, total payments to be made to the Contractor shall be limited to lumpsum price indicated, irrespective of the progressive payments made during execution based on the split up of price.

2. Bidder shall quote LUMPSUM PRICE for entire scope of work Design, Engineering, Procurement, Fabrication, Supply, Construction & Commissioning and Initial Operation (reliability run/ site acceptance test) of the Plant for a period of 03 (Three) Months from the Date of Commissioning in all respects. The quote shall be inclusive all liabilities and taxes including statutory liabilities. This LUMPSUM PRICE may also be referred as Engineering, Procurement, Construction & Commissioning Basis (EPC).

3. Bidder needs to mandatorily quote for all the items SOR – 1, 2, 3 and 4. The bid will not be evaluated if bidder fails to quote against all the items mentioned in the SOR – 1, 2, 3 and 4. The SOR-Summary is the total of SOR's – 1, 2, 3 and 4.

4. **Price Bids will be evaluated on overall lowest cost basis (L-1 offer) i.e., considering total quoted price for all SOR's inclusive of all liabilities and GST as per SOR-Summary.**

5. The LUMP SUM PRICE AS PER SOR-Summary shall be considered as Contract Price which Owner (OIL) agrees to pay and the Contractor agrees to accept as full compensation for the Contractor's full performance of the Work in accordance with the provisions of the Contract Documents. Contract Price shall not be subjected to any adjustment except in case of Change Order or statutory variations (as per Clauses of SCC) in accordance with the provisions of the Contract.

6. Lumpsum prices quoted by the Contractor shall include cost of any other supplies/work(s)/Services not specifically mentioned in the Bid Document but necessary for the efficient, trouble free operation of the Plant and to make this job complete in all respects.

7. Obligation of the Contractor is not limited to the quantities that the Contractor may either indicate in the Breakup of Lumpsum Prices along with his bid or in further detailed breakup of lumpsum prices furnished after award of Work. Contractor shall carry entire scope of work/supplies/Services as detailed in various sections/volumes of the Bid Document within the quoted Lumpsum Price.

SUMMARY PRICE SCHEDULE/SUMMARY SCHEDULE OF RATES - (SOR-SUMMARY)

Item No.	SOR-REF	Description of Services	Total as per SOR'S (Exclusive GST) (₹)	GST Amount (₹)	Total as per SOR'S (Inclusive GST) (₹)
10	SOR-1	Design And Detailed Engineering, A			
20	SOR-2	Procurement and Supply Portion, B			
30	SOR-3	Construction / Installation Portion, C			
40	SOR-4	Pre-Commissioning, Mechanical Completion, Commissioning & Reliability Run/ Site Acceptance Test Portion, D			
TOTAL EST. CONTRACT VALUE = A+B+C+D					
			Total Contract Value (Exclusive GST) (₹)	**Total GST Amount (₹)**	**Total Contract Value (Inclusive of GST) (₹)**

Note:

1. Break up of TOTAL LUMPSUM PRICE as per FORM SOR-1,2,3 and 4.

FORM	**SOR-1**
NAME OF WORK	**Design and Detailed Engineering**
Name of Bidder	

Sl. No.	**Description of Items**	**UOM**	**Qty.**	**Unit Rate** (₹)	**Total (₹) (Ex GST)**
1	Residual Process Design	Lumpsum	1.00		
2	Detailed Design & Engineering	Lumpsum	1.00		
3	Vendors final documents for supply items duly certified	Lumpsum	1.00		
4	As-Built Documentation	Lumpsum	1.00		
				TOTAL - Exclusive GST (₹)	
				Applicable GST Rate (in %)	
				GST Amount (₹)	
				TOTAL - Inclusive of GST (₹)	

FORM	**SOR-2**
NAME OF WORK	**Procurement and Supply**
Name of Bidder	

Sl. No.	**Description of Items**	**UOM**	**Qty.**	**Unit Rate** (₹)	**Total (₹) (Ex GST)**
1	Procurement and Supply for Civil Engineering Portion.	Lumpsum	1.00		
2	Procurement and Supply for Mechanical & Plant Piping Portion.	Lumpsum	1.00		
3	Procurement and Supply of Raw Water Pipeline.	Lumpsum	1.00		
4	Procurement and Supply for Electrical Engineering Portion.	Lumpsum	1.00		
5	Procurement and Supply for Instrumentation Engineering Portion.	Lumpsum	1.00		
				TOTAL - Exclusive GST (₹)	
				Applicable GST Rate (in %)	
				GST Amount (₹)	
				TOTAL - Inclusive of GST (₹)	

FORM	**SOR-3**
NAME OF WORK	**Construction / Installation**
Name of Bidder	

Sl. No.	**Description of Items**	**UOM**	**Qty.**	**Unit Rate** (₹)	**Total (₹) (Ex GST)**
1	Construction of Civil Engineering Portion.	Lumpsum	1.00		
2	Installation of Mechanical & Plant Piping Portion.	Lumpsum	1.00		
3	Construction/ Installation of Raw Water Pipeline.	Lumpsum	1.00		
4	Installation of Electrical Engineering Portion.	Lumpsum	1.00		
5	Installation of Instrumentation Engineering Portion.	Lumpsum	1.00		
				TOTAL - Exclusive GST (₹)	
				Applicable GST Rate (in %)	
				GST Amount (₹)	
				TOTAL - Inclusive of GST (₹)	

FORM	**SOR-4**
NAME OF WORK	**Pre-Commissioning, Mechanical Completion, Commissioning & Reliability Run/ Site Acceptance Test Portion**
Name of Bidder	

Sl. No.	**Description of Items**	**UOM**	**Qty.**	**Unit Rate** (₹)	**Total (₹) (Ex GST)**
1	Completion of Pre-Commissioning activities.	Lumpsum	1.00		
2	Mechanical Completion.	Lumpsum	1.00		
3	Completion of Commissioning.	Lumpsum	1.00		
4	Completion of Reliability Run/ Site Acceptance Test for 03 months.	Lumpsum	1.00		
				TOTAL - Exclusive GST (₹)	
				Applicable GST Rate (in %)	
				GST Amount (₹)	
				TOTAL - Inclusive of GST (₹)	

PART-III

SPECIAL CONDITIONS OF CONTRACT (SCC)

The Clauses of SCC shall supplement and / or amend the General Conditions of Contract (GCC). Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

1.0 BRIEF SOCPE OF WORK

PROJECT TITLE: Hiring Services for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning of Pontoon Type Raw Water in-take Plant including cross country Raw Water Pipeline, Plant Piping and all Electrical and Instrumentation jobs on EPC-LSTK Basis at Oil India Limited, Duliajan, Assam.

Procurement and Supply of items like construction materials, plant piping and equipment, pipes for cross country Raw Water Pipe Line, Electrical Cables and Instrumentation items shall be under the scope of the EPC Contractor.

All materials like fuel, water, consumables, and power for construction activities, safe storage of all items, tools and tackles, manpower for the entire project shall be under the scope of the EPC Contractor.

The detailed Scope of Work is defined in the following:

- Section-I - Preamble Document
- Section-II - Civil and Structural Engineering
- Section-III - Mechanical Engineering and Plant Piping
- Section IV - 813 MM Cross Country Underground Raw Water Pipeline (Length: 2.0 Km, Approx)
- Section V - Electrical Engineering
- Section VI – Instrumentation

2.0 Engineering And Design Capability: The Contractor should engage their in-house Engineering and Design Team, or they may hire/outsource the Engineering and Design part of the Project, as declared in their Bid.

If the Contractor declares to hire/outsource the Engineering and Design part of the Project, then the proposed Design Agency/Firm/Party should have executed projects involving Engineering and Design. In case of inevitable situation, the replacement shall be made by a Design Agency/Firm/Party having experience equivalent or more (as defined above), with approval of client (OIL).

3.0 PROJECT MANAGEMENT: The Contractor should provide the Manpower as detailed under Clause No: 12 (EPC Contractor's Personnel and Office) of SECTION -I: Preamble Document.

4.0 The manpower earmarked for the project should be associated with the project till project completion and in case of inevitable situation the replacement should be made by personnel of equivalent experience or more (as defined under Clause No-3.0 above), with approval of client (OIL).

5.0 Completion period for the Main LSTK-EPC work is 18 Months from completion of mobilization period.

6.0 During the tenure of main LSTK-EPC work of 18 Months from completion of mobilization period, OIL will be engaging a PMC contractor for assisting OIL in project execution and monitoring the project. Since PMC Contractor will be engaged by OIL for the entire duration of main LSTK-EPC work, therefore in the event of failure on the part of EPC contractor to complete the main LSTK-EPC work on time i.e., 18 months from completion of mobilization period, the extra expenditure on PMC Contractor towards the extended period [attributable to EPC Contractor] will be recovered from the EPC Contractor.

7.0 During detailed engineering design phase and execution of the project, the Contractor should apply software for the followings:

(i) Piping network analysis
(ii) 3D modelling (piping, electrical, instrumentation & Structural)
(iii) 2D drawings
(iv) Structural analysis and design
(v) Pipe stress analysis
(vi) Project management

Notes:

(i) The Contractor to provide the list of software proposed to be used for the above jobs during the Project Kick -Off Meeting for approval of OIL.
(ii) Custom made software shall NOT be accepted.
(iii) The output file formats of the Software proposed by the bidder as above, should be compatible with Industry Standard Software like, PipeNet, HYSYS, AVEDA, AUTOCAD, STAAD PRO, Revit, MS Projects, Primavera, etc.

8.0 MOBILIZATION

8.1 **MOBILISATION PERIOD: 15 (fifteen) days** from the date of issue of Letter of Award (LOA).

8.2 **TERMS OF MOBILIZATION:** The Contractor shall report to Field Engineering Department within **15 days** from date of issue of LOA for a Kick-off Meeting for obtaining necessary information and instructions for commencement of work. Date of Kick Off Meeting shall be deemed as completion of mobilization. The venue for the Kick-off Meeting shall be at FHQ of OIL, i.e., Duliajan, Assam. During the Kick-off Meeting, the Contractor should provide/furnish details as appended below:

a) Detailed Proposed Project Execution Schedule.
b) Proposed Manpower Deployment schedule.
c) Implementation Schedule as defined under Point Nos a) & b) of Clause No. 8.0 of Section-I, Preamble Document.
d) Proposed Document Management System.
e) The Contractor shall also prepare a Schedule of Inputs/Support required from PMC/OIL, for detailed engineering of the project and submit it during the kick-off meeting for review.
f) The Contractor shall furnish schedule for submission for all drawings/documents during the kick-off meeting.
g) List of Softwares as per Clause No. 7.0 above.
h) Any other point as mentioned in the Contract Document.

9.0 DURATION OF THE CONTRACT

The total duration of the contract will be for a period of 21 Months and 15 Days from date of issue of LoA.

Break-up of Contract Duration is as under:

- Mobilization – 15 Days.
- Main LSTK-EPC work: Eighteen (18) Months for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning on LSTK-EPC Basis of Pontoon Type Raw Water in-take Plant at Duliajan, Assam, India inclusive of cross country Raw Water Pipeline, Plant Piping, and all Electrical and Instrumentation jobs.
- Reliability Run/Site Acceptance Test: Contractor shall be responsible for Initial Operation of the Plant for a period of 03 (Three) Months from the Date of Commissioning of the Plant is all aspects.

10.0 RECORDS, REPORTS & INSPECTION: The contractor shall be responsible for maintaining all applicable records and report. During the tenancy of the contract inspection may be carried out by OIL's approved TPI Agencies.

11.0 PERFORMANCE SECURITY: 3.00 % of Contract Value.

12.0 FORCE MAJEURE: In case of Force Majeure, no Force Majeure Rates shall be paid.

13.0 REMUNERATION & TERMS OF PAYMENT

13.1 Payment will be made, as per following payment terms. Final payment shall be based on the work actually done allowing for deviations and any deductions and the measurement shall be checked and certified correct by the Company's authorised representative before any such final payment is made.

13.2 Terms of Payment

(i) 5% of the project cost payable for completion of fieldwork, Design report, working drawings for Pontoon Type Raw Water In-Take Plant including allied buildings and approval of the project deliverables by the OIL.

(ii) 40% of project cost payable for supply, Installation and testing of the equipment including electromechanical components of pumps, motors, Pipes, specials, crane, and valves and as per the measurements recorded jointly at site and certifications of the materials by the OIL.

(iii) 25% of project cost payable after completion of construction the Civil works and allied buildings.

(iv) 30 % of the payments shall be made after the completion of the pre-commissioning, mechanical completion, successful commissioning, and Reliability test run.

13.3 All Invoices are to be uploaded through Vendor Invoice Management portal only via the following link

https://vim.oilindia.in/velocious-portal-app/.

CGM-Field Engineering
Oil India Limited
P.O. Duliajan-786602
Dist. Dibrugarh, Assam

14.0 DE-MOBILIZATION

a) On successful Commissioning, completion of 03 (Three) Months Reliability Run Test and completion of all other balance works as per scope of work covered under these specifications,

including fulfillment of requirements of Documentations, Drawings and Data, the Plant shall be ready for handover to OIL. PMC/ OIL shall issue to the Contractor a Taking Over Certificate, as stipulated in the General Conditions of Contract. The takeover by PMC/OIL as aforesaid shall be for the Plant complete in all respects. The date of Taking over shall be the Completion date of the Main LSTK-EPC work.

b) The contractor shall be required to submit the following documents but not limited to the same on completion of work along with the final bill.

1. Certificate for Successful Completion of Commissioning and Performance test
2. Completion certificate
3. Submission of completion documents as per SCC
4. Submission of operating manuals
5. Submission of Guarantees as specified contract
6. Approval from Statutory Authorities and Government bodies.
7. No claims certificate.
8. No dues certificate.
9. Detailed contract close out report.
10. Any other documents to be submitted as specified elsewhere in the contract.
11. No liability certificate: - Self-certification from the contractor that no payment is balance to their laborer subcontractor and vendors on account of service rendered/materials supplied by them.
12. Insurance Policies required as per contract.
13. Validity Extension of various Bank Guarantees required as per contract.
14. Submission of as-built documentation

c) Any item purchased upon OIL's approval for the project, if remains unused upon handing over of the project needs to be handed over to OIL.

15.0 LIQUIDATED DAMAGES: In the event of the Contractor's default in timely completion within the stipulated period, the Contractor shall be liable to pay liquidated damages @ 0.5% of contract value, per week or part thereof of delay subject to maximum ceiling of 7.5% of contract value.

16.0 WARRANTY AND REMEDY OF DEFECTS: A period of 12 (Twelve) Months beyond Contract duration shall be considered as Defect Liability Period. During this defect liability period, the responsibilities of the Contractor shall be as below:

a. Repairing of any defective equipment/machinery, piping etc. commissioned by the Contractor as per the terms and condition of the Contract at no additional cost to OIL.

b. All equipment/machinery, manpower, consumables etc. required for repairs as defined above to be arranged by the contractor.

17.0 KEY PERSONNEL: Detail of Key Personnel to be deployed by the contractor is as detailed below:

Sl. No.	Designation	Nos.	Qualification & Experience
1	Project Manager	1	Experience: Graduate in Civil/ Mechanical Engineering with a minimum of 5 years or Diploma in Civil/ Mechanical Engineering with minimum of 10 years of experience in the field of Plant Construction.

Sl. No.	Designation	Nos.	Qualification & Experience
2	Site In-charge (Civil/ Structural)	1	Experience: A Graduate in Civil/ Structural Engineering with minimum 3 years or Diploma in Civil/Structural Engineering with minimum of 5 years of experience of site supervision in the field of civil construction work.
3	Site In-charge (Mechanical)	1	Experience: A Graduate in Mechanical Engineering with minimum of 3 years or Diploma in Mechanical Engineering with minimum of 5 years of experience in mechanical engineering jobs of project nature.
4	Site In-Charge (Electrical)	1	Experience: A Graduate in Electrical Engineering with minimum of 3 years or Diploma in Electrical Engineering with minimum of 5 years of experience in electrical engineering jobs of project nature.
5	Civil Quantity Surveyor	1	A Graduate in Civil/ Structural Engineering with minimum 3 years or Diploma in Civil/ Structural Engineering with minimum of 5 years of experience of Quality Control of civil construction work.
6	HSE Officer	1	Experience: A Graduate in Environment /safety Engineering with minimum of 3 years or Diploma in Environment /safety Engineering with minimum of 5 years of experience in the relevant field.

18.0 SUBCONTRACTING/ASSIGNMENT: The EPC/LSTK contractor may sub-contract the following services subject to COMPANY's prior written approval. However, EPC/LSTK contractor shall be fully responsible for complete execution and performance of the services under the Contract.

a) Detailed Engineering and Design (Part of Full)
b) Software required for the Project
c) Construction of Pontoon Barges
d) Construction of Raw Water Pipeline & Plant Piping
e) Civil construction jobs
f) Electrical Jobs
g) Instrumentation Jobs
h) Logistics
i) NDT
j) TPI
k) Site Security

19.0 AREA OF OPERATION: Duliajan, Assam

20.0 HSE POLICY: Safety norms as mentioned in PART-V Safety Measures (SM) of this tender/contract document are to be strictly followed by the contractor and his working personnel.

21.0 ASSOCIATION OF COMPANY'S PERSONNEL: Association of company's Personnel shall be supervisory in nature.

22.0 Financing of trade receivables of Micro and Small Enterprises (MSEs) through Trade Receivables Discounting System (TReDS) platform: Based on the initiatives of Government of India to help MSE vendors get immediate access to liquid fund based on Buyers credit rating by discounting, OIL has registered itself on TReDS platform with M/s RXIL and M/s A TREDS Ltd. (Invoice Mart). MSE vendors can avail this benefit by registering themselves with any of the exchanges providing e-discounting / electronic factoring services on TReDS platform and following the procedures defined therein, provided OIL is also participating in such TReDS Platform as a Buyer.

22.1 MSE Vendor should be aware that all costs relating to availing the facility of discounting on TReDS platform including but not limited to Registration charges, Transaction charges for financing, Discounting Charges, Interest on financing, or any other charges known by any name shall be borne by MSE Vendor.

22.2 MSE Vendor hereby agrees to indemnify, hold harmless and keep OIL and its affiliates, Directors, officers, representatives, agents and employees indemnified, from any and all damages, losses, claims and liabilities (including legal costs) which may arise from Sellers submission, posting or display, participation, in any manner, on the TReDS Platform or from the use of Services or from the Buyer's breach of any of the terms and conditions of the Usage Terms or of this Agreement and any Applicable Law on a full indemnity basis.

22.3 OIL shall not be liable for any special, indirect, punitive, incidental, or consequential damages or any damages whatsoever (including but not limited to damages for loss of profits or savings, business interruption, loss of information), whether in contract, tort, equity or otherwise or any other damages resulting from using TReDS platform for discounting their (MSE Vendor's) invoices.

Note:

(i) Buyer means OIL who has placed Purchase Order / Contract on a MSE Vendor (Seller).

(ii) Seller means a MSE vendor, who has been awarded Purchase Order/Contract by OIL (Buyer).

23.0 GOODS & SERVICE TAX

(1) 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.

(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.

(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.

(4) Quoted price/rate(s) 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 cess on GST if applicable) on the final service. However, GST rate (including cess) to be provided in the respective places in the Price Bid. 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.

(5) Bidder should also mention the Harmonised System of Nomenclature (HSN) and Service Accounting Codes (SAC) at the designated place in SOR.

(6) 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.

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

(8) 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. 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.

(9) The bids will be evaluated based on total price **including GST.**

(10) 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.

(11) Contractor/Contractor 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 / Contractor fails to provide the invoice in the form and manner prescribed under the GST Act read with GST Invoicing Rules there under, OIL shall not be liable to make any payment on account of GST against such invoice.

(12) 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/Contractor, OIL shall withhold the payment of GST.

(13) GST payable under reverse charge mechanism for specified services or goods under GST act or rules, if any, shall not be paid to the contractor/Contractor but will be directly deposited to the government by OIL.

(14) Where OIL has the obligation to discharge GST liability under reverse charge mechanism and OIL has paid or is /liable to pay GST to the Government on which interest or penalties becomes payable as per GST laws for any reason which is not attributable to 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.

(15) Notwithstanding anything contained anywhere in the Agreement, in the event that the input tax credit of the GST charged by the Contractor / Contractor is denied by the tax authorities to OIL for reasons attributable to Contractor / Contractor, OIL shall be entitled to

recover such amount from the Contractor / Contractor 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.

(16) TDS under GST, if applicable, shall be deducted from contractor's/ Contractor's bill at applicable rate and a certificate as per rules for tax so deducted shall be provided to the contractor/Contractor.

(17) 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. Any error of interpretation of applicability of taxes/ duties by the contractor shall be to contractor's account.

(18) It is the responsibility of the bidder to quote the correct GST rate. The classification of goods/services 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 the OIL on account of any error on the part of the contractor.

(19) In case, the quoted information related to various taxes, duties & levies subsequently proves wrong, incorrect or misleading, OIL will have no liability to reimburse the difference in the duty/tax, if the finally assessed amount is on the higher side and OIL will have to right to recover the difference and in case the rate of duty/taxes finally assessed is on the lower side.

(20) Notwithstanding anything mentioned elsewhere in the Bidding Document the aggregate liability of OIL towards Payment of Taxes & Duties shall be limited to the volume of GST declared by the bidder in its bid & nothing shall be payable extra except for the statutory variation in taxes & duties.

(21) Further, it is the responsibility of the bidders to make all possible efforts to make their accounting/IT system GST compliant in order to ensure availability of Input Tax Credit (ITC) to Oil India Ltd.

(22) GST liability, if any on account of supply of free samples against any tender shall be to bidder's account.

(23) 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.

(24) 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.

(25) 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.

(26) 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.

(27) The base date for the purpose of applying statutory variation shall be the Bid Opening Date.

(28) The contractor will be liable to ensure to have registered with the respective tax authorities, wherever applicable 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.

(29) 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.

(30) 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.

(31) Procurement of Specific Goods: Earlier, there is no tax incidence in case of import of specified goods (i.e., the goods covered under List-34 of Customs Notification no. 12/2012-Cus dated. 17.03.2012 as amended). Customs duty is not payable as per the policy. However, under GST regime, IGST Plus GST compensation cess (if applicable) would be leviable on such imports. Bidders should quote GST as inclusive considering IGST component for the imported Materials portion while quoting their prices on destination basis. However, GST rate to be specified in the price bid format.

(32) Documentation requirement for GST: The Contractor 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;

Note: OIL GSTIN numbers are as follows:
Assam : 18AAACO2352C1ZW
Arunachal Pradesh: 12AAACO2352C1Z8

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 and
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:

(i) The original copy being marked as ORIGINAL FOR RECIPIENT;
(ii) The duplicate copy being marked as DUPLICATE FOR TRANSPORTER and

The triplicate copy being marked as TRIPLICATE 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 details of advance taken along with particulars as mentioned in clause no. (a), (b), (c), (d), (g), (k), (l), (m) & (o) above.

(33) 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.

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

24.0 NOTICES

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

COMPANY

a) **For contractual matters**

GM-Contracts
Oil India Limited
P.O. Duliajan-786602
ASSAM, INDIA
Phone No. 91-374-2808650
Email: contracts@oilindia.in

b) **For technical matters**

CGM – FIELD ENGINEERING
Oil India Limited
P.O. Duliajan-786602
Dist. Dibrugarh, Assam.
Phone No. 91-374- 280 7330
Email: parthadutta@oilindia.in

CONTRACTOR

_____

_____

Phone No.:

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

*****End of SCC*****

SECTION -I : Preamble Document

PROJECT TITLE:

DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, SUPPLY, CONSTRUCTION AND COMMISSIONING ON EPC/LSTK BASIS OF PONTOON TYPE RAW WATER IN-TAKE PLANT & RAW WATER PIPELINE AT DULIAJAN, ASSAM, INDIA

List of Abbreviations:

1. DED - Diesel Engine Driven
2. DG - Diesel Generating
3. EMD - Electrical Motor Driven
4. EPC - Engineering, Procurement and construction
5. FEED - Front End Engineering Design
6. HAZOP - Hazard and Operability study
7. HFL - High Flood Level
8. HOT – Hand Operated Travelling
9. HSE - Health, Safety and Environmental
10. IRS - Indian Register of shipping
11. LOA – Letter of Award
12. LSTK - Lump Sum Turn Key
13. MGD - Million Gallons per Day
14. MOC – Material of Construction
15. MT – Metric Ton
16. NRV - Non Return Valves
17. OEM - Original Equipment Manufacturer
18. OIL – Oil India Limited
19. P&ID - Piping & Instrumentation Diagrams
20. PFD - Process Flow Diagrams
21. PMC - Project Management Consultant
22. PWHT - Post weld heat treatment
23. QAP – Quality Assurance Plan
24. RMU - Ring Main Unit
25. SLD – Single Line Drawing
26. SWL – Safe Working Load
27. UFD - Utility Flow Diagrams
28. WTP - Water Treatment Plant

1.0 INTRODUCTION

Oil India Limited (OIL) is a Navaratna E & P Enterprise under Government of India. OIL is in the business of exploration/production & transportation of crude oil and natural gas and production of LPG. The Field Headquarter of the company is situated at OIL township of Duliajan in the District of Dibrugarh of Assam.

Duliajan is a self-sufficient township having all the civic amenities like Schools, Colleges, Markets, Hospitals, parks etc The Offices of Oil India Limited, Industrial Areas of Oil India Limited, housing quarters for the employees are all situated here.

The entire Water requirement (Domestic, Industrial & fire fighting) of Duliajan Township is supplied from Water Treatment Plant (WTP) located at Tipling approximately 5 KM from Duliajan. The water requirement of the nearby field installations like Oil Collecting Stations/ Gas Compression Stations/ Bowser Unloading Stations is also catered to from this Water Treatment Plant. Source of water is the River Burhi Dihing which is located at approximately 6 KM from Duliajan.

OIL now intends to set up / construct new water treatment facilities for catering to the water demand of Duliajan Township and nearby field installations. M/s SECON Private Limited, Bangalore was hired to carryout consultancy services (referred hereafter as PMC) for the same. The Front End Engineering Design (FEED) Package has been developed by M/s SECON and implementation of the facilities shall be done by engagement of an Engineering, Procurement and Construction Contractor (referred hereafter as EPC Contractor) on Lump Sum Turn Key (LSTK) basis.

The capacity of the new water treatment plant to be constructed has been fixed at 8 Million Gallons per Day (MGD). **The Unit of Measurement is Imperial Gallons, ie: 1 Gallon = 4.54 Liters.** The construction phase of the new 8 MGD WTP shall comprise of the following packages:

a) Package – I: Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning on LSTK Basis of Pontoon Type Raw Water in-take Plant for 8 MGD WTP at Duliajan, Assam, India.
b) Package – II: Design, Engineering, Procurement, Supply, Construction and Commissioning on LSTK Basis of Raw Water pipe line [813 MM (32 Inch) OD] from Pontoon Type Raw Water in-take Plant to the site of 8 MGD WTP at Duliajan, Assam, India.
c) Package – III: Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning on LSTK Basis of 8 MGD WTP at Duliajan, Assam, India. The job also involves site clearance entailing demolition of an old WTP.

OIL now intends to hire EPC services for Packages -I & II (as defined above) on LSTK basis. This volume details the scope of work, conditions of work and relevant details of required for the LSTK vendor to participate in the Tendering Process. PACKAGE-III AS DEFINED ABOVE SHALL NOT BE PART OF THIS CONTRACT.

2.0 BRIEF DESCRIPTION OF WORK

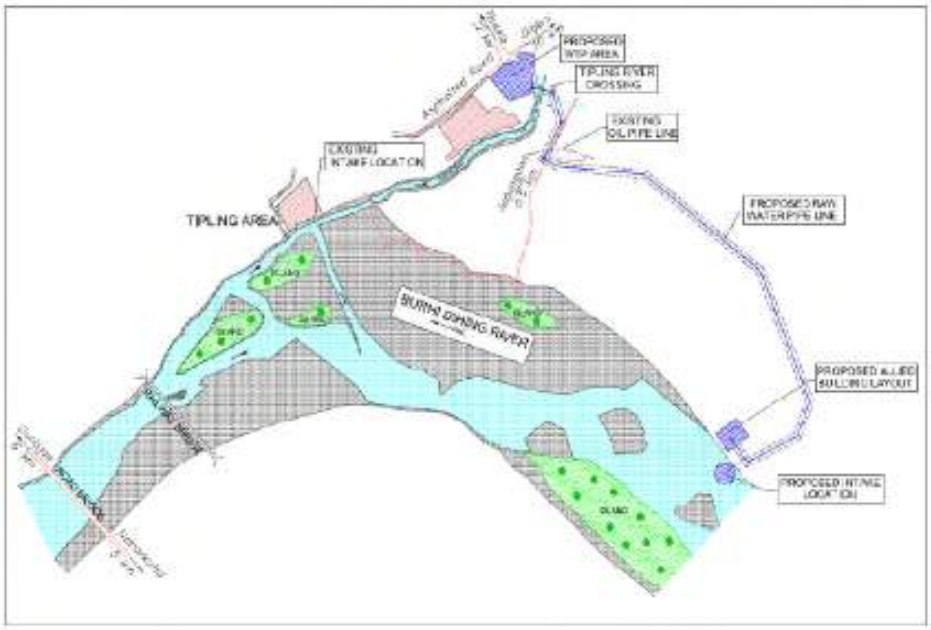
I. Introduction:

This volume defines the jobs and responsibilities of the LSTK Contractor for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning on LSTK Basis of Pontoon Type Raw Water in-take Plant and Raw Water pipe line complete in all aspects at Duliajan, Assam, India.
The scope of work includes (but not limited to) Basic Engineering and Design (based on FEED of the PMC), Detail Engineering (based on FEED of the PMC), Obtaining all necessary approvals from statutory bodies as applicable , Health, Safety and Environmental (HSE) compliance, Soil Investigation, Tendering, Procurement, Supply, Manufacture, Fabrication, Carrying out Route Survey wherever required for over dimensional consignments, Transportation of all equipment and material to site including loading, unloading, secure storage, insurance, and

maintenance, Installation, Construction, Hook up, Testing, Pre-commissioning, Performance Guarantee Test Runs, Final Commissioning including Total Project Management on LSTK Basis for Commissioning, Completion and handing over the Pontoon Type Raw Water in-take Plant complete in all aspects at Duliajan, Assam, India.

II. Basic Details:

The Pontoon Type Raw Water in-take Plant shall be located at the banks of the river Burhi Dihing near Duliajan, Assam , India (around Lat 27^0 19'12.48" and Long 95^0 19' 48.37''). The plant shall be drawing about 10.3 MGD of raw water from the river through 02 (two) nos of Pontoons. The location of the plant is shown in the key map as below:



III. Brief Process Description:

(a) The Pontoon Type Raw Water Intake plant shall be the raw water supply source to the 8 MGD WTP to be constructed at Tipling near Duliajan , Assam, India. The raw water (minimum 10. 3 MGD) shall be drawn by EMD Centrifugal Pump sets installed on 02 (two) nos Pontoons from the River Burhi Dihing. Pontoons are basically floating platforms (constructed out of steel plates and sections) suitable for rivers having large variation in water levels. There shall be total 04 Nos EMD Raw Water pump sets (02 nos each installed on each pontoon, with 01 running and as standby, complete with all requisite valves, piping and fittings). The discharge header of the raw water pump sets of each pontoons pump houses shall be connected to the main raw water delivery pipe line by individual pipe lines supported on swivel joints on both ends (ie: Pontoon or river end and the river bank end) to accommodate the variations in the water level in the river during summer and winter. The design of the swivel joints should be so that the same can accommodate the variations of water level in the river wrt the High Flood Level (HFL) and low water level. The basic data wrt the water level in the river are as follows:

Sl. No.	Particulars	Details
1.	High Flood Level (HFL)	122.69 m
2.	Ground level at proposed Pontoons	119.9 m
3.	Low water level in River	107.0 m
4.	Discharge level	120.5 m

The Basic Design Operational philosophy of Pontoon Pump Houses are as below:

Sl. No.	Description	Pontoon Pump House-1	Pontoon Pump House-2
1.	Type of Pump	Centrifugal	Centrifugal
2.	Type of Prime Mover	Electric Motor	Electric Motor
3.	Total No of Installed Pump Sets	2	2
4.	No of working Pump Set	1	1
5.	No of Stand-By Pump Set	1	1
6.	No of Hours Pumping	22	22
7.	Minimum Duty point Discharge per Pump (LPS)	295.56	295.56
8.	Minimum Head (M)	56	56
9.	Minimum Negative Suction Head (M)	6	6

There shall be 02 nos additional Diesel Engine Driven (DED) Raw water pump sets (of 50% Capacity of EMD Raw water pump sets, complete with all requisite valves, piping and fittings) installed on the river bank to cater to pumping requirements in the event of a power failure. Basket strainers (installed on the river bank) of requisite mesh size installed on inlet pipe line of each of the raw water pump sets shall act as initial strainers of raw water for large debris and impurities. Suitably rated 02 (two) nos EMD Centrifugal back wash pump sets (complete with all requisite valves, piping and fittings)shall be installed for cleaning of the basket strainers. The 10.3 MGD raw water (minimum) from the river Burhi Dihing drawn by the EMD Raw water pup sets shall be pumped to the 8 MGD WTP through underground 813 MM (32 Inch) diameter pipeline. The 8 MGD WTP shall be located at a distance approximately 2.0 KM from the Raw Water intake Plant.

(b) The main electrical power requirement of the Raw Water intake plant shall be catered to by OIL's captive power. The electrical power is to be tapped from the 11 KV overhead line at Tipling area (approximately 2.0 KM away from the Raw water intake plant). There shall be 2 nos. of 11kV underground feeders to be taken to Raw water intake plant. One of the feeder shall be directly laid from Tipling to the Raw water intake plant and the second feeder shall be from Tipling to the Raw water plant through an 11KV RMU to be installed at Balighat area. Suitably rated separate Diesel Generating (DG) Sets for catering to the lighting load and process critical equipments shall have also to be supplied and installed for catering to power supply in case of any power failure. All electrical works including design, procurement, testing, installation (inclusive of the underground cable laying), commissioning and approval from CEA and CEIG required for the substation and the Raw water intake plant shall be under the scope of the LSTK Contractor.

(c) For process monitoring a PLC based control panel shall be placed in the operator's room, which shall indicate the followings:

Sl. No.	Parameters	Display	Remarks
I.	Raw Water Pump Running status	Running/ Standby / Tripped	AV Alarm in case of tripping with reset.
II.	Raw Water Pump Discharge pressure	Pressure	AV Alarm in case of Set High or Low pressure with reset.
III.	Raw Water Pump Motor parameters	Electrical Parameters like Voltage, Ampere etc.	AV Alarm in case of abnormality with reset.
IV.	Water Ingress to the Pontoons	Safe / Alarm	AV Alarm in event of crossing of the set point with reset..
V.	ESD		

(d) The Raw Water drawn by the pumps at Pontoon Type Raw Water Intake plant shall be discharged via an underground welded raw water pipe line [813 MM (32 Inch) OD] from Pontoon Type Raw Water in-take Plant

to the site of 8 MGD WTP at Duliajan, Assam, India. The length of the pipe line shall be 2.0 KM (Approx). The Raw Water Pipe Line shall cross Tipling River, near Tipling Tinali. Suitable river crossing arrangement shall have to constructed for the same.

(e) All Civil Engineering works like Coffer Dam, Embankment Bund cum approach road, Panel Room and Allied Buildings near Intake Location, Retaining wall, Asphalt Roads etc for completion of the Pontoon Type Raw Water Intake Plant shall be under the scope of the LSTK Contractor.

NB: The concept plan and details of the above are attached as below:

i. Doc No: SECON/OIL/WS/Vol-III/September-19, Package-I, Volume -III
ii. Doc No: SECON/OIL/WS/Vol-III/September-19, Package-II, Volume -III
iii. DWG. No. SECON/OIL/WS/EE/SLD-01

IV. The summary of major Mechanical Machinery / Equipment/Pipe Line to be supplied, installed & commissioned at the Raw Water intake Plant under are as below:

Sl No	Description	Quantity	Details
1.	Pontoons	02 Nos	Minimum specification for Pontoon: Length- 17.5 m, Width- 10 m with Safety railing. Pontoon lifting lugs. MOC for Hull: IS 3039 MOC for General Construction– MS IS 2062 Grade – Br E250.
2.	Foot Bridge	02 Nos	From each of the Pontoons to the river bank.
3.	EMD Centrifugal Raw water pump set	04 Nos [02 nos each on each pontoons, 01 working and 01 standby on each pontoons]	Type: Centrifugal, Horizontal split casing Minimum Discharge: 295.56 LPS Total Head: 56.0 M Minimum Negative Suction: 6 M
4.	EMD Back wash Pump sets	02 Nos	Type: Centrifugal
5.	Diesel Engine Driven (DED) Raw water pump set	02 Nos	Type: Centrifugal, Horizontal split casing Discharge: 147.78LPS Total Head: 56.0 M Minimum Negative Suction: 10 M
6.	Piping, Pipe Fittings and Valves	For the complete plant.	
7.	HOT Crane	03 Nos	Type: Single Girder SWL: 10 / 2 MT
8.	Welded Underground Raw Water Pipe Line	2.0 KM (approx.)	Conforming Standard: IS 3589:2001 Out Side Diameter: 813 MM (32 Inch) Wall Thickness: 18 MM Pipe Construction Type: SAW Total Length Required: 2.0 KM (approx.) Grade of Steel: Fe410 End Preparation: Beveled

Sl No	Description	Quantity	Details
			Length of Pipe Joints: As per IS 3589:2001 External Coating: 3 LPE

V. The summary of major Electrical Machinery / Equipment to be supplied, installed & commissioned at the Raw Water intake Plant under are as below:

Sl No	Description	Quantity	Details
1.	11 KV Ring Main Unit (RMU)	01 (One) No	Design, Procurement/ Fabrication Supply, installation, testing, inspection and commissioning of 11 KV, 630A, 4 Way Extensible, Outdoor, Motorised RMU Comprising of 4 VCB TYPE: VVVV+M. SF6 insulated, Motor Operated ring main unit contained within a metal clad enclosure, suitable for Outdoor use, free standing. Auxiliary power supply for motor and Indication shall be self-contained in the RMU. NB: The RMU is to be installed at Balighat area approximately 1.6 KM away from the Raw water intake plant.
2.	11 KV HT Panel	01 (One) No	Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of 11KV Indoor Switchgear at Raw water intake plant brand new make weather proof Indoor Panel with IP52 or better protection grade with 3ph ,50 cycle VCB panel conforming to IEC-56 suitable for Indoor installation. Necessary adopter panel shall be supplied along with breaker panel.
3.	1250 KVA Transformer	02 (Two) Nos	Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of Oil immersed naturally cooled continuous duty with Copper winding 1250 KVA 11,000/415 volts 3 Ph 50Hz DYn 11 vector group Distribution Transformer fitted with the all requisite accessories suitable for outdoor installation. The Distribution Transformer should conform to IEC 60076: Power transformers. The make of the Distribution Transformers should be ABB/Siemenns/Voltamp/Crompton grieves/Kirloskar or equivalent.
4.	Main LT Panel	01 No	415V Indoor Switchgear weather proof Indoor Panel with IP52 or better protection grade with 3ph ,50 cycle ACB panel conforming to IEC-56 suitable for Indoor installation with incorporating the necessary accessories .

Sl No	Description	Quantity	Details
5.	Backwash Pump set MCC Panel	01 No	415V Back wash pump MCC panel , weather proof Indoor Panel with IP52 or better protection grade with 3ph ,50 cycle ACB panel conforming to IEC-56 suitable for Indoor installation with incorporating the necessary accessories.
6.	Pontoon MCC Panel	02 Nos	415V Pontoon MCC weather proof Indoor Panel with IP52 or better protection grade with 3ph ,50 cycle ACB panel conforming to IEC-56 suitable for Indoor installation with incorporating the necessary accessories.
7.	Digital Soft Starter	06 Nos	Digital Soft Starter Indoor Type Suitable for 3Phase,415volts,50Hz,250KW Motor and should have capacity to restrict the initial drawing current 2.5 to 3 times of the motor. It Shall be suitable for motor protection. The IEC standard for soft starters shall be confirmed to IEC 60947-4-2.
8.	Capacitor Panel	01 No	The panel shall be adequate to handle incoming and outgoing cables. Timers, automatic power factor controller unit of suitable capacity shall be provided with 6 taps (contactors) which can switch on the individual bank of capacitor such that the power factor shall not be less than 0.9 lag. The connection of the APF panel shall be such that when working on D.G set, the supply to this panel shall be switched off. The capacitor banks shall be suitable for operating pumpsets in solo or parallel operation.
9.	Lighting Distribution Panel	03 No	415V Lighting Panel ,weather proof Indoor Panel with IP52 or better protection grade with 3ph ,50 cycle MCCB panel conforming to IEC-56 suitable for Indoor installation with incorporating the necessary accessories.
10.	DCDB and Battery Charger Panel	01 No	Batteries (110 V, 150 AH), Battery Chargers & D.C.D.B. Battery charger (trickle/boost) complete with transformer, rectifier, semiconductor devices, resistors, indicating instruments (ammeter/ voltmeter) on AC and DC sides, lamps, selector switches, etc., The continuous rating of the bridge shall be around 20 A for 180 AH and transformer rated for 100 VA continuously.
11.	11 KV, 3CX240 Sqmm Aluminum armored XLPE cable	5.0 KM (Requirement indicated is approximate, to be finalized during Detailed	To be laid underground from existing 11kV overhead feeder at Tipling area to 11 KV HT Panel located at Raw water intake plant.

Sl No	Description	Quantity	Details
		Engineering base on site conditions)	
12.	Silent Diesel Generating (DG)Set	01 for critical plant machinery and lighting load	Design, Procurement, Supply, installation, testing and commissioning of 415 V, 3 phase, 50 Hz 3-Ø DG set. Rating to be finalized during Detailed Engineering. DG Set is to be designed considering running of at least 01 No of EMD Centrifugal Raw water pump set along with lighting load. (Minimum Rating of DG Set shall be 500 KVA)
13.	DG AMF Panel	01 No.	AUTO MAINS FAILURE (AMF) Panel at 0.8 pf 415V 50Hz 3-Ø DG set. The AMF panel shall have only DG breaker and additional cable to be laid for EB power failure sensing/ interlocking with the EB breaker of Main HT panel.
14.	11 KV, 1CX120 Sqmm Aluminum armored XLPE cable	5.0 KM (Requirement indicated is approximate, to be finalized during Detailed Engineering base on site conditions)	1Cx120sqmm PVC insulated Aluminum Conductor as earth wire to be laid along with Power cable as continuity conductor.
15.	LT cable Copper and Aluminum, Control cables.	For the Complete Plant	The LV power cables shall be 1100V grade, single/multi core stranded Copper/Aluminum conductor, extruded XLPE/PVC insulated with extruded PVC inner sheath, armoured and overall sheath with extruded Flame Retardant Low Smoke (FRLS) PVC compound (Type ST-1). These cables shall conform to IS 7098 (Part I) for XLPE and 1554(part 1) for PVC insulation. The control cables shall be 1100 V grade, multi core, stranded annealed high conductivity copper with extruded PVC insulated inner sheath, armoured and overall sheath with extruded Flame Retardant Low Smoke (FRLS) PVC compound (Type ST-1).

VI. The summary of major Civil Work to be carried out at the Raw Water intake Plant is as below:

Sl. No	Component	Description including Purpose and facilities the structure has to cater
1.	Design, Engineering and Construction of Embankment Bund with Asphalt Road to Raw Water Intake Locations (Allied Building area)	Embankment bund has been proposed from Allied building layout upto existing PWD road to facilitate the rise in floor level of Allied Buildings due to HFL at the location. Approximate Details are as below: Length: 500 M (Approx)

Sl. No	Component	Description including Purpose and facilities the structure has to cater
		Height: 6.8 M Width: 4 M Material: Earthen , with asphalt topping
2.	Design, Engineering and Construction of Coffer Dam	Protection wall/Stone Revetment for Pontoons and boundary walls/ Compound walls are proposed to be constructed within the river bank, in order to facilitate the construction of Protection wall & boundary walls/Compound wall. Temporary coffer dam has to be constructed during monsoon period. Coffer Dam has been proposed for an approximate length of 100 m along the River bund at Intake location.
3.	Design, Engineering and Construction of Panel Room at allied building layout (20 m x 6 m)	This panel room is to be constructed for housing of all Electrical Panels and related equipment. The panel room also includes cables ducts/ trenches, necessary foundation for Electrical Panels and related equipment etc.
4.	Design, Engineering and Construction of Transformer Yard	This yard is to be constructed for installation of 02 nos 1500 KVA outdoor type Transformer.
5.	Design, Engineering and Construction of DG Set Foundation and Shed	Foundation Pad and suitable Shed for installation of 02 Nos Silent DG Set has to be constructed along with suitable shed with 10 MT HOT crane.
6.	Design, Engineering and Construction of Foundation and Shed for DED Raw Water Pump Sets	Foundation Pad and suitable Shed for installation of 02 Nos DED Raw Water Pump Sets has to be constructed.
7.	Design, Engineering and Construction of Operator cum Security Room at allied building layout (Size - 6.0 m x 4.5 m)	The operator Room is to be constructed at the entrance of the at allied building layout. The room shall house the Instrumentation Display Panel for Process Critical Parameters including includes cables ducts/ trenches, necessary foundation. The Room is inclusive of change room and sanitary room and necessary plumbing work.
8.	Design, Engineering and Construction of Retaining Wall (around Allied Buildings layout/ platform)	This Retaining Wall is to be constructed along the Allied Buildings layout/ platform along the river bank. This is to be constructed for protection of the Allied Buildings layout/ platform from any erosion or any other damage that might be caused by the river.
9.	Design, Engineering and Construction of Compound Wall	230 mm thick burnt brick masonry wall of 10 feet height and wire fencing of 2 feet height of compound wall is to be constructed around the layout as per Concept Drawing.
10.	Design, Engineering and Construction of Security Room 2m x2m (Near Gate)	The Security room is to be constructed at the Entrance Gate. The room is exclusive of security purpose.
11.	Design, Engineering and Construction of Drainage and Protection Wall	Drainage system (Pipe Culverts) is to be constructed to drain off the rain water from upstream side of the allied buildings to reach the River at downstream end.
12.	Design, Engineering and Construction of Asphalt Road inside Allied Buildings Layout	Asphalt Road of 4 Meter width is to be constructed inside Allied Buildings Layout as per Concept Drawing.

3.0 Mobilization and Completion Period

A. Mobilization Period: The "Project Kick Off Meeting" shall be held within 15 (Fifteen) Days from the Date of Issue of LoA. The Date of " Project Kick Off Meeting " shall be treated as completion of Mobilization.

B. Completion Period : Twenty One (21) Months from the date of completion of mobilization.
NB:
(i) Eighteen (18) Months from the date of completion of mobilization shall be considered for Completion and Final Commissioning of the Project.
(ii) The EPC Contractor shall also be responsible for Initial Operation (reliability run/ site acceptance test)of the Plant the for a period of 03 (Three) Months from the Date of Commissioning in all aspects.

4.0 Site Location and Environmental Conditions

I.Approach to Site:

Duliajan is well connected to the rest of India by air, rail as well as roads. The nearest airport is 48 km away at Dibrugarh. Dibrugarh airport is connected by regular flights from Kolkata, the nearest international airport, and New Delhi. Besides there is also an air route to Dibrugarh from Guwahati the capital city of Assam. Nearest railway station is Duliajan. Four major inter-state express trains operate on the rail link close to Duliajan. Three of these trains originate from New Delhi and one from Kolkata. The nearest stoppages are at Tinsukia (30 km) and Dibrugarh town (50 km). An inter-city shuttle plies daily between Dibrugarh and Guwahati (495 km). Easily accessible by road by a branch-off (40 km) from the nearest national highway (NH-37), Duliajan is also well connected to the nearest district headquarters of Tinsukia (30 km) and Dibrugarh (50 km). The NH-37 traverses across the state of Assam connecting all major towns and cities.

II.4.2 Geographical location & Climate:

Situated in 27.3667° N, 95.3167° E, in Duliajan, the climate is moderate. In winter there is much less rainfall than in summer. The average annual temperature in Duliajan is 23.2 °C. The average annual rainfall is 2528 mm. The driest month is December with 21 mm. Most precipitation falls in July, with an average of 489 mm. The warmest month of the year is August with an average temperature of 27.8 °C. In January, the average temperature is 16.1 °C. It is the lowest average temperature of the whole year.

5.0 SCOPE OF WORK

I.General:

a) The scope of work includes (but not limited to) Basic Engineering and Design (based FEED of the PMC), Detail Engineering based on FEED of the PMC, Obtaining all necessary approvals from statutory bodies as applicable , Health, Safety and Environmental (HSE) compliance, Soil Investigation, Tendering, Procurement, Supply, Manufacture, Fabrication, Carrying out Route Survey wherever required, for over dimensional consignments, Transportation of all equipment and material to site including loading, unloading, secure storage, insurance, and maintenance, Installation, Construction, Hook up, Testing, Pre-commissioning, Performance Guarantee Test Runs including Total Project Management on LSTK Basis for completion and handing over the Pontoon Type Raw Water in-take Plant complete in all aspects at Duliajan, Assam, India.

The scope of work also includes 03 (Three) Months of Initial Operation (reliability run/ site acceptance test) and 1 Year Maintenance Service during Warranty, including all manpower, materials and consumables for the Pontoon Type Raw Water in-take Plant from the date of final commissioning.

FEED Package is provided along with the tender documents, consists of Design Basis, PFDs, P&IDs, Process Data Sheets for equipment, instruments and packages, Mechanical data sheets for equipment, Plot Plan and other related Civil Drawings, equipment layout, scope drawings, area classification drawings, specifications and standards etc.

b) All the required static and rotary equipment, packages, instrumentation items, electrical items , and other bulk materials shall be supplied by the EPC Contractor as per approved specification. Moreover, the standard furniture required for control room building will be under the scope of the EPC Contractor.

c) The EPC Contractor has to ensure the following :
   i. Verification of Process Data and Confirmation of additional requirement, if any.
   ii. Provide guarantee for Equipment Performance

d) EPC Contractor arrange for the visit of vendor specialists for minimum two occasions during engineering stage without any cost implication to OIL.

e) EPC Contractor shall verify the information and requirement provided herein and satisfy them for the proper execution of the job. Once the EPC Contractor is satisfied, the EPC Contractor without any additional cost and time to the OIL shall supply any item not specifically included herein but required for the completion of the project.

f) The BIDDER may visit the site at their cost prior to submission of bid and apprise himself of the existing site conditions.

g) The requirement stipulated in the Bid Document is the minimum requirement for the project. Any item that was not covered in the document but required, as per assessment of the Bidder, for fulfilling the performance of the system/ stations, EPC Contractor may indicate the same with techno-economical justification for OILs consideration along with the BID.

h) The drawing of the buildings and architecture shown in the drawings are also indicative of minimum requirement. Any alternate scheme within the built-in area provided may be suggested to make the buildings more suitable, useful and aesthetically pleasing beautiful without incurring any additional cost.

i) Any Local/ Environmental issue arising out of the work by EPC Contractor shall have to be resolved by the EPC Contractor on their own.

II. Statutory Regulations:

a) The EPC CONTRACTOR shall adhere to all Statutory Regulations for the Project and shall have to meet all the pre-requisites required for job execution.

b) The EPC CONTRACTOR shall arrange requisite inspection of the works (if stipulated by statutory rules and regulations) by the by the appropriate Authorities and necessary coordination and liaison work in this respect shall be the responsibility of the EPC CONTRACTOR .

c) Any dispute with Statutory Authorities/Bodies arising out of the job/work of the EPC Contractor shall have to be resolved by the EPC Contractor at extra Cost to OIL.

III. Engineering:

a) Scope of Work of EPC CONTRACTOR includes acceptance of the FEED package for execution, Residual Process Design , Basic Engineering and Detailed Design, Engineering, Residual Engineering, Procurement, Fabrication, Supply, Construction and Commissioning on LSTK basis.

b) Engineering required to be done by the EPC CONTRACTOR may arise singularly or in combination be it manufactured / fabricated / purchased / construction / commissioning / statutory requirements, Govt. Regulations / safety requirements, site conditions. Resultant total procurement and construction installation, testing, insulation, painting and commissioning are also in the scope of EPC CONTRACTOR . The deliverables of Detailed Engineering are defined hereafter under discipline wise scope of works.

c) The EPC CONTRACTOR shall comply with all prerequisites mentioned in the contract document.

d) The EPC CONTRACTOR shall carry out engineering based on the Front End Engineering and Design (FEED) Package provided in the bid document. The EPC CONTRACTOR shall enter into a secrecy agreement with the OIL / PMC for non-disclosure of any data / details without written consent of the OIL / PMC.

e) No changes to the basic parameters provided in the Engineering Package shall be acceptable. If for any technical reason a change is warranted then such changes required by the EPC CONTRACTOR shall be requested to OIL / PMC, with detailed explanation, for obtaining OIL's / PMC approval / clarification. The EPC CONTRACTOR shall do the changes only if agreed by the OIL / PMC. Such changes shall be deemed as a part of scope of work of the EPC CONTRACTOR and shall have no additional cost and time implication to OIL / PMC. However, if the agreed changes / deviations result in cost saving, then the same shall be passed on to OIL.

f) Any clarification required on package by the EPC CONTRACTOR shall be sent to OIL / PMC. The EPC CONTRACTOR shall abide by the OIL / PMC's clarification and shall be deemed as a part of scope of work of the EPC CONTRACTOR and shall have no additional cost and time implication to OIL / PMC. However, if the agreed changes / deviations result in cost saving, then the same shall be passed on to OIL.

g) Indicative Equipment Layout Plans have been developed indicating the respective locations of various equipment envisaged under the above project. The plot plan provided in the tender document has to be suitably prepared by the EPC EPC Contractor . The EPC CONTRACTOR may develop better to improve human engineering and shall fit in all the facilities within this area.

h) The EPC CONTRACTOR shall have to carry out Basic Engineering and Design (based FEED of the PMC), Detail Engineering based on FEED of the PMC.

IV. Procurement and Supply:

a) The procurement to be carried out by the EPC CONTRACTOR shall cover the purchasing including creation of Technical Specifications, getting the specifications vetted by OIL/PMC, ordering and supply, inspection (TPI & OIL as per schedule) , expediting, custom clearance where applicable, transportation to site, stores management which includes preservation and storage of equipment and materials, covered storage, air conditioned storage (if required) and ambient storage. EPC Contractor shall issue request for quotation and obtain offers from the prospective vendors based upon the bid specifications and submit the purchase requisition along with the complete filled up data sheets, specifications, vendor catalogs/drawings to OIL/PMC for review/approval.

b) Following items are identified as critical for timely completion of the project. EPC Contractor shall ensure finalization of the processing of orders for the same within 90 (Ninety) days from the date of award of the LoA:

Sl. No.	Brief Description
1.	Pontoons
2.	EMD Centrifugal Raw water pumpset
3.	EMD Back wash Pumps
4.	Diesel Engine Driven (DED) Raw water pump set
5.	Piping, Pipe Fittings and Valves
6.	HOT Crane
7.	Welded Underground Raw Water Pipe Line
8.	11 KV Ring Main Unit (RMU)
9.	11 KV HT Panel
10.	1500 KVA Transformer
11.	Main LT Panel
12.	11 KV, 3X240 Sqmm Aluminum armored XLPE cable
13.	Silent Diesel Generating (DG)Set
14.	DG AMF Panel

15.	11 KV, 1X120 Sqmm Aluminum cable
16.	LT cable Copper and Aluminum, Control cables.

c) All skid mounted major equipment such as EMD Raw Water pump sets, DED Raw Water pump sets, EMD Back Wash Pump Sets, DG Sets as indicated in the tender document, shall be supplied as a complete functional unit. The packaging of the skids with all accessories, control system, valves and fittings etc. shall be done by the main equipment manufacturer and shall be responsible for the performance of the total skid mounted package.

d) All valves and any other flanged fitting shall have to be supplied along with matching companion flanges and nut and bolts.

e) Before ordering, clearances for technical portion should be taken from OIL / PMC in respect of items defined else where in the bid document. Before ordering any equipment and material the EPC Contractor shall submit the purchase requisition and obtain approval from the OIL / PMC. Any items ordered which do not conform to the contractual requirement identified at any stage of the project, shall be rejected. Replacement / modification and the cost impact, project delay arising out of such rejection shall be solely to the account of the EPC CONTRACTOR . Replacement / modification leading to cost implication, project delay arising out of any kind of rejection of equipment and materials shall be solely to the EPC Contractor 's account.

f) Procurement and supply of commissioning spares as necessary and mandatory spares, as mentioned in this bid document is also in the scope of the EPC CONTRACTOR within the quoted price.

g) The EPC CONTRACTOR shall also quote spares for two years operation and maintenance for all items. OIL will decide on ordering during the tenure of the project.

h) The EPC CONTRACTOR is required to organize a proper inspection and expedition system so as to ensure timely delivery of all the items / equipment meeting the specified quality criteria. The EPC CONTRACTOR is required to engage a third party Inspection Agency. Approved by OIL. The list of the same shall be forwarded in due course.
Bidders are required to include the TPI charges within their lump sum prices.

i) Inspection shall be carried out by TPI/OIL / EPC. A list of items shall be finalized after the award of the job clearly identifying the items to be inspected by TPI/OIL/PMC with details of the location and schedule for inspection. However, EPC Contractor shall have his own inspection organization in place to carry out inspection activities in respect of indigenous and imported equipment / materials through an OIL / PMC approved third party inspection agency. The payments to be made to the third party inspection agency towards third party inspection shall be borne by the EPC CONTRACTOR and shall be the total responsibility of the EPC CONTRACTOR . Further, the responsibility for inspection / testing as per specifications, approved documents and agreed inspection test plans shall be that of the EPC CONTRACTOR . OIL reserves the right to inspect the items deemed necessary by them without any time and cost implication. A clear two weeks notice in writing (10 working days) is required to be provided by the EPC CONTRACTOR for such items where OIL / PMC require inspection. The inspection charges of OIL including stay at vendor's city shall be borne by OIL. The EPC CONTRACTOR shall be responsible for all coordination of inspection by OIL / PMC. The inspection by the TPI / OIL / PMC shall NOT ABSOLVE the EPC CONTRACTOR from his responsibilities under this Contract.

j) The EPC CONTRACTOR is required to organize a custom clearance and transportation system to ensure prompt clearance of imported equipments from customs and transportation of equipments / materials to project site from Ports / Vendor's works. EPC CONTRACTOR shall maintain supervision, monitoring and coordination of above contracts for import clearance and transportation without any extra cost to OIL.

V. Construction and Installation:

a) The EPC CONTRACTOR shall supply all the requisite Manpower, Materials and Machinery for Construction, Fuel, Lube oil, water etc not specifically mentioned herein but nevertheless necessary for

the fabrication, construction, installation, testing/ pre-commissioning, mechanical completion, and commissioning of the complete plant.

b) The safety and security of the Men, Material and Machinery deployed by the EPC CONTRACTOR shall be under the purview of the EPC CONTRACTOR .

c) The EPC CONTRACTOR shall arrange water and power for construction activities fabrication, testing and commissioning. OIL shall not provide power and water from any source.

d) Any defect in workmanship, deviation from design/standards, damage in transit / storage etc shall have to be rectified / replaced by the EPC CONTRACTOR at no extra cost to OIL.

VI. Pre-Commissioning:

a) The EPC CONTRACTOR shall be responsible to carry out pre-commissioning, commissioning in association with OIL's personnel.

b) Pre-commissioning activities are defined as those activities, which are required to be performed after completion/ installation, inspection, testing etc. of equipment/ system to make it ready for commissioning. The Pre-commissioning involves the process (s) to be carried out by the EPC CONTRACTOR for verification of functional operability of elements within the system to achieve a state of readiness for the Commissioning and Start-up operation. EPC CONTRACTOR shall inform OIL/PMC as per format given which certifies that all checklist points are liquidated and the plant/ system/ subsystem is ready for pre-commissioning. EPC CONTRACTOR will start pre-commissioning activities after acceptance of the above by PMC/ OIL. This shall include but shall not be limited to activities such as system checking as per P&IDs/ Drawings, site modifications, internal inspection of equipment/ vessels, flushing, air blowing of pipelines purging of system using inert gas, leak test both for low / high pressure systems, cleaning of pumps suction lines, lube oil circuits, calibration of instruments, checking of the electrical equipment for proper earthing, continuity, insulation resistance, conducting operability test on individual equipment/ system, charging of lubes & other chemicals. Fabrication and supply of temporary facilities, for example, temporary bypasses, spools, blinds, jump overs, vents, strainers, screens etc. which will be required to carry out pre-commissioning activities shall be the in the scope of the EPC CONTRACTOR . In case the commissioning of utility facilities are required to be carried out for facilitating the Pre – Commissioning activities, the EPC Contractor should define the same for approval of OIL/PMC. If the Pre-commissioning requires energisation of equipment that includes the running and entire testing of the power generation systems, testing of emergency shutdown and control systems and dynamic trials the EPC Contractor to define the same for approval of OIL/PMC.

c) The EPC CONTRACTOR should develop a Pre-Commissioning and subsequent Commissioning schedule detailing all the activities to be carried out by the EPC CONTRACTOR. The said schedule is to be submitted to OIL/ PMC for review and approval at least 03 (Three) months prior to starting of proposed Pre-Commissioning date.

d) The EPC CONTRACTOR should submit the organization chart of Pre -Commissioning & Commissioning team and the bio-data of key persons who shall be present at the time of commissioning.

e) Before start-up of the pre-commissioning activities safety audit to be conducted by EPC CONTRACTOR and OIL/PMC for entire plant. Checklist/ deficiency generated by safety audit team shall be corrected/ rectified by EPC CONTRACTOR .

f) The EPC CONTRACTOR shall pre-commission and later commission the Plant as per the requirement of the bid. Pre-commissioning will be followed by mechanical completion upon receiving clearance from OIL/PMC.

g) The scope includes providing technical experts / technicians if required, mobilizing Original Equipment Manufacturer's (OEM) personnel as shall be deemed necessary by OIL/PMC.

h) The EPC CONTRACTOR shall prepare plant specific draft-operating manual of the unit and submit to OIL/PMC for review at least 60 days prior to mechanical completion. Five copies of each draft operating manuals will be submitted by the EPC CONTRACTOR for review. This should include procedure related with package items if any. In particular the following information shall be covered as a minimum as an applicable.

1. Design basis of unit.
2. Detailed process / plant description.
3. Pre-start checks.
4. Pre-commissioning procedures
5. Start-up procedure.
6. Normal operating procedure.
7. Shutdown procedure (normal & emergency).
8. Plant trouble shooting procedure.
9. Vendor instructions for all equipment for start-up, shutdown, normal operation and trouble shooting.
10. Operating parameters and set points of alarms and trips.
11. Operating conditions of different cases of operation.
12. Effect of operating variables on the process.
13. Functional description of all complex control schemes and safe shut down systems.
14. Details of interlock logic, trip etc.
15. List of emergencies and emergency handling procedures.
16. List of equipment and their major details.
17. List of all instruments like control valves, shutdown valves, and field instruments etc.
18. Relief valve schedule including tag numbers, location, set pressure, capacity basis, failure scenarios consideration etc.
19. List of blinds for shut down and start-up.
20. Approved final PFDs / P&IDs, cause and effect drawings and engineering equipment datasheets etc.
21. Any other special conditions / instructions / information etc.
22. Feed, Product and Effluent summary.
23. Summary of chemical consumption.
24. Summary of utility consumption.
25. Lubrication schedule (with equivalent lubricant available in India).
26. Life saving devices and usage details.
27. Fire and safety system.
28. Laboratory analysis requirement and procedure with sampling schedule.
29. Procedure for preparation of equipment hand over.
30. Work Permit Procedures.
31. Safe handling of chemicals & catalysts.
32. Personnel safety procedure

Review of operating manuals shall be done by OIL/PMC within 30 days after receipt of draft operating manuals. All the changes, additions, deletion required by the OIL/PMC shall be discussed with the EPC CONTRACTOR and shall be incorporated in the final operating manuals by the EPC CONTRACTOR. Twenty hard bound copies of final operating manual shall be submitted by EPC CONTRACTOR. Minimum five soft copies of the same shall also be forwarded. This manual shall be furnished to OIL at least 60 days prior to mechanical completion. This operating manual shall be followed during start-up and commissioning of the Plant. Operating manuals provided by equipment suppliers shall not form a part of this operating manual.

In case of any revisions due to any reason, the same shall be incorporated and submitted as revised sheets during the start-up and commissioning stage. However, revised operating manual incorporating changes shall be submitted as final operating manual after the commissioning has been completed.

VII. Mechanical Completion:

a) The EPC CONTRACTOR should develop a phased Mechanical Completion program to facilitate subsequent Commissioning activities in a logical manner to meet the Overall Project Schedule.

b) The Mechanical Completion Program developed by the EPC CONTRACTOR to be approved by OIL/PMC.
c) Upon Mechanical Completion of the project the EPC CONTRACTOR shall declare that the plant has been built per engineering specifications, all materials and equipment have been installed and tested and all the electrical and instrumentation installations have been completed as per the approved Mechanical Completion Program.
d) EPC CONTRACTOR 's representative shall check the system/subsystems so that plant/ system/ sub-system meets the process requirement and is constructed as per the approved drawings/ specifications. After liquidating the checklist EPC CONTRACTOR shall submit certificate stating system/ subsystem, which is mechanically completed. Checklist generated by EPC CONTRACTOR representative and test certificates connected with the system/ sub-system will be submitted. Certificates of various statutory bodies for relevant portion of the work completed shall be made available by the EPC CONTRACTOR as part of mechanical completion. OIL/ PMC representative shall check the system along with EPC CONTRACTOR 's representative and shall issue a list of pending activities which includes deficiencies / modifications if required for the portion of the work that is declared by the EPC CONTRACTOR as mechanically complete.
e) Upon completion of all the pending activities including deficiencies / modifications the Project shall be treated as Mechanically Complete.
f) The Mechanical Completion of the Project shall have to be certified by the PMC / OIL.

VIII. Ready for Commissioning

a) The plant shall be considered `Ready for Commissioning' when all the facilities have been completed along with their auxiliaries and support facilities in every respect including charging of lubes, chemicals, preparation of solution, any last minute modifications, if any, as recommended by the OIL/PMC/Process Licensor. All temporary structures, scaffolding etc. used for carrying out the pre-commissioning works shall be removed, all the blinds shall be put into position as required by P&IDs / Process Licensor and all systems as recommended by Process Licensors shall be purged and pressurised. All pre-commissioning and other documents including blinds list, set pressures of PSVs and TSVs and their test certificates etc. shall be handed over to OIL.
b) The EPC CONTRACTOR shall issue a written certificate of ready for commissioning of process unit for acceptance by the OIL/PMC. After the process unit has been declared as `Ready for Commissioning', the EPC CONTRACTOR shall not carry out any hot work in the plant without prior written permission of OIL.

IX. Commissioning:

a) It shall be the responsibility of the EPC CONTRACTOR to commission the plants/ section under the scope of this Contract. Commissioning of the unit will be carried out under necessary guidance and overseeing of representatives of OIL/ PMC/ after mechanical completion is over successfully, all pre-commissioning activities are carried out and certificate of "Ready for commissioning" is accepted by OIL.
b) The Plant shall be considered to be commissioned successfully when all the units, with instrumentation / control systems, process, utilities and support systems have been on uninterrupted stable operation for not less those 72 hours. Whether the 72 hours operation has been successful or not, shall be decided by the OWNER based on observations recorded during 72 hours. The countdown for 72 hours operation shall start only after the Plant has been on stable operation with all controls and safety system in normal operation for a period of not less than 48 hours. The Plant shall be considered to be commissioned successfully when the entire unit, equipment, with instrumentation / control systems, process, utilities and support systems have been commissioned.
c) The EPC CONTRACTOR shall depute trained/ experienced operating team for managing the daily operating shifts comprising of commissioning coordinator, process/ operational coordinators, mechanical, electrical and instrument engineers, technicians/ semi- skilled personnel etc. as deemed necessary to carry out plant start-up and commissioning and for process operations and maintenance.

d) The EPC CONTRACTOR in some cases may be required to do part commissioning of the mechanically completed sections of the plant as per directives from OIL.
e) The EPC CONTRACTOR also is required to provide on the job training to OIL's personnel by associating them in all the day to day pre-commissioning, commissioning and maintenance activities and process operations. However, responsibility for adequate manning of the plant shall be that of EPC CONTRACTOR. Any requirement of training at Original Equipment Manufacturer's (OEM)site shall have to be arranged by the EPC Contractor. OIL shall bear the cost of travel and stay for OIL's personnel during such trainings at OEM's site.
f) After the Plant has been successfully Commissioned, put into operation and steady state operation is established, the Plant shall be handed over to the EPC Contractor for 03 (Three) Months of Reliability Run, inclusive of day to day operation and maintenance. The on job training to OIL's personnel shall continue during this 03 (Three) Months period also. The EPC Contractor shall provide the services of his commissioning engineers who were associated with the commissioning of the Plant at site during this performance test run period.
g) Any deviation from design process parameters, any fault to any equipment, structure, instrument, system whatsoever to be rectified/ restored by the EPC Contractor during 03 (Three) Months of Performance Guarantee Test wih no additional cost to OIL.

X. Spares and Consumables

a) EPC Contractor 's scope of supply shall include supply of mandatory spares, pre-commissioning, commissioning spares and initial fill of chemicals/ lubes/ Transformer OIL's etc on as required basis and also chemicals and spares for three months operation and maintenance after successful commissioning and acceptance by OIL. EPC Contractor shall submit a list of mandatory spares and commissioning spares along with the offer for review by OIL/PMC.
b) Apart from above EPC Contractor shall submit item wise list of recommended spares for 2 years smooth operation along with the offer. Prices for the same shall remain valid till the currency of the job. OIL may place order for the same separately.

XI. Storage

a) The EPC Contractor to develop a Storage yard/ Location suitably located for execution of the jobs/ works under the scope of this Contract. OIL shall provide suitable plot(s) of land for said Storage yard/ Location.
b) The safe and secure storage of all the items required for Project inclusive of Construction, Commissioning machinery and tools shall be under the scope of the EPC Contractor.
c) Such Scope of storage also includes the specific requirements of item specific storage like , stipulated indoor storage, Air Conditioned Storage etc.
d) OIL shall not be responsible for any pilferage of items from the Storage yard/ Locations as mentioned above. In such event the contractor to arrange the items at no additional cost and time implications to OIL.

6.0 Documentation

a) The EPC Contractor shall submit the activities chart within 15 days issue of the LoA.
b) The EPC Contractor shall submit a list of documents which shall be submitted as per the Contract Documents and requirement of the Project which shall be generated during the course of the execution of the Project along with suitable document numbers to OIL / PMC for review. Documents to be reviewed, approved by OIL/PMC shall be clearly identified. Approval of the list of documents have to be completed within 30 days of Award of LOA for the Project.

c) The EPC Contractor shall submit 06 (Six) copies each documents for PMC review. Upon review of the same by PMC the same shall be reviewed by OIL. OIL/PMC shall return 02 (Two) copies of the same duly reviewed / approved.

d) The Reviewed documents shall be returned to the EPC Contractor within 15 (Fifteen) working days from the date of receipt of the document, in following categories:

i. Code-1- Approved
ii. Code-2- Approved & Retained for information
iii. Code-3- Approved with comments, document to be re-submitted for final Approval
iv. Code-4- Not approved, to be re-submitted
v. Code-5- Retained for information

e) Approval by OIL / PMC shall not absolve the Contractor of his responsibilities under the terms of the Contract.

f) Final Documentation: The EPC Contractor to submit the following documents:

i. Soft copies of all the "AS BUILT" drawings.
ii. Three complete set of all "AS BUILT" drawings inclusive of P&IDs, PFDs for all the facilities.
iii. Three complete set of all "AS BUILT" drawings pertaining to civil (including structural and architectural), mechanical, piping layout, electrical, and instrumentation job.
iv. Six sets of equipment folders containing "AS BUILT" tracings, design drawings, specifications, and detailed fabrication drawings, stage wise inspection reports. Third party inspection release notes, Guarantee/Warrantee Certificates complete in all respects.
v. Six sets of Operating and Maintenance manuals for all the bought out items.
vi. Results of All Test Reports.

g) SPECIAL REQUIREMENT: One three dimensional model of the Plant (As-Built) shall be made ready immediately after mechanical completion of the project. This model shall be kept with proper supporting arrangement at a suitable place in the respective Control Room Building for demonstration to visitors. Proper Transparent Unbreakable Glass coverage and protection shall be provided to keep the models clean and safe.

7.0 Discipline Wise Detailed Scope of Work and Design Basis

The detailed scope of work for the whole project is sub divided into the followings disciplines:

A. Civil and Structural Engineering
B. Mechanical Engineering and Piping
C. Electrical Engineering
D. Instrumentation & Control

The detailed discipline wise scope of work is attached as follows:

1. Section – II - Civil and Structural Engineering
2. Section – III - Mechanical Engineering and Plant Piping
3. Section – IV – Cross Country Raw Water Pipe Line
4. Section – V - Electrical Engineering
5. Section – VI - Instrumentation & Control

NB:

a) <u>All the above Sections are to be read in conjunction with this Preamble Document.</u>

b) <u>All HSE issue shall be as guided by this Preamble Document.</u>

c) <u>In case of any conflict/contradictions amongst the documents , OIL's decision shall prevail.</u>

8.0 Implementation Schedule

a) A master network schedule conforming to the overall schedule shall be prepared by the EPC Contractor and submitted for review during the Project Kick-Off Meeting. The Master Network will identify the Project Critical Path in the areas of engineering, procurement, manufacture, transportation, erection and commissioning. The same shall be approved after incorporation of modifications/ amendments etc within 10 days of first receipt.

b) The EPC Contractor shall submit a Risk Analysis and Risk Mitigation Plan wrt the Project execution during the Project Kick-Off Meeting. The same shall be approved after incorporation of modifications/ amendments etc within 10 days of first receipt. The Risks Register and the Hindrance Register to be maintained by the EPC Contractor during the entire project duration.

c) The EPC Contractor will also submit the site mobilization /infrastructure development plans, which will include plan for construction of site office, storage shed, deployment of tools and tackles etc. so as to commence the erection as per programme.

d) The EPC Contractor shall submit fortnightly detailed progress report, indicating the progress achieved in design, manufacturing, supply, erection etc., actions proposed to be taken in delayed areas and areas needing attention of OIL. The Progress Report should be in the form of Gantt Chart, S-Curve and EVMS.

e) The EPC Contractor will be called upon to attend design co-ordination meeting with the PMC/ OIL during the period of the Contract. The Contractor shall attend such meetings at his own cost at mutually agreed venues as and when required.

f) Overall project progress review meetings will be conducted from time to time to ascertain the progress of engineering, manufacturing, dispatches, erection and commissioning activities. Representatives of all concerned groups from the PMC/Company (OIL) and the EPC Contractor shall participate in these reviews to expeditiously resolve issues which may directly or indirectly affect the progress of the project.

g) Official project communication language is English. All correspondence, drawings, catalogues, illustrations, printed specifications and other documentation related to the present project shall be in English. Any deviations are not acceptable.

h) All non-conforming documents must be translated properly and in a technically correct manner into English language. The EPC Contractor is responsible for all consequential damages caused by improper translation of project document from any language to the Eng. language. Such Translations to be submitted in duly Notarized Format only.

i) The SI system shall be applied on all documentation such as drawings, diagrams, schedules, flow sheets, reports, manuals, calculation, invoices and transportation papers which shall be prepared by the Contractor or his sub-Contractors. If any other Unit of measurement is used in any part of the Project the SI equivalent Unit of Measurement shall have to be clearly mentioned / indicated.

j) The SI system shall also be applied on instruments, gauges, tags, labels, name plates, packing or any equipment, buildings and structures provided for this project.

9.0 Construction Management

a) The EPC Contractor shall construct the Plant in accordance with the requirements of the approved documents, Technical Standards, with proven / generally accepted / good industry practices and procedures. The Plant such Constructed shall be safe, reliable and suitable for their intended purpose.

b) The EPC Contractor shall provide all supervision, manpower (as detailed later in the document) , arrange food, boarding and lodging facilities for his personnel, construction equipments, tools & tackles, materials

and consumables, temporary facilities, construction utilities, etc. and render all support services necessary for the construction.

c) The EPC Contractor shall plan, execute, manage and control all the construction activities for the Facilities forming a part of this contract. Frontline construction supervision is to be provided by the EPC Contractor.

d) The EPC Contractor to ensure mechanizing the construction activities to a great extent.

e) Contractor is deemed to be having full knowledge of the applicable laws and regulations, conditions of labour, local conditions, the SITE conditions, environmental aspects and shall comply with the requirements thereof.

f) Any Local/ Environmental issue arising out of the work by EPC Contractor shall have to be resolved by the EPC Contractor on their own.

g) Construction supervision and management functions to be performed by the EPC Contractor will include the following as key functions for effective execution, monitoring and control:

i. Planning, scheduling, monitoring & reporting.
ii. Construction supervision, discipline wise.
iii. Quality assurance and quality control, discipline wise.
iv. Shipping, custom clearances, inland transportation
v. Warehouse management and material control.
vi. Field engineering/Purchase.
vii. Health, Safety and Environment (HSE) Management
viii. Statutory clearances and enforcement of statutory rules / regulations and Labour Laws
ix. Personnel/administration/Industrial Relations
x. Billing and Invoicing
xi. Finance and Accounts
xii. Security

10.0 Quality Assurance

a) Quality Assurance Programme : To ensure that the equipment and services under the scope of this Contract, whether manufactured (Bought out) or performed within the EPC Contractor's works or at his Sub-Contractor's premises or at the Company (OIL)'s site or at any other place of work, are in accordance with the specifications, the EPC Contractor shall adopt suitable quality assurance programme to control such activities at all points necessary. Such programme shall be outlined by the Contractor and shall be submitted for PMC/ OIL's approval.

b) The PMC/ OIL or representative and/or an outside inspection agency acting on behalf of the Company (OIL) shall have, at all reasonable times access to the EPC Contractor's premises or Works and shall have the power at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection, and if part of the Works is being manufactured or assembled at other premises of works, the EPC Contractor shall obtain from the PMC/ OIL and for his duly authorised representative permission to inspect as if the Works were manufactured or assembled on the EPC Contractor's own premises or works.

c) The EPC Contractor shall give the PMC/ OIL thirty (30) days written notice (in case of indigenous item) and ninety (90) days (in case of imported item) of any material being ready for testing/ witness testing at OEM's works. Such tests shall be to the EPC Contractor's account except for the expenses for travel, board and lodging of PMC/ OIL.The Engineer of the PMC/ OIL, unless witnessing of the tests is waived, will attend such tests within the specified date on which the equipment is notified as being ready for test/inspection, failing which the EPC Contractor may proceed with the test subject to waiver note of the PMC/ OIL and he shall forthwith forward to the Inspector six copies of duly certified tests certificates.

d) The PMC/ OILshall within fifteen (15) days from the date of inspection as defined herein, give notice in writing to the EPC Contractor, of any objection to any drawings and all or any equipment and

workmanship which in his opinion is not in accordance with the Contract. The EPC Contractor shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to the PMC/ OIL giving reasons therein, that no modifications are necessary to comply with the Contract.

e) When the factory tests have been completed at the Contractor's works, PMC/Company (OIL)shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by PMC/Company (OIL), the certificates shall be issued within fifteen (15) days of the receipt of the Contractor's Test Certificate by PMC/Company (OIL). Failure of PMC/Company (OIL)to issue such a Certificate shall not prevent the Contractor from proceeding with the works. The completion of these tests or the issue of the certificate shall not bind the Company (OIL) to accept the equipment should it, on further tests after erection, be found not to comply with the Contract.

f) The inspection by PMC/Company (OIL) and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed quality assurance programme forming a part of the Contract.

11.0 Guarantee and Performance Guarantee

a) Guarantee: All the equipment supplied, installed and commissioned shall have to be warranted for a minimum period of 18 (eighteen) months from the date for completion of commissioning.

b) Performance Guarantee : The EPC Contractor shall be responsible for the detailed design for the entire facilities as per the basic design concept provided with the bid documents. All equipment and materials shall be supplied strictly in accordance with the specifications, drawings, data sheets attachments and other conditions stated in the bid document and as approved by OIL/PMC during the course of execution of the project. The EPC Contractor shall be responsible for the detailed design and supply, fabrication, construction, installation as per the bid document and Guarantee the performance of the Equipment as per Conditions of the Contract. This shall be read in conjunction with the guarantee clause as per commercial terms and condition in the bid document.

c) Initial Operation (reliability run/ site acceptance test): The EPC Contractor shall be responsible for Initial Operation (reliability run/ site acceptance test)of the Plant the for a period of 03 (Three) Months from the Date of Commissioning of the Plant is all aspects. All requisite manpower for the same shall have to arranged by the EPC Contractor. The details of required manpower shall be finalized during detailed engineering phase of the Project.

12.0 EPC Contractor's Personnel and Sub-Contracting

a) The EPC Contractor shall supply all the requisite Manpower for Basic Engineering and Design (based FEED of the PMC), Detail Engineering (based on FEED of the PMC), Obtaining all necessary approvals from statutory bodies as applicable , Health, Safety and Environmental (HSE) compliance, Soil Investigation, Tendering, Procurement, Supply, Manufacture, Fabrication, Carrying out Route Survey wherever required, for over dimensional consignments, Transportation of all equipment and material to site including loading, unloading, secure storage, insurance, and maintenance, Installation, Construction, Hook up, Testing, Pre-commissioning, Commissioning, Reliability Test Run, Total Project Management on LSTK Basis for completion and handing over the Pontoon Type Raw Water in-take Plant complete in all aspects at Duliajan, Assam, India. The EPC Contractor shall arrange & provide all categories of personnel i.e. shift engineers, operators, technician, safety engineer etc. required for construction and commissioning of the Plant. The EPC Contractor shall also supply all the requisite not specifically mentioned herein but nevertheless necessary for the fabrication, construction, installation, testing/ pre-commissioning, mechanical completion and commissioning of the complete plant.

b) The safety and security of all the Manpower supplied shall be under the purview of the EPC Contractor.

c) The food, boarding , lodging and transportation facilities all the Manpower supplied/ arranged by the EPC Contractor shall be under the purview of the EPC Contractor.

d) The EPC Contractor should deploy the following key personnel / man power during project execution Period. Bio data of individual key personnel signed by the individual member shall have to be furnished for review and approval by PMC/OIL:

Sl. No.	Designation	Nos.	Qualification & Experience
1.	Project Manager	01	Experience: Graduate in Civil / Mechanical Engineering with a minimum of 5 years or Diploma in Civil / Mechanical Engineering with minimum of 10 years of experience in the field of Plant Construction.
2.	Site In-charge (Civil / Structural)	01	Experience: A Graduate in Civil/ Structural Engineering with minimum 3 years or Diploma in Civil/ Structural Engineering with minimum of 5 years of experience of site supervision in the field of civil construction work.
3.	Site In-charge (Mechanical)	01	Experience: A Graduate in Mechanical Engineering with minimum of 3 years or Diploma in Mechanical Engineering with minimum of 5 years of experience in mechanical engineering jobs of project nature.
4.	Site In-Charge (Electrical)	01	Experience: A Graduate in Electrical Engineering with minimum of 3 years or Diploma in Electrical Engineering with minimum of 5 years of experience in electrical engineering jobs of project nature.
5.	Civil Quantity Surveyor	01	A Graduate in Civil/ Structural Engineering with minimum 3 years or Diploma in Civil/ Structural Engineering with minimum of 5 years of experience of Quality Control of civil construction work.
6.	HSE Officer	01	Experience: A Graduate in Environment /safety Engineering with minimum of 3 years or Diploma in Environment /safety Engineering with minimum of 5 years of experience in the relevant field.

e) The above key personnel must be stationed at site, during the execution of the jobs of the EPC contract under his/ her respective domains. However the Project Manager and the HSE Officer must be station at site, as soon as commencement of the site activities till the handing over of the project.

f) Sub-Contracting may be allowed for the followings:

i) Detailed Engineering and Design (Part of Full)
ii) Software required for the Project
iii) Construction of Pontoon Barges
iv) Construction of Raw Water Pipe Line & Plant Piping
v) Civil construction jobs
vi) Electrical Jobs
vii) Instrumentation Jobs
viii) NDT
ix) TPI
x) Logistics
xi) Site Security

In case of Sub-Contracting, OIL's Prior Approval shall have to be obtained for the Item Nos i) to vii) as mentioned above.

13.0 Health Safety and Environmental requirements

A. Condition of works :

I. Standard conditions of work:

1.0 The contractor should arrange all the requisite Manpower and Tools & Machinery for materials transportation, handling and execution of the jobs as detailed in the scope of work.
2.0 The contractor must work on Sundays and Holidays whenever required with prior permission from representative of OIL/PMC.
3.0 The contractor/authorized representative of contractor shall be informed for job execution by representative of OIL/PMC.
4.0 No accommodation, transportation, portable water, electricity, etc will be provided by OIL against this contract.
5.0 Water for hydraulic testing will be sourced by the Contractor. All other necessary arrangement including pump, etc. is also to be made by the contractor for hydro test.
6.0 Any material found defective due to poor workmanship will have to be replaced by the contractor at his own cost.
7.0 Security and responsibility of all company's materials will have to be borne by the contractor once these are handed over to the contractor till the same are returned to the company after completion of work(s).
8.0 The contractor shall not engage minor laborer below eighteen (18) years of age under any circumstances.
9.0 Any non-technical/local problem causing disruption of work arising in the work site shall have to be settled by the contractor at his own cost.
10.0 Building Materials, Equipment, Pipes and pipe fittings etc. are to be transported by the Contractor at his own cost from Field Engineering Yard/Any other yard to the site including loading/unloading causing without any damage to the materials. In case of any damage of materials, the same have to be rectified or replaced by the contractor at own cost as per instruction of OIL's representative.
11.0 Any defect during Construction/installation/testing/commissioning/Welding shall have to be rectified or replaced at contractors cost.
12.0 All materials for cutting and beveling of pipes and digging of trench/pit for hooking up job are to be provided by the Contractor. All safety precautions are to be observed.
13.0 All necessary equipment/materials such as pumps, valves, fittings, pipes etc. required for hydraulic testing will be arranged by the Contractor.
14.0 While cutting across asphalted/graveled road the pipe should pass the road crossing at the same level through a suitable casing pipe in it. The Contractor has to place the casing pipe properly through which the carrier pipe shall be inserted. The casing pipe of suitable size will be supplied by the Company. The trench should be restored back to the original condition by the Contractor. The Contractor shall have to arrange for emergency traffic diversion, road closer sign, skid etc. The weld joints on the casing as well as pipes and two ties at the end shall be considered as a part of road crossing.
15.0 If painting is required for any equipment/pipeline, then prior to painting all such surfaces are to be cleaned. Exterior surfaces are to be scrapped thoroughly by means of emery tapes, wire brush to the entire satisfaction of OIL's representative. After thorough cleaning, Primer (Red-Oxide) as a 1st coat is to be applied on the surface of the pipeline, vales, etc along with trestles and allow the primer to dry completely. Thereafter, the contractor shall be required to apply enamel paint on the above pipeline surfaces. The shades of the enamel paint shall be designated by the representatives of OIL/PMC. All the materials i.e. brushes, emery paper, primer, paint, safety gadgets like safety shoe, hand gloves, goggles etc., including efficient supervisor/manpower will have to be provided by the Contractor.
16.0 For any clarification with regard to the above, the contractor may contact the representative of OIL/PMC.

B. Safety Guidelines

(a) The following General Health, Safety & Environment (HSE) points will have to be followed by the contractor strictly.

1.0 It will be solely the Contractor's responsibility to fulfill all the legal formalities with respect to the Health, Safety and Environmental aspects of the entire job (namely; the person employed by him, the equipment, the environment, etc.) under the jurisdiction of the district of that state where it is operating. Ensure that all sub-contractors hired by him comply with the same requirement as the contractor himself and shall be liable for ensuring compliance of all HSE laws by the sub or sub-sub contractors.

2.0 Every person deployed by the contractor must use appropriate PPEs (Personal Protective Equipment) to be provided by the contractor. The Contractor shall provide Personnel Protective Equipment as per the hazard identified and risk assessed for the job and conforming to statutory requirement and company's PPE schedule. Safety appliances like protective footwear, Safety Helmet and Full Body harness shall conform to relevant IS codes. Necessary supportive document shall have to be submitted as proof. If the Contractor fails to provide the safety items as mentioned above to the working personnel, the Contractor may apply to the Company (OIL) for providing the same. OIL will provide the safety items, if available. But in turn, OIL will recover the actual cost of the items by deducting from Contractor's Bill. However, it will be the Contractor's sole responsibility to ensure that the persons engaged by him in the mines use the proper PPE while at work. Contractor employees should be trained in the proper use and maintenance of PPE.
In absence of appropriate PPEs, the representative of OIL/PMC has the right to stop the work which will be binding for the Contractor. Moreover, the accountability towards any delay in work/ penalty due non-adherence to PPE shall be binding to the Contractor.

3.0 Soft copy of SOP related to scope of work will be handed over to the OIL Engineer in charge by contractor including an assessment of risk, wherever possible and safe methods to deal with it/them. Printout of copy (spiral binding) of the SOP mentioned above is to be kept with all working teams at all times. The SOP clearly stating the risk arising to men, machineries & material from the mining operation / other operations to be done by the contractor and how it is to be managed. However; in case of any doubts, the Contractor shall reconfirm the same from the Engineer In Charge.

4.0 Contractor has to ensure that all work is carried out in accordance with the Statute and SOP and for the purpose he may deploy adequate qualified and competent personnel for the purpose of carrying out the job in a safe manner. For work of a specified scope/nature, he should develop and provide to both the representatives of OIL and PMC, who shall be supervising the contractor's work, a site specific code of practice in line.

5.0 In case of deviation of SOP or non-availability of SOP ,job Safety Analysis (JSA) shall be carried out before commencement of the work.

6.0 All persons deployed by the contractor for working in a mine must undergo Mines Vocational Training, initial medical examination and Periodic Medical Examination (if required). They should be issued cards stating the name of the contractor and the work and its validity period, indicating status of MVT, IME & PME.

7.0 Necessary facilities for monitoring the levels of parameters in respect of Methane, Oxygen, Hydrogen Sulphide and Carbon Monoxide should be provided at mines. Portable multi-gas detector (LEL/O2/CO/H2S) and FLP tool, torch light etc.to be made available at site

8.0 The contractor shall be solely responsible to comply all the statutory norms as applicable while executing the job.

9.0 It will be entirely the responsibility of the Contractor/his Supervisor/representative to ensure strict adherence to all HSE measures and statutory rules during operation in OIL's installations and safety of workers engaged by him. The crew members will not refuse to follow any instruction given by OIL/PMC's Safety Officer / Engineer / Official / Supervisor/Junior Engineer for safe operation.

10.0 Any compensation arising out of the job carried out by the Contractor whether related to pollution, Safety or Health will be paid by the contractor only. Contractor shall keep a reasonable degree of order by disposing of accumulated rubbish and excess material. Disposal of solid wastes generated by the Contractor shall be in accordance with the company's Procedure for Solid Waste Management.

11.0 Any compensation arising due to accident of the Contractor's personnel while carrying out the job, will be payable by the contractor and their medical treatment/ facilities in case of accidents should be provided by

the same Contractor. The contractor's personnel should be aware about the existing as well as probable hazards and ensured their training to tackle such untoward events by the Contractor.

12.0 The contractor shall have to report all incidents including near miss to both the representatives of OIL and PMC who shall be supervising the contractor's work.

13.0 The contractor has to keep a register of the persons employed by him/her. The contractor's supervisor shall take and maintain attendance of his men every day for the work, punctually.

14.0 If the company arranges any safety class / training for the working personnel at site (company employee, contractor worker, etc.) the contractor will not have any objection to any such training.

15.0 The health check up of contractor's personnel is to be done by the contractor in OIL empanelled Hospital and the reports and statutory forms as applicable to be vetted from the OIL authorised Medical Officer. The frequency of periodic medical examinations should be every five years for the employees up to 45 years of age and every three years for employees of 45 years of age and above.

16.0 The contactor personnel shall arrange daily tool box meeting and monthly pit level meeting headed by the OIL Engineer and maintain records accordingly.

17.0 a) It may be noted that as per DGMS circular & Gazatte Notification for maintenance of register as required by the Mines Act 1952 and Mines Rules, 1955, the forms A, B, D and E have been updated and modified. The above mentioned forms needs to be maintained as per the new format.

b) All other statutory forms to be maintained in respect to Mines Act, 1952, Mines Rules 1955, Oil Mines Regulations 2017 and other applicable laws.

18.0 The Contractor shall submit to DGMS returns indicating –Name of his firm, Registration number, Name and address of person heading the firm, Nature of work, type of deployment work persons, Number of work persons deployed, how many work persons hold VT Certificate, how many work persons undergone IME and type of medical coverage given to the work persons.

19.0 The return shall be submitted quarterly (by 10th of April, July ,October & January) for contracts of more than one year . However, for contracts of less than one year, returns shall be submitted monthly.

20.0 The Contractor shall report all near misses, minor and, reportable accident to the Engineer in Charge and maintain the record of near misses as per OIL's practice, and accidents in the Form- J for Reportable accident and Form – K for Minor Accidents as per The Mines Rules 1955 in consultation with the Engineer in Charge.

21.0 A contractor employee must, while at work, take reasonable care for the health and safety of people who are at the employee's place of work and who may be affected by the employee's act or omissions at work.

22.0 A contractor employee must, while at work, cooperate with his or her employer or other persons so far as is necessary to enable compliance with any requirement under the act or the regulations that is imposed in the interest of health, safety and welfare of the employee or any other person.

23.0 Contractor's arrangements for health and safety management shall be consistent with those for the company.

24.0 In case Contractor is found non-compliant of HSE laws as required, company will have the right for directing the contractor to take action to comply with the requirements, and for further non-compliance, the contractor will be penalized as per prevailing relevant Acts/Rules/Regulations.

25.0 When there is a significant risk to health, environment or safety of a person or place arising because of a non-compliance of HSE Measures Company will have the right to direct the contractor to cease work until the non-compliance is corrected.

26.0 The contractor should prevent the frequent change of his employees deployed as far as practicable. The contractor shall not employ or terminate his worker without the knowledge of the OIL engineer in charge.

27.0 The contractor should frame a mutually agreed bridging document between OIL & the contractor with roles and responsibilities clearly defined.

28.0 For issues not envisaged under the terms and conditions of the contract, the contractor should give consent for formulating a mutually agreed bridging document between OIL and the contractor with the roles and responsibilities clearly defined.

29.0 The First-Aid box should be provided by the Contractor and the same has to be kept ready to use at the site throughout the working hours.

30.0 The availability of First-Aid Fire Fighting equipment should be ensured by the Contractor at all working hours.

31.0 Contractors/ Supervisor/ Contractor's personnel needs to be aware about the site specific emergency response plan (which includes display of emergency contact nos., establish telephone communication, layout of working area, use of fire extinguisher, emergency exit, assembly point).

32.0 Smoking is prohibited in all COMPANY Restricted Areas except in authorized smoking areas/ shelters. Carrying of matches and lighters into the Hazardous Area is prohibited. Cellular phones shall not be used in operating areas / hazardous areas unless they have been classified as 'intrinsically safe' for use in that atmosphere. Consumption of alcohol and possession of non- prescribed drug in COMPANY work site is strictly prohibited.

33.0 Considering the ongoing Covid-19 pandemic, those who are engaged in the above operations should be followed the Covid-19 Protocol.

(b) Specific Safety measures for the job:

The bidder will have to strictly follow the following norms / guidelines.

1.0 Necessary cold and hot work permits including excavation clearance and permission for working at height as applicable are to be obtained by the competent person of the Contractor from the site representative of OIL/PMC before start of the job(s).

2.0 While carrying out the welding and cutting work, the contractor should strictly enforce the guidelines as stated in OMR-2017 and OIL's SOP VOL-II (Safe Maintenance Procedure for Floating roof crude oil tanks)

3.0 The gas cutting sets will have to be fitted with flash back arrestors in the regulator side as well as nozzle side.

4.0 The jobs of pipe line laying will have to be executed as per strict compliance of regulations enforced by State Pollution Control Board.

5.0 All Lifting equipment of the Contractor like Crane etc. shall have to be duly calibrated. Calibration Certificate of these equipment shall have to be shown to the representatives of PMC/OIL, IF deemed required.

6.0 All personnel of the Contractor working near Water Bodies like river, stream, pond etc shall have to mandatorily wear Life Jacket apart from the requisite PPE. While working near water bodies, appropriate safety and precautionary measures are to be adopted.

7.0 While working at Height all personnel of the Contractor must mandatorily use appropriate safety harness conforming to the relevant Indian standard.

8.0 During transportation of line pipes by road, they should be tied up securely with rope/ chain on trailers, to prevent toppling over of pipes on bumpy roads alongwith necessary signage. The pipes should be unloaded carefully to prevent damage at the ends/ body of the pipes.

9.0 The trenching operation should be just ahead of welding operation. This will avoid deep trenches remaining open for many days, creating safety hazards. In any case all the open tranches dug are to be suitably barricaded and marked.

10.0 Before lowering the pipeline in the trench, it should be ensured that no person is present inside the trench. In case the sides cave in, the pipeline should be kept adequately supported before removing loose soil from underneath.

11.0 Utmost care is to be observed in deciding the number of the tripods with chain pulley blocks for handling any job. Also the capacity of the chain pulley blocks must be minimum 1.5 times the weight of the material it is going to lift / lower. Two point anchoring may be used wherever required as additional safety measure.

12.0 After receipt of the workorder the contractor shall have to submit authorized list of contract personnel, who will be engaged for the jobs including name of the Contractor's competent persons and every contact details.

13.0 Necessary sign board / warning signals like caution, "hot work" in progress, emergency telephone numbers, no entry without permission etc. should be used while working on tanks. The said signals / sign

boards shall have to be arranged by the contractor. Barricading of area to be done with reflecting tapes as applicable during work.

14.0 The contractor shall clear all the rubbish and surplus materials from the site on completion of the work and shall have to leave the site clean and tidy.

15.0 The contractor have to ensure complete safety of the personnel engaged by him, and of all the equipment they will handle and must take full responsibility for their safety.

16.0 The contractor have to ensure the quality and reliability of all the tools, equipment and instruments they use. The documents relevant to prove the above should be submitted. Defective tools shall be immediately removed.

17.0 The daily attendance register of contractor's personnel shall have to be signed by the contractor or his authorized representative.

18.0 The contractor has to provide suitable facility such as Drinking Water, and sanitation.

19.0 The contractor personnel have to take every possible care to keep the environment clean and free from pollution.

20.0 The contractor personnel should understand the implication of the known hazards related to the work undertaken by them and the necessity of having an emergency plan approved by OIL to counter them, if anything goes wrong.

21.0 Safety Briefing, Evacuation plan in case of emergency and how to inform (in case of emergency) to be discussed during the tool box meeting.

(c) Electrical Safety Points:

1.0 Every person deployed by the contractor must wear safety gadgets. The Contractor shall provide proper Personnel Protective Equipment as per the hazard identified and risk assessed for the job and conforming to statutory requirement and company PPE schedule. Safety appliances like protective footwear, safety helmet and full body harness shall conform to relevant IS codes

2.0 Contractor has to ensure that all work is carried out in accordance with the Statute and SOP and for the purpose he may deploy adequate qualified and competent personnel for the purpose of carrying out the job in a safe manner. For work of a specified scope / nature, he should develop and provide a site specific code of practice (site specific SOP or job specific SOP) in line.

3.0 Contractor personnel must confirm that, necessary Electrical isolation / energization permit etc. are obtained by OIL's Engineer/ Junior Engineer (Elect.) before starting the jobs.

4.0 The contractor should have valid Electrical Contractor License issued or recognized/endorsed by State Licensing Board, Govt. of Assam. In case license expires during contract period the same shall be renewed by the contractor. The contract may be terminated if the license is not renewed. In case the contractor/firm does not possess Electrical Contractor License, he/the firm may form a consortium with another person/firm who/which possesses valid Electrical Contractor License issued or recognized/endorsed by State Licensing Board, Govt. of Assam. In such a case, the partner having the valid Electrical contractor license shall be responsible for executing the electrical portion of the contract as per stipulations detailed in the tender.

5.0 Contractor shall employ work persons with valid wireman permit (covering relevant portions), issued/recognised by State Licensing Board, Govt. of Assam to carry out all electrical jobs and shall deploy supervisor holding valid Electrical supervisor's competency certificate (covering relevant portions), issued/recognized/endorsed by State Licensing Board, Govt. of Assam for supervision of electrical jobs.

6.0 Quality of jobs carried out by the Contractor shall be of high standard and should be as per the norms of BIS, NEC, CEA Regulations and other electrical standards recognized by the company.

14.0 Payment Terms

a) 5% of the project cost payable for completion of fieldwork , Design report, working drawings for Pontoon Type Raw Water In-Take Plant including allied buildings and approval of the project deliverables by the OIL.
b) 40% of project cost payable for supply, Installation and testing of the equipments including electro mechanical components of pumps, motors, Pipes, specials, crane, valves and as per the measurements recorded jointly at site and certifications of the materials by the OIL.
c) 25% of project cost payable after completion of construction the Civil works and Allied buildings.
d) 30 % of the payments shall be made after the completion of the pre- commissioning, mechanical completion, successful commissioning and Reliability test run.

15.0 Contract Completion and Closure

a) On successful Commissioning, completion of 03 (Three) Months Reliability Run Test and completion of all other balance works as per scope of work covered under these specifications, including fulfillment of requirements of Documentations, Drawings and Data, the Plant shall be ready for Handover to OIL. PMC/ OIL shall issue to the Contractor a Taking Over Certificate, as stipulated in the General Conditions of Contract. The takeover by PMC/OIL as aforesaid shall be for the Plant complete in all respects. The date of Taking over shall be the Completion date of the Main LSTK-EPC work

b) The contractor shall be required to submit the following documents but not limited to the same on completion of work along with the final bill.

1. Certificate for Successful Completion of Commissioning and Performance test
2. Completion certificate
3. Submission of completion documents as per SCC
4. Submission of operating manuals
5. Submission of Guarantees as specified contract
6. Approval from Statutory Authorities and Government bodies.
7. No claims certificate.
8. No dues certificate.
9. Detailed contract close out report.
10. Any other documents to be submitted as specified elsewhere in the contract.
11. No liability certificate: - Self-certification from the contractor that no payment is balance to their laborer subcontractor and vendors on account of service rendered/materials supplied by them.
12. Insurance Policies required as per contract.
13. Validity Extension of various Bank Guarantees required as per contract.
14. Submission of as-built documentation

c) Any item purchased upon OIL's approval for the project, if remains unused upon handing over of the project needs to be handed over to OIL.

SECTION -II

Project Title:
DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, SUPPLY, CONSTRUCTION AND COMMISSIONING ON LSTK BASIS OF PONTOON TYPE RAW WATER IN-TAKE PLANT AT DULIAJAN, ASSAM, INDIA

SCOPE OF WORK

CIVIL AND STRUCTURAL ENGINEERING

CIVIL AND STRUCTURAL ENGINEERING

A. Introduction:

The scope of Civil and Structural Engineering works under this Project shall include Geotechnical Investigation, design, detailed engineering, procurement & supply of all materials, items, equipment, transportation to site, consumables, tools, tackles, etc. and construction of all relevant works, erection, testing, commissioning, obtaining approvals etc, as per Scope drawings, Engineering design basis, Standard specifications and Standard drawings.

The scope of Civil and Structural Engineering works under this Project shall broadly include design, detailed engineering, Construction of Coffer Dam, Construction of Embankment Bund with Asphalt Road to Raw Water Intake Plant, Construction of Panel Room, Allied Buildings, Construction of Retaining Wall (around Allied Buildings platform), Construction of Compound Wall, Construction of Drainage and Protection Wall, Construction of Asphalt Road inside Allied Buildings, Construction of Foundation and shed for Diesel Engine Driven Raw Water pump sets, Construction of Foundation and shed for DG Sets etc.

B. General:

I. The CONTRACTOR to note that site development, underground / aboveground general Civil & Structural work etc. shall not be limited to conceptual layouts attached with the bid document. These drawings furnished only the minimum requirements and developed for reference only.

II. Any change in standards / specifications / design must be approved by OIL/PMC. For approval of design, the relevant reference documents shall also be approved by PMC/OIL prior to the deign approval. If any approved modification to the Concept plan results in Financial Gain, the same shall have to be passed onto OIL.

III. Any temporary activities required must be listed.

IV. Clearing the site after completion of all types of work.

V. Documentation of `As Built` details for all types of works.

C. Geotechnical Investigation:

Survey

Bidder will carry out his own survey in the area ear-marked for the new plant by using Total Station equipment. Guidelines for details of survey to be carried out are as follows:

i) Preparation of contour plan of the site using a grid of 10m x 10m

ii) Collection of details for all features such as utilities, existing roads, electric and telephone poles and lines, sewer lines and water mains if any, huts, buildings, or any other structure, fencing and trees (with girth greater than 0.3m) etc, falling within the extent of survey.

Soil Investigation

a) Layout Plan

The bidder should prepare layout keeping in mind the utilization of minimum space. The bidders should also consider the following parameters for the preparation of layout plan.

i) Space between boundary wall and structures – minimum 5 m

ii) Space between edge of road and structures – 3m

iii) Space between two structures – minimum 5 m

iv) Space between structures and pipeline – minimum 1000 mm or 1.5 times diameter of pipe whichever is more.

b) Finished Ground Level

Site grading shall be done as specified in Technical Specifications for Civil Works.

i) Finished ground – 0.5 m above the HFL

All the earthwork shall be carried out as per site condition. Sample topographical survey and soil investigation report is enclosed with the tender documents for guidance only. The bidders are required to verify the details at their own cost and also to carry out topographical survey and soil investigation after award of project. Finally the safe bearing capacity of soil will be minimum value of SBC available from soil investigation work to be carried out by the bidder. Cost of all earthwork either in soil, rock, etc. are in the scope of the bidder.

The bidder in coordination with the Engineer in-charge has to determine at each location of a building or a liquid retaining structure the soil characteristics (safe bearing capacity, angle of friction, cohesion) in order to calculate the dimensions of the foundations. It is also important to assess the potential of changes in water table, erosion and exposure of foundations and the stability of soil with view to the lateral resistance to be taken into account.

On finalization of the layout, the bidder will conduct additional soil investigation to find out actual soil condition at the site. At least 3 boreholes are to be taken for soil investigation of all the structures having liquid depth of more than 5 m. The bidder shall submit the report to Employer for their comments/approval. In case there is a discrepancy between the two reports lower of the values of the safe bearing capacity shall be considered for the design.

a) Penetration Tests

Standard penetration test to a depth corresponding to at least 1.5 times the width of the building/foundation; at least 3 tests per building/storage structure; distance between the penetration points less than 20 m.

b) Plate Load Tests

- To assess soil bearing capacity at the foundation level (Plate Test)
- To take samples for laboratory analyses

At least 3 test pits shall be made for each site of a building/tank/structure, preferably after having fixed the location of the building. The distance should be less than 20 m.

In addition the following soil data have to be obtained from the test pits:

Composition and classification of the soil (sand, clay, silt, organic matter etc, soft, medium, hard, decomposed rock, rock etc.) with view to:

- Excavation
- Need to support walls of trenches
- Compacting
- Permanent or temporary groundwater (water logging)
- Hard pans below sand (depth, thickness, type of layer)
- Clay lenses

The results of the survey, the sampling, the laboratory analyses the calculations have to be presented in a report in three copies to the Engineer-in-charge. The execution of the foundations shall be started only after approval of the Engineer-in-charge. The bidder however will be responsible for design of the structures based on these investigations.

Along with the excavation for the buildings and storage structures the bidder has to assess/complete the type of soil, strata, the level of groundwater and other parameters important for design. He has to establish soil profiles and submit these to the Engineer-in-charge for approval.

D. Component and Brief description: Highlighting the various civil works which is required to be executed by the contractor for the completion of the Raw Water Intake Plant including specific mention about the intending purpose of each of the civil structure and the various utilities that it is to cater. This description may not be exhaustive and the CONTRACTOR should intimate PMC/ OIL in writing about any additional job(s) to be carried out for completion of construction of all Civil and Structural Engineering job wrt the Project for approval.

Sl.No	Component	Description including Purpose and facilities the structure has to cater
I.	Design, Engineering and Construction of Embankment Bund with Asphalt Road to Raw Water Intake Locations (Allied Building area)	Embankment bund has been proposed from Allied building layout upto existing PWD road to facilitate the rise in floor level of Allied Buildings due to HFL at the location. Details are as below: Length: 250 M Height: 6.8 M Width: 4 M Material: Earthen , with asphalt topping
II.	Design, Engineering and Construction of Coffer Dam	Protection wall/Stone Revetment for Pontoons and boundary walls/ Compound walls are proposed to be constructed within the river bank, in order to facilitate the construction of Protection wall & boundary walls/Compound wall. Temporary coffer dam has to be constructed during monsoon period. Coffer Dam has been proposed for an approximate length of 100 m along the River bund at Intake location.
III.	Design, Engineering and Construction of Panel Room at allied building layout (20 m x 6 m)	This panel room is to be constructed for housing of all Electrical Panels and related equipment. The panel room also includes cables ducts/ trenches, necessary foundation for Electrical Panels and related equipment etc.
IV.	Design, Engineering and Construction of Transformer Yard	This yard is to be constructed for installation of 02 nos 1500 KVA outdoor type Transformer.
V.	Design, Engineering and Construction of DG Set Foundation and Shed	Foundation Pad and suitable Shed for installation of 01 No 750 KVA Silent DG Set has to be constructed along with suitable shed with 10 MT HOT crane.
VI.	Design, Engineering and Construction of Foundation and Shed for DED Raw Water Pump Sets	Foundation Pad and suitable Shed for installation of 02 Nos DED Raw Water Pump Sets has to be constructed.
VII.	Design, Engineering and Construction of Operator cum Security Room at allied building layout (Size - 6.0 m x 4.5 m)	The operator Room is to be constructed at the entrance of the at allied building layout. The room shall house the Instrumentation Display Panel for Process Critical Parameters including includes cables ducts/ trenches, necessary foundation. The Room is inclusive of change room and sanitary room and necessary plumbing work.
VIII.	Design, Engineering and Construction of Retaining Wall (around Allied Buildings layout/ platform)	This Retaining Wall is to be constructed along the Allied Buildings layout/ platform along the river bank. This is to be constructed for protection of the Allied Buildings layout/ platform from any erosion or any other damage that might be caused by the river.
IX.	Design, Engineering and Construction of Compound	230 mm thick burnt brick masonry wall of 10 feet height and wire fencing of 2 feet height of compound

Sl.No	Component	Description including Purpose and facilities the structure has to cater
	Wall	wall is to be constructed around the layout as per Concept Drawing.
X.	Design, Engineering and Construction of Security Room 2m x2m (Near Gate)	The Security room is to be constructed at the Entrance Gate. The room is exclusive of security purpose.
XI.	Design, Engineering and Construction of Drainage and Protection Wall	Drainage system (Pipe Culverts) is to be constructed to drain off the rain water from upstream side of the allied buildings to reach the River at downstream end.
XII.	Design, Engineering and Construction of Asphalt Road inside Allied Buildings Layout	Asphalt Road of 4 Meter width is to be constructed inside Allied Buildings Layout as per Concept Drawing.

E. Design Guidelines: The LSTK CONTRACTOR should ensure good engineering/international standards practice accepted by OIL/PMC in all respect of all the General Civil & Structural activities for the project. Indian Standard Codes, unless otherwise specified herein, shall be applicable for the project. In all cases, the latest revision of the codes shall be referred to.

F. Drawings to be submitted: The LSTK CONTRACTOR should develop drawings based detailed engineering wrt the FEED of the PMC. The drawings so developed to be approved by PMC/ OIL.

G. Procurement Datasheet: The LSTK CONTRACTOR should develop Procurement Data Sheets for procurement of Bought out Items. Such Procurement Data Sheets are to be approved by PMC/ OIL.

H. Quality Control:

The Contractor shall be responsible for the quality of the work in the entire construction work within the contract. He shall, therefore, have his own independent and adequate set-up for ensuring the same.

The Engineer in charge shall inspect the work from time to time during and after construction and ascertain the quality of the work tested (by himself, by his Testing and Quality Control Units or by any other agency deemed fit by him)

The Contractor shall provide necessary co-operation and assistance in obtaining the samples for tests and carrying out the field tests as required by the Engineer in charge from tome to time. This may include provision of labour, attendance, assistance in packing and dispatching and any other assistance considered necessary in connection with the tests.

For the work of embankment, sub grade and pavement, construction of subsequent layer of same or other material over the finished layer shall be done after obtaining permission from the Engineer in charge.

The Contractor shall carry out modification in procedure of work, if any, as directed by the Engineer in charge during inspection.

For testing of samples of soil, soil mix, granular material and mix, bituminous mix, aggregates, cores,

steels etc. Samples in the required quantity and form shall be supplied to the Engineer in charge by the Contractor at his own cost. For cement, bitumen and similar other materials where essential tests are to be carried out at the manufacturer's plants or at laboratories other than the site laboratory, the cost of samples, sampling, testing and furnishing of test certificates shall be borne by the Contractor. He shall also furnish the test certificates to the Engineer in charge.

All the electro mechanical components, pipes, valves, pumps and motors, flowmeters etc., shall be tested at the manufacturer plant before dispatch to the site as per the design specifications and to the specifications of the relevant IS code. The contractor is required to produce the relevant test certificates along with the supply of materials.

Where the Engineer in charge considers that in the interest of the control of the quality on materials or workmanship, modifications, if any, are necessary, such modifications shall be carried out by the Contractor at no extra cost.

The Contract rate quoted for work in the Bill of Quantities shall be deemed to be inclusive of all costs of sampling, testing, labour, attendance required for the project as per BIS.

I. Detailed Scope of Work for Civil and Structural Engineering: The detailed Scope of Work for Civil and Structural Engineering is given hereunder,

I.SITE CLEARANCE (CLEARING AND GRUBBING)

1. Scope
2. This work shall consist of cutting, removing and disposing of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, top organic soil not exceeding 150 mm in thickness, rubbish etc., from the area of Works wherein, the opinion of the Engineer in charge are unsuitable for incorporation in the Works, and such other areas as may be specified on the Drawings or by the Engineer in charge. It shall include necessary excavation, backfilling of pits resulting from uprooting of trees and stumps to required compaction, handling, salvaging, and disposal of cleared materials. Clearing and grubbing shall be performed in advance of earthwork operations and in accordance with the requirements of these Specifications.
3. Preservation of Property/Amenities
4. Trees, shrubs, any other plants, pole lines, fences, signs, monuments, buildings, pipelines, sewers and all facilities within or adjacent to the site which are not to be disturbed shall be protected from injury or damage. The Contractor shall provide and install at his own expense, suitable safeguards approved by the Engineer in charge for this purpose.
5. During clearing and grubbing, the Contractor shall take all adequate precautions against soil erosion, water pollution, etc., and where required, undertake additional safety Works relevant to elsewhere mentioned in the documents or as directed by engineer in charge. Before start of his operations, the Contractor shall submit detailed work plan to the Engineer in charge for approval. The work plan shall include the procedure to be followed for disposal of waste materials, etc., and the schedules for carrying out temporary and permanent erosion control Works as stipulated elsewhere mentioned in the documents or as directed by engineer in charge.
6. Methods, Tools and Equipments
7. Only such methods, tools and equipments as are approved by the Engineer in charge and which will not affect the property to be preserved shall be adopted for the Work. If the area

has thick vegetation / roots / trees, a crawler or pneumatic tyred dozer of adequate capacity may be used for clearance purposes. The dozer shall have ripper attachments for removal of tree stumps. All trees, stumps, etc., falling within excavation and fill lines shall be cut to such depth below ground level that in no case these fall within 500 mm of the sub grade / foundation / bed level. Also, all vegetation such as roots, under-growths, grass and other deleterious matter unsuitable for incorporation in the Work shall be removed between fill lines to the satisfaction of the Engineer in charge. On the areas beyond these limits, trees and stumps required to be removed as directed by the Engineer in charge shall be cut down to below ground level as directed by the Engineer in charge so that these do not present any unsightly appearance.

8. All branches of trees extending above the roadway shall be trimmed as directed by the Engineer in charge.
9. All excavations below the general ground level arising out of the removal of trees, stumps, etc., shall be filled with suitable material and compacted thoroughly so as to make the surface of these points conform to the surrounding area.
10. Ant-hills both above and below the ground, as are liable to collapse and obstruct free subsoil water flow shall be removed and their workings, which may extend to several m, shall be suitably treated.
11. Disposal of Materials
12. All materials including soil after refilling generated from clearing and grubbing operations shall be the property of Employer and shall be disposed of by the Contractor as hereinafter provided or directed by the Engineer in charge.
13. Trunks and stumps of trees shall be cleaned of limbs and roots and stacked. Also boulders, stones and other materials usable in construction shall be neatly stacked as directed by the Engineer in charge. Stacking stumps, boulders, stones etc., shall be done at specified spots with all lead and lifts as directed by the Engineer in charge.
14. All products of clearing and grubbing which, in the opinion of the Engineer in charge, cannot be used or auctioned shall be cleared away from the site in a manner as directed by the Engineer in charge. Care shall be taken to see that unsuitable waste materials are disposed off in such a manner that there is no likelihood of these getting mixed up with the materials meant for construction.

II. CARRIAGE OF MATERIALS

1. Scope
2. This Specification covers the general requirements for carriage of materials.
3. General
4. The carriage and stacking of materials shall be done as directed by the Engineer. Any tools and plants required for the work shall be arranged by the Contractor. The carriage of materials including loading within a lead of 50 m, unloading and stacking within a lead of 50 m.
5. Responsibility for Loss or Damage
6. Loading, carriage, unloading and stacking shall be done carefully to avoid loss or damage to the materials. In case of any loss or damage, recovery shall be effected from the Contractor at twice the departmental issue rates of the materials. If the departmental issue rates of the materials are not available then the recovery shall be effected at twice the prevailing market rates as determined by the Engineer.
7. Mode of Carriage
8. Depending upon the feasibility and economy, the Engineer shall determine the mode of carriage viz. whether by mechanical or animal transport or manual labour.

9. Lead
10. All distances shall be measured over the shortest practical route and not necessarily the route actually taken.
11. Carriage by manual labour shall be reckoned in units of 50 m.
12. Carriage by animal and mechanical transport shall be reckoned in one km unit. Distances of 0.5 km or more shall be taken as 1 km and distance of less than 0.5 km shall be ignored. However, when the total lead is less than 0.5 km, it will not be ignored but paid for separately in successive stages of 50 m subject to the condition that the rate worked on this basis does not exceed the rate for initial lead of 1 km by mechanical / animal transport.
13. Stacking, Covering and Protection
14. Material shall be stacked in such a manner as to ensure the preservation of their quality and fineness for the work. Different types of materials shall be stacked separately and in such a way that counting and measurements can be done without disturbing the stacks. Any material that is liable to be affected by rain or other adverse weather conditions shall be covered and protected against the same.
15. Earth, dismantled materials, malba and other similar materials shall be stacked as directed by the Engineer.
16. Cement bags, steel bars, structural steel sections, bricks and timber and other similar materials shall be stacked in regular tiers.
17. Pipes of RCC, SW, GI, CI, etc. shall be stacked as per manufacturers/suppliers instructions or as directed by the engineer.
18. Lime, stone metal, sand and such similar materials shall be stacked as directed by the Engineer.
19. Measurements
20. Length, breadth and height of stacks shall be measured correct to a cm. The quantity shall be worked out in cubic meter correct to two places of decimal. The volume of stacks, shall be reduced by percentages as shown against each for looseness in stacking to arrive at the net quantity for payment. No reduction shall be made in respect of articles or materials for which mode of payment is by length or weight or number.
21. Earth

In loose stacks such as cart loads, lorry loads, etc.	20%
In fills consolidated by light mechanical machinery	10%
In fills consolidated by heavy mechanical machinery but not under OMC	5%
In fills consolidated by heavy mechanical machinery at OMC	Nil
Consolidated fills in confined situation such as under floors etc.	Nil

22. Others

Manure or sludge	8%
Moorum, building rubbish Lime and sand	Nil
Stone metal, 40 mm nominal size and above	7.5%
Coarse aggregate/stone metal below 40 mm nominal size	Nil
Soling Stone / Boulder 100 mm and above	15%

Excavated rocks	50%

23. Rate
24. The rate for carriage of materials is inclusive of all the operations described above.

III. **EARTHWORK EXCAVATION**

1. Scope
2. This Specification covers the general requirements of earthwork in excavation in different materials necessary for the construction of the Works for intake structures, in accordance with requirements of these Specifications and the lines, grades and cross-section shown in the Drawings or as indicated by the Engineer in charge.
3. Excavation for structures shall consist of the removal of material for the construction of foundation for bridges, culverts, retaining walls, headwalls, cutoff walls, pipe culverts and other similar structures, in accordance with the requirements of these Specifications and to the lines and dimensions shown on the Drawings or as indicated by the Engineer in charge. The work shall include construction of the necessary cofferdams and cribs and their subsequent removal; all necessary sheeting, shoring, bracing, draining and pumping; the removal of all logs, stumps, grubs and other deleterious matter and obstructions, necessary for placing the foundations; trimming bottoms of excavations; backfilling and clearing up the site and the disposal of all surplus material.
4. Applicable Codes
5. The following Indian Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest revision of the codes shall be referred to.

   (a) IS: 3764 Safety code for excavation work.
   (b) IS: 2720 Method of test of soils (All parts)
   (c) IS: 1498 Classification and identification of soils for General Engineering purposes
   (d) IS: 2809 Glossary of terms and symbols relating to Soil Engineering
   (e) IS :4081 Safety code for blasting and related drilling operations
   (f) IS: 4988Glossary of terms and classifications of earth moving machinery (All Parts)

6. Drawings
7. Engineer in charge will furnish Drawings wherever, in his opinion, such Drawings are required to show areas to be excavated / filled, sequence of priorities etc. Contractor shall follow strictly such Drawings.
8. Classification of Excavated Material
9. Authority for classification
10. The classification of excavation shall be decided by the Engineer in charge and his decision shall be final and binding on the Contractor. Merely the use of explosive in excavation will not be considered as a reason for higher classification unless blasting is clearly necessary in the opinion of the Engineer in charge.
11. Classification
12. All materials involved in excavation shall be classified by the Engineer in charge in the following Manner.
13. Soil
14. This shall comprise topsoil, turf, sand, silt, loam, clay, mud, peat, black cotton soil, soft shale or loose moorum a mixture of these and similar materials which yields to the ordinary application of pick, spade and/or shovel, rake or other ordinary digging implement. Removal of gravel or any other nodular material having dimension in any one direction not

exceeding 75 mm occurring in such strata shall be deemed to be covered under this category.

15. Marshy Soil
16. This shall include soil like soft clays and peats excavated below the original ground level of marshes and swamps and soils excavated from other areas requiring continuous pumping or bailing out of water.
17. General
18. Contractor shall furnish all tools, plants, instruments, qualified supervisory personnel, labour, materials, any temporary work, consumable, any and everything necessary, whether or not such items are specifically stated herein for completion of the job in accordance with Specification requirements.
19. Contractor shall carry out the survey of the site before excavation and properly mark all lines and establish levels for various works such as earthwork in excavation for grading, basement, foundations, plinth filling, roads, drains, cable, trenches, pipelines etc. Such survey shall be carried out by taking accurate cross sections of the area perpendicular to established reference / grid lines at intervals as determined by Engineer in charge based on ground profile. These shall be checked by Engineer in charge and thereafter properly recorded.
20. The excavation shall be done to correct lines and levels. This shall also include, where ever required, proper shoring to maintain excavations and also providing, erecting and maintaining of substantial barricades around excavated areas and warning lamps at night for ensuring safety.
21. The rates quoted shall also include the dumping of excavated materials in regular heaps, bunds, riprap with regular slopes as directed by Engineer in charge, within the lead specified and leveling the same as to provide natural drainage. Rock / soil excavated shall be stacked properly as directed by Engineer in charge. As a rule, all softer material shall be laid along the center of heaps, the harder and more weather resisting materials forming the casing on the sides and the top. Rock shall be stacked separately.
22. Clearing
23. The area to be excavated / filled shall be cleared as described in the documents or as directed by engineer in charge.
24. Slips and Slides
25. If slips, slides, over-breaks or subsidence occur in cuttings during the process of construction, they shall be removed at the cost of the Contractor as ordered by the Engineer in charge. Should slips occur, the slipped material shall be removed and dressed to the required slope. Removal of the slipped earth will not be paid for if the slips are due to the negligence of Contractor. Adequate precautions shall be taken to ensure that during construction, the slopes are not rendered unstable or give rise to reoccurrence of slides after construction.
26. Dewatering
27. If water is met within the excavations due to springs, seepage, rain or other causes, it shall be removed by suitable diversions, pumping or bailing out and the excavation kept dry whenever so required or directed by the Engineer in charge. Care shall be taken to discharge the drained water into suitable outlet as not to cause damage to the works, crops or any other property. Due to any negligence on the part of the Contractor, if any such damage is caused, it shall be the sole responsibility of the Contractor to repair / restore to the original condition at his own cost or compensate for the damage. Sumps made for dewatering must be kept clear of the excavations / trenches required for further work. Method of pumping shall be approved by Engineer in charge; but in any case, the pumping

arrangement shall be such that there shall be no movement of subsoil or blowing in due to differential head of water during pumping. Pumping arrangements shall be adequate to ensure no delays in construction.

28. All excavations shall be kept free of water. Grading in the vicinity of excavations shall be controlled to prevent surface water running into excavated areas.
29. When there is a continuous inflow of water and quantum of water to be handled is considered in the opinion of Engineer in charge, as large, 'Well Point System' - single stage or multistage, shall be adopted. Contractor shall submit to Engineer in charge his scheme of well point system including the stages, the spacing, number and diameter of well points, headers, etc. and the number, capacity and location of pumps for approval. Unless separately provided for in the schedule of prices, the cost of dewatering shall be included in the item rate for excavation.
30. Unless separately provided for in the schedule of quantities, dewatering is deemed to have been included in the unit rates quoted for excavation. If separately provided for, the unit of measurement shall be as indicated in the schedule of quantities
31. Methods, Tools and Equipment
32. Only such methods, tools and equipment as approved by the Engineer in charge shall be adopted / used in the work. If so desired by the Engineer in charge, the Contractor shall demonstrate the efficiency of the type of equipment to be used before the commencement of work.
33. Marsh Excavation
34. The excavation of soils from marshes/swamps shall be carried out as per the programme approved by the Engineer in charge.
35. Excavation of marshes shall begin at one end proceed in one direction across the entire marsh immediately ahead of backfilling. The method and sequence of excavating and backfilling shall be such as to ensure, to the extent practicable, the complete removal or displacement of all muck from within the lateral limits as per the Drawings or as stated by the Engineer in charge, and to the bottom of the marsh, firm support or levels indicated.
36. Construction Operation for Structures
37. Setting out
38. After the site has been cleared according to Chapter 2, the limits of excavation shall be set out true to lines, curves and slopes
39. Excavation
40. Excavation shall be done to the required width/Diameter to facilitate the sufficient work space and up to the required depth as indicated in the drawings and to the lowest step of the footing in case of valve chamber and for thrust blocks. The sides shall be kept to the plumb where the nature of soil allows it. If not, the Contractor at his own expense shall put up necessary shoring, strutting and planking or cut slopes to a safer angle or both with due regard to the safety of personnel and works and to the satisfaction of the Engineer in charge.
41. Dewatering and protection
42. Normally, open foundations shall be laid dry. Where water is met with in excavation due to stream flow, seepage, springs, rain or other reasons, the Contractor shall take adequate measures elsewhere mentioned in the documents or as directed by engineer in charge.
43. Pumping from the interior of any foundation enclosure shall be done in such a manner as to preclude the possibility of the movement of water through any fresh concrete. No pumping shall be permitted during the placing of concrete or for any period of at least 24 hours thereafter, unless it is done from a suitable sump separated from the concrete work by a watertight wall or other similar means.

44. The Contractor shall take all precautions in diverting channels and in discharging the drained water as not to cause damage to the works, crops or any other property.
45. Public Safety
46. Near towns, villages and all frequented places, trenches and foundation pits shall be securely fenced, provided with proper caution signs and marked with red lights in the night to avoid accidents. The Contractor shall take adequate protective measures such that, the excavation operations do not affect or damage adjoining structures. For safety precautions, reference may be made to IS: 3764
47. Blasting Operations
48. General
49. Blasting shall be carried out in a manner that completes the excavation to the lines indicated in Drawings, with the least disturbance to adjacent material. It shall be done only with the written permission of the Engineer in charge. All the statutory laws, regulations, rules, etc., pertaining to the acquisition, transport, storage, handling and use of explosives shall be strictly followed.
50. The Contractor may adopt any method or methods of blasting consistent with the safety and job requirements. Prior to starting any phase of the operation the Contractor shall provide information describing pertinent blasting procedures, dimensions and notes.
51. The magazine for the storage of explosive shall be built to the designs and Specifications of the Explosives Department concerned and located at the approved site. No unauthorized person shall be admitted into the magazine which when not in use shall be kept securely locked. No matches or inflammable material shall be allowed in the magazine. The magazine shall have an effective lighting conductor. The following shall be hung in the lobby of the magazine.
    a) A copy of the relevant rules regarding safe storage both in English and in the language with which the workers concerned are familiar.
    b) A statement of up-to-date stock in the magazine.
    c) A certificate showing the last date of testing of the lighting conductor.
    d) A notice that smoking is strictly prohibited.

52. All explosive shall be stored in a secure manner in compliance with all laws and ordinances, and all such storage places shall be clearly marked. Where no local laws or ordinances apply, storage shall be provided to the satisfaction of the Engineer in charge and in general not closer than 300 m from the road or from any building or camping area or place of human occupancy. In addition to these, the Contractor shall also observe the following instructions and any further additional instructions which may be given by the Engineer in charge and shall be responsible for damage to property and any accident which may occur to workmen or the public on account of any operations connected with the storage, handling or use of explosives and blasting. The Engineer in charge shall frequently check the Contractor's compliance with these precautions.
53. Materials, Tools and Equipment
54. All the materials, tools and equipment used for blasting operations shall be of approved type. The Engineer in charge may specify the type of explosives to be allowed in special cases. The fuse to be used in wet locations shall be sufficiently water resistant as to be unaffected when immersed in water for 30 minutes. The rate of burning of the fuse shall be uniform and definitely known to permit such a length being cut as will permit sufficient time to the firer to reach safety before explosion takes place. Detonators shall be capable of giving effective blasting of the explosives. The blasting powder, explosives, detonators, fuses, etc., shall be fresh and not damaged due to dampness, moisture or any other cause.

They shall be inspected before use and damaged articles shall be discarded totally and removed from the size immediately.

55. Personnel
56. The blasting operation shall remain in the charge of competent and experienced supervisor and workmen who are thoroughly acquainted with the details of handling explosives and blasting operations.
57. Blasting Operations
58. The blasting shall be carried out during fixed hours of the day preferably during the mid-day or at the close of the work as ordered in writing by the Engineer in charge. The hours shall be made known to the people in the vicinity. All the charges shall be prepared by the man in charge only.
59. The Contractor shall notify each public utility company having structures in proximity to the site of the work of his intention to use explosives. Such notice shall be given sufficiently in advance to enable the companies to take such steps as they may deem necessary to protect their property from injury. In advance of any blasting work within 50 m of any railway track or structures, the Contractor shall notify the concerned Railway Authority of the location, date, time and approximate duration of such blasting operations.
60. Red danger flags shall be displayed prominently in all directions during the blasting operations. The flags shall be planted 200 m from the blasting site in all directions. People, except those who actually light the fuse, shall be prohibited from entering this area, and all persons including workmen shall be excluded from the flagged area at least 10 minutes before the firing, a warning siren being sounded for the purpose.
61. The charge holes shall be drilled to required depths and at suitable places. Blasting should be as light as possible consistent with thorough breakage of material necessary for economic loading and hauling. Any method of blasting which leads to overshooting shall be discontinued.
62. When blasting is done with powder, the fuse cut to the required length shall be inserted into the hole and the powder dropped in. The powder shall be gently tamped with copper rods with rounded ends. The explosive powder shall then be covered with tamping material which shall be tamped lightly but firmly.
63. When blasting is done with dynamite and other high explosive, dynamite cartridges shall be prepared by inserting the square cut end of a fuse into the detonator and finishing it with nippers at the open end, the detonator gently pushed into the primer leaving 1/3rd of copper tube exposed outside. The paper of the cartridge shall then the closed up and securely bound with wire or twine. The primer shall be housed into the explosive. Boreholes shall be of such size that the cartridge can easily go down. The holes shall be cleared of all debris and explosive inserted. The space of about 200 mm above the charge shall then be gently filled with dry clay, pressed home and the rest of the tamping formed of any convenient material gently packed with a wooden rammer.
64. At a time, not more than 10 such charges will be prepared and fired. The man in charge shall blow a siren in a recognized manner for cautioning the people. All the people shall then be required to move to safe distances. The charges shall be lighted by the man-in-charge only. The man-in-charge shall count the number of explosions. He shall satisfy himself that all the charges have been exploded before allowing the workmen to go back to the work site.
65. After blasting operations, the Contractor shall compact the loose residual material below subgrade and replace the material removed below subgrade with suitable material.
66. Misfire
67. In case of misfire, the following procedure shall be observed
    a) Sufficient time shall be allowed to account for the delayed blast. The man-in-charge

shall inspect all the charges and determine the missed charge.

b) If it is the blasting powder charge, it shall be completely flooded with water. A new hole shall be drilled at about 450 mm from the old hole and fired. This should blast the old charge. Should it not blast the old charge, the procedure shall be repeated till the old charge is blasted.

c) In case of charges of gelignite, dynamite, etc., the man-in-charge shall gently remove the tamping and the primer with the detonator. A fresh detonator and primer shall then be used to blast the charge. Alternatively, the hole may be cleared of 300 mm of tamping and the direction then ascertained by placing a stick in the hole. Another hole may then be drilled 150 mm away and parallel to it. This hole shall then be charged and fired when the misfired hole should explode at the same time. The man-in-charge shall at once report to the Contractor's office and the Engineer in charge all cases of misfire, the cause of the same and what steps were taken in connection therewith.

68. If a misfire has been found to be due to defective detonator or dynamite, the whole quantity in the box from which defective article was taken must be sent to the authority directed by the Engineer in charge for inspection to ascertain whether all the remaining materials in the box are also defective.

69. Account

70. A careful and day to day account of the explosive shall be maintained by the Contractor in an approved register and manner which shall be open to inspection by the Engineer in charge at all times.

71. Backfilling

72. Backfilling shall be done with approved material after concrete or masonry is fully set and carried out in such a way as not to cause undue thrust on any part of the structure. All space between foundation masonry or concrete and the sides of excavation shall be refilled to the original surface in layers not exceeding 150 mm compacted thickness. The compaction shall be done with the help of suitable equipment such as mechanical tamper, rammer, plate vibrator etc., after necessary watering, so as to achieve a density not less than the field density before excavation.

73. Disposal

74. Disposal of Surplus excavated materials from the site shall be done to the disposal area as per the instructions of the Engineer in charge as per the specifications.

75. Filling, Backfilling and Site Grading:

76. General

77. All fill material will be subject to Engineer in charge's approval. If any material is rejected by Engineer in charge, Contractor shall remove the same forthwith from the site at no extra cost to the Employer. Surplus fill material shall be deposited / disposed off as directed by Engineer in charge after the fill work is completed.

78. No Earth fill shall commence until surface water discharges and streams have been properly intercepted or otherwise dealt with as directed by Engineer in charge.

79. Material

a) To the extent available, selected surplus spoils from excavated materials shall be used as backfill. Fill material shall be free from clods, salts, sulphate, organic or other foreign material. All clods of earth shall be broken or removed. Where excavated material is mostly rock, the boulders shall be broken into pieces not larger than 150 mm size, mixed with properly graded fine material consisting of moorum or earth to fill up the voids and the mixture used for filling.

b) If any selected fill material is required to be borrowed, Contractor shall make arrangements

for bringing such material from outside borrow pits. The material and source shall be subject to prior approval of Engineer in charge. The approved borrow pit area shall be cleared of all bushes, roots of trees, plants, rubbish etc. top soil containing salts / sulphate and other foreign material shall be removed. The materials so removed shall be burnt or disposed off as directed by Engineer in charge. Contractor shall make necessary access roads to borrow areas and maintain the same, if such access road does not exist, at his cost.

80. Filling in pits and trenches around foundations of structures, walls etc

81. As soon as the work in foundations has been accepted and measured, the spaces around the foundations, structures, pits, trenches etc. shall be cleared of all debris, and filled with earth in layers not exceeding 15 cm., each layer being watered, rammed and properly consolidated, before the succeeding one is laid. Each layer shall be consolidated to the satisfaction of Engineer in charge. Earth shall be rammed with approved mechanical compaction machines. The final backfill surface shall be trimmed and leveled to proper profile as directed by Engineer in charge or indicated on the Drawings.

82. Fill Density

83. The compaction, only where so called for, in the schedule of quantities / items shall comply with the specified (Proctor / Modified Proctor) density at moisture content differing not more than 4 percent from the optimum moisture content. Contractor shall demonstrate adequately at his cost, by field and laboratory tests that the specified density has been obtained.

84. Lead

85. Lead for deposition / disposal of excavated material, shall be as specified in the respective item of work. For the purpose of measurement of lead, the area to be excavated or filled or area on which excavated material is to be deposited / disposed off shall be divided into suitable blocks and for each of the blocks, the distance between centre lines shall be taken as the lead which shall be measured by the shortest straight line route on the plan and not the actual route taken by Contractor. No extra compensation is admissible on the grounds that the lead including that for borrowed material had to be transported over marshy or 'katcha' land / route.

86. Soil Erosion and Sedimentation Control

87. Turffing with Sods

88. Scope

89. This work shall consist of furnishing and laying of the live sod of perennial turf forming grass on embankment slopes, verges (earthen shoulders) or other locations shown on the Drawings or as directed by the Engineer in charge. Unless otherwise specified, the work shall be taken up as soon as possible following construction of the embankment, provided the season is favorable for establishment of the sod.

90. Materials

91. The sod shall consist of dense, well-rooted growth of permanent and desirable grasses, indigenous to the locality where it is to be use, and shall be practically free from weeds or other undesirable matter. At the time the sod is cut, the grass on the sod shall have a length of approximately 50 mm and the sod shall have freed of debris.

92. Thickness of the sod shall be as uniform as possible, with some 50-80 mm or so of soil covering the grass roots depending on the nature of the sod, so that practically all the dense root system of the grasses is retained in the sod strip. The sods shall be cut in rectangular strips of uniform width, not less than about 250 mm X 300 mm in size but not so large that it is inconvenient to handle and transport these without damage. During wet weather, the sod shall be allowed to dry sufficiently to prevent rearing during handling and during dry

weather shall be watered before lifting to ensure its vitality and prevent the dropping of the soil in handling.

93. Construction Operations for Turffing with Sods
94. Preparation of earth bed
95. The area to be sodden shall have been previously constructed to the required slope and cross section. Soil on the area shall be loosened, freed of all stones larger than 50 mm size, sticks, stumps and any undesirable foreign matter, and brought to a reasonably fine granular texture to a depth of not less than 25 mm for receiving the sod.
96. Where required, topsoil shall be spread over the slopes. Prior to placing the topsoil, the slopes shall be scarified to a depth which, after settlement, will provide the required nominal depth shown on the plans. Spreading shall not be done when the ground is excessively wet.
97. Following soil preparation and top soiling, where required, fertilizer and ground limestone when specified shall be spread uniformly at the rate indicated on the plans. After spreading, the materials are incorporated in the soil by discing or other means to the depths shown on the plans.
98. Placing the Sods
99. The prepared sod bed shall be moistened to the loosened depth, if not already sufficiently moist, and the sod shall be placed thereon within approximately 24 hours after the same had been cut. Each sod strip shall be laid edge to edge and such that the joints caused by abutting ends are staggered. Every strip, after it is snugly placed against the strips already in position, shall be lightly tamped with suitable wooden or metal tampers so as to eliminate air pockets and to press it into the underlying soil.
100. On side slopes steeper than 2 (horizontal) to 1 (vertical), the laying of sods shall be started from bottom upwards. At points where water may flow over a sodden area, the upper edges of the sod strips shall be turned into the soil below the adjacent area and a layer of earth placed over this followed by its through compaction.
101. Staking the Sods
102. Where the side slope is 2 (horizontal) to 1 (vertical) or steeper and the distance along the slope is more than 2 m, the sods shall be staked with pegs or nails spaced approximately 500 to 1000 mm along the longitudinal axis of the sod strips. Stakes shall be driven approximately plumb through the sods to be almost flush with them.
103. Top Dressing
104. After the sods have been laid in position, the surface shall be cleaned of loose sod, excess soil and other foreign material. Thereafter, a thin layer of topsoil shall be scattered over the surface of top dressing and the area thoroughly moistened by sprinkling with water.
105. Watering and maintenance
    a) The sods shall be watered by the Contractor for a period of at least four weeks after lying. Watering shall be so done as to avoid erosion and prevent damage to sodden areas by wheels of water tanks.
    b) The Contractor shall erect necessary warning signs and barriers, repair or replace sodden areas failing to show uniform growth of grass or damaged by his operations and shall otherwise maintain the sod at his cost until final acceptance.

IV. SURFACE AND SUB-SURFACE GEOTECHNICAL EXPLORATION

1. General
2. The objective of sub-surface exploration is to determine the suitability or otherwise of the soil or rock surrounding the foundation and soil parameters and rock characteristics for the design of foundation by in-situ testing or testing of samples/cores taken out of exploration.

The sub-surface exploration shall be planned in such a way that different types of soil up to the desired depth and their profile for the full proposed length of the bridge can be recorded and other information such as mechanical and physical properties like grain-size distribution, sensitivity, any existence of deleterious material in soil or ground water, etc., are determined along with soil parameters and rock characteristics. The sub-surface exploration shall also throw light on porosity of rock and subsidence due to mining, ground water level, artesian condition, if any, likely sinking and driving effort, likely

3. Field Investigation
   a) Reconnaissance
   b) Preliminary Explorations
   c) Detailed Explorations
4. Reconnaissance includes a review of available topographic and geological information, aerial photographs and data from previous investigations and site examination.
5. Preliminary investigation shall include the study of existing geological information, previous site reports, geological maps; air photos, etc., and surface geological examination. For large and important structures the information may be supplemented by geophysical methods. In some cases where no previous sub-strata data are available, exploratory geophysical investigation may need to be supplemented by resorting to a few bore-holes. These will help to narrow down the number of sites under consideration and also to locate the most desirable location for detailed sub-surface investigation like bore or drill holes, sounding probes, etc.
6. The scope of detailed investigation for bridges may be decided based on data obtained after preliminary investigations. Based on data obtained after preliminary investigations, the bridge site, type of structure with span arrangement and the location and type of foundations, shall be tentatively decided. Thereafter, the scope of detailed investigation including the extent of exploration, number of bore-holes, type of soundings, type of tests, number of tests, etc., shall be decided, so that adequate data considered to be necessary for the detailed design and execution, are obtained.
7. The width of exploration: One purpose of detailed exploration for high embankments is to ascertain the compressibility of the clayey strata. It is, therefore, necessary that detailed and well illustrated description of the characteristics of stratification should be prepared. After the general shape and trend of the boundaries of the various soil deposits have been determined and rough assessment of their strength has been made by sub-surface sounding, with or without sampling in exploratory boring, the location of bore-hole(s) for undisturbed sampling shall be decided. At least one representative undisturbed sample should be collected from each strata. When homogeneous strata is very thick, one representative sample shall be collected for each 3 m thickness of the strata.
8. Soil investigation for foundations shall contain a programme for boring and retrieval of samples. The field work shall consist of excavation, drilling of bore-holes for the purposes of collection of undisturbed and disturbed samples, standard penetration tests, in-situ vane tests, static and dynamic cone penetration tests, other field tests, as specified by the Engineer and preparation of bore-logs. Collection and preservation for testing of disturbed and undisturbed samples from boreholes, borrow pits, etc., as specified by the Engineer shall form a part of the above, All in-situ tests shall be supplemented by laboratory investigations. Relevant Indian Standards such as IS: 1498, IS: 1888, IS: 1892, IS: 2131, IS: 2132, IS: 2720, IS: 4434 and IS: 4968 and Appendix I of IRC:78, etc., shall be followed for guidance.
9. The soundings by dynamic method shall be carried out in bore-holes using a standard sampler as specified in IS: 2131.

10. Preliminary Investigation
11. Foundations
12. Preliminary exploration shall be carried out to determine the soil profile showing the boundaries between the different soil types and between loose and dense parts in the same type of deposits. For guidance reference may be made to IRC: 75. For this purpose, as a first step, a suitable type of sub-surface sounding (e.g., static or dynamic cone penetration test) shall be carried out. As many soundings as necessary should be made, until the penetration data is complete enough to leave no doubt concerning the general shape and the trend of boundaries of the various soil deposits., Exploratory drill holes should then be made at one or two locations where average condition prevails and near those few points where the penetration diagrams indicate maximum deviations from the average.
13. The exploration shall cover the entire length of the bridge and also extend at either side for a distance about twice the depth below bed of the last main foundations. If there is any necessity for designing investigation for approaches particularly on soft soil or with high embankment or there is a possibility of considering alternatives between viaduct or earthen embankment, the extended length and location of the borings beyond the proposed location of abutment should determined and executed.
14. The depth of exploration should be at least 1 1/2 times the minimum width of foundation below the proposed foundation level. Where such investigation end in any unsuitable or questionable foundation material the exploration shall be extended to a sufficient depth into firm and stable solid or rock but not less than four times the minimum depth of foundation below the earlier contemplated foundation level. In case of good sound rock the stipulation of minimum depth may be decreased based on difficulty to conduct core drilling and the minimum depth may be restricted to 3 metres.
15. Guide bund and Embankment
16. The depth of exploration should include all strata likely to affect stability of embankment, guide bund and/or cause undesirable settlement. In general, the requirement of settlement governs the depth of exploration for high embankments in particular. However, borings can be terminated at shallower depths when firm strata or bed rock is encountered. Ordinarily, the boring shall be taken to a depth of at least 1.5 times the height of embankment and guide bund. However, where highly compressible strata are encountered, the boring may have to be taken deeper. In order to ensure that firm strata is sufficiently thick, the boring should extend 3 metre into the firm strata.
17. Detailed Exploration
18. The exploration shall cover the entire length of the bridge and also extend at either end for a distance of about twice the depth below bed of the last main foundation to assess the effect of the approach embankment on the end foundations. Generally the sub-surface investigations (preliminary and detailed) for bridges shall extend to a depth below the anticipated foundation level equal to about one and a half times the width of the foundation. However, where such investigations end in any unsuitable or questionable foundation material, the exploration shall be extended to a sufficient depth into firm and stable soils or to rock.
19. The type and extent of exploration shall be divided into the following groups as per requirement of foundation design and likely method of data collection:
    a) Foundation requiring shallow depth of exploration
    b) Foundation requiring large depth of exploration
    c) Fills behind abutments and protection works
20. Location Boring

21. Where the data made available by detailed exploration indicates appreciable variation or where variations in a particular foundation are likely to appreciably affect the construction (specially in case of bridge foundations resting on rock), it will be necessary to resort to additional bores/soundings to establish complete profile of the underlying strata. The additional borings/soundings shall be decided depending upon the extent of variation at a particular foundation location and should cover the entire area of the particular foundation.
22. Construction Stage Exploration
23. Whenever a change in the sub-soil strata/rock profile in encountered during construction, explorations shall be resorted to establish the correct data for further decisions.
24. Logging of bore-holes by radio-active methods shall be done for detailed investigations as specified in the contract or in special provisions.
25. For bridge works, the investigations shall be comprehensive enough to enable the designer to estimate or determine the following:
    I. The engineering properties of the soil/rock,
    II. The location and extent of soft layers and gas pockets, if any, under the hard founding strata,
    III. The geological condition like type of rock, faults, fissures or subsidence due to mining, porosity etc.,
    IV. The ground water level,
    V. Artesian conditions, if any,
    VI. Quality of water in contact with the foundation,
    VII. The depth and extent of scour,
    VIII. Suitable depth of foundation,
    IX. The bearing capacity of the foundation,
    X. Probable settlement and probable differential settlement of the foundations
    XI. Likely sinking or driving effort, and
    XII. Likely construction difficulties.
26. Exploration for Bridge Foundations Resting on Rock
27. Investigation and interpretation of data for rock is specialized work. To arrive at the characteristic strength of rock mass, reliance shall be placed more on in-situ tests in comparison to laboratory tests. An engineering geologist shall also be associated in the exploration programme.
28. Identification and classification of rock types for engineering purposes may in general be limited to broad, basic geological classes in accordance with accepted practice. Strength of parent rock alone is of limited value because overall characteristics depend considerably on character, spacing and distribution of discontinuities of the rock mass, such as the joints, bedding planes, faults and weathered seams. An important factor affecting the behaviour is the weathered zone at top.
29. Basic Information Required from Explorations
    a) Depth of rock strata and its variation over the site,
    b) Whether isolated boulder or massive rock formation,
    c) Extent and character of weathered zone,
    d) Structure of rock - including bedding planes, faults, fissures, solution cavities etc.,
    e) Properties of rock material - strength, geological formation, etc.,
    f) Erodibility of rock to the extent possible, Colour of water.
30. Exploration Programme
31. If preliminary investigations have revealed presence of rock within levels where the foundation is to rest, it is essential to take up detailed investigation to collect necessary

information mentioned in Clause 5.4.3. The exploratory bore-hole shall be drilled into the rock to a depth of about 3 meters to distinguish a boulder from a continuous rock formation.

32. The extent of exploration shall be adequate enough to give a complete picture of the rock profile both in depth and across the channel width to assess the constructional difficulties in reaching the foundation levels.
33. The depth of boring in rock depends primarily on local geology, erodibility of the rock, extent of structural loads to be transferred to foundation etc. Normally, it shall pass through the upper weathered or otherwise weak zone, well into the sound rock. Minimum depth of boring in sound rock shall be 3 meters.
34. Detailed Investigation for Rock
35. This covers sounding, boring and drilling. An adequate investigation programme shall be planned to cover the whole area for general characteristics and in particular the foundation location, to obtain definite information regarding rock-depth and its variation over the foundation area. The detailed programme of exploration will depend on the type and depth of over-burden, the size and importance of the structure, etc. To decide this, geophysical methods adopted at the preliminary investigation stage will be helpful, this data being supplemental by sounding, bore-holes and drill holes.
36. Drilling through rock is a very specialized work and every care shall be taken to notice and record any small change during drilling. The time required to drill through a certain depth, amount of core recovery, physical condition, length of pieces of core, joints, colour of water residue, weathering and evidence of disturbance and other effects shall be carefully noticed and entered in the drilling log. for guidance, IS: 5313 may be referred to. The data shall be presented in accordance with IS: 4464.
37. The cores shall be stored properly in accordance with IS: 4078.
38. The rock cores obtained shall be subjected to following laboratory tests:
    a) Visual identification for texture, structure, composition, colour and grain size.
    b) Laboratory tests shall be done for specific gravity, porosity and moisture content.
39. In-situ tests shall be made in accordance with IS: 7292; IS: 7317; and IS: 7746. In addition, laboratory tests can also be made on samples.
40. Use of in-situ tests for measuring strength and deformation characteristics shall be made. Use of bore-hole photography will be desirable to evaluate the presence of faults, fissures or cavities, etc.
41. Special Cases
42. Investigation for Conglomerate
43. A drill hole shall be made same as for rock. The samples collected shall be subjected suitable tests depending upon the material, special care shall be taken to ascertain erodibility of the matrix. Where possible, specially for shallow foundation, Plate Load Test shall be conducted.
44. Investigation for Laterites
45. The investigation shall be generally similar to that required for cohesive soils, use of penetration tests shall be preferred, if suitable correlation charts are available. This may be static or dynamic penetration tests or vane shear tests. In the case of hard laterite, recourse may have to be made to core drilling as for soft rocks. For laterites at shallow depths, use of Plate Load Test may be advantageous.
46. Caution
47. The interpretation of laboratory results on rock samples depends upon the relationship of the specimens tested to the overall rock characteristics, enumerated in Appendix I of IRC:

78. For this purpose, care shall be exercised in the choice of specimen size and its orientation in relation to the joint pattern.

48. In some cases, the foundation behaviour will be dominated by a possible mode of failure involving movement along some joint surface, fissures or weak layer within a generally strong rock system and also by possible weathering. In-situ shear tests may be conducted wherever feasible, as such tests are likely to give more representative data than the shear tests conducted on core samples.

49. Presentation of Data

The data shall be given in diagrammatic form in 3 sheets giving the following details:

a) Sheet 1: Plan showing the position of bore-holes clearly marked so as to fix the position at a future date.

b) Sheet 2: This shall contain the bore-log chart and test results of the samples separately for each bore-hole/pit etc.

c) Sheet 3: This shall contain pictorial representation of the borelog data to get an overall picture of the soil profile at the cross-section of the river.

50. Pile Foundation

51. Description

52. Relevant details of proprietary system of piling shall be included in the bid

53. Documents and shall be subject to the approval of the Engineer.

54. The Contractor in his methods statement shall include the procedure for carrying out initial and routine load tests of piles including design calculations and drawings. The format for reporting test results shall be included in the methods statement.

55. Type of Piles

56. Bored cast-in-situ piles as shown in drawings or as directed by the Engineer shall be provided.

57. Cast In - Situ Concrete

58. Concreting

59. Concreting of bored cast-in-situ piles shall be done by tremie method

60. Use of Tremie

61. In the exceptional case of interruption of concreting, which can be resumed within 1 or 2 hours, the tremie pipe shall not be taken out of the concrete. Instead it shall be raised or lowered slowly, from time to time. Concreting shall be resumed by introducing a little richer concrete with a slump of about 200 mm.

62. If the concreting cannot be resumed before final set of concrete already placed, pile shall be rejected.

63. The top of concrete in a pile shall be brought minimum 600mm above the cut off level to permit removal of all laitance and weak concrete by removing this extra 600mm pile concrete including exposing reinforcement before pile cap is laid.

64. Pile Tests

65. Initial Load Test

66. The methodology of carrying out load tests and of arriving at safe load on piles shall conform to IS:2911 (Part IV). It shall be ensured that the testing arrangement is symmetrical and the thrust is axial to the pile and the test frame. Joints of the loading frame should be inspected prior to the commencement of loading and during test where a tension pile system is used.

67. Pressure gauges and dial gauges shall be calibrated at an approved laboratory immediately prior to use and then at regular intervals not exceeding 3 months. The readings shall be corrected with the aid of calibration curve.

68. In case the safe load (vertical or lateral) determined by initial load exceeds or equals to design working load, no alteration or modification shall be made to the foundation working details.
69. If the safe load (vertical or lateral) determined from any of the initial load falls below the design working load value, modification to foundation detail including change in depth and/or number of piles shall be made and necessary revised drawings shall be issued by the Engineer to the Contractor within 4 weeks from the presentation of test results to the Engineer.
70. In case the safe load determined from any of the routine load, falls below the design working load value, the pile shall be rejected and remedial measures as directed by the Engineer shall be taken by the Contractor at his own risk and cost.
71. Boring
72. Boring shall be done by any of the following methods depending on the soil type and types of samples required for the investigation:
    a) Auger Boring
    b) Shell and Auger Boring
    c) Percussion Boring
    d) Wash Boring
    e) Rotary Boring
73. For preliminary and detailed sub-surface investigation only rotary drills shall be used. The casing shall also be invariably provided with diameters not less than 150 mm up to the level of rock, if any. However, use of percussion or wash boring equipment shall be permitted only to penetrate through bouldery or gravelly strata for progressing the boring but not for the collection of samples. While conduction detailed borings, the resistance to the speed of drilling i.e., rate of penetration, core loss, etc., as already specified in Appendix 3 of IRC: 78 shall be carefully recorded to evaluate the different types of strata and to distinguish specially sand from sandstone, clay from shale, etc.
74. Records of Borings and Trial Pits
75. The field records for the preliminary and detailed exploration shall contain the date when the boring was made, the location of the boring with reference to a permanent system of co-ordinates and the elevation of the ground surface with respect to a permanent bench mark. They shall include elevation at which the water table and the upper boundary of each of the successive soil strata were encountered, the investigator's clarification of the layer on the basis of general information obtained from field examination (refer to Appendix 2.1 of IRC:75) and the value of the resistance obtained by means of Standard Penetration Test. The type of tools used for borings shall be recorded. If the tools were changed, the depth at which the change was made and the reason thereof shall also be noted. Incomplete and abandoned borings shall be described with no less care than successfully completed drill holes. The notes shall contain everything of significance observed on the job such as the elevation at which wash water was lost from the hole.
76. For all borings and trial pits, necessary information as detailed below shall be given. A site plan showing the disposition of the bore holes shall also be attached:
    I. Agency
    II. Location with reference map
    III. Pit/Bore-hole number
    IV. reduced level (R.L.) of ground surface or other reference point
    V. Dates of starting and completion
    VI. Name of supervisor
    VII. Scales of plans and sections

VIII. Dimensions, methods of advancing exploration such as by hand tools, blasting, boring, etc.
IX. General description of strata met with and RLs at which they are met
X. Position and altitude of contacts, faults, strong joint, slacken sides, etc.
XI. Inflow of water, methods of controlling the water, required capacity of pumps for dewatering
XII. The level at which the sub-soil water is met with
XIII. Dip and strike of bedding and of cleavage.
XIV. Visual description of strata
XV. Results of field tests e.g. SPT, in-situ vane shear test etc

77. Upon removal of sampling tube, the length of the sample in the tube and the length between the top of the tube and the top of the sample in the tube shall be measured and recorded.
78. Methods of Sampling
79. There are two types of samples viz., (a) Disturbed sample (b) Undisturbed sample. The usual methods for sampling conforming to IS: 1892 and IS: 2132 are given ahead:

Name of Ground	Type of Sample	Method of Sampling
Soil	Disturbed Undisturbed	Hand Samples / Auger Samples / Shell Samples Hand Samples / Tube Samples
Rock	Disturbed Undisturbed	Wash Samples from percussion or rotary drilling Cores

80. Procedure for Taking Samples
81. For proper identification of sub-surface material, sample should be recovered containing all the constituents of the materials in their proper proportion. In clayey deposits such samples could be collected by split spoon samplers. In the case of sandy deposits, sampling spoons shall be fitted with suitable devices for retaining samples. All data required for soil identification (Appendix 2.1 of IRC: 75) should be collected from the samples so extracted when undisturbed samples, which are more desirable for collection of some of the data, are not available. Penetration test should be carried out with the standard split-spoon sampler or penetro meters if the soil is coarse grained. When it is known in advance that the soil profile is fairly regular, preliminary and detailed investigation may be combined. Tube samplers can be used in place of split spoon samplers for collecting samples in clayey strata.
82. Disturbed Soil Samples
83. Disturbed samples of soil shall be obtained in the course of excavation and boring. For procuring samples from below the ground water level, where possible, special type of sampler shall be used. Where Standard Penetration Test is conducted, representative samples shall be obtained from the split spoon. While collecting disturbed samples from borrow areas it shall be ensured that the samples collected represented all types of borrow materials to be used in the construction of embankment and sub-grade.
84. The size of sample generally requited shall be as given in Table 6-1.
85. Table 6-1 Size of Soil Sample Require

Sl.	Purpose of Sample	Soil Type	Weight of Sample Required (kg)
	Soil identification, natural moisture content tests, mechanical analysis and index properties, chemical tests	Cohesive Soils Sands and Gravel	13
	Compression Tests	Cohesive Soils and Sand	12.5
	Comprehensive examination of construction material and borrow area soil including soil stabilization	Cohesive Soils and Sands Gravelly Soil	25 - 50 50 - 100

86. While taking out disturbed soil samples, Standard Penetration Test may also be conducted to find out the bearing capacity of the sub-soils at specified levels.
87. Undisturbed Soil Samples
88. The location of the bore-hole shall be as indicated on the Drawing or given by the Engineer. The depth of the bore-hole shall be as indicated on the Drawing or shall be governed by the criteria given therein or as directed by the Engineer.
89. Samples shall be obtained in such a manner that their moisture content and structure do not get altered. This may be ensured by careful protection and packing and by use of correctly designed sampler.
90. Standard Penetration Test may have to be conducted in each case to obtain additional data as directed by Engineer. In soft clay, in-situ vane shear test as per IS: 4434 may have to be conducted. Where all the three operations have to be carried out in one layer, the sequence shall be undistributed soil sampling followed by in-situ vane shear test, followed by Standard Penetration Test.
91. For compression test samples, core of 40 mm diameter and about 150 to 200 mm length may sufficient, but for other laboratory tests, a core of 100 mm diameter and 300 mm length shall be taken as far as possible, unless otherwise specified by the Engineer.
92. The upper few millimeters of both types of sample shall be rejected as the soil at the bottom of the bore hole usually gets disturbed by the boring tools.
93. Rock Samples
94. Disturbed samples
95. The sludge from percussion borings or from rotary borings which have failed to yield a core, shall be collected for a disturbed sample. It may be recovered from circulating water by settlement in a trough.
96. Undisturbed samples
97. Block samples taken from the rock formation shall dressed to a size of about 90 x 75 x 50 mm. For core samples - cores of rock shall be taken by means of rotary drills fitted with a coring bit with core retainer, if warranted.
98. In case of rock at shallow depths which can be conveniently reached, test pits or trenches are the most dependable and valuable methods since they permit a direct examination of the surface, the weathered zone and presence of any discontinuities. It is also possible to take representative samples for tests. For guidance, IS: 4453 may be referred to.
99. Protection, Handling and Labeling of Samples

100. Care shall be taken in handling and labeling of samples so that they are received in a fit state for examination and testing and can be correctly identified as coming from a specified trial pit or boring.
101. The disturbed material in the upper end of the tube shall be completely removed before applying wax for sealing. The length and type of sample so removed should be recorded.
102. The soil at the lower end of the tube shall be reamed to a distance of about 20 mm. After cleaning, both ends shall be sealed with wax applied in a way that will prevent wax from entering the sample. Wax used for sealing should not be heated to more than a few degrees above its melting temperature. The empty space in the samplers, if any, should be filled with moist with moist soil, saw dust, etc., and the ends covered with tight fittings caps.
103. Labels giving the following information should be affixed to the tubes:
    a) Tube number
    b) Job designation
    c) Sample location
    d) Boring number
    e) Sample number
    f) Depth
    g) Penetration
    h) Gross recovery ratio
104. The tube and boring numbers should be marked in duplicate. Duplicate markings of the boring number and sample number on a sheet which will not be affected by moisture should be enclosed inside the tube.
105. Tests for Exploration of Shallow Foundations of Bridges
106. Test pits or trenches are the most dependable and valuable methods of exploration since they permit direct visual examination and more reliably the type of soil and their stratification. This will also allow in-situ tests like plate bearing tests, shear tests and uni-axial jacking tests, etc.
107. Tests shall be conducted on undisturbed samples, which may be obtained from open pits. The use of Plate Load Test (as per IS: 1888) is considered desirable to ascertain the safe bearing pressure and settlement characteristics. A few exploratory bore holes or soundings shall be made to safeguard against presence of weak strata underlying the foundation. This shall extend to a depth of about 11/2 times the proposed width of foundation.
108. The laboratory results shall correlate with in-situ tests like Plate Load Tests and Penetration Test results.
109. Tests for Exploration for Deep Foundations of Bridges
110. The tests to be conducted at various locations for properties of soil. etc., are different for cohesive and cohesionless soils. These are enumerated below and shall be carried out, wherever practicable, according to soil type.
111. Cohesionless Soil
    a) Classification Tests, Density, etc.
    b) Field Tests:
    - Plate Load Test as per IS: 1888
    - Dynamic Penetration Test as per IS: 2131 and Use of Dynamic Cone penetration Test as per IS: 4968 (Part 1 or Part 2) may be conducted where considered appropriate.

    c) Laboratory Tests: Shearing strength test - triaxial or box shear tests - in case of the possibility of rise of water table, the test shall be done on saturated samples.

112. Cohesive Soil

a) Classification Tests, Density, etc.
b) Field Tests:

- Plate Load Test
- Unconfined Compression Test as per IS: 2720 (Part 10)
- Vane shear Test as per IS: 4434
- Static cone Penetration Test as per IS: 4968 (Part 3).

c) Laboratory Tests: Shearing strength test - triaxial tests (IS: 2720 Part 9). Consolidation Test (IS: 2720 Part 17).

113. The sub-surface exploration for bridge works can be divided into 3 Zones:
    a) Between bed level and upto anticipated maximum scour depth (below H.F.L.)
    b) From the maximum scour depth to the foundation level.
    c) From foundation to about 11/2 times the width of the foundation below it.

114. The sub-soil water shall be tested for chemical properties to ascertain the hazard of deterioration to foundations. Where dewatering is expected to be required, permeability characteristics shall be determined.
115. For the different zones categorised in Clause 5.11.2 the data required, such as soil classification, particle size distribution, shearing strength characteristics, method of sampling disturbed and undisturbed samples, testing, including particle size distribution, shear strength, unconfined compression test, shall be complied with.
116. Testing of Material for Guide Bund and High Embankment and Its Foundations
117. The soil properties for the embankment foundation shall be as specified in particular Specifications and shall be got verified prior to construction operation. In case the actual soil properties do not match the particular Specification, then embankment design shall be revised.
118. Field investigation for the embankment material should be carried out to collect general information as indicated in IRC: 75. For details refer to Clause 5.2. Field investigations for subsoil strata shall consist of taking minimum two bore holes for each approach to a bridge along centre line of the alignment at a distance of 50 m and 120 m behind the abutment positions on both sides. The depth of bore holes below the ground level may ordinarily be 2.5 times the maximum height of the embankment subject to minimum depth of 20 m. Thin walled sampling tubes of 100 mm internal diameter and 450 mm minimum length conforming to IS: 2132 shall be used for collecting undisturbed samples from bore-holes at an interval of 2.5 to 3.5 m. Standard penetration test should be conducted immediately after undisturbed sample is collected.
119. In addition to the relevant identification tests, mentioned in IRC: 75, it shall be necessary to conduct some of the following tests on the undisturbed samples collected from the sub-strata. The choice of test is primarily determined by the type of soil, type of stability analysis (vide Table 6-2), availability of apparatus and cost of investigation.

Shear Strength Tests for Stability Analysis

Stage in Life of Embankment	Shear Test	Type of Analysis
(a) During construction or immediate post- construction	Unconsolidated undrained triaxial shear test on undisturbed samples and on compacted embankment material	Total stress analysis
(b) During construction or immediate post-construction	Unconfined compression test in laboratory or vane shear test	Total stress analysis
(c) During construction or immediate post- construction	Consolidated undrained test with pore-pressure measurement on as compacted soil samples of embankment materials and on disturbed samples	Effective stress analysis
(d) Long term stability	Consolidated undrained test with pore-pressure measurement on as compacted soil samples of embankment materials and on disturbed	Effective stress analysis

120. Laboratory Investigations of Embankment Material

121. The following tests should be conducted on representative samples of embankment material:

TEST	T
Gradation Test (Sieve Analysis)	I
Atterberg Limit Test	I
Standard Proctor Test	I
Natural Moisture Content	I

122. In addition to the above, there is need for shear strength tests on compacted samples of the till material. For this purpose, the relative compaction should be 95 per cent of the Standard Proctor maximum dry density and moisture content, same as that likely to prevail in the embankment during the period covered by the stability analysis or to be used in the field during construction. Undrained test shall be run on cohesive soils and shear strength parameters should be ascertained for the ranges of normal pressures which are likely to be experienced in the field. In cases where effective stress analysis is required to be done, pore-pressure measurements should also be made during the undrained tests and effective strength and pore-pressure parameters should found to out. For fill material of cohesionless soils, a direct shear box test (IS: 2720 - Part 13) may be conducted to ascertain shear strength of soil.

123. The results of reconnaissance, field and laboratory investigations for embankments shall be consolidated into a well-knit report. The record of findings and recommendations, if any, may be presented in the form of written test, graphs, figures and tables, as appropriate for different types of data and findings.

124. Information and data to be contained in the report should include general location map, pertinent geological information on reconnaissance observations, sub-soil properties (Fig. 2.1 of IRC: 75), boring logs and summary of sub-soil properties (Fig. 2.2 of IRC: 75), graphs and tables related to laboratory investigations, results of borrow area investigations (Fig 2.3 of IRC: 75) and recommendations, if any.
125. The undisturbed samples shall be collected from each layer of sub-soil unless the stratum is such that undisturbed samples cannot be collected using ordinary sampler. Where indicates by the Engineer, undisturbed samples shall be collected using piston sampler or core-cutter or such special devices. In thick layers undisturbed samples shall be collected at 3 m interval.
126. Measurements for Payment
127. In case of bridge and road structures, the work of boring and trial pits shall be considered as incidental to the foundation works and nothing extra shall be paid unless otherwise specified in the contract. In cases where it is specified to be paid separately, like contract for soil investigation, the work shall be measured in running metres for boring, in cubic meters for trial pits, in number of samples for collection of disturbed and undisturbed samples and in number of tests for each type of test
128. Rate
129. The contract unit rate shall include the cost of all labour, materials, tools and plant and equipment required for doing the boring or making pits as per these Specifications, taking out and packing the samples, sending and getting them tested in approved laboratories and making available the test report as specified or directed by the Engineer inclusive of all incidental costs to complete the work as per the Specifications.

V. MATERIALS OF STRUCTURES

1. Scope
2. Materials to be used in the work shall conform to the Specifications mentioned on the Drawings, the requirements laid down in this section and Specifications for relevant items of work covered under these Specifications.
3. If any material, not covered in these Specifications, is required to be used in the work, it shall conform to relevant Indian Standards, if there are any, or to the requirements specified by the Engineer in charge.
4. Sources of Material
5. The Contractor shall notify the Engineer in charge of his proposed source of materials prior to delivery to of work site. If it is found after the inspection and testing that, source of supply previously approved do not meet the standard specifications and fail to produce the uniform and satisfactory products, are liable for the rejection of entire material or part by the Engineer in charge. if the product from any other source proves unacceptable at any time, the Contractor shall furnish acceptable material from other sources at his own expense.
6. Cement
7. Cement to be used in the works shall be any of the following types with the prior approval of the Engineer in charge.
   (a) Rapid Hardening Portland Cement, conforming to IS: 8041.
   (b) Ordinary Portland cement, 43 Grade, conforming to IS: 8112.
   (c) Ordinary Portland cement, 53 Grade, conforming to IS: 12269.
   (d) Sulphate Resistant Portland cement, conforming to IS: 12269.

8. Cement conforming to IS: 269 shall be used only after ensuring that the minimum required design strength can be achieved without exceeding the maximum permissible cement content of 540 kg/cum of concrete.
9. Cement conforming to IS: 8112 and IS: 12269 may be used provided the minimum cement content mentioned pertaining to durability considerations shall not be reduced. Considering the early strength, these cements shall be used with a certain caution as high early strengths of cement in the 1 to 28-day range can be achieved by finer grinding and higher constituent ratio of C3S/C2S, where C3S is Tricalcium Silicate and C2S is Dicalcium Silicate. In such cements, the further growth of strength beyond say 4 weeks may be much lower than that traditionally expected. Therefore, further strength tests shall be carried out for 56 and 90 days to examine the mix design.
10. Cement conforming to IS: 12330 shall be used when sodium sulphate and magnesium sulphate are present in large enough concentration to be aggressive to concrete. The recommended threshold values as per IS: 456 are sulphate concentration in excess of 0.2 percent in soil substrata or 300 ppm (0.03 percent) in ground water. Tests to confirm actual values of sulphate concentration are essential when the structure is located near the sea coast, chemical factories, and agricultural land using chemical fertilizers and sites where there are effluent discharges or where soluble sulphate bearing ground water level is high. Cement conforming to IS: 12330 shall be carefully selected from strength considerations to ensure that the minimum required design strength can be achieved without exceeding the maximum permissible cement content of 540 kg/cum. of concrete.

11. Cement conforming to IS: 8041 shall be used only for precast concrete products after specific approval of the Engineer in charge.
12. Total chloride content in cement shall in no case exceed 0.05 percent by mass of cement; and total sulphur content calculated as sulphuric anhydride (SO3) shall in no case exceed 2.5 percent and 3.0 percent when tri-calcium aluminate percent by mass is upto 5 or greater than 5 respectively.
13. Coarse Aggregates
14. For plain and reinforced cement concrete (PCC and RCC) or Prestressed concrete (PSC) works, coarse aggregate shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone, crushed gravel, natural gravel or a suitable combination thereof or other approved inert material. They should not consist, pieces of disintegrated stones, soft, flaky, elongated particles, salt, alkali, vegetable matter or other deleterious materials in such quantities as to reduce the strength and durability of the concrete, or to attack the steel reinforcement. Coarse aggregate having positive alkali silica reaction shall not be used. All coarse aggregates shall conform to IS: 383 and tests for conformity shall be carried out as per IS: 2386 Parts I to VIII.
15. The Contractor shall submit for the approval of the Engineer in charge, the entire information indicated in Appendix A of IS: 383.
16. The maximum value for flakiness index for coarse aggregate shall not exceed 35 percent. The coarse aggregate shall satisfy the following requirements of grading

IS Sieve Size	Percent by Weight Passing the Sieve		
	40 m	20 mm	12.5 mm
63 mm	100	-	-
40 mm	95-100	100	-
20 mm	30-70	95-100	100
12.5 mm	-	-	90-100

IS Sieve Size	Percent by Weight Passing the Sieve		
	40 m	20 mm	12.5 mm
10 mm	10-35	25-55	40-85
4.75 mm	0-5	0-10	0-10

17. Sand / Fine Aggregates
18. For masonry work, sand shall conform to the requirements of IS: 2116.
19. For plain and reinforced cement concrete (PCC and RCC) or Prestressed concrete (PSC) works, fine aggregate shall consist of clean, hard, strong and durable pieces of crushed stone, crushed gravel, or a suitable combination of natural sand, crushed stone or gravel. They shall not contain dust, lumps, soft or flaky, materials, mica or other deleterious materials in such quantities as to reduce the strength and durability of the concrete, or to attack the embedded steel. Motorized sand washing machines should be used to remove impurities from sand. Fine aggregate having positive alkali-silica reaction shall not be used. All fine aggregate shall conform to IS: 383 and test for conformity shall be carried out as per IS: 2386 (Part I to VIII). The Contractor shall submit to the Engineer in charge the entire information indicated in Appendix A of IS: 383. The fineness modules of fine aggregate shall neither be less than 2.0 nor greater than 3.5.
20. Sand/fine aggregate for structural concrete shall conform to the following grading requirements:

IS Sieve Size	Percent by Weight Passing the Sieve		
	Zone I	Zone II	Zone III
10 mm	100	100	100
4.75 mm	90-100	90-100	90-100
2.36 mm	60-95	75-100	85-100
1.18 mm	30-70	55-90	75-100
600 mm	15-34	35-59	60-79
300 mm	5-20	8-10	12-40
150 mm	0-10	0-10	0-10

21. Reinforcement / Untensioned Steel for plain and reinforced cement concrete (PCC and RCC) or Prestressed concrete (PSC) works, the reinforcement / untensioned steel as the case may be shall consist of the following grades of reinforcing bars:

Grade Designation	Bar Type conforming to governing IS Specification	Characteristic Strength MPa	Elastic Modulus GPa
S 240	IS:432 Part I Mild Steel Bar	240	200
S 415	IS:1786 High Yield Strength Deformed Bars	415	200

22. Other grades of bars conforming to IS: 432 and IS: 1786 shall not be permitted.
23. All steel shall be procured from primary producers; no re-rolled steel shall be incorporated in the work.

24. Only new steel shall be delivered to the site. Every bar shall be inspected before assembling on the work and defective, brittle or burnt bar shall be discarded. Cracked ends of bars shall be discarded.Mild steel bar shall not be used for reinforcing concrete in the civil structures.
25. Fusion-bonded epoxy coated reinforcing bars shall meet the requirements of IS: 13620. Additional requirements for the use of such reinforcement bars have been given below:
    (a) Patch up materials shall be procured in scared containers with certificates from the agency who has supplied the fusion bonded epoxy bars.
    (b) PVC coated G.I. binding wires of 18G shall only be used in conjunction with fusion bonded epoxy bars.
    (c) Chairs for supporting the reinforcement shall also be of fusion bonded epoxy coated bars.
    (d) The cut ends and damaged portions shall be touched up with repair patch up material
    (e) The bars shall be cut by saw-cutting rather than flame cutting.
    (f) While bending the bars, the pins of work benches shall be provided with PVC or plastic sleeves.
    (g) The coated steel shall not be directly exposed to sun rays or rains and shall be protected with opaque polyethylene sheets or such other approved materials.
    (h) While concreting, the workmen or trolleys shall not directly move on coated bars but can move on wooden planks placed on the bars.
26. Water
27. Water used for mixing and curing shall be clean and free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. Potable water is generally considered satisfactory for mixing concrete. Mixing and curing with sea water shall not be permitted. As a guide, the following concentrations represent the maximum permissible values:
    (a) To neutralize 200 ml sample of water, using phenolphthalein as an indicator, it should not require more than 2 ml of 0.1 normal NaOH.
    (b) To neutralize 200 ml sample of water, using methyl orange as an indicator, it should not require more than 10 ml of 0.1 normal HCl.
    (c) The permissible limits for solids shall be as follows when tested in accordance with IS:3025:

1.	Organic	200 mg/lit
2.	Inorganic	3000 mg/lit
3.	Sulphate (SO4)	500 mg/lit
4.	Chlorides (Cl)	500 mg/lit *
5.	Suspended matter	2000 mg/lit

* *In case of structures of lengths 30m and below, the permissible limit of chlorides may be increased upto 1000 mg/lit. All samples of water (including potable water) shall be tested and suitable measures may be where necessary to ensure conformity of the water to the requirements states herein.*

(d) The pH value shall not be less than 6.

28. Tests and Standard of Acceptance
29. All materials, even though stored in an approved manner shall be subjected to an acceptance test prior to their immediate use. Independent testing or cement for every consignment shall be done by the Contractor at site in the laboratory approved by the Engineer in charge before use. Any cement with lower quality than those shown in

manufacturer's certificate shall be debarred from use. In case of imported cement, the same series of tests shall be carried out before acceptance.

30. Testing and Approval of Material
31. The Contractor shall furnish test certificates from the manufacturer/supplier of materials along with each batch of material(s) delivered to site.
32. The Contractor shall set up a field laboratory with necessary equipment for testing of all materials, finished products used in the construction as per requirements of conditions of contract and the relevant Specifications. The testing of all the materials shall be carried out by the Engineer in charge or his representative for whom the Contractor shall make all the necessary arrangements and bear the entire cost.
33. Tests which cannot be carried out in the field laboratory have to be got done at the Contractor's cost at any recognized laboratory/testing establishments approved by the Engineer in charge.
34. Sampling of Materials
35. Samples provided to the Engineer in charge or his representatives for their retention are to be in labeled boxes suitable for storage.
36. Samples required for approval and testing must be supplied well in advance by at least 48 hours or minimum period required for carrying out relevant tests to allow for testing and approval. Delay to works arising from the late submission of samples will not be acceptable as a reason for delay in the completion of the works.
37. If materials are brought from abroad, the cost of sampling/testing whether in India or abroad shall be borne by the Contractor.

Rejection of Materials not conforming to the Specifications

38. Any stack or batch of material(s) of which sample(s) does not conform to the prescribed tests and quality shall be rejected by the Engineer in charge or his representative and such materials shall be removed from site by the Contractor at his own cost. Such rejected materials shall not be made acceptable by any modifications.
39. Testing and Approval of Plant and Equipment
40. All Plants and equipment used for preparing, testing and production of materials for incorporation into the permanent works shall be in accordance with manufacturer's Specifications and shall be got approved by the Engineer in charge before use.

VI. STRUCTURAL CONCRETE

1. Scope
2. This Specification covers the general requirements for concrete to be used on jobs using on-site production facilities including requirements in regard to the quality, handling, storage of ingredients, proportioning, batching, mixing and testing of concrete and also requirements in regard to the quality, storage, bending and fixing of reinforcement. This also covers the transportation of concrete from the mixer to the place of final deposit and the placing, curing, protecting, repairing and finishing of concrete.
3. Applicable Codes and Specifications
4. The following Specifications, standards and codes are made a part of this Specification. All Standards, Specifications, Codes of Practice referred to herein shall be the latest editions with all applicable official amendments and revisions. In case of discrepancy between this Specification and those referred to herein, this Specification shall govern.
5. Materials

IS:269	Specification for Ordinary, Rapid-Hardening and Low Heat Portland Cement
IS:455	Specification for Portland Blast Furnace Slag Cement

IS:1489	Specification for Portland-Pozzolana Cement.
IS:4031	Methods of Physical Tests for Hydraulic Cement.
IS:650	Specification for Standard Sand for Testing Of Cement.
IS:383	Specification for Coarse and Fine Aggregates from Natural Sources for Concrete.
IS:2386	Methods of Test for Aggregates for Concrete. (Part I To VIII)
IS:516	Method of Test for Strength of Concrete.
IS:1199	Method of Sampling And Analysis Of Concrete.
IS:3025	Method of Sampling And Test (Physical And Chemical) Water Used In Industry.
IS:432	Specification for Mild Steel and Medium Tensile Steel Bars and Hard Drawn Steel Wire For Concrete Reinforcement. (Part I & II)
IS:1139	Specification for Hot Rolled Mild Steel and Medium Tensile Steel Deformed Bar for Concrete Reinforcement.
IS:1566	Specification for Plain Hard Drawn Steel Wire Fabric for Concrete (Part I) Reinforcement.
IS:1785	Specification for Plain Hard Drawn Steel Wire for Prestressed Concrete.
IS:1786	Specification For Cold Twisted Steel Bars For Concrete Reinforcement
IS:2090	Specification for High Tensile Steel Bars Used In Prestressed Concrete.
IS:4990	Specification for Plywood for Concrete Shuttering Work.
IS:2645	Specification for Integral Cement Water-Proofing Compounds.
BS4461	Cold Worked Steel Bars For The Reinforcement Of Concrete
IS:4098	Lime Pozzolana Mixture (1st Revision) (Amendment 2)

6. Equipment

IS:1791	Specification for Batch Type Concrete Mixers.
IS:2438	Specification for Roller Pan Mixer.
IS:2505	Specification for Concrete Vibrators, Immersion Type.
IS:2506	Specification for Screen Board Concrete Vibrators.
IS:2514	Specification for Concrete Vibrating Tables.
IS:3366	Specification for Pan Vibrators.
IS:4656	Specification for Form Vibrators For Concrete.
IS:2722	Specification For Portable Swing Weigh Batchers For Concrete (Single And Double Bucket Type).
IS:2750	Specification for Steel Scaffoldings.
IS:2438	Roller Fan Mixer (Reaffirmed 1990)

7. Codes of Practice

IS:456	Code of Practice for Plain and Reinforced Concrete.
IS:457	Code of Practice for General Construction Of Plain And Reinforced Concrete For Dams And Other Massive Structures.
IS:3370	Code of Practice For Concrete Structures For Storage Of Liquids (Part I to IV)
IS:2502	Code of Practice for Bending and Fixing Vibrators for Consolidating

	Concrete.
IS:3558	Code of Practice for Use of Immersion Vibrators for Consolidating Concrete.
IS:3414	Code of Practice for Design and Installation of Joints In Buildings.
IS:4014	Code of Practice for Steel Tubular Scaffolding. (Part I & II)
IS:2571	Code of Practice for Laying Insitu Cement Concrete Flooring.
IS:2250	Code of Practice For Preparation and Use of Masonry Mortar (1st Revision)
IS:3696	Safety Code for Scaffolds and Ladders. (Part I& II)
IS:3385	Code of Practice for Measurement of Civil Engineer in chargeing Works.

8. General
9. The quality of materials and method and control of manufacture and transportation of all concrete work irrespective of mix, whether reinforced or otherwise, shall conform to the applicable portions of this Specification.
10. Engineer in charge shall have the right to inspect the source(s) of material(s), the layout and operation of procurement and storage of materials, the concrete batching and mixing equipment, and the quality control system. Such an inspection shall be arranged and Engineer in charge's approval obtained, prior to starting of concrete work.
11. Materials
12. All materials shall conform to the requirements laid in to the requirements of the relevant IS standard specifications and subjected to the approval of Engineer in charge
13. Steel Reinforcement
14. Laps

    Laps and splices for reinforcement shall be as shown on the Drawings. Splices in adjacent bars shall be staggered and the locations of all splices, except those specified on the Drawings, shall be approved by Engineer in charge. The bars shall not be lapped unless the length required exceeds the maximum available length of bars at site.
15. Bending
    a) Reinforcing bars supplied bent or in coils, shall be straightened before they are cut to size. Straightening of bars shall be done in cold and without damaging the bars. This is considered as a part of reinforcement bending fabrication work.
    b) All bars shall be accurately bent according to the sizes and shapes shown on the detailed working Drawings They shall be bent gradually by machine or other approved means. Reinforcing bars shall not be straightened and re bent in a manner that will injure the material and bars containing cracks or splits shall be rejected. They shall be bent cold, except bars of over 25 mm in diameter which may be bent hot if specifically approved by Engineer in charge. Bars which depend for their strength on cold working shall not be bent hot. Bars bent hot shall not be heated beyond cherry red colour (nor exceeding 845^{o}C) and after bending, shall be allowed to cool slowly without quenching. Bars incorrectly bent shall be used only if the means used for straightening and rebending is such as shall not, in the opinion of Engineer in charge, injure the material. No reinforcement shall be bent when in position in the work without approval, whether or not it is partially embedded in hardened concrete. Bars having kinks or bends other than those required by design shall not be used.
16. Fixing

Reinforcement shall be accurately fixed by any approved means and maintained in the correct position shown in the Drawings by the use of blocks, spacers and chairs as per IS:2502 to prevent displacement during placing and compaction of concrete. Bars intended to be in contact at crossing points shall be securely bound together at all such points with number 16 gauge annealed soft iron wire. The vertical distances required between successive layers of bar in beams or similar members shall be maintained by the provision of mild steel spacer bars at such intervals that the main bars do not perceptibly sag between spacer bars.

17. Welding of Bars

When permitted or specified on the Drawings, joints of reinforcement bars shall be butt welded so as to transmit their full strength. Welded joints shall preferably be located at points where the reinforcement steel will not be subject to more than 75% of the maximum permissible stresses and the welded joints should be staggered such that, at any one section, not more than 33% of bars are welded. Only electric arc welding using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work will be accepted. Suitable means shall be provided for holding the bars securely in position during welding. It must be ensured that no voids are left in welding and when welding is done two or three stages, the previous surfaces shall be cleaned properly. Ends of bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work. The MS electrodes used for welding shall conform to IS: 814. Welded pieces of reinforcement shall be tested. Specimens shall be taken from the actual site and their number and frequency of test shall be as directed by the Engineer in charge.

18. Cover

Unless indicated otherwise on the Drawings, clear concrete cover for reinforcement (exclusive of plaster or other decorative finish) shall be as follows

I. At each end of reinforcing bar, not less than 25 mm or less than twice the diameter of the bar.

II. For a longitudinal reinforcing bar in a column, not less than 40 mm, nor less than the diameter of the bar. In case of columns of minimum dimension of 20 cm. or under, with reinforcing bars of 12 mm and less in diameter, a cover of 25 mm may be used.

III. For longitudinal reinforcing bars in a beam, not less than 25 mm nor less than the diameter of the bar.

IV. For tensile, compressive, shear, or other reinforcement in a slab or wall, not less than 13 mm, nor less than the diameter of such reinforcement.

V. For any other reinforcement, not less than 13 mm, nor less than the diameter of such reinforcement.

VI. For footings and other principal structural members in which the concrete is deposited directly against the ground, cover to the bottom reinforcement shall be 75 mm. If concrete is poured on a layer of lean concrete the bottom cover may be reduced to 50 mm.

VII. For concrete surfaces exposed to the weather or the ground after removal of forms, such as retaining walls, grade beams, footing sides and top, etc., not less than 50 mm for bars larger than 16 mm diameter and not less than 40 mm for bars 16 mm diameter or smaller.

VIII. Increased cover thickness shall be provided, as indicated on the Drawings, for surfaces exposed to the action of harmful chemicals (or exposed to earth contaminated by such chemical), acid, alkali, saline atmosphere, sulphurous smoke,

etc.

IX. For reinforced concrete members, totally or periodically immersed in sea water or subject to sea water spray, the cover of concrete shall be 50 mm more than those specified in (1) to (5) above.

X. For liquid retaining structures, the minimum cover to all steel shall be 40 mm or the diameter of the main bar, whichever is greater. In the presence of sea water and soils and waters of a corrosive character the cover shall be increased by 10 mm.

XI. Protection to reinforcement in case of concrete exposed to harmful surroundings may also be given by providing a dense impermeable concrete with approved protective coatings, as specified on the Drawings. In such a case the extra cover mentioned in (8) and (9) above, may be reduced by Engineer in charge to those shown on the Drawings.

XII. The correct cover shall be maintained by cement mortar cubes or other approved means. Reinforcement for footings, grade beams and slabs on subgrade shall be supported on precast concrete blocks as approved by Engineer in charge. The use of pebbles or stones shall not be permitted.

XIII. The 28 day crushing strength of cement mortar cubes / precast concrete cover blocks shall be at least equal to the specified strength of concrete in which these cubes / blocks are embedded.

XIV. The minimum clear distance between reinforcing / bars shall be in accordance with IS: 456 or as shown in Drawings.

19. Inspection
Erected and secured reinforcement shall be inspected and approved by Engineer in charge prior to placement of concrete.

20. Controlled Concrete: All concrete in the works shall be "Controlled Concrete" as defined in IS: 456, unless it is a nominal mix concrete such as 1:3:6, 1:4:8 whether reinforced or otherwise, all controlled concrete works to be carried out under this Specification shall be divided into the following classification:

21. Minimum compressive strength of 15 cm. Cubes at 7 and 28 days after mixing, conducted in accordance with IS: 516

Class	Preliminary test N/mm^2		Work test N/mm^2		Max. size of	Location for Use
	At 7 days	At 28 days	At 7 days	At 28 days		
M40	32.85	49.03	26.48	39.27	20	As shown in schedule of quantity
M35	29.42	43.15	23.04	34.32	20	
M30	24.52	37.26	19.61	29.42	20	
M25	21.57	31.38	16.67	24.51	20	
M20	17.16	25.50	13.24	19.61	20	
M15	13.23	19.61	9.80	14.71	40 or 20	

22. Note: It shall be very clearly understood that whenever the class of concrete such as M200 is specified it shall be Contractor's responsibility to ensure that minimum crushing strength stipulated for the respective class of concrete is obtained at works. The maximum total quantity of aggregate by weight per 50 Kg. of cement shall not exceed 450 Kg., except when otherwise specifically permitted by Engineer in charge.
23. Mix Design
24. This is to investigate the grading of aggregates, water cement ratio, workability and the quantity of cement required to give preliminary and works cubes of the minimum strength specified. The proportions of the mix shall be determined by weight. Adjustment of aggregate proportions due to moisture present in the aggregate shall be made. Mix proportioning shall be based on the principles given in IS: 456-2000 and SP: 23-1982 "Handbook for Design Mix Concrete."
25. Whenever there is a change either in required strength of concrete, or water-cement ratio or workability or the source of aggregates and / or cement, preliminary tests shall be repeated to determine the revised proportions of the mix to suit the altered conditions. While designing mix proportions, over-wet mixes shall always be avoided.
26. While fixing the value for water / cement ratio for preliminary mixes, assistance may be derived from the (Table 5 IS: 456-2000) showing the relationship between the 28-day compressive strengths of concrete mixes with different water /cement ratios and the 7 day compressive strength of cement tested in accordance with IS:269.
27. Preliminary Tests
28. Tests specimens shall be prepared with minimum of two different types of water / cement ratios for each class of concrete, consistent with required workability for the nature of the work. The materials and proportions used in making preliminary tests shall be similar in all respects to those, to be actually employed in the works. The objective of these tests is to determine the proportions of cement, aggregates and water necessary to produce concrete of required consistency and specified compressive strength. It will be Contractor's sole responsibility to carry out statement of proportions proposed to be used for the various concrete mixes. For preliminary tests, the following procedure shall be followed.
29. Materials shall be brought to the room temperature and it shall be in a dry condition. The quantities of water, cement and aggregates for each batch shall be determined by weight to an accuracy of 1 part in 1000 parts.
30. Concrete Mixing
31. For all works, concrete shall be mixed in a mechanical mixer. Mixing shall be continued till materials are uniformly distributed and shows a uniform colour. Each individual particle of the coarse aggregate shows a complete coating of mortar containing its proportionate amount of cement. In no case, the mixing is done for a period of not less than two minutes after all ingredients have been put into the mixer. In no case hand mixing, shall be permitted.
32. Consistency
33. The consistency of each batch of concrete shall be measured immediately after mixing, by the slump test, care should be taken to ensure that no water or other material is lost; the material used for the slump test may be remixed with the remainder of the concrete for making the specimen test cubes. The period of re-mixing shall be as short as possible yet sufficient to produce a homogeneous mass.
34. Size of Test Cubes
35. Compression tests of concrete cubes shall be made as per IS: 516 on 15 cm cubes. Each mould shall be provided with a metal base plate having no leakage. The base plate shall be preferably attached to the mould when assembled and shall be positively and rigidly held

together. Before placing concrete, the mould and base plate shall be cleaned and oiled. The dimensions and internal faces of the mould shall be accurate within the following limits:

36. Height and distance between the opposite faces of the mould shall be of specified size + 0.2 mm. The angle between the adjacent internal faces and between internal faces and top and bottom planes of mould shall be 90o + 0.5o.
37. The interior faces of the mould shall be plane surfaces with a permissible variation of 0.03 mm.
38. Compacting
39. Concrete tests cubes shall be moulded by placing fresh concrete in the mould and compacted as specified in IS: 516.
40. Curing
41. Curing shall be as specified in IS: 516. The cubes shall be kept in moist air of at least 90% relative humidity at a temperature of 27oC + 2oC for 2 hours + 1/2 hr. from the time of adding water to the dry ingredients. Thereafter in clean, fresh water and kept at 27o + 2oC temperature until seven days. A record of maximum and minimum temperatures at the places of storage of the cubes shall be maintained during the period they remain in storage.
42. Testing of Specimens
43. The strength shall be determined based on not less than five cube test specimens for 7days and 28 days for every sample of water cement ratio. All these laboratory test results shall be tabulated and furnished to Engineer in charge. The test results shall be accepted by Engineer in charge if the average compressive strengths of the specimens tested are not less than the compressive strength specified for the age at which specimens are tested, subject to the condition that only one out of the five consecutive tests may give a value less than the specified strength for that age. Engineer in charge may direct Contractor to repeat the tests if the results are not satisfactory and also to make such changes as he considers necessary to meet the requirements specified. All these preliminary tests shall be conducted by Contractor at his own cost in an approved laboratory.
44. Proportioning, Consistency, Batching and Mixing of Concrete
45. Proportioning Aggregate
46. The proportions which shall be decided by conducting preliminary tests shall be by weight. These proportions of cement, fine and coarse aggregates shall be maintained during subsequent concrete batching by means of weigh batchers conforming to IS: 2722 capable of controlling the weights within one percent of the desired value. Except where it can be shown to the satisfaction of Engineer in charge that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate shall be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions. The different sizes shall be stocked in separate stock piles. The grading of coarse and fine aggregate shall be checked as frequently as possible, as determined by Engineer in charge, to ensure maintaining of grading in accordance with the sample used in preliminary mix design. The material shall be stock piled well in advance.
47. Cement
48. The cement shall be measured by weight.
49. Water
50. Only the required quantity of water as calculated by W/C ratio shall be added to the cement and aggregates in the concrete mix to ensure dense concrete, specified surface finish, satisfactory workability, consistent with the strength stipulated for each class of concrete. There shall not be segregation of material or the collection of excessive free water on the surface of the concrete.
51. Water / Cement Ratio

52. The water cement (W/C) ratio is defined as the weight of water in the mix (including the surface moisture of the aggregates) divided by the weight of cement in the mix. The actual water cement ratio to be adopted shall be determined in each instance by Contractor and approved by Engineer in charge.
53. Proportioning by Water / Cement Ratio
54. The W/C ratio specified for use by Engineer in charge shall be maintained. Contractor shall determine the water content of the aggregates as frequently as directed by Engineer in charge In-Charge as the work progresses and as specified in IS : 2386 (part III) and the amount of water added at the mixer shall be adjusted as directed by Engineer in charge so as to maintain the specified by W/C ratio. To allow for the variation in weight of aggregates due to variation in their moisture content, suitable adjustments in the weights of aggregates shall also be made.
55. Consistency and Slump
56. Concrete shall be of required consistency and workability, suitable for the condition of the job. After determining the quantity of water required, the consistency of the mix shall be maintained throughout the progress of the concreting of the particular design mix. Compacting factor tests, in accordance with IS: 1199 shall be conducted from time to time to ensure the maintenance of such consistency.
57. The following table gives a range of slumps which shall generally be used for various types of construction unless otherwise instructed by the Engineer in charge. (the range of the slump values to be considered for various constructions should be in line with the slump values as mentioned in IS 456.)

Types of Construction	Slump in mm	
	Maximum	Minimum
Reinforced foundation walls and footings	75	25
Plain footings, caissons and substructure walls	75	25
T.G. and massive compressor foundations	50	25
Slabs, Beams and reinforced walls	100	25
Pumps & miscellaneous Equipment	75	25
Building columns	100	25
Pavements	50	25
Heavy mass construction	50	25

58. Batching and mixing of concrete
59. Concrete shall be produced only by weigh batching the ingredients. The mixer and weigh batchers shall be maintained in clean, serviceable condition. The accuracy of weigh batchers shall be periodically checked. They shall be set up level on a firm base and the hopper shall be loaded evenly. The needle shall be adjusted to zero when the hopper is empty. Fine and

coarse aggregates shall be weighed separately. Volume batching will not be permitted. However, Engineer in charge In- Charge may permit volume batching by subsequent conversion of the weights of important pours involving concrete of not more than 0.25 cubic metres, on days when other pours involving weigh batching are not likely to be taken up. Concrete shall be of strength stipulated in the respective items. All concrete shall be mixed in mechanically operated batch mixers complying with IS: 1791 and of approved make with suitable provision for correctly controlling the water delivered to the drum.

60. The quantity of water actually entering the drum shall be checked with the reading of the gauge or valve setting, when starting a job. The test should be made while the mixer is running. The volume of the mixed material shall not exceed the manufacturer's rated mixer capacity. The batch shall be charged into the mixer so that some water will enter the drum in advance of cement and aggregates. All water shall be in the drum by the end of the first 15 seconds of the specified mixing time. Each batch shall be mixed until the concrete is uniform in colour, for a minimum period of two minutes after all the materials and water are in the drum. The entire contents of the drum shall be discharged in one operation before the raw materials for the succeeding batches are fed into the drum.
61. Each time the work stops, the mixer shall be cleaned out and when next commencing the mixing, the first batch shall have 10% additional cement to allow for sticking in the drum.
62. Sampling and testing concrete in the field
63. Sampling for strength of concrete

    At least 6 test cubes of each class of concrete shall be taken for every 100 cum. concrete or part thereof. Such samples shall be drawn on each day for each type of concrete. Of each set of 6 cubes, three shall be tested at 7 days age and three at 28 days age. The laboratory test results shall be tabulated and furnished to Engineer in charge. Engineer in charge will pass the concrete if average strength of the specimens tested is not less than the strength specified, subject to the condition that only one out of three consecutive tests may give a value less than the specified strength but this shall not be less than 90% of the specified strength.
64. Consistency
65. Slump tests shall be carried out as often as demanded by Engineer in charge and invariably from the same batch of concrete from which the test cubes are made. Slump tests shall be done immediately after sampling.
66. Water proofing agent
67. Where specified and approved by Engineer in charge, water proofing agent confirming to IS: 2645, shall be added in quantities specified by Engineer in charge.
68. Optional Tests
69. Engineer in charge, if he so desires, may order tests to be carried out on cement, sand, coarse aggregate, water in accordance with the relevant Indian Standards.
70. Tests on cement shall include:
    a) Fineness test
    b) Test for normal consistency
    c) Test for setting time
    d) Test for soundness
    e) Test for tensile strength
    f) Test for compressive strength
    g) Test for heat of hydration (by experiment and by calculations) in accordance with IS: 269.
71. Tests on Sand
    a) Sieve test

b) Test for organic impurities
c) Decantation test for determining clay and silt content
d) Specific gravity test
e) Test for unit weight and bulkage factor
f) Test for sieve analysis and fineness modulus.

72. Tests on coarse aggregate
a) Sieve analysis
b) Specific gravity and unit weight of dry, loose and ridded aggregate
c) Soundness and alkali aggregate reactivity
d) Petrographic examination
e) Deleterious materials and organic impurities
f) Test for aggregate crushing value.

73. Any or all these tests would normally be ordered to be carried out only if Engineer in charge In- Charge feels the materials are not in accordance with the Specifications or if the specified concrete strengths are not obtained and shall be performed by Contractor at an approved test laboratory. Contractor shall pay for all the tests which are felt necessary by the Engineer in Charge as deployed by PMC for ensuring the quality control art site irrespective of the result of the tests.

74. If the works cubes do not give the stipulated strengths, Engineer in charge reserves the right to ask Contractor to dismantle such portions of the work, which in his opinion are unacceptable and re-do the work to the standard stipulated, at Contractor's cost. The unit rate for concrete shall be all inclusive, including making preliminary mix design and test cubes, works, cubes, testing them as per Specification, slump tests, optional tests, etc. complete.

75. Unsatisfactory Tests:
Should the results of any test prove unsatisfactory, or the structure shows signs of weakness, undue deflection or faulty construction Contractor shall remove and rebuild the member or members involved or carry out such other remedial measures as may be required by Engineer in charge. No extra payment will be made to the contractor for any rectification job. The cost of load and other tests shall be borne by Contractor if the tests show unsatisfactory results.

76. Preparation prior to concrete placement, final inspection and approval

77. Before the concrete is actually placed in position, the insides of the formwork shall be inspected to see that they have been cleaned and oiled. Temporary openings shall be provided to facilitate inspection, especially at bottom of columns and wall forms, to permit removal of saw dust, wood shavings, binding wire, rubbish, dirt etc. Openings shall be placed or holes drilled so that these materials and water can be removed easily. Such openings / holes shall be later suitably plugged.

78. All embedded parts, inserts etc. supplied by Contractor shall be correctly positioned and securely held in the forms to prevent displacement during depositing and vibrating of concrete.

79. All anchor bolts shall be positioned and kept in place with the help of properly manufactured templates unless specifically waived in writing by Engineer in charge. The use of all such templates, fixtures etc. shall be deemed to be included in the rates. Slots, openings, holes, pockets etc. shall be provided in the concrete work in the positions indicated in the Drawings or as directed by Engineer in charge.

80. Reinforcement and other items to be cast in concrete shall have clean surfaces that will not impair bond.
81. Prior to concrete placement all work shall be inspected and approved by Engineer in charge and if found unsatisfactory, concrete shall not be poured until after all defects have been corrected at Contractor's cost.
82. Approval by Engineer in charge of any and all materials and work as required herein shall not relieve Contractor from his obligation to produce finished concrete in accordance with the Drawings and Specifications.
83. Rain or Wash Water
84. No concrete shall be placed in wet weather or on a water covered surface. Any concrete that has been washed by heavy rains shall be entirely removed, if there is any sign of cement and sand having been washed away from the concrete mixture. To guard against damage which may be caused by rains, the works shall be covered with tarpaulins immediately after the concrete has been placed and compacted before leaving the work unattended. Any water accumulating on the surface of the newly placed concrete shall be removed by approved means and no further concrete shall be placed thereon until such water is removed. To avoid flow of water over / around freshly placed concrete, suitable drains & sumps shall be provided.
85. Bonding mortar
86. Immediately before concrete placement begins, prepared surfaces except formwork, which will come in contact with the concrete to be placed, shall be covered with a bonding mortar.
87. Transportation
88. All buckets, containers or conveyers used for transporting concrete shall be mortar-tight. Irrespective of the method of transportation adopted, concrete shall be delivered with the required consistency and plasticity without segregation or loss of slump. However, chutes shall not be used for transport of concrete without the written permission of Engineer in charge.
89. Retempered or contaminated concrete
90. Concrete must be placed in its final position before it becomes too stiff to work. The water shall not be added after initial mixing. Concrete which has become stiff or has been contaminated with foreign materials shall be rejected and disposed off as directed by Engineer in charge.
91. Cleaning of equipment
92. All equipment used for mixing, transporting and placing of concrete shall be maintained in clean condition. All pans, buckets, hoppers, chutes, pipelines and other equipment shall be thoroughly cleaned after each period of placement.
93. Procedure for Placing of Concrete
94. Engineer in charge's approval of equipment &methods
95. Before any concrete is placed, the entire placing programme, consisting of equipment, layout, proposed procedures and methods shall be submitted to Engineer in charge for approval if so demanded by Engineer in charge and no concrete shall be placed until Engineer in charge's approval has been received. Equipment for conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete during depositing, without segregation of materials, considering the size of the job and placement location.
96. Time interval between mixing and placing
97. Concrete shall be placed in its final position before the cement reaches its initial set and concrete shall normally be compacted in its final position within thirty minutes of preparation of concrete mix.

98. Avoiding segregation
99. Concrete shall, in all cases, be deposited as nearly as practicable directly in its final position, and shall not be re handled or caused to flow in a manner which will cause segregation, loss of materials, displacement of reinforcement, shuttering or embedded inserts or impair its strength. For locations where direct placement is not possible, and in narrow forms, Contractor shall provide suitable drop and "Elephant Trunks" to confine the movement of concrete.
100. Special care shall be taken when concrete is dropped from a height, especially if reinforcement is in the way, particularly in columns and thin walls.
101. Placing by manual labour
102. Except when otherwise approved by Engineer in charge, concrete shall be placed in the shuttering by shovels or other approved implements and shall not be dropped from a height more than 1.0 M or handled in a manner which will cause segregation.
103. Placing by mechanical equipment
104. The following Specification shall apply when placing of concrete by use of mechanical equipment.
105. Types of Bucket
106. Central-bottom-dump buckets of a type that provides for positive regulation of the amount and rate of deposition of concrete in all dumping position shall be employed.
107. Operation of Bucket
108. Placing concrete in large open areas, the bucket shall be spotted directly over the position designated and then lowering for dumping. The open bucket shall clear the concrete already in place and the height of drop shall not exceed 1.00 M. The bucket shall be opened slowly to avoid high vertical bounce. Dumping of buckets on the swing or in any manner which results in separation of ingredients or disturbance of previously placed concrete will not be permitted.
109. Chute
110. Where it is necessary to use transfer chutes, specific, approval of Engineer in charge must be obtained to type, length, slopes, baffles, vertical terminals and timing of operations. These shall be so arranged that an almost continuous flow of concrete is obtained at the discharge and without segregation. To allow for the loss of mortar against the sides of the chutes, the first mixes shall have less coarse aggregate. During cleaning of chutes, the waste water shall be kept clear of the forms. Concrete shall not be permitted to fall from the end of the chutes by more than 1.0 M. Chutes, when approved for use, shall have slopes not flatter than 1 vertical: 3 horizontal and not steeper than 1 vertical 2 horizontal. Chutes shall be of metal or metal lined and of rounded cross section. The slopes of all chute sections shall be approximately the same. The discharge end of the chutes shall be maintained above the surface of the concrete in the forms.
111. Concrete in layers
112. Concrete, once started, shall be continuous until the pour is completed. Concrete shall be placed in successive horizontal layers of uniform thickness ranging from 15 to 90 cm or as directed by Engineer in charge. These shall be placed as rapidly as practicable to prevent the formation of cold joints or planes of weakness between each succeeding layer within the pour. The thickness of each layer shall be such that it can be deposited before the previous layer has stiffened. The bucket loads or other units of deposit shall be spotted progressively along the face of the layer with such overlap as will facilitate spreading the layer to uniform depth and texture with a minimum of shoveling. Any tendency to segregation shall be corrected by shoveling stones. Such a condition shall be corrected by redesign of mix or other means, as directed by Engineer in charge.

113. Bedding of layers
114. The top surface of each pour and Bedding planes shall be approximately horizontal unless otherwise instructed.
115. Compaction
116. Concrete shall be compacted during placing, with approved vibrating equipment until the concrete has been consolidated to the maximum practicable density, is free of pockets of coarse aggregate fits tightly against all form surfaces, reinforcement and embedded fixtures. Particular care shall be taken to ensure that all concrete placed against the form faces and into corners of forms or against hardened concrete at joints is free from voids or cavities. The use of vibrators shall be consistent with the concrete mix and precautions shall be taken not to over vibrate the concrete results in segregation of concrete.
117. Type of Vibrators
118. Vibrators shall conform to IS Specifications. Type of vibrator to be used shall depend on the structure where concrete is to be placed. Shutter vibrators to be effective, shall be firmly secured to the formwork which must be sufficiently rigid to transmit the vibration and strong enough to take the shock.
119. Immersion vibrators in sufficient numbers and each of adequate size shall be used to properly consolidate all concrete. Tapping or external vibrating of forms by hand tools or immersion vibrators will not be permitted.
120. Use of Vibrators
121. The exact manner of application and the most suitable machines for the purpose must be carefully considered and operated by experienced men. Immersion vibrators shall be inserted vertically at points not more than 450 mm apart and withdrawn when air bubbles cease to come to the surface. Immersion vibrators shall be withdrawn very slowly. In no case shall immersion vibrators be used to transport concrete inside the forms. Particular attention shall be paid to vibration at the top of lift e.g. in a column or wall.
122. Melding Successive Batches
123. When placing concrete in layers, which are advancing horizontally as the work progresses, great care shall be exercised to ensure adequate vibration, blending and melding of the concrete between the succeeding layers.
124. Penetration of Vibrator
125. The immersion vibrator shall penetrate the layer being placed and also penetrate the layer below while the under layer is still plastic to ensure good bond and homogeneity between the two layers and prevent the formation of cold joints.
126. Vibrating Against Reinforcement
127. Care shall be taken to prevent contact of immersion vibrators against reinforcement steel. Immersion vibrators shall not be allowed to come in contact with reinforcement steel after start of initial set. They shall also not be allowed to come in contact with forms or finished surfaces.
128. Use of Form Attached Vibrators
129. Form attached vibrators shall be used only with specific authorization of Engineer in charge.
130. Placement interval
131. Except when placing with slip forms, each placement of concrete in multiple lift work shall be allowed to set for atleast 24 hours after the final set of concrete and before the start of a subsequent placement.
132. Special provision in placing

133. When placing concrete in walls with openings, in floors of integral slabs and beam construction and other similar conditions, the placing shall stop when the concrete reaches the top of the opening in walls or bottom horizontal surface of the slab, as the case may be Placing shall be resumed before the concrete in place takes initial set, but not until it has had time to settle as determined be Engineer in charge In- Charge
134. Bleeding
135. Bleeding of the concrete shall not take place while placing the concrete. The bleeding of concrete is the result of excess vibration and hence care shall be taken in giving vibration to the concrete.
136. Curing, Protecting, Repairing and Finishing
137. Curing
138. All concrete shall be cured by keeping it continuously damp for the period of time required for complete hydration and hardening of concrete. Preference shall be given to the use of continuous spraying of water, continuously saturated covering of sacking, canvas, Hessians or other absorbent materials, or approved effective curing compounds applied with spraying equipment capable of producing a smooth, even- textured coat. Extra precautions shall be exercised in curing concrete during cold and hot weather as outlined hereinafter. The quality of curing water shall be the same as the one used for mixing concrete.
139. Certain types of finish or preparation for overlaying concrete must be done at certain stages of the curing process and special treatment may be required for specific concrete surface finish.
140. Curing of concrete made of high alumina cement and super sulphate cement shall be carried out as directed by Engineer in charge.
141. Curing with water
142. Fresh concrete shall be kept continuously wet for a minimum period of 10 days from the date of placing of concrete, following a lapse of 12 to 14 hours after lying concrete. The curing of horizontal surfaces exposed to the drying winds shall however begin immediately after the concrete has hardened. Water shall be applied to unformed concrete surfaces within 1 hour after concrete has set. Water shall be applied to formed surfaces immediately upon removal of forms. Quantity of water applied shall be controlled so as to prevent erosion of freshly placed concrete.
143. Continuous Spraying
    Curing shall be assured by use of an ample water supply under pressure in pipes, with all necessary appliances of hose, sprinklers and spraying devices. Continuous fine mist spraying or sprinkling shall be used, unless otherwise specified or approved by Engineer in charge.
144. For curing of concrete in pavements, side-walks, floors, flat roofs or other level surfaces, the ponding method of curing is preferred. The method of containing the ponded water shall be approved by Engineer in charge. Special attention shall be given to edges and corners of the slabs to ensure proper protection to these areas. The ponded areas shall be kept continuously filled with water during the curing period.
145. Curing Compounds
    Surface coating type curing compounds shall be used only by special permission of Engineer in charge. Curing compounds shall be liquid type white pigmented, conforming to U.S. Bureau of Reclamation Specification. No curing compound shall be used on surfaces where future blending with concrete, water or acid proof membrane, or painting is specified.
146. Protection
147. All concrete shall be protected against damage until final acceptance by Engineer in charge.
148. Formwork

149. The formwork shall consist of shores, bracings, sides of beams and columns, bottom of slabs including ties, anchors, hangers, inserts and shall be properly designed and planned for the work. False work shall be so constructed that vertical adjustments can be made to compensate for take up and settlements. Wedges may be used at the top or bottom of timber shores, but not at both ends, to facilitate vertical adjustment or dismantling of the formwork.
150. Design of formwork
151. The design and Engineer in charge of the formwork as well as its construction shall be the responsibility of Contractor. If so instructed, the Drawings and / or calculations for the design of the formwork shall be submitted to Engineer in charge In- Charge for approval before proceeding with work, at no extra cost to Employer. Engineer in charge's approval shall not however relieve Contractor of the full responsibility for the design and construction of the formwork. The design shall take into account all the loads vertical as well as lateral, that the forms will be carrying including live and vibration loadings.
152. Camber
153. Suitable camber shall be provided in horizontal members of structure, especially in cantilever spans to counteract the effect of deflection. The formwork shall be so assembled as to provide for camber. The camber for beams and slabs shall be 4 mm per metre (1 to 25) or as directed by the Engineer in charge, so as to offset the subsequent deflection. For cantilevers the camber at free end shall be 1/50th of the projected length or as directed by the Engineer in charge.
154. Tolerances
155. Tolerance is specified as permissible variation from lines, grade or dimensions given in Drawings. No tolerances specified for horizontal or vertical lines or footings shall be construed to permit encroachment beyond the legal boundaries. Unless otherwise specified, the following tolerances will be permitted.
156. Tolerances in fixing anchor bolts shall be as follows:
    a) Anchor bolts without sleeves :± 1.5 mm in plan
    b) Anchor bolts with sleeves : ± 5.0 mm in elevation
    - For bolts upto & including 28 mm diameter: ± 5 mm in all directions.
    - For bolts 32 mm diameter and above: ± 3 mm in all direction.

    c) Embedded parts: ± 5 mm in all direction.

157. Type of Formwork
158. Formwork may be of timber, plywood, metal,. For special finishes the formwork may be lined with plywood, steel sheets, oil tempered hard board, etc. Sliding forms and slip forms may be used with the approval of Engineer in charge.
159. Formwork Requirements
160. Forms shall conform to the shapes, lines, grades and dimensions including camber of the concrete as per the Drawings. The studs, braces, ties, straps, shores, etc. shall be used to hold the forms in proper position without any distortion whatsoever until the concrete has set sufficiently to permit removal of the form. In special cases where form vibrators are to be used, the shuttering shall be close boarded. Timber shall be well seasoned, free from sap, shakes, loose knots, worm holes, warps or other surface defects in contact with concrete. Faces coming in contact with the concrete shall be free from adhering grout, plaster, paint, projecting nails, splits or other defects. Joints shall be sufficiently tight to prevent loss of water and fine material from concrete.
161. Plywood shall be used for Exposed Concrete surfaces; Sawn and wrought timber may be used for unexposed surfaces. Inside faces of forms for concrete surfaces which are to be

rubbed finished shall be planned to remove irregularities or unevenness in the face. Formwork with linings will be permitted.

162. Bracing, struts and props

163. Shuttering shall be braced, strutted, propped and so supported that it shall not deform under weight and pressure of the concrete and also due to the movement of men and other materials. Bamboo shall not be used as props or cross bearers. The shuttering for beams and slabs shall be so erected that the shuttering on the sides of the beams and under the soffit of slabs can be removed without disturbing the beam bottoms. Re propping of beams shall not be done except when props have to be reinstated to take care of construction loads anticipated to be in excess of the design load. Vertical props shall be supported on wedges or other measures shall be take whereby the props can be gently lowered vertically while striking the shuttering.

164. If the shuttering for a column is erected for the full height of the column, one side shall be left open and built up in sections as placing of concrete proceeds, or windows may be left for pouring concrete from the sides to limit the drop of concrete to 1.0 M or as directed by Engineer in charge.

165. Mould oil

166. Care shall be taken to see that the faces of form-work coming in contact with concrete are perfectly cleaned and two coats of mould oil or any other approved materials applied before fixing reinforcement and placing concrete. Such coating shall be insoluble in water, non-staining and not injurious to the concrete. It shall not become flaky or be removed by rain or wash water. Reinforcement and / or other items to be cast in the concrete shall not be placed until coating of the forms is complete. Adjoining concrete surfaces shall also be protected against contamination from the coating materials.

167. Removal of forms

168. Contractor shall record on the Drawing or on a special register the date upon which the concrete is placed in each part of the work and the date on which the shuttering is removed there from.

169. In no circumstances shall forms be struck until the concrete reaches strength of at least twice the stress due to self weight and any construction / erection loading to which the concrete may be subjected at time of striking formwork.

170. Informal circumstances (generally where temperatures are above 20°C) forms may be struck after expiry of the following periods:

Item	Ordinary Portland cement concrete	Rapid hardening Portland cement concrete
Walls, and vertical sides of beams	24 to 48 hours or as directed by the Engineer in charge	24 hours
Slabs (props left under).	3 days	2 days
Beam soffit (Props left under)	7 days	4 days

171. Reinforced temporary openings shall be provided, as directed by Engineer in charge, to facilitate removal of formwork which otherwise may be inaccessible.

172. Tie rods, clamps, form bolts, etc. which must be entirely removed from walls or similar structures shall be loosened neither sooner than 24 hours nor later than 40 hours after the concrete has been deposed. Ties, except those required to hold forms in place, may be removed at the same time. Ties, withdrawn from walls and grade beams shall be pulled toward the inside face. Cutting ties back from the faces of walls and grade beams will not be permitted.
173. For liquid retaining structures no sleeves for through bolts shall be used nor shall through bolts be removed The bolts, in this case, shall be cut at 25 mm depth from the surface and then the hole shall be made good by sand cement mortar of the same proportions as the concrete just after striking the formwork.
174. Foundation Bedding, Bonding and Jointing
175. All surfaces upon or against which concrete will be placed shall be suitably prepared by thoroughly cleaning, washing and dewatering, as may be indicated in the plans or as Engineer in charge, may direct, to meet the various situations encountered in the work.
176. Soft or spongy areas shall be cleaned out and back filled with either a soil-cement mixture, lean concrete or clean sand fill compacted to a minimum density of 90% Modified Proctor, unless otherwise mentioned in Schedule of Quantities.
177. Prior to construction of formwork for any item where soil will act as bottom form, approval shall be obtained from Engineer in charge as to the suitability of the soil.
178. Preparation of rock strata of foundations
179. To provide tight bond with rock foundations, the rock surface shall be prepared and the following general requirements shall be observed.
180. Concrete shall not be deposited on large sloping rock surfaces. Where required by Engineer in charge or as indicated on the plans, the rock shall be cut to form rough steps or benches to provide roughness or a more suitable bearing surface.
181. Rock foundation stratum shall be prepared by picking, barring, wedging and similar methods which will leave the rock in an entirely sound and unshattered condition.
182. Shortly before concrete is placed, the rock surface shall be cleaned with high pressure water and air jet even though it may have been previously cleaned in that manner.
183. Prior to placing concrete, the rock surface shall be kept wet for a period of 2 to 4 hours unless otherwise directed by Engineer in charge.
184. Before placing concrete on work surfaces all water shall be removed from depressions to permit thorough inspection and proper bonding of the concrete to the rock.
185. Preparation of earth strata of foundations
186. All earth surfaces upon which or against which concrete is to be placed, shall be well compacted and free from standing water, mud or debris. Soft, yielding solid shall be removed and replaced with suitable earth well compacted as directed by Engineer in charge. Where ever specified, lean concrete shall be provided on the earth stratum for receiving concrete. The surface of absorptive soils in which concrete are to be placed shall be moistened thoroughly so that no moisture will be drawn from the freshly placed concrete and later shall help to cure the concrete.
187. Preparation of concrete surfaces
188. The preparation of concrete surfaces upon which additional concrete is to be placed later, shall preferably be done by scarifying and cleaning while the concrete is between its initial and final set. This method shall be used wherever practicable and shall consist of cutting the surface with picks and stiff brooms and by use of an approved combination of air and water jet as directed by Engineer in charge. Great care shall be taken in performing this work to avoid removal of too much mortar and the weakening of the surface by loosening of aggregate.

189. When it is not practicable to follow the above method, it will be necessary to employ air tools to remove laitance and roughen the surface.
190. The final required result shall be a pitted surface from which all dirt, unsound concrete, laitance and glazed mortar have been removed.

VII. COFFER DAMS AND READY MIX CONCRETE

1. Coffer Dam
2. General
3. The specifications cover the construction of coffer dam on the river bank for the constructions of Intake arrangements.
4. The Foundations/ Structures constructed through shallow bodies of water by means of cofferdams. These are essentially walls of clay confined between wooden frames, the walls being sufficiently impervious to water so that all water and mud within the walled space may be pumped out easily and the work shall be Executed up to the desired depth. It is seldom expected that a cofferdam constructed shall be impervious to water that no pumping will be required to keep it clear; but when a cofferdam can be kept clear with a moderate amount of pumping, the advantages are so great that its use becomes advisable.
5. To keep cofferdam dry if there is a firm soil, preferably of clay, up to a moderate depth (say 5 feet to 12 feet), into which sheet piling may be driven. The sheet piles are driven as closely together as possible. The bottom of each pile (when made of wood) is beveled so as to form a wedge which tends to force it against the pile previously driven In this way a fairly tight joint between adjacent piles is obtained. Larger piles made of squared timber are first driven to act as guide-piles. These are connected by waling strips which are bolted to the guide-piles and which serve as guides for the sheet piling the space between the two rows of sheet piling is filled with puddle, which ordinarily consists chiefly of clay.
6. The puddlingmaterial used shall also contain some part of gravel, which will enable less danger that a serious leak will form and enlarge. Numerous cross-braces or tie-rods must be used to prevent the walls of sheet piling from spreading when the puddle is being packed between them. The width of the puddle wall is usually made to vary between three feet and ten feet, depending upon the depth of the water.
7. The sheet piling shall be fixed to the firm footing in the subsoil, and the cofferdam shall be made watertight; but the soil shall be kept very porous so that the water soaks up from under the lower edge of the cofferdam, or when, on the other hand, the cofferdam is to be placed on a bare ledge of rock, or when the rock has only a thin layer of soil over it, it becomes exceedingly difficult to obtain a water-tight joint at the bottom of the dam.
8. Excessive leakage is sometimes shall be reduced by providing a layer of canvas or tarpaulin which is placed around the outside of the base of the cofferdam, and which is held in place by stones laid on top of it. Brush, straw, and similar fibrous materials are used in connection with earth for stopping the cracks on the outside of the dam, and are usually effective, provided they are not washed away by a swift current.
9. Ready Mix Concrete
10. The contractor are permitted to use the ready mix concrete (RMC) for the construction work with the prior permission from the Engineer in charge
11. The Contractor shall submit the QAP and work plan for the approval prior to14 days of commence of concerting work and Contractor shall proceed with the use of RMC only after getting the approval for the QAP & Work plan
12. All the specifications shall be as specified as elsewhere mentioned in the document or as said by Engineer-in-charge pertaining to materials, Design mix, Quality tests, Placing of Concrete

13. Ready-Mix Concrete
14. Concrete mixed in a stationary mixer in a central batching and mixing plant or in a truck-mixer and supplied in the fresh condition to the purchaser either at the site or into the purchaser's vehicles.
15. Truck-Mixer - A mixer generally mounted on a self-propelled chassis, capable of mixing the ingredients of concrete and of agitating the mixed concrete during transportation.
16. Materials
17. Materials used should satisfy the requirements for the safety, structural performance, durability and appearance of the incised structure, taking fill account of the environment to which it will be subjected. The selection and use of materials shall be in accordance with IS 456. Materials used shall conform to the relevant Indian Standards applicable. Where materials are used which are not covered by the provisions of the relevant Indian Standard, there should be satisfactory data on their suitability and assurance of quality control. Records and details of performance of such materials should be maintained. Account should be taken of possible interactions and compatibility between materials used. Also, prior permission of the purchaser shall be obtained before use of such materials.
18. Cement-Cement used for concrete shall be in accordance with the requirements of IS 456.
19. Mineral Admixtures -Use of mineral admixtures shall be permitted in accordance with the provisions of IS: 456.
20. Aggregates - Aggregates used for concrete shall be in accordance with the requirements of IS 456. Unless otherwise agreed testing frequencies for aggregates shall be as given in Annex B of IS 4926-2003.
21. Chemical Admixtures
22. Use of chemical admixtures shall be permitted in accordance with the provisions of IS 456.
23. It shall be the responsibility of the producer to establish compatibility and suitability of any admixture with the other ingredients of the mix and to determine the dosage required to give the desired effect.
24. Admixtures should be stored in a manner that prevents degradation of the product and consumed within the time period indicated by the admixture supplier. Any vessel containing an admixture in the plant or taken to site by the producer shall be clearly marked as to its content.
25. When offering or delivering a mix to a purchaser it should be indicated if such a mix contains an admixture or combination of admixtures or not. The admixtures may be identified generically and should be declared on the delivery ticket.
26. The amount of admixture added to a mix shall be recorded in the production record. In special circumstances, if necessary, additional dose of admixture may be added at project site to regain the workability of concrete with the mutual agreement between the producer and the purchaser.
27. Water
28. Water used shall be in accordance with the requirements of IS 456. Unless otherwise agreed, the testing frequencies for water shall be as given in Annex B of IS 4926-2003.
29. The use of re-cycled water is encouraged as long as concrete of satisfactory performance can be produced and steps are taken to monitor the buildup of chlorides in any re circulated water and that any subsequent adjustments to the mix design are made to ensure that any overall limit on chloride contents is satisfied. The addition of any recycled water shall be monitored and controlled to meet these requirements.
30. The total amount of water added to the mix shall be recorded in the production record. The water content of concrete shall be regulated by controlling its workability or by measuring and adjusting the moisture contents of its constituent materials. The producer's production

staff and truck-mixer drivers shall be made aware of the appropriate responses to variations in concrete consistence of a particular mix caused by normal variations in aggregate moisture content or grading

31. GENERAL REQUIREMENTS
32. Basis of Supply
33. Ready-mixed concrete shall be supplied having the quality and in the quantity in accordance with the requirements agreed with the purchaser or his agent. Notwithstanding this, the concrete supplied shall generally comply with the requirements of IS:456.
34. All concrete will be supplied and invoiced in terms of cubic metres (full or part) of compacted fresh concrete. All proportioning is to be carried out by mass except water and admixture, by volume which may be measured.
35. Transport of Concrete
36. General
37. Ready-mixed concrete shall be transported from the mixer to the point of placing as rapidly as practicable by methods that will maintain the required workability and will prevent segregation, loss of any constituents or ingress of foreign matter or water. The concrete shall be placed as soon as possible after delivery, as close as is practicable to its final position to avoid re handling or moving the concrete horizontally by vibration. If required by the purchaser the producer can utilize admixtures to slow down the rate of workability loss, however this does not remove the need for the purchaser to place the concrete as rapidly as possible. The purchaser should plan his arrangements so as to enable a full load of concrete to be discharged within 30 min of arrival on site.
38. Concrete shall be transported in a truck-mixer unless the purchaser agrees to the use of non-agitating vehicles. When non-agitating vehicles are used, the mixed concrete shall be protected from gain or loss of water.
39. Time in Transport
40. The general requirement is that concrete shall be discharged from the truck-mixer within 2 h of the time Gf loading. However, a longer period may be permitted if retarding admixtures are used or in cool humid weather or when chilled concrete is produced.
41. The time of loading shall start from adding the mixing water to the dry mix of cement and aggregate or of adding the cement to the wet aggregate whichever is applicable.
42. Ready-mixed concrete plant shall have test facilities at its premises to carry out routine tests as per the requirement of the standard.
43. SAMPLING AND TESTING OF READY MIX CONCRETE
44. Point and Time of Sampling For the assessment of compliance of ready-mixed concrete, the point and time of sampling shall be at discharge from the producer's delivery vehicle or from the mixer to the site or when delivered into the Purchaser's vehicle. It is critical that the sampling procedure and equipment used enables as representative a sample as possible to be taken of the quantity of concrete delivered.
45. The sampling may be carried out jointly by the purchaser and the supplier with its frequency mutually agreed upon. However, it will not absolve the supplier of his responsibility from supplying concrete as per the requirements given in this standard or otherwise agreed to where so permitted in the standard.
46. Workability
47. The test for acceptance is to be performed upon the producer's delivery vehicle discharge on site or upon discharge into the purchaser's vehicle. If discharge from the producers' vehicle is delayed on site due to lack of preparedness on behalf of the purchaser then the responsibility passes to the purchaser after a delay of more than 30 min. The workability shall be within the following limits on the specified value as appropriate:

48. Slump: ±25 mm or ±1/3 of the specified value, whichever is less.
Compacting factor: ± 0.03, where the specified value is 0.90 or greater,
±0.04, where the specified value is less than 0.90 but more than 0.80, and
±0.05, where the specified value is 0.80 or less
49. Flow table test may be specified for concrete, for very high workability (see IS 9103). Acceptance criteria for spread (flow) are to be established between the supplier and the purchaser.
50. Specified Strength
51. Compliance shall be assessed against the requirements of IS 456 or other agreed Indian Standard. The purchaser may perform his own sampling and testing or may enter in to an arrangement with the producer to provide his testing requirements
52. Unless otherwise agreed between the parties involved, the minimum testing frequency to be applied by the producer in the absence of a recognized ready mixed concrete industry method of production control, should be one sample for every 50m^3 of production or every 50 batches, whichever is the greater frequency. Three test specimens shall be made up for each sample for testing at 28 days (see also IS 456).
53. In order to get a relatively quicker idea of the quality of concrete, optional test on beams for modulus of rupture at 72 + 2 h or at 7 days or compressive strength test at 7 days may be carried out in addition to 28 days compressive strength test. For this purpose the value should be arrived at based on actual testing. In all cases 28 days compressive strength shall alone be the criteria for acceptance or rejection of the concrete.
54. The purchaser shall inform the producer if his requirements for sampling and testing are higher than one sample every 50 m^3 or 50 batches, whichever is the greater frequency.
55. Additional Compliance Criteria
56. Any additional compliance criteria shall be declared to the producer by the purchaser prior to supply and shall be mutually agreed upon in terms of definition, tolerance, frequency of assessment, method of test and significance of result.
57. Non-Compliance
58. The action to be taken in case of non-compliance shall be declared and mutually agreed upon.
59. INFORMATION TO BE SUPPLIED BY THE PURCHASER
60. The purchaser shall provide to the producer the details of the concrete mix or mixes required by him and all pertinent information on the use of the concrete and the specified requirements. Prior to supply taking place, it is recommended that a meeting is held between the purchaser and the producer. Its objective to clarify operational matters, such as notice to be given prior to delivery, delivery rate, the name of the purchaser's authorized representative who will coordinate deliveries, any requirements for additional services such as pumping, on site testing or training, etc.
61. Designed Mixes
62. Where the purchaser specifies a designed mix to be supplied it is essential that all relevant information is conveyed to the producer. In order to assist in this, the format given in Annex D may be completed and forwarded to the producer at the time of enquiry.
63. Prescribed Mixes
64. The concrete mix shall be specified by its constituent materials and the properties or quantities of those constituents to produce a concrete with the required performance. The assessment of the mix proportions shall form an essential part of the compliance requirements. The purchaser shall provide the producer with all pertinent information on the use of the concrete and the specified requirements. In order to assist in this, the format

given in Annex D may be followed with suitable modifications as applicable to prescribed mixes.

65. INFORMATION TO BE SUPPLIED BY THE PRODUCER
66. When requested, the producer shall provide the purchaser with the following information before any concrete is supplied:
    a) Nature and source of each constituent material,
    b) Source of supply of cement, and
    c) Proposed proportions or quantity of each constituent/m3 of fresh concrete.
67. When requested, the producer shall provide the purchaser the following information on admixtures:
68. Generic type(s) of the main active constituent(s) in the admixture;
69. Whether or not the admixture contains chlorides and if so, the chloride content of the admixture expressed as a percentage of chloride ion by mass of admixture;
70. Whether or not the admixture leads to the entrainment of air when used at the adopted dosage;
71. Where more than one admixture is used, confirmation of their compatibility; and Initial and final setting time of concrete when admixture is used at adopted dosage (tested as per IS: 8142).
72. PRODUCTION AND DELIVERY
73. Plant and Equipment
74. Material storage and handling
75. Cement
76. Separate storage for different types and grades of cement shall be provided. Containers may be used to store cements of different types provided these are emptied before loading anew cement. Bins or silos shall be weatherproof and permit free flow and efficient discharge of the cement. Each silos or compartment of silos shall be completely separate and fitted with a filter or alternative method of dust control. Each filter or dust control system shall be of sufficient size to allow delivery of cement to be maintained at a specified pressure, and shall be properly maintained to prevent undue emission of cement dust and prevent interference with weighing accuracy by buildup of pressure.
77. Cement shall be stored and stacked in bags and shall be kept free from the possibility of any dampness or moisture coming in contact with them and where cement can be stored and retrieved without undue damage to the bags. The bags are to be protected from becoming damp either from the ground or the weather.
78. The cement is to be used in the order it is delivered (see also IS 4082).
79. In case, the cement remains in storage for more than 3 months, the cement shall be retested before use and shall be rejected if it fails to conform to any of the requirements given in the relevant Indian Standard.
80. Dry pulverized fuel ash and other mineral admixtures
81. Suitable separate arrangement for storage of pulverized fuel ash, silica fume, metakeolin, rice husk ash, ground granulated blast furnace slag such as for cement, shall be provided, in the plants utilizing these materials.
82. Aggregates (coarse and fine)
83. Stockpiles shall be free draining and arranged to avoid contamination and to prevent intermingling with adjacent material. Handling procedures for loading and unloading aggregates shall be such as to reduce segregation to a minimum. Provision shall be made for separate storage for each nominal size and type of aggregate and the method of loading of storage bins shall be such as to prevent intermingling of different sizes and types. Fine

aggregates shall be stacked in a place where loss due to the effect of wind is minimum (see also IS 4082 and IS 456).

84. Water
85. An adequate supply shall be provided and when stored on the plant such storage facilities shall be designed to minimize the risks of contamination.
86. Chemical admixtures
87. Tanks or drums containing liquid admixtures shall be clearly Labeled for identification purposes and stored in such a way to avoid damage, contamination or the effects of prolonged exposure to sunlight (if applicable). Agitation shall be provided for liquid admixtures, which are not stable solutions.
88. Batching Plants and Batching Equipment
89. Hoppers for weighing cement, mineral admixtures, aggregates and water and chemical admixture (if measured by mass) shall consist of suitable containers freely suspended from a scale or other suitable load measuring device and equipped with a suitable discharging mechanism. The method of control of the loading mechanism shall be such that, as the quantity required in the weighing hopper is approached, the material may be added at a controllable rate and shut off precisely within the weighing tolerances specified in Annex E of IS 4926-2003. The weighing hoppers for cement, mineral admixtures aggregate shall be capable of receiving their rated load, without the weighed material coming into contact with the loading mechanism. Where the rated capacity of a batching plant mixing cycle is less than 2.0 Cum, additional precautions shall be taken to ensure that the correct number of batches are loaded into the ruck mixer. The weighing hoppers shall be constructed so as to discharge efficiently and prevent the buildup of materials. A tare adjustment, up to 10 percent of the nominal capacity of the weigh scale, shall be provided on the weighing mechanism so that the scale can be adjusted to zero at least once each day. Dust seals shall be provided on cement hoppers between the loading mechanism and the weigh hopper, and shall be fitted so as to prevent the emission of cement dust and not to affect weighing accuracy. The hopper shall be vented to permit escape of air without emission of cement dust.
90. Vibrators or other attachments, where fitted, shall not affect the accuracy of weighing. There shall be sufficient protection to cement and aggregate weigh hoppers and weighing mechanisms to prevent interference with weighing accuracy by weather conditions or external build-up of materials.
91. Where chemical admixture dispensers are used, they shall be capable of measurement within the tolerances and a calibrated container or weigh scales shall be provided to check the accuracy of measurement at least once a month.
92. Where a continuous mixer with ribbon loading is used, the batching procedure specified by the manufacturer of the plant shall be followed.
93. Each control on the batching console and weigh-dial or display shall be clearly labeled with its function and where concerned with the batching of materials, the material type.
94. When more than one type or grade of cement is being used, the weighing device and discharge screw or other parts of the transfer system shall be empty before changing from one type of cement to another.
95. When pulverized fuel ash and other mineral admixtures are batched through the cement weigh system, the weighing device and discharge screw or other parts of the transfer system shall be empty when the weighing system has returned to zero reading or completed the batch.
96. Where a back weigh system is utilized to weigh materials a system shall be in place so as to prevent materials being loaded during the process of weighing.

97. Measurement of Materials
98. Cement and mineral admixture materials shall be measured by mass in a hopper or compartment separate from those used for other materials and on a scale of appropriate sensitivity, measurement being taken from a zero reading. Aggregates shall be measured by mass, allowance being made for the free moisture content of the aggregates. The added water shall be measured by volume or by mass. Any liquid chemical admixture (or paste) shall be measured by volume or by mass and any solid admixture by mass. When weighing materials, any build up in the hopper during the day must be tared out or allowed for in the batch weights. After measurement all materials shall be discharged into the mixer without loss.
99. The accuracy of the measuring equipment shall be within * 2 percent of the quantity of cement and mineral admixtures being measured and within + 3 percent of the quantity of aggregate, chemical admixture and water being measured. The plant operator shall be provided with a clear display of the quantities of materials to be batched for each mix and batch size and with information indenting the display to be selected for each designed and prescribed mix to be produced.
100. Analogue scale displays for the weighing of cement, mineral admixtures, aggregates and water shall be readily hedge from the operating position. For digital readouts the numerals shall be readily discernible from the operating position. Fully automatic production systems shall be fitted with control equipment to allow the correct operation of the plant to be monitored during weighing and batching. Automatic control systems on batching plants shall not commence batching until all hoppers have been emptied and/or tarred and the scales zeroed unless such systems are designed to take account of build up in their programming.
101. Each control on the batching console and weigh-dial or display shall be clearly labelled with its function and where concerned with the batching of materials, the material type. When more than one type or grade of cement is being used, the weighing device and discharge screw or other parts of the transfer system shall be empty before changing from one type of cement to another.
102. When pulverized fuel ash and other mineral admixtures are batched through the cement weigh system, the weighing device and discharge screw or other parts of the transfer system shall be empty when the weighing system has returned to zero reading or completed the batch.
103. Where a back weigh system is utilized to weigh materials a system shall be in place so as to prevent materials being loaded during the process of weighing.
104. All scales shall be tested and calibrated as per Annex E of IS 4926-2003.
105. Mixing
106. Washing out water
107. Before loading concrete materials or mixed concrete into either a stationary mixer or truck mixer any water retained in the mixing drum for washing out purposes shall be completely discharged.
108. Stationary - or central mixers
109. Stationary mixers shall not be loaded in excess of the manufacturer's rated capacity. The mixing time shall be measured from the time all the materials required for the batch, including water, are in the drum of the mixer. The mixing time shall not be less than that recommended by the manufacturer. Where a continuous mixing plant is used the complete mixing time shall be sufficient to ensure that the concrete is of the required uniformity.
110. Truck Mixers

111. When a truck mixer is used for the partial or complete routine maintenance recommended by manufacturers for specific items of equipment The name and/or mixing of concrete, mixing shall be considered to commence from the moment when all the materials position of the person responsible for ensuring that the maintenance schedules are carried out shall be included required for the batch, including water, are in the on each checklist and a provision made for their rotating drum of the mixer. Signature
112. Truck mixers or agitators shall not be loaded in excess revolutions, mixing shall continue for not less than 60 revolutions of the truck mixer drum at a rate of not less than 7 revolutions/min all completely truck mixed concrete shall be visually inspected for uniformity prior to leaving the plant
113. When a truck mixer or agitator is used for transporting concrete which has been mixed before leaving the plant, the concrete shall be agitated during transit and re-mixed at the site for at least 2 min so that the concrete is of the required uniformity.
114. Where water is added to the concrete in the truck mixer through the truck mixer water meter and when such water is being accounted for in the total water within the mix, it shall be ensured that the truck mixer water meter is in operational condition and properly calibrated. Where a water meter is not available, water must be measured in a suitable container before being added to the truck mixer.
115. Condition of mixers
116. Stationary and truck mixers shall be maintained in an efficient and clean condition with no appreciable build
117. Up of hardened concrete or cement in the mixing drum, on the mixing blades, or on the loading hopper or
118. Discharge chutes. When, due to wear the height or depth of the mixing blades or paddles is less than two-thirds of the original, the blade or paddles shall be renewed or replaced.

VIII. RIVER TRAINING WORK AND PROTECTION WORK

1. Scope
2. River training and protection work shall include construction of guide bunds, guide walls, bank protection, flooring and approach embankment protection as required for ensuring safety of the structures and their approaches against damage by flood / flowing water. Construction of various components shall conform to IRC: 89 and these Specifications or as directed by the Engineer in charge.
3. Guide Bund
4. This work shall consist of construction of embankment of guide bund and provision of pitching / revetment of slopes, apron, toe protection, curtain walls etc., As indicated in the Drawings and shall be in accordance with Specifications or as approved by the Engineer in charge.
5. The provisions given hereunder are applicable only to guide bunds for structures across alluvial rivers. Guide bunds for structures across submontane rivers shall call for supplemental Specifications.
6. The alignment and layout of guide bund shall be as indicated on the Drawing or as approved by the Engineer in charge. The construction of embankment for guide bund shall conform to provisions of Standard Specifications. Pitching, filter underneath pitching and Turffing, apron, toe protection, curtain walls, etc., shall be as per these Specifications.
7. Guide bunds shall generally be made of locally available materials from the river bed preferably cohesion less materials. Trial pits shall be taken in borrow holes to examine suitability of soil for construction and also to decide the types of earth moving machinery to

be arranged. The borrow pits should be sufficiently away from the location of the launching apron. No borrow pits should be dug on the river side of the guide bunds.

8. Construction of guide bund shall be taken along with the construction of the bridge every effort shall be made to complete the work of the guide bund in one working season. If not possible to complete in one working season, suitable measures shall be planned and executed for protection of completed work. In such cases the construction of guide bund shall be started from abutment towards upstream.
9. Construction of apron and pitching of the guide bunds shall generally conform to Specifications elsewhere mentioned in the document or as said by Engineer-in-charge. Sufficient length of pit along the guide bund shall be ready within one to two months of commencement of work so that the placing of stones in the apron and in the slope pitching can be commenced. As a guideline, earthwork should be completed within 80 percent of working season and about 70 per cent working season shall be available for laying apron and pitching. No portion of the guide bund should be left below HFL before the onset of monsoon. Bottom of apron pit shall be as low as permitted by sub-soil water/lowest water level. Sufficient labour and appropriate earth moving machinery and trained staff shall be deployed in construction.
10. The Contractor shall furnish his planning for approval of the Engineer in charge regarding transport of stones from the quarries to the site of work taking into account the quantities of stone required to be transported every day, train/truck, etc., deployed, available ferry or boats and labour available for loading and unloading and for laying within the time frame for construction of guide bund. Adequate reserve of stones should be maintained for major works as decided by the Engineer in charge. Reserve stones shall be stacked far away from the main channel of the river.
11. Where the alignment of guide bund or the approach embankment crosses a branch channel of the river, the branch channel may be either diverted to the main channel of the river with the help of spurs, etc. Or to be closed by properly designed closing dyke or closure bund before taking up construction of guide bund.
12. Apron
13. General
14. This work shall consist of laying boulders directly or in wire crates on the bed of rivers for protection against scour.
15. Where the required size of boulders is not available economically, cement concrete blocks of equivalent weight shall be used. The grade of concrete shall be M20 nominal mix. (This holds good for pitching on slopes and flooring also). Cement concrete blocks shall be preferred where practicable.
16. The stones used in apron shall be sound, hard, durable and fairly regular in shape. Stone subject to marked deterioration by water or weather shall not be used.
17. Quarry stones are preferable to round boulders as the latter roll off easily. Angular stones fit into each other better and have good interlocking characteristics.
18. Where the required size stones are not economically available, cement concrete blocks in M20 grade conforming to elsewhere mentioned in the document or stones in wire crates in combination may be used in place of isolated stones of equivalent weight. Cement concrete blocks will be preferred, wherever practicable.
19. Laying Boulder Apron
20. The size of stone should conform to IRC: 89.
21. The size of stone shall be as large as possible. In no case any fragment shall weigh less than 40 kg. The specific gravity of stones shall be as high as possible and it shall not be less than 2.65.

22. To ensure regular and orderly disposition of the full intended quantity of stone in a the apron, template cross walls in dry masonry shall be built about a metre thick and to the full height of the specified thickness of the apron at intervals of 30 m all along the length and width of the apron. Within these walls, the stone then shall be hand packed.
23. The surface on which the apron is to be laid shall be leveled and prepared for the length and width as shown on the Drawings. In case the surface on which apron is to be laid is below the low water level, the ground level may be raised upto low water level by dumping earth and the apron laid thereon. The quantity of stone required in the apron shall be re-worked out by taking the toe of pitching at higher level.
24. Laying Wire Creates and Mattresses in the Apron
25. Wire crates shall be made from hot dipped galvanized mild steel wire of diameter not less than 4 mm in annealed condition having tensile strength of 300-450 MPa conforming to IS: 280. The galvanizing coating shall be heavy coating for soft condition conforming to IS: 4826.
26. The mesh of the crate shall not be more than 150 mm.
27. Wire crates for shallow or accessible situations shall be 3M X 1.5M X 1.25M in size. Where these have to be deposited and there is a chance of overturning, the crate shall be divided into 1.5 meter compartments by cross netting.
28. For deep or inaccessible situations, wire crates can be made smaller subject to the approval of the Engineer in charge.
29. Wire crates built in-situ, shall not be larger than 7.5 meters X 3 meters x 0.6 m, or smaller than 2 m x 1 m x 0.3 m. Sides of large crates shall be securely stayed at intervals of not more than 1.50 meters to prevent bulging.
30. The netting shall be made by fixing a row of spikes on a beam at spacing equal to the mesh. The beam must be a little longer than the width of netting required. The wire is to be cut to lengths about three times the length of the net required. Each piece shall be bent at the middle around one of the spikes and the weaving commenced from one corner.
31. A double twist shall be given at each intersection. This twisting shall be carefully done by means of a strong iron bar, five and half turns being given to the bar at each splice.
32. The bottom and two ends of the crate or mattress shall be made at one time. The other two sides shall be made separately and shall be secured to the bottom and the ends by twisting adjacent wires together. The top shall be made separately and shall be fixed in the same manner as the sides after the creates or mattress have been filled.
33. Wherever possible, crates shall be placed in position before filling with boulders. The creates shall be filled by carefully hand-packing the boulders as tightly as possible and not by merely throwing in stones or boulders.
34. For laying of wire crates in aprons of bridges, two situations arise:
    a) Where the crates are to be laid in deep water and have to be dumped and then joined together.
    b) Where depth of water is low or dry bed is available. In such cases, the crates can be laid at site.
35. Pitching / Revetment on Slopes
36. Description
37. This work shall consist of covering the slopes of guide bunds, training works and road embankments with stone, boulders, cement concrete blocks or stones in wire crates over a layer or granular material called filter. While river side slopes are given this protection against river action, the rear slopes, not subjected to direct attack of the river, may be protected against ordinary wave splashing by 0.3-0.6 m thick cover of clayey or silty earth and turfed.

38. Pitching
39. Pitching: The pitching shall be provided as indicated in the Drawings. The thickness and the shape of stone pitching shall be shown on the Drawing.
40. The stone shall be sound, hard, durable and fairly regular in shape. Quarry stone should be used. Round boulders shall not be allowed. The stones subject to marked deterioration by water or weather shall not be accepted.
41. The size and weight of stone shall conform to IRC: 89. No stone, weighing less than 40 kg shall, however, be used. The sizes of spalls shall be a minimum of 25 mm and shall be suitable to fill the voids in the pitching.
42. Where the required size stones are not economically available cement concrete blocks in M15 grade conforming to specifications elsewhere mentioned in the document or stones in wire crates may be used in place of isolated stones of equivalent weight. Cement concrete blocks will be preferred wherever practicable.
43. Filter media
44. The material for the filter shall consist of sand, gravel, stone or coarse sand. To prevent escape of the embankment material through the voids the stone pitching / cement concrete blocks as well as to allow free movement of water without creating any uplift head on the pitching, one or more layers of graded materials, commonly known as a filter medium, shall be provided underneath the pitching.

45. The gradation of the filter material shall satisfy the following requirements:
    Provision of a suitably designed filter is necessary under the slope pitching to prevent the escape of underlying embankment material through the voids of stone pitching/cement concrete blocks when subjected to the attack of flowing water and wave action, etc. In order to achieve this requirement, the filter may be provided in one or more layers satisfying the following criteria:
    - Ratio of D 15 (Filter) to D 85 (Base) shall be less than 5;
    - Ratio of D 15 (Filter) to D 15 (Base) shall be within the limits of 4 and 20; and
    - Ratio of D 50 (Filter) to D 50 (Base) shall be less than 25;

    Notes:

    a) Filter design may not be required if embankment consists of CH or Ch soils with liquid limit greater than 30, resistant to surface erosion. In this case, if a layer of material is used as bedding for pitching, it shall be well graded and its D 85 size shall be at least twice the maximum void size in pitching.

    b) In the foregoing, D 15 means the size of that sieve which allows 15 per cent by weight of the filter material to pass through it and similar is the meaning of D 50 and D 85.

    c) If more than one filter layer is required, the same requirement as above shall be followed for each layer. The finer filter shall be considered as abase material for selection of coarser filter.

    d) *The filter shall be compacted to a firm condition. The thickness of filter is generally of the order of 200 mm to 300 mm. Where filter is provided in two layers, thickness of each layer shall be 150 mm.*
46. Construction Operations
47. Before laying the pitching, the sides of banks shall be trimmed to the required slope and profiles put up by means of line and pegs at intervals of 3 meters to ensure regular straight work and a uniform slope throughout. Depressions shall be filled and thoroughly compacted.

48. The filter granular material shall be laid over the prepared base and suitably compacted to the thickness specified on the Drawings.
49. The lowest course of pitching shall be started from the toe wall and built up in courses upwards. The toe wall shall be in dry rubble masonry (uncoursed) in case of dry rubble pitching and shall be in nominal mix cement concrete (M 20) conforming to specifications mentioned elsewhere in the document or said by Engineer in charge in case of cement concrete block pitching.
50. The stone pitching shall commence in a trench below the tow of the slope. Stone shall be placed by derrick or by hand to the required length, thickness and depth conforming to the Drawings. Stones shall be set normal to the slope, and placed so that the largest dimension is perpendicular to the face of the slope, unless such dimension is greater than the specified thickness of pitching.
51. The largest stones shall be placed in the bottom courses and for use as headers for subsequent courses.
52. In hand placed pitching, the stone of flat stratified nature should be placed with the principal bedding plane normal to the slope. The pattern of laying shall be such that the joints are broken and voids are minimum by packing with spalls, wherever necessary, and the top surface is as smooth as possible.
53. When full depth of pitching can be formed with a single stone, the stones shall be laid breaking joints and all interstices between adjacent stones shall be filled in with spalls of the proper size and wedged in with hammers to ensure tight packing.
54. When two or more layers of stones must be laid to obtain the design thickness of pitching, dry masonry shall be used and stones shall be well bonded. To ensure regular and orderly disposition of the full intended quantity of stone as shown, template cross walls in dry masonry shall be built about a metre wide and to the full height of the specified thickness at suitable intervals and all along the length and width of the pitching. Within these walls the stones shall be hand packed as specified.
55. Toe Protection
56. This shall be in conformity with IRC:89, a toe wall shall be provided at the junction of slope pitching and launching apron of a guide bund so as to protect the slope pitching from falling even when the apron is not laid at low water level. The toe wall shall be in dry rubble masonry (uncoursed) in case of dry rubble pitching or pitching/revetment with stones in wire crates and in nominal mix cement concrete (M 15) conforming to specifications mentioned elsewhere in the document or said by Engineer in charge in case cement concrete blocks have been used in pitching. For protection of toes of bank slopes terminating either in short aprons at bed levels or anchored in flooring / rocky bed, the provisions of IRC: 89 may be complied with. The relevant Specifications of the protective works for individual components will be followed.
57. Rubble Stone/Cement Concrete Block Flooring Over Cement Concrete Bedding
58. This work shall consist of constructing rubble stone / C.C. block flooring laid over Cement concrete (M 15) bedding. The floor protection will comprise rigid flooring stated above with curtain walls and flexible apron.
59. Construction Operations
60. Excavations for laying the bedding and floor protection works shall be carried out as per Specifications under proper supervision. Before laying the foundation and protection walls, the excavated trenches shall be thoroughly inspected by the Engineer in charge to ensure that:
    a) There are no loose pockets and unfilled depressions left in the trench.
    b) The soil at the founding level is properly compacted to true lines and level so as to have

even bedding.

c) All concrete and other elements are laid in dry bed.

61. Cement concrete nominal mix (grade M15) of 300 mm thickness shall then be laid in accordance with provisions given in specifications mentioned elsewhere in the document or said by Engineer in charge except that the surface of the concrete shall not be given a smooth finish. The paving work shall be embedded in green concrete.
62. Flooring shall consist of 150 mm thick flat stone/cement concrete blocks (Nominal mix Grade M 15 conforming to specifications mentioned elsewhere in the document or said by Engineer in charge. It shall be bedded on layer of cement mortar (1:3) Spalls shall be used to fill in the voids. The joints shall then be filled with cement mortar and finished neat. The stone shall break joints and the joints shall not exceed 20 mm in thickness. Spacing of joints may be 20 m or so. The top of flooring shall be kept to 300 mm below the lowest bed level.
63. Dry Rubble Flooring
64. This work shall consist of constructing dry rubble flooring at cross drainage works for relatively less important works.
65. The base for the flooring shall be prepared to the specified levels and slopes and compacted suitable with hand rammers or other means to have even bedding.
66. The thickness of flooring shall be made with one stone only. The stones shall then be laid closely on the prepared base in one or more layers as specified and the bond used shall be as specified by the Engineer in charge.
67. Curtain Wall and Flexible Apron
68. Curtain Wall
69. The rigid flooring shall be enclosed by curtain walls (tied to the wing walls) with a minimum depth below floor level or 2 m on upstream side and 2.5 m on downstream side. The curtain wall will be in cement concrete M 15/stone masonry in cement mortar 1:3 the rigid flooring shall be continued over the top width of curtain wall.
70. Flexible Apron
71. Flexible apron 1 m thick comprising loose stone boulders (weighting not less than 40 kg) shall be provided beyond curtain walls for a minimum distance of 3 m on upstream side and 6 m on downstream side. The work of floor protection shall be simultaneously completed Along with the work on bridge foundations.
72. Tests and Standards of Acceptance
73. The materials shall be tested in accordance with these Specifications and shall meet the prescribed criteria.
74. The work shall conform to these Specifications and shall meet the prescribed standards of acceptance.

I. MATERIALS:

IS:269	Specification for Ordinary, Rapid Hardening and Low Heat Portland Cement
IS:455	Specification for Portland Blast Furnace Slag Cement
IS:1489	Specification for Portland-Pozzolana Cement.
IS:4031	Methods of Physical Tests for Hydraulic Cement.
IS:650	Specification for Standard Sand for Testing Of Cement.
IS:383	Specification for Coarse and Fine Aggregates from Natural Sources for Concrete.
IS:2386	Methods of Test for Aggregates for Concrete. (Part I To VIII)

IS:516	Method of Test for Strength of Concrete.
IS:1199	Method of Sampling And Analysis Of Concrete.
IS:3025	Method of Sampling And Test (Physical And Chemical) Water Used In Industry.
IS:432	Specification for Mild Steel and Medium Tensile Steel Bars and Hard Drawn Steel Wire For Concrete Reinforcement. (Part I & II)
IS:1139	Specification for Hot Rolled Mild Steel and Medium Tensile Steel Deformed Bar for Concrete Reinforcement.
IS:1566	Specification for Plain Hard Drawn Steel Wire Fabric for Concrete (Part I) Reinforcement.
IS:1785	Specification for Plain Hard Drawn Steel Wire for Prestressed Concrete.
IS:1786	Specification For Cold Twisted Steel Bars For Concrete Reinforcement
IS:2090	Specification for High Tensile Steel Bars Used In Prestressed Concrete.
IS:4990	Specification for Plywood for Concrete Shuttering Work.
IS:2645	Specification for Integral Cement Water-Proofing Compounds.
BS4461	Cold Worked Steel Bars For The Reinforcement Of Concrete
IS:4098	Lime Pozzolana Mixture (1st Revision) (Amendment 2)
IS - 1077	Specifications for common burnt clay building bricks
IS - 1200	Measurements for Building works
IS - 1725	Specifications for solid cement blocks used in general building construction
IS - 1905	Code of practice for structural safety of buildings: Masonry walls.
IS - 2116	Sand for masonry mortars
IS - 2180	Specification for heavy duty burnt clay building bricks
IS - 2185	Specification for concrete masonry units: Hollow and solid concrete blocks
IS - 2212	Code of practice for brick work
IS - 2222	Specification for burnt clay perforated building bricks
IS - 2691	Specification for burnt clay facing bricks
IS - 3115	Specification for lime based blocks
IS - 3414	Code of practice for design and installation of joints in buildings
IS - 3466	Specification for masonry cement
IS - 3861	Method of measurement of plinth, carpet and rentable areas of buildings.
IS - 3952	Specification for burnt clay hollow blocks for walls and partitions
IS - 4098	Specification for lime-pozzolana mixture
IS - 4139	Specification for sand lime bricks
IS - 4441	Code of practice for use of silicate type chemical resistant mortars
IS - 4442	Code of practice for use of sulphur type chemical resistant mortars

II. EQUIPMENT

IS:1791	Specification for Batch Type Concrete Mixers.
IS:2438	Specification for Roller Pan Mixer.
IS:2505	Specification for Concrete Vibrators, Immersion Type.

IS:2506	Specification for Screen Board Concrete Vibrators.
IS:2514	Specification for Concrete Vibrating Tables.
IS:3366	Specification for Pan Vibrators.
IS:4656	Specification for Form Vibrators For Concrete.
IS:2722	Specification For Portable Swing Weigh Batchers For Concrete (Single And Double Bucket Type).
IS:2750	Specification for Steel Scaffoldings.
IS:2438	Roller Fan Mixer (Reaffirmed 1990)

III. CODES OF PRACTICE

IS:456	Code of Practice for Plain and Reinforced Concrete.
IS:457	Code of Practice for General Construction Of Plain And Reinforced Concrete For Dams And Other Massive Structures.
IS:3370	Code of Practice For Concrete Structures For Storage Of Liquids (Part I to IV)
IS:2502	Code of Practice for Bending and Fixing Vibrators for Consolidating Concrete.
IS:3558	Code of Practice for Use of Immersion Vibrators for Consolidating Concrete.
IS:3414	Code of Practice for Design and Installation of Joints In Buildings.
IS:4014	Code of Practice for Steel Tubular Scaffolding. (Part I & II)
IS:2571	Code of Practice for Laying Insitu Cement Concrete Flooring.
IS:2250	Code of Practice For Preparation and Use of Masonry Mortar (1st Revision)
IS: 800	General Construction In Steel — Code Of Practice
IS 1893	Criteria For Earthquake Resistant Design Of Structures
IS 13920	Ductile Detailing Of Reinforced Concrete Structures Subjected to Seismic Forces - Code Of Practice

IV. CONSTRUCTION SAFETY

IS:3696	Safety Code for Scaffolds and Ladders. (Part I& II)
IS:3385	Code of Practice for Measurement of Civil Engineer in charging Works. The laying of pipes and fittings / specials shall comply with all currently applicable statutes, regulations, standards and Codes. In particular, the following standards, unless otherwise specified herein, shall be referred. In all cases, the latest revision of the standards / Codes shall be referred to. If requirements of this Specification conflict with the requirements of the standards / Codes, this Specification shall govern. In case of discrepancy between this specification and those referred to herein, this specification shall govern. IS: 2062 Specification for steel for general structural purposes

	IS: 808 Specification for dimensions for hot rolled steel beam, column, channel and angle sections IS: 3613 Acceptance tests for wire flux combination for submerged arc welding IS: 7280 Specification for bare wire electrodes for submerged arc welding of structural steel IS: 1367 Technical supply conditions for threaded steel fasteners IS: 2016 Specification for plain washers IS: 2074 Specification for ready mixed paint air drying, red oxide zinc chrome and priming IS: 102 Ready mixed paint, brushing, red lead, non setting, Priming IS: 814 Specification for high strength deformed steel bars and wires for concrete reinforcement IS: 432 (PART-I) Specification for mild steel & medium tensile steel bars and hard drawn steel wire for concrete reinforcement: Mild steel and medium tensile steel bars IS: 432 (PART-II)Specification for mild steel & medium tensile steel bars and hard drawn steel wire for concrete reinforcement: Hard drawn steel wire IS: 800 Code of practice for general construction in steel IS: 816 Code of practice for use of metal arc welding for general construction in mild steel IS: 4353 Recommendation for submerged arc welding of mild steel & low alloy steels IS: 817 Code of practice for training and testing of metal arc welders IS: 1182 recommended practice for radiographic examination of fusion - welded butt joints in steel plates IS: 2595 Code of practice for radiographic testing IS: 3658 Code of practice for liquid penetrant flaw detection

	IS: 5334 Code of practice for magnetic particle flaw detection of welds IS: 3600 Code of procedure for testing of fusion welded joints and weld metal in steel IS: 4853 recommended practice for radiographic examination of fusion welded circumferential joints in steel pipes IS: 3589 Specification for seamless or electrically welded steel pipes for water gas and sewage (168.3 to 2032 mm outside diameter) IS : 6631 Steel pipes for hydraulic purposes IS: 7343 Code of practice for ultrasonic testing of ferrous welded pipes and tubular products IS: 2598 Safety code for industrial radiographic practice IS: 5822 Code of practice for laying of welded steel pipes for water supply BS EN 499 Welding Consumables. Covered Electrodes for Manual Metal Arc Welding of Non Alloy and Fine Grain Steel. Classification AWS : A-5.1 Specification for Mild Steel Covered Arc Welding Electrodes AWS: A-5.17 Specification for Bare Mild Steel Electrodes and Fluxes for Submerged Arc Welding ASTM E 94 Guide for Radiographic Testing ASTM E 709 Guides for Magnetic Particle Examination. ASTM E 165 Test Method for Liquid Penetrant Examination. IS:5504 & IS:3589 Code for SW PIPES IS: 10748 Requirements for Wieldable Hot Rolled Carbon Steel Strip in Coils. IS 1710 - 1989 Specification for Pumps – Vertical Turbine Mixed and Axial Flow, for clear cold water

	IS 9137 - 1978 Code for acceptance tests for centrifugal, Mixed flow and axial pumps class – C IS 7322 - 1985 Specification for Specials for Steel cylinder reinforced concrete force.

SECTION -III

Project Title:
DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, SUPPLY, CONSTRUCTION AND COMMISSIONING ON LSTK BASIS OF PONTOON TYPE RAW WATER IN-TAKE PLANT AT DULIAJAN, ASSAM, INDIA

SCOPE OF WORK

MECHANICAL ENGINEERING AND PLANT PIPING

MECHANICAL ENGINEERING AND PIPING

A. Introduction:

The Scope of work of Mechanical Engineering and Piping shall consist of design, detailed engineering, procurement/supply of materials, fabrication / manufacturing, Post weld heat treatment (PWHT) / stress relieving, inspection, testing, insulation, fire proofing as applicable, chemical cleaning, surface preparation, purging and painting, supply and erection/installation and commissioning of all the equipment as per equipment list and in accordance with Design basis for successful commissioning and Handing over of the Raw Water Intake Plant.

B. Item Description:

The following minimum items / equipment have been suggested in the FEED by the PMC for the Pontoon Type Raw Water Intake Plant wrt Mechanical Engineering and Piping.

Sl No	Description	Quantity	Details
I.	Pontoons	02 (Two) Nos	Design, Procurement/ Fabrication Supply, installation, testing, inspection and commissioning of Pontoon Pump House (02 Nos.) for pumping of raw water to Water Treatment Plant. Minimum specification for Pontoon: Length- 17.5 m, Width- 10 m with Safety railing. Pontoon lifting lugs. MOC for Hull: IS 3039 MOC for General Construction– MS IS 2062 Grade – Br E250. NB: Welding scheme as approved by in Indian Register of shipping (IRS) is to be followed throughout the pontoon. The weld leg length is not to be less than 5 mm and all butts to be for 100% strength. The plate preparation welding and dimensional accuracies are to be to the satisfaction of the OIL/ EPMC. Suitable carling is to be provided under bollards. Wherever the details are not given in the concept drawings, the builder is to prepare such details and submit the same to the Employers approval. Watertight integrity of each enclosed space is to be checked by pressure testing as per IRS recommendation.
II.	Foot Bridge	02 (Two) Nos	Design, Procurement/ Fabrication Supply, installation, testing and commissioning of foot bridges with suitable hand rails from each of the Pontoons to the River bank. The Foot Bridges should be equipped with material handling system (SWL – 5 T Min) for transfer of Materials from each of the pontoons to the river bank . MOC for General Construction– MS IS 2062 Grade – Br E250.
III.	Swivel Joints	04 (Four) Nos	Design, Procurement, Supply, installation, testing and commissioning of suitably rated Swivel Joints. The Swivel Joints shall have to be installed on each

<table>
<tr><th>Sl No</th><th>Description</th><th>Quantity</th><th>Details</th></tr>
<tr><td></td><td></td><td></td><td>of the discharge pipe lines of the raw water pump sets of each pontoons pump houses. The purpose of the Swivel Joints is to accommodate the variations in the water level in the river during summer and winter. The design of the swivel joints should be so that the same can accommodate the variations of water level in the river wrt the High Flood Level (HFL) and low water level.

The basic data wrt the water level in the river are as follows:
<table>
<tr><th>Sl. No.</th><th>Particulars</th><th>Details</th></tr>
<tr><td>1.</td><td>High Flood Level (HFL)</td><td>122.69 m</td></tr>
<tr><td>2.</td><td>Ground level at proposed Pontoons</td><td>119.9 m</td></tr>
<tr><td>3.</td><td>Low water level in River</td><td>107.0 m</td></tr>
<tr><td>4.</td><td>Discharge level</td><td>120.5 m</td></tr>
</table></td></tr>
<tr><td>IV.</td><td>EMD Centrifugal Raw water pumpset</td><td>04 (Four) Nos [02 nos each on each pontoons, 01 working and 01 standby on each pontoons]</td><td>Design, Procurement, Supply, installation, testing and commissioning of EMD Horizontal split casing Centrifugal Raw water pumpset.
Type: Centrifugal, Horizontal split casing
Discharge: 295.58 LPS
Head: 56.0 M
Power: 250 KW
NB: The Pump sets should be complete with suitable Vacuum Priming System.</td></tr>
<tr><td>V.</td><td>Diesel Engine Driven (DED) Raw water pump set</td><td>02 (Two) Nos</td><td>Design, Procurement, Supply, installation, testing and commissioning of DED Raw water pump sets.
Type: Centrifugal, Horizontal split casing
Discharge: 147.79 LPS
Head: 56.0 M
NB: The Pump sets should be complete with suitable Priming System.</td></tr>
<tr><td>VI.</td><td>Strainers (EMD Raw Water Pump Sets)</td><td>04 (Four) Nos</td><td>Design, Procurement, Supply, installation of Strainers at the Suction of each of the EMD Raw Water Pumps.
Type: Self-Cleaning Basket Strainer
Mesh Size: 8-10 mm</td></tr>
<tr><td>VII.</td><td>Strainers (DMD Raw Water Pump Sets)</td><td>02 (Two) Nos</td><td>Design, Procurement, Supply, installation of Strainers at the Suction of each of the DED Raw Water Pumps.
Type: Self-Cleaning Basket Strainer
Mesh Size: 8-10 mm</td></tr>
<tr><td>VIII.</td><td>EMD Back wash Pumps</td><td>02 (Two) Nos</td><td>Design, Procurement, Supply, installation, testing</td></tr>
</table>

Sl No	Description	Quantity	Details
			and commissioning of EMD Centrifugal Back wash Pump sets. Type: Centrifugal Discharge: To be finalized during detailed engineering Head: To be finalized during detailed engineering Power: 112 KW
IX.	HOT Crane	03 (Three) Nos	Design, Procurement, Supply, installation, testing and commissioning of HOT Cranes. ➢ 01 no each on each pontoons to facilitate dismantling, lifting and transportation of pump/ motor from Pontoon to river bank. ➢ 01 No on the DG Set house for critical plant machinery . Type: Single Girder SWL: 10 / 2 MT Standard: Class of Duty / Standards: As per IS 3177 / IS 807 or the relevant IS Code. Certification: As per Code
X.	Foot Valves (EMD Raw Water Pump Sets)	04 (Four) Nos	Design, Procurement, Supply, installation, testing and commissioning of Foot Valves along with matching companion flanges and bolts, nuts & requisites gaskets. Type: Swing type, Two Disc (Semi Circular) Class: PN0.2 MoC: CI IS210 Gr FG200 Standard: IS:4038
XI.	Suction Valves (EMD Raw Water Pump Sets)	04 (Four) Nos	Design, Procurement, Supply, installation, testing and commissioning of Suction Valves along with matching companion flanges and bolts, nuts & requisites gaskets. Type: Rising Stem Gate Class: 150 MoC: Cast Carbon Steel Standard: API 600 (Generally conforming to)
XII.	Foot Valves (DED Raw Water Pump Sets)	02 (Two) Nos	Design, Procurement, Supply, installation, testing and commissioning of Foot Valves along with matching companion flanges and bolts, nuts & requisites gaskets. Type: Swing type, Two Disc (Semi Circular) Class: PN0.2 MoC: CI IS210 Gr FG200 Standard: IS:4038
XIII.	Suction Valves (DED Raw Water Pump Sets)	02 (Two) Nos	Design, Procurement, Supply, installation, testing and commissioning of Suction Valves along with matching companion flanges and bolts, nuts & requisites gaskets. Type: Rising Stem Gate

Sl No	Description	Quantity	Details
			Class: 150 MoC: Cast Carbon Steel Standard: API 600 (Generally conforming to)
XIV.	Suction Valves (EMD Back wash Pumps)	02 (Two) Nos	Design, Procurement, Supply, installation, testing and commissioning of Suction Valves along with matching companion flanges and bolts, nuts & requisites gaskets. Type: Rising Stem Gate Class: 150 MoC: Cast Carbon Steel Standard: API 600 (Generally conforming to)
XV.	Discharge Valves (EMD Raw Water Pump Sets)	04 (Four) Nos	Design, Procurement, Supply, installation, testing and commissioning of Discharge Valves along with matching companion flanges and bolts, nuts & requisites gaskets. Type: Rising Stem Gate Class: 150 MoC: Cast Carbon Steel Standard: API 600 (Generally conforming to)
XVI.	Discharge Valves (DED Raw Water Pump Sets)	02 (Two) Nos	Design, Procurement, Supply, installation, testing and commissioning of Discharge Valves along with matching companion flanges and bolts, nuts & requisites gaskets. Type: Rising Stem Gate Class: 150 MoC: Cast Carbon Steel Standard: API 600 (Generally conforming to)
XVII.	Discharge Valves (EMD Back wash Pumps)	02 (Two) Nos	Design, Procurement, Supply, installation, testing and commissioning of Discharge Valves along with matching companion flanges and bolts, nuts & requisites gaskets. Type: Rising Stem Gate Class: 150 MoC: Cast Carbon Steel Standard: API 600 (Generally conforming to)
XVIII.	Swing Check / Non Return Valves (NRV) (EMD Raw Water Pump Sets)	04 (Four) Nos	Design, Procurement, Supply, installation, testing and commissioning of NRVs along with matching companion flanges and bolts, nuts & requisites gaskets. Type: Dual Plate Swing Check Valve Class: 150 MoC: Cast Carbon Steel Standard: API 594(Generally conforming to)
XIX.	Swing Check / Non Return Valves (NRV) (DED Raw Water Pump Sets)	02 (Two) Nos	Design, Procurement, Supply, installation, testing and commissioning of NRVs along with matching companion flanges and bolts, nuts & requisites gaskets. Type: Dual Plate Swing Check Valve

Sl No	Description	Quantity	Details
			Class: 150 MoC: Cast Carbon Steel Standard: API 594 (Generally conforming to)
XX.	Swing Check / Non Return Valves (NRV) (EMD Back wash Pumps)	02 (Two) Nos	Design, Procurement, Supply, installation, testing and commissioning of NRVs along with matching companion flanges and bolts, nuts & requisites gaskets. Type: Dual Plate Swing Check Valve Class: 150 MoC: Cast Carbon Steel Standard: API 594 (Generally conforming to)
XXI.	Flow Control Valve	01 (One) No	Design, Procurement, Supply, installation, testing and commissioning of Flow Control Valve along with matching companion flanges and bolts, nuts & requisites gaskets. Type: Rising Stem Gate Size: not less than 400 mm MoC: Cast Carbon Steel / Cast Iron Size: 32 Inch Diameter.
XXII.	Pressure Gauge	08 (Eight)	Design, Procurement, Supply, installation, testing and commissioning of suitably sized and rated analogue type pressure gauge at the discharge point of each of the installed pump sets to facilitate to measure the discharge pressure of the each pump. The capacity of the pressure gauge shall be minimum of 16 Kg/sq.cm. And one pressure gauge has to be provided as a spare.
XXIII.	Suction Piping	For all the Pump Sets to be installed.	Design, Procurement, Supply, installation, testing, requisite painting and commissioning of suction piping for all Pump Sets complete with all requisite pipe fittings such as flanges, tapers, specials, reducers etc. The design of the suction piping should be such that the suction velocity should be less than 2 m/s. MoC: Mild Steel Standard: IS: 3589
XXIV.	Discharge Piping	For all the Pump Sets to be installed.	Design, Procurement, Supply, installation, testing, requisite painting and commissioning of discharge piping for all Pump Sets complete with all requisite pipe fittings such as flanges, tapers, specials, reducers etc. MoC: Mild Steel Standard: IS: 3589
XXV.	Station Piping		Design, Procurement, Supply, installation, testing, requisite painting and commissioning of all requisite piping arrangement required to Complete the piping network of the Raw Water Intake Plant including all headers / manifolds to

Sl No	Description	Quantity	Details
			draw raw water from the river and to pump the raw water through the main raw water trunk pipeline. In general the flow velocities for design are considered based on the guidelines provided by the Manual on Water supply and treatment Third edition- revised and updated (CPHEEO Manual)
XXVI.	Welding	For the whole Plant	All the welding to be carried out by the EPC Contractor for Plant to be in accordance with respective BIS/IWWA/AWWA/AWS/API standards/guidelines to be finalized during detailed engineering upon approval of PMC/OIL.
XXVII.	Inspection, Testing & NDT	For the whole Plant	All equipment, piping, welding etc have to be inspected (as per approved QAP), tested (Hydraulic and NDT). The scope for the shall be under the scope of the EPC Contractor as per approved QAP to be approved during detailed engineering.
XXVIII.	Painting – Pontoons	For the 02 (two) nos Pontoons	The surfaces and profiles are to be power wire brushed /sand blasted and cleaned to remove mild Scales and dirts. Thereafter they are to be coated with one coat (25 micron) of ship primer prior to the construction. The quality of the primer to be approved by PMC/OIL before application. Each coat is to be applied only after it is ascertained that the previous layer has achieved the required hardness. The painting scheme will have to be prepared and submitted by the builder for the approval of OIL/ EPMC. The table -1 below will give guidance for the preparation of the painting scheme.

Table – 1 : Painting Guidance Scheme (m below denotes micro-meter)

Area	**Shop Printer**	**1st coat**	**2nd coat**	**3rd Coat**	**Total dry(mm)**
1.Bottom plating	RB epoxy 25mm	Coltar epoxy 100 mm	Coltar epoxy 100 mm	Anti foul 100 mm	300m
2.Boot top area	-Do-	-Do-	-Do-	-Do-	-Do-
3.Boot top to Deck at side	-Do-	epoxy 100 mm	epoxy 100 mm	N.A	200m
4.Main Deck	-Do-	epoxy 100 mm	epoxy 100 mm	N.A	200m
5.F.W Tank	-Do-	Cement washing	-	-	N.A
6.F.O Tank	-Do-	To be treated with F.O	-	-	N.A
7.Other spaces	-Do-	epoxy 50 mm	epoxy 50	-	100m

Sl No	Description	Quantity	Details
			mm
XXIX.	Painting – Plant Machinery and Piping	For the whole Plant and Plant Piping.	Color scheme, Surface preparation, Coating and DFT to be decided during detailed engineering.

NB: The concept Plant lay out drawings are attached for reference purpose. Drawing Nos:

i. Doc No: SECON/OIL/WS/Vol-III/September-19, Package-I, Volume -III
ii. Doc No: SECON/OIL/WS/Vol-III/September-19, Package-II, Volume -III
iii. Survey Drawing No 1 & 2 (For Cross Country Raw Water Pipe Line)

C. Summary of Standards & Codes: The LSTK CONTRACTOR should ensure good engineering/international standards practice accepted by OIL/PMC in all respect of all the General Civil & Structural activities for the project. Indian Standard Codes, unless otherwise specified herein, shall be applicable for the project. In all cases, the latest revision of the codes shall be referred to.

Sl No.	Description	Conforming Standard
1.	MOC for Pontoon Hull	IS 3039 (Grade:)
2.	MOC for Pontoon General Construction and other General Construction	IS 2062 Grade – Br E250
3.	Welding scheme for Pontoon	Indian Register of shipping (IRS)
4.	Centrifugal Pump Set	To be finalized during detailed engineering upon approval of PMC/OIL
5.	Strainers	-do-
6.	HOT Crane	-do-
7.	Diesel Generating (DG)Set	-do-
8.	Foot Valves	IS:4038
9.	Rising Stem Gate Valve	API 600 (Generally Conforming to)
10.	Swing Check / Non Return Valves	API 594 (Generally Conforming to)
11.	Piping	IS: 3589
12.	Swivel Joints	
13.	Painting	
14.	Specification for Pumps – Vertical Turbine Mixed and Axial Flow, for clear cold water	IS 1710
15.	Code for acceptance tests for centrifugal, Mixed flow and axial pumps class – C	IS 9137
16.	Specification for Specials for Steel cylinder reinforced concrete force.	IS 7322
17.	Method of Chemical Analysis of Steel	IS 228

18.	Specifications for Covered Electrodes for Metal Arc Welding for Mild Steel.	IS 814
19.	Code of Practice for Use of Metal Arc Welding for General Construction	IS 816
20.	Code of Practice for Training and Testing of Metal Arc Welders.	IS 817
21.	Recommended Practice for Radiographic Examination of Fusion-Welded Butt Joints in Steel Plants.	IS 1182
22.	Hexagon Head Bolts, Screws and Nuts of Product Grade `C' – Part 2 : Hexagon Head Screws Size Range M 5 to M 64	IS 1363
23.	Method for Tensile Testing of Steel Products.	IS 1608
24.	Specifications for Rolling and Cutting Tolerances for Hot Rolled Steel Products	IS 1852
25.	Bare Wire Electrodes for Submerged Arc Welding.	IS 1974
26.	Steel for General Structural Purpose and Specifications	IS 2062
27.	Safety Code for Industrial Radiographic Practice.	IS 2598
28.	Code of Practice for Radio-Graphic Testing.	IS 2595
29.	Steel Pipes for Water and Sewage (168.3 to 2540 mm Outside Diameter)	IS 3589
30.	Code of Procedure for Testing of Fusion Welded Joints and Weld- Metal in Steel.	IS 3600
31.	Acceptance Tests for Wire Flux Combinations for Submerged Arc Welding.	IS 3613
32.	Code of Practice for Liquid Penetrant Flaw Detection.	IS 3658
33.	Code of Practice for Magnetic Particle Flaw Detection of Welding.	IS 5334
34.	Specifications for Spirally Welded Pipes.	IS 5504
35.	Code of Practice for Laying of Welded Steel Pipes for Water Supply.	IS 5822
36.	Welding Rods and Bare Electrodes for Glass Shielded Arc Welding of Structural Steel	IS 6419
37.	Steel Pipes for Hydraulic Purposes.	IS 6631
38.	Approval Tests for Welding Procedures.	IS 7307
39.	Approval Tests for Welders Working To Approved Welding Procedures.	IS 7310
40.	Code of Practice for Ultrasonic Testing of Ferrous Welded Pipes and Tubular Products.	IS 7343
41.	Code of Practice for Coating and Wrapping of Underground Mild Steel Pipeline.	IS 10221
42.	Hot –Rolled Steel Strips for Welded Tubes and Pipes.	IS 10748
43.	Specification for Sulphate Resisting Portland Cement.	IS 12330
44.	Recommended Practice for Radiographic Testing.	ASTM E-94
45.	Dry Powder Magnetic Particle Inspection.	ASTM E-109
46.	Wet Magnetic Particle Inspection.	ASTM E-138
47.	Liquid Penetrant Inspection.	ASTM E-165
48.	Specification for Mild Steel Covered Arc Welding	AWS A-5.1

	Electrodes.	
49.	Specification for Bare Mild Steel Electrodes and Fluxes for Submerged Arc Welding.	AWS A-5.17
50.	Covered Electrodes for Manual Metal Arc Welding of Mild Steel and Medium Tensile Steel.	BS 639

D. Detailed Engineering Deliverables:

The deliverables of Mechanical Engineering and Piping detailed engineering are broadly defined hereunder [The Contractor might add any additional item(s) for satisfactory and efficient completion of the project]

I. Detailed Engineering Design of the whole plant and piping.
II. Basis of Design
III. Process Flow Diagrams (PFDs), Utility Flow Diagrams (UFDs) and Heat & Material Balances (if any)
IV. Process & Operational Control Description
V. Process Equipment List
VI. Process Datasheets for Equipment (per Equipment List)
VII. Procurement Datasheet for Procurement
VIII. Piping & Instrumentation Diagrams (P&ID's)
IX. Cause & Effects Diagrams
X. Effluent and Emission Summary
XI. Catalyst and Chemicals Summary
XII. Process Simulation Report
XIII. Process Design Calculations
XIV. HAZOP Report
XV. QAP
XVI. Performance Guarantees Statement
XVII. Performance Test / Inspection Procedure and Schedule
XVIII. Pre-commissioning and Commissioning Manual
XIX. Operating & Maintenance Manual

The draft of the above to be duly vetted by PMC/ OIL.

E. The detailed Scope of Work for Mechanical Engineering and Piping are as below:

I. Scope of Work

1. The Specification sets out requirement for pumps and pumping machinery comprising pump, motor, base frame, column pipe, discharge head, coupling, guard and pump mounted instrumentation of general applicability for use within the pumping station of the project.
2. The pump sets covered by this specification shall comply with the Indian Standards. All components used in the construction of pumps supplied on this contract shall be new, of the latest design, and in current production. Pump components shall be identified by specification or by written description. The failure to identify any items, which may be necessary for the proper operation of the pumps, shall not relive the contractor of the responsibility of providing such items.
3. The contractor shall be fully and solely responsible for all the equipment, materials, services provided under this specification and complete co-ordination and compatibility of the component parts. The contractor shall be fully responsible for the installation, testing and commissioning of the Pumps and pumping machinery, piping work and fittings. The contactor shall utilize the services of the Vendor (OEM)during site testing or other times of necessary.

II. Design Conditions

1. All equipment covered by this specification shall be designed to operate in the environmental condition and stated in the Project Technical Report.
2. The pump sets shall be designed to meet the performance requirements as described in the FEED.
3. The equipment design in general shall primarily fulfill the desired service requirements and maximum equipment availability for a minimum service life of 20 years.
4. The make and models of all the equipment should not be obsolete for a period of minimum 10 (Ten) years from the date of supply.
5. For all rotating equipment, the main equipment together with its driver (motor), auxiliaries and accessories will be purchased from one vendor and the OEM shall be responsible for the performance of complete unit. The pump unit as defined herein means as a minimum the pump, the driver, mechanical seal, coupling, coupling guards, base plates, foundation bolts, local instruments, local start/ stop push button and other auxiliaries & accessories as specified in the bid document. All equipment and the auxiliaries shall be procured from approved vendor list attached.
6. All horizontal centrifugal Raw Water pumps shall have Horizontal Split casing design, equipped with suitable vacuum priming system.
7. All Raw Water pumps to be equipped with suitable Mechanical Seals.
8. Pumps shall be selected from standard series in such a way so as to have maximum interchangeability between components to minimize inventory cost.
9. Guards for all moving parts i.e. coupling guards / belt drive etc shall be of non-sparking material and shall be provided with hole for visual inspection of coupling.
10. Performance & Complete unit test of critical equipments shall be witnessed by PMC/OIL vendor's (OEM) premises.
11. Duty pumps shall be taken to run continuously, duty pumps shall be rotated with stand by pumps to equalize running hours.
12. EPC Contractor shall carry out the following activities for procurement of rotating equipment.
    - I. EPC Contractor shall prepare the enquiry specifications/ documents for each pump including spare parts for erection, commissioning & minimum recommended spare parts for 2 years normal operation.
    - II. Datasheets indicating the basic process & mechanical requirements are attached in the bid document. Contractor shall use only these datasheets for enquiry & purchase.
    - III. EPC Contractor shall prepare the detailed Purchase Requisition / specification/ spare parts/ vendor data requirement for all equipment and shall obtain the approval/ review of purchase requisition of all the equipment from OIL/ PMC.
    - IV. EPC Contractor shall carry out the detailed review, checking and approval of engineering, fabrication drawing and technical data from vendors for equipment and materials to ensure scope adequacy and consistency with the design, safety and operability requirements.
    - V. LSTK Contractor shall submit all engineering drawings/ documents/ data and obtain the approval of OIL/PMC.
    - VI. Mandatory spares for all rotating equipment for one-year operation shall be provided. As a minimum following mandatory spares shall be provided:
        a) Set of bearings
        b) Wear rings, if applicable
        c) Shaft Sleeve
        d) Mechanical seal, if applicable
        e) Set of couplings.
    - VII. For all equipment minimum recommended spares for 2 years normal operation shall be submitted for PMC/OIL's approval.
    - VIII. EPC to provide insurance spare as per list furnished by vendor (OEM) and approved by PMC/OIL.
    - IX. EPC Contractor shall include all the commissioning spares as required for the equipment vendor's scope. Contractor shall procure the same from the equipment vendors and make it available well

before commissioning of plant/ equipment. In case, any additional spares are consumed during commissioning, the same shall be provided by the contractor at no additional cost to the OIL.

X. EPC Contractor shall furnish a list of special tools/ tackles required for assembly and maintenance. Such tools/ tackles shall be supplied by the vendor and shall form part of supply by contractor to Owner.

XI. EPC Contractor's scope shall include complete supply, transportation of equipment package from vendor's shop to site, receipt of material at site. Handling at site and arrange for storage at site.

XII. EPC Contractor shall carry out erection of each equipment at the specified location on the properly designed & cast foundation as per requirement.

XIII. EPC Contractor shall note that consumables, lubricants etc. required during erection, commissioning and performance guarantee run of equipment such as first fill of lubricants etc. shall be in contractor's scope. A consolidated list for all equipment shall be provided indicating

XIV. type of lubricant, grease, oil etc. giving specifications, qualities, brand name and their Indian equivalent.

XV. EPC Contractor shall supply & install all maintenance facilities sized for handling the heaviest single piece of equipment for maintenance. Contractor shall provide sufficient space for maintenance, dismantling and platforms for maintenance.

XVI. EPC Contractor shall carry out the pre-commissioning and commissioning activity at site for all equipment.

XVII. EPC Contractor shall ensure the presence of equipment manufacturers (vendor) at site for supervision of erection and commissioning for equipments, wherever required.

13. Skid Mounted Equipments:

I. Skid shall be sized and designed to accommodate the equipment, piping, instruments/junction box and other consideration of operation & maintenance aspect.

II. Skid shall be rigid and designed for static load, wind load, seismic load etc. It shall also be designed for adequacy during lifting/transportation.

III. Skid shall be provided with 4 nos. lifting lugs, 2 Nos. on each side.

IV. If the holes drilled in beam flange or holes cut on web of members reduces the net section to the extent that stresses in the members exceed the allowable stresses, the member shall be reinforced with welded plate with sufficient thickness to provide additional required area.

V. Skid shall be designed for single point lift at hook and four point lift at skid. Vendor shall provide necessary spreader bar/sling shackle etc.

VI. Skid should be covered by "Anti Skid" checkered plates to facilitate O & M of the equipment.

VII. Skid structural design calculation shall be submitted during detail engineering for PMC/OIL review.

14. Piping Design:

I. The plant piping shall be connected / hooked up to 813 MM OD , 2.00 KM (Approx) Long Raw Water transfer Cross country Pipe line which shall be delivering the raw water to the Water Treatment Plant.

Preliminary project details of the proposed raw water pipeline are as given in the table below"

Sl. No.	Parameter	Details
1.	Source	River the Burhi Dihing
2.	Selected pipe material	MS Pipe
3.	Flow (MGD)	10.3

4.	Hours of Pumping (Hrs.)	22
5	Length (Km)	2.00 (approximately)
6	Diameter(OD) (mm)	813
7	Shell Thickness/Class (mm)	7.1
10	Head (m)	56

II. The EPC Contractor shall be required to design , supply and construct all station pipelines based on the guide lines /Standard issued by the BIS,Indian Water Works Association, IWWA, Publication No M1, "Design of Large Diameter Steel pipelines" and American Water works Association. AWWA Manual MA 11, Third edition, "Steel Pipe- A Guide for Design and Installation". The preliminary design basis of the Raw Water pipe line through which raw water shall be pumped from the plant shall be as under:

<table>
<tr><th>Sl.No.</th><th>Description</th><th>Details</th></tr>
<tr><td>1</td><td>Discharge</td><td>10.30 MGD</td></tr>
<tr><td>2</td><td>Pipeline Material</td><td>Mild Steel</td></tr>
<tr><td>4</td><td>Velocity in Pipeline</td><td>Velocity of Water Vmin > 0.6 m/s and
Vmax ≤ 2.1 m/s.
(Confirm to: CPHEEO Manual on Water Supply and Treatment)</td></tr>
<tr><td>5</td><td>Nominal Thickness of Steel Pipes</td><td>Minimum Thickness :
The thickness of the plate used for steel cylinder shall be as per IS: 3589: 2001,not less than the thickness specified in below table
<table><tr><td>Tentative Outside Diameter of Finished Pipe mm</td><td>Tentative Minimum Plate Thickness mm</td></tr><tr><td>813 mm</td><td>7.1</td></tr></table></td></tr>
<tr><td>6</td><td>Minimum Pressure</td><td>Minimum pressure 3 m above the highest point along the Transport Main alignment</td></tr>
<tr><td>9</td><td>Pumping Hours</td><td>22 Hours</td></tr>
<tr><td rowspan="3">11</td><td rowspan="3">Economic Analysis Data</td><td>Capitalized cost of pump
Po = C/(1+r)n
Po = Initial Capitalized investment
C = Amount Needed after 15 Years
R = Rate of Interest
N = Number of Years
(Confirm to: CPHEEO Manual on Water Supply and Treatment - Ministry of Urban Development, New Delhi)</td></tr>
<tr><td>Rate of interest 12%</td></tr>
<tr><td>Energy charges in Rs 6.0 / KW units</td></tr>
</table>

		KW required =(QxH)/102x1/ήx24/X Q - Discharge in lps H - Total Head in m ή - Efficiency of pump X= average pumping hours (Confirm to: CPHEEO Manual on Water Supply and Treatment - Ministry of Urban Development, New Delhi)

III. The piping layout in the Pumping stations has to be been done in such a way as to avoid interference with the proposed structural steel and concrete, electrical cable trenches, conduits etc.

IV. The above ground piping shall be laid on pipe supports / Anchor Blocks. Supports have been designed to support the pipe without causing excessive local stress in the pipe and keep the desired freedom of Movement.

V. For Horizontal split casing Centrifugal pump the suction piping size is selected based on the suction velocity should be less than 2 m/s.

VI. Basket Strainers shall be installed at the suction pipe end of the raw water pumps. Strainers shall be Self-Cleaning Basket Strainer to save cleaning time & it automates the filtering process and maintenance will be easy .The strainers shall be of cylindrical type with a mesh size of approx. 8-10 mm. The strainer mesh shall be of rigid design and its thickness shall be determined with sufficient Safety against deformation taking into account that foreign matters have accumulated in the Strainer.

VII. All valves, flanges, dismantling joints, suction strainers etc required to make piping complete shall be under the scope of the EPC Contractor.

VIII. The EPC Contractor may add any additional item/equipment required for successful completion of the project with proper justification and prior approval of OIL.

SECTION -IV

Project Title:
DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, SUPPLY, CONSTRUCTION AND COMMISSIONING ON LSTK BASIS OF PONTOON TYPE RAW WATER IN-TAKE PLANT AT DULIAJAN, ASSAM, INDIA

SCOPE OF WORK

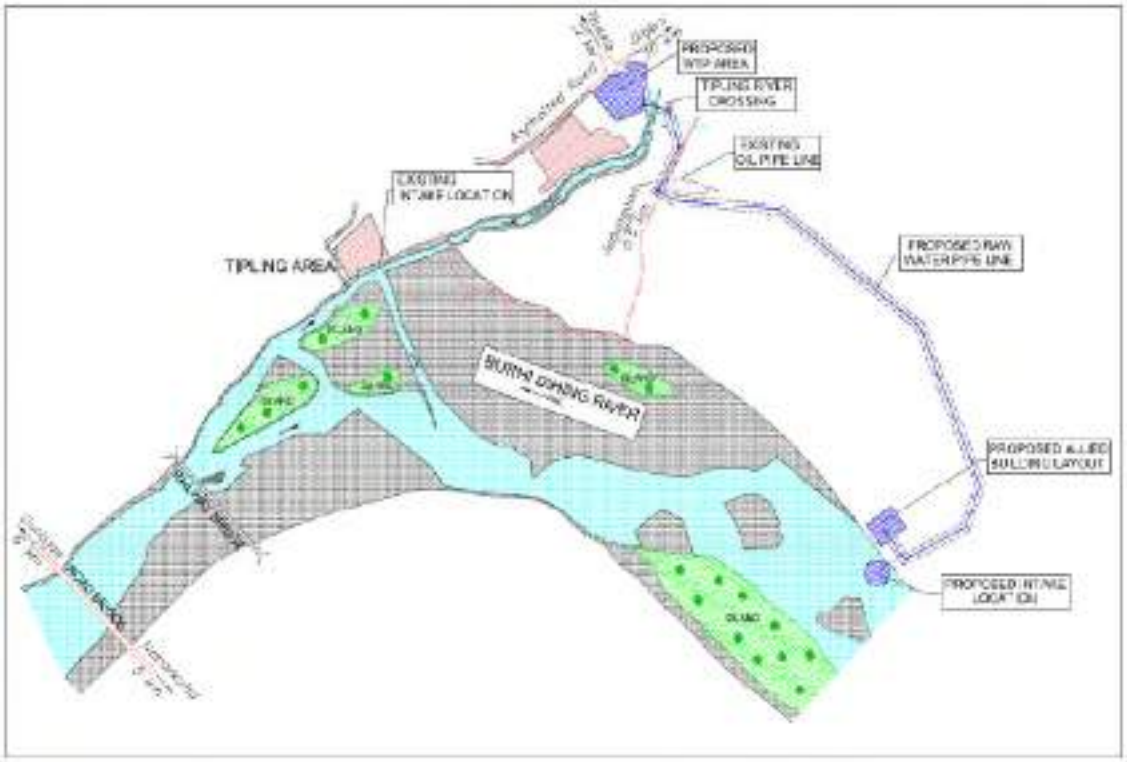
813 MM CROSS COUNTRY UNDERGROUND RAW WATER PIPE LINE (LENGTH: 2.0 KM, APPROX,)

A. Introduction:

1. This document describes the jobs and responsibilities of the LSTK EPC Contractor for Design, Engineering, Procurement, Inspection, Supply, Construction and Commissioning on LSTK Basis of 813 MM Cross Country underground, welded Raw Water pipe line from Pontoon Type Raw Water in-take Plant to the 8 MGD Water Treatment Plant (site) at Duliajan, Assam, India.

   The scope of work includes (but not limited to) Basic Engineering and Design (based on FEED of the PMC), Detailed Engineering based on FEED of the PMC, Obtaining all necessary approvals from statutory bodies as applicable , Health, Safety and Environmental (HSE) compliance, Tendering, Procurement, Inspection, Supply, Manufacture, Fabrication, Carrying out Route Survey wherever required for over dimensional consignments, Transportation of all equipment and material to site including loading, unloading, secure storage, insurance, and maintenance, Installation, Construction, Hook up, Testing, Pre-commissioning, Performance Guarantee Test Runs including Total Project Management on LSTK Basis for completion and handing over of Raw Water pipe line from Pontoon Type Raw Water in-take Plant to the 8 MGD Water Treatment Plant (site) at Duliajan, Assam, India.

2. Basic Details: The Pontoon Type Raw Water in-take Plant shall be located at the banks of the river Burhi Dihing near Duliajan, Assam , India (around Lat 270 19'12.48" and Long 950 19' 48.37"). The plant shall be drawing about 10.3 MGD of raw water from the river through 02 (two) nos. of Pontoons. Raw water pipeline is proposed to transport 10.3 MGD of Raw water from the Pontoon type raw water pump house to the proposed WTP. Concept Drawing is as below:



   The concept plan and route map of the Cross Country Raw Water Pipe Line is attached as below:

   a. Doc No: SECON/OIL/WS/Vol-III/September-19, Package-II, Volume -III
   b. Survey Drawing Nos 1& 2

3. Brief Process Description: The proposed raw water pipeline of 2.00 km approximate length shall transport water from the Pontoon type raw water pump house to the 8MGD WTP. Preliminary project details of the proposed raw water pipeline are as given in the table below:

Sl. No.	Parameter	Details
I.	Source	River Burhi Dihing
II.	Selected pipe material	MS as per IS 3589
III.	Flow (MGD)	10.3
IV.	Hours of Pumping (Hrs.)	22
V.	Length (Km)	2.00 (Approx.)
VI.	Diameter(OD) (mm)	813
VII.	Shell Thickness/Class (mm)	18 MM
VIII.	Head (m)	56
IX.	Head Loss Formula	Hazen-William's Formula : V = 4.567 x 10-3 C d 0.63 S 0.54 Where, V = Velocity of flow in m/sec C = Hazen – Williams coefficient = 140 d = Diameter of pipe in mm S = Slope of Hydraulic Gradient (Confirm to: CPHEEO Manual on Water Supply and Treatment) 10% of Head loss due to friction shall be considered additional as Minor loss across specials.
X.	Velocity in Pipeline	Velocity of Water Vmin > 0.6 m/s and Vmax ≤ 2.1 m/s. (Conforming to: CPHEEO Manual on Water Supply and Treatment)
XI.	Water Hammer	Maximum Hmax= C. V0/g Hmax= Maximum pressure rise in closed conduit above normal pressure in m C= Velocity of pressure wave travel in m / sec g= Acceleration due to gravity in m / sec2 V0= Normal velocity in pipeline before sudden closer In m /sec C = 1425 / Sqrt (1+Kd/ECt) K= Bulk modules of water = 2.07 x 10 8 Kg/m2 d= Diameter of pipe in m E= Modulus of elasticity of pipe material in Kg / m2 for steel 2.1 x 1010 Ct = Wall thickness of pipe in m (Manual on Water Supply and Treatment - Ministry of Urban Development, New Delhi)
XII.	Economic Analysis Data	Capitalized cost of pump Po = C/(1+r)n Po = Initial Capitalized investment C = Amount Needed after 15 Years R = Rate of Interest N = Number of Years (Confirm to: CPHEEO Manual on Water Supply and Treatment - Ministry of Urban Development, New Delhi) • Rate of interest 12%

		• Energy charges in Rs 6.0 / KW units KW required =(QxH)/102x1/ήx24/X Q - Discharge in lps H - Total Head in m ή - Efficiency of pump X= average pumping hours (Confirm to: CPHEEO Manual on Water Supply and Treatment - Ministry of Urban Development, New Delhi)
XIII.	Design Basis of Pipe Line	The EPC EPC EPC Contractor shall have to to design the pipeline based on the guide lines issued by the Indian Water Works Association , IWWA, Publication No M1, "Design of Large Diameter Steel pipelines" and American Water works Association. AWWA Manual MA 11, Third edition, "Steel Pipe- A Guide for Design and Installation" or equivalent IS Standard, to be finalized during detailed engineering.

4. The summary of major Components of Pipe/Machinery / Equipment for the Raw Water pipeline are as below:

Sl No	Description	Quantity	Details
I.	3 LPE Externally Coated 813 mm diameter SAW MS Pipe as per IS 3589	2.00 Km (approx.)	Design, Engineering , Procurement, Inspection, Supply, Storage, Fabrication & Construction, Testing , Commissioning and Handing over 813 mm diameter MS Pipe Line. Type of Construction of Pipe Line: Welded, Underground. Welding to be carried out as per IS:5822.
II.	Steel Bridge for Tipling river crossing of 813 MM Pipe Line	01 No	Design, Engineering , Procurement, Inspection, Supply, Storage, Fabrication & Construction, Testing , Commissioning and Handing of Steel Bridge for Tipling river crossing of 813 MM Pipe Line . Approximate Length – 50 m
III.	Butterfly valves	3 Nos or as required	Design, Engineering , Procurement, Inspection, Supply, Storage, Fabrication & Construction, Testing , Commissioning and Handing over . Technical Specifications to be finalized during detailed engineering .
IV.	Air Valves	4 nos or as required	Design, Engineering , Procurement, Inspection, Supply, Storage, Fabrication & Construction, Testing , Commissioning and Handing over . Technical Specifications to be finalized during detailed engineering .
V.	Score Valves	3 nos or as required	Design, Engineering , Procurement, Inspection, Supply, Storage, Fabrication & Construction, Testing , Commissioning and Handing over . Technical Specifications to be finalized during detailed engineering .
VI.	3 LPE Externally Coated 813 mm diameter Bends & Specials	As required	For the 813 mm diameter MS Pipeline to suit the contour of the ROW as required with long radius bends. Technical

Sl No	Description	Quantity	Details
			Specifications to be finalized during detailed engineering .

5. The summary of major Civil Engineering Works to be carried out for the 813 MM Raw Water Pipe Line are as below:

Sl No	Description	Quantity	Details
I.	Thrust Blocks	As required	Design, Engineering , Procurement, Inspection, Supply, Storage, Fabrication & Construction, Testing , Commissioning and Handing over of Thrust blocks shall be proposed at points where the pipe changes direction with more than 10 degree. The design of thrust blocks are based on the following. • Soil density 1700 Kg/m3 • Angle of internal friction Φ 30.00 • Pressure in pipe line (P)in Kg/ Sq.cm-including surge pressure • Density of concrete - 2500 Kg/m3 • Density of water - 1000 Kg/ m3 Technical Specifications to be finalized during detailed engineering .
II.	Butterfly valve Chambers	As required	Design, Engineering , Procurement, Inspection, Supply, Storage, Fabrication & Construction, Testing , Commissioning and Handing over of Butterfly valve Chambers at Butterfly valve locations as per approved drawing. The RCC valve chambers Shall be proposed for Butterfly valve, with removable pre cast RCC slabs. Technical Specifications to be finalized during detailed engineering .
III.	Air valve Chambers	As required	Design, Engineering , Procurement, Inspection, Supply, Storage, Fabrication & Construction, Testing , Commissioning and Handing over of Air valve Chambers shall be proposed at Air valves locations as per approved drawing. The RCC valve chambers Shall be proposed for Air valve, with removable pre cast RCC slabs. Technical Specifications to be finalized during detailed engineering .
IV.	Scour valve Chambers	As required	Design, Engineering , Procurement, Inspection, Supply, Storage, Fabrication & Construction, Testing , Commissioning and Handing over of Scour valve Chambers shall be proposed at Scour valves locations as per approved drawing. The RCC valve chambers Shall be proposed for Scour valve, with removable pre cast RCC slabs. Technical Specifications to be finalized during detailed engineering .

Sl No	Description	Quantity	Details
V.	Water Bodies Crossings	As required	The ROW of the Raw Water pipeline crosses minor Water Bodies at a few locations. The Technical Specifications for the same to be finalized during detailed engineering .
VI.	PWD Road / Village Road Crossing	As required	Design, Engineering and execution of PWD Road / Village Road Crossings. Technical Specifications to be finalized during detailed engineering . **NB: Any approval for the same from Statutory Bodies are to be obtained by the EPS EPC EPC Contractor on OIL's Behalf.**

B. BRIEF SCOPE OF WORK

1. General: The scope of work broadly includes (but not limited to) the followings for Design, Engineering , Procurement, Inspection, Supply, Storage, Fabrication & Construction, Testing , Commissioning and Handing over of 2.0 KM (Approx) long 813 MM MS welded underground raw water pipe line complete in all aspects as per basic Concept Plan:
    a) Basic Engineering and Design (based FEED of the PMC)
    b) Detailed Engineering based on FEED of the PMC
    c) Obtaining all necessary approvals from statutory bodies as applicable
    d) Health, Safety and Environmental (HSE) compliance
    e) Soil Investigation (If required)
    f) Tendering, Procurement, Inspection, Supply
    g) Manufacturing, Construction, Fabrications
    h) Transportation of all equipment and material to site including loading, unloading, secure storage, insurance
    i) Hook up, Testing, Pre-commissioning, Performance Guarantee Test Runs
    j) Final Commissioning and Handing over.

Note:

a) EPC EPC Contractor shall verify the information and requirement provided herein and satisfy them for the proper execution of the job. Once the EPC EPC Contractor is satisfied, the EPC EPC Contractor without any additional cost and time to OIL shall supply any item not specifically included herein but required for the completion of the project.
b) The drawing are indicative of minimum requirement only.

2. Statutory Approvals / State Regulations / Permissions:
    a) Statutory approval / permissions from any authorities as per statutory rules and regulations of Central / State Government shall be EPC CONTRACTOR's responsibility. The application on behalf of OIL for submission to relevant authorities along with copies of required certificates complete in all respects shall be prepared by the EPC EPC CONTRACTOR well ahead of time so that the actual construction / commissioning of the work is not delayed for want of approval / inspection by concerned authorities.
    b) The EPC CONTRACTOR shall arrange requisite inspection of the works (if stipulated statutory rules and regulations) by the by the appropriate Authorities and necessary coordination and liaison work in this respect shall be the responsibility of the EPC CONTRACTOR.
    c) Any and all fees required to be submitted / paid to the statutory authorities / State / Central Government regulatory bodies etc shall be borne by the EPC CONTRACTOR as a part of his scope. No reimbursement whatsoever shall be made by OIL / EPMC.
    d) Any additions / changes / modifications required to be made to meet the requirements of the statutory authorities / regulatory boards shall be carried out by the EPC CONTRACTOR without any extra cost to OIL and shall have no implication on time schedule. The inspection and

acceptance of the work by the statutory authorities shall however, NOT ABSOLVE the EPC CONTRACTOR from his responsibilities under this contract.

e) OIL shall provide initiation/introductory letters wherever required.

3. Surveys and Investigations (shall include, but not limited to):
   a) Topographical conditions of the work site, for horizontal and vertical control including over burden profiles (existing utilities), shall cover entire area for the work with additional area for stockpiling of materials and equipment, connection with the pipes up and down streams of jacking work, parking of vehicles, etc. to determine the exact locations of pits and pipeline alignment
   b) Collection of information for the existing underground utilities, and carrying out test diggings to confirm the location(s) of the existing utilities and groundwater with appropriate interval (not less than 20 m) and locations up to the depth of casing/main pipe.
   c) Subsurface investigation shall consist of review of available geological information and collection of site specific geo-technical information to obtain subsurface profile and characteristics of soil as required. Sampling and testing, where required, shall be carried out to determine the capacity of equipment and dimensions of casing pipe as required. For HDD method, soil characteristics to be obtained will be, but not limited to the following items:
   d) Standard classification of soils (sieve analysis).
   e) Electric resistively and mineralogical constituents.
   f) The EPC Contractor shall carry out the additional surveys and investigation in addition to the above to complete the work satisfaction to the Engineer in accordance with the manufacturer's instruction/recommendations including soil investigations.

C. Detailed Scope of Work

1. The following minimum items / equipment/Jobs have been suggested in the FEED by the PMC for the 813 MM underground welded Raw Water pipe line from Pontoon Type Raw Water In-Take Plant to the 8 MGD WTP. All the items detailed below shall be under the scope of the EPC Contractor.

Sl No	Description	Quantity (approx.)	Details
Raw water pipeline:			
I.	Clearing Jungle for pipe line	2.00 Km	Cleaning Jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50m outside the periphery of the Area cleared.
II.	Excavation of pipe line trench	2.00 Km	Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth upto 1.5 M, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m.
III.	Sand bedding	2.00 Km	Supply and filling the sand under and above the pipeline including watering, ramming, consolidating and dressing complete.
IV.	Back Filling of trenches	2.00 Km	Supply and filling the available excavate earth (excluding rock) in trenches, sides etc. layers not exceeding 20 cm in depth, Consolidating each deposited layer by ramming and watering, lead upto 50m and lift upto 1.5 m.

<table>
<tr><th>Sl No</th><th>Description</th><th>Quantity (approx.)</th><th>Details</th></tr>
<tr><td>V.</td><td>MS Line Pipe</td><td>2.00 Km</td><td>Procurement, Inspection, Supply of 3 LPE Externally Coated 813 MM MS pipes as below:
<table>
<tr><td>Conforming Standard</td><td>IS 3589:2001</td></tr>
<tr><td>Class</td><td>150</td></tr>
<tr><td>Type</td><td>SAW</td></tr>
<tr><td>Out Side Diameter</td><td>813 MM</td></tr>
<tr><td>Wall Thickness</td><td>18 MM</td></tr>
<tr><td>Pipe Construction Type</td><td>ERW</td></tr>
<tr><td>Total Length Required</td><td>2.0 KM</td></tr>
<tr><td>Grade of Steel</td><td>Fe410</td></tr>
<tr><td>End Preparation</td><td>Beveled</td></tr>
<tr><td>Length of Pipe Joints to be supplied</td><td>As per IS 3589:2001</td></tr>
<tr><td>External Coating</td><td>3 LPE</td></tr>
</table></td></tr>
<tr><td>VI.</td><td>MS Pipe Bends-Specials</td><td>As required</td><td>Design, Procurement, Supply ,Provision of Mild Steel specials fabricated / manufactured out of MS coil of steel grade Fe410 as per IS 3589:2001 and external / outside 3 LPE epoxy coating; minimum thickness of M.S. Coil as specified; complete in all respect; with upto date amendments in relevant IS codes and as directed by Engineer-in-charge .</td></tr>
<tr><td>VII.</td><td>Butterfly Valves (EMD Raw Water Pipeline)</td><td>03 (Three) Nos or as required</td><td>Design, Procurement, Supply, installation, testing and commissioning of Butterfly Valves. Technical Specifications to be finalized during detailed engineering phase.</td></tr>
<tr><td>VIII.</td><td>Air Valves (EMD Raw Water Pipeline)</td><td>04 (Four) Nos or as required</td><td>Design, Procurement, Supply, installation, testing and commissioning of Air Valves. Technical Specifications to be finalized during detailed engineering phase.</td></tr>
<tr><td>IX.</td><td>Scour Valves (EMD Raw Water Pipeline)</td><td>03 (Three) Nos or as required</td><td>Design, Procurement, Supply, installation, testing and commissioning of Scour Valves. Technical Specifications to be finalized during detailed engineering phase.</td></tr>
<tr><td>X.</td><td>RCC Thrust Blocks / Anchor Blocks</td><td>Thrust Blocks-10 Nos or as required Anchor Blocks-15 Nos or as required</td><td>Design, Provision and constructing of the RCC Thrust Blocks / Anchor Blocks for bends including the excavations of soils up to the required depth ,disposal of soils after refilling with selected available earth, providing PCC including cost of labours, materials tools, curing etc., complete as finalized during detailed engineering phase.</td></tr>
<tr><td>XI.</td><td>Valve Chambers</td><td>10 (Ten) Nos or as required</td><td>Concrete valve chamber using M20 (1:1.5:3)concrete with 600 mm x 600 mm MS inspection door and frame with locking arrangement etc., including earthwork to the required depth, Refilling with available earth , disposal etc., complete as per specification and as finalized during detailed engineering phase.</td></tr>
<tr><td>XII.</td><td>Structural Steel Bridge across Tipling River</td><td>1(one) Nos</td><td>Design, Procurement, Supply, installation and Construction of Structural steel Bridge for pipeline crossing the Tipling River including foundation and civil works. Approximate Length is 50m. Technical Specifications to be finalized during detailed engineering phase.</td></tr>
</table>

Sl No	Description	Quantity (approx.)	Details
XIII.	Pipe Line ROW Markers	100 Nos or as required.	Design and construction of Concrete Pipe Line ROW Markers as per Technical Specifications to be finalized during detailed engineering phase.

2. Summery of Standards & Codes:
The applicable design codes and standards for MS pipe shall include, but not be limited, to those listed in the Table below

Code	Code No	Title of the Code
IS	228	Method of Chemical Analysis of Steel
IS	814	Specifications for Covered Electrodes for Metal Arc Welding for Mild Steel.
IS	816	Code of Practice for Use of Metal Arc Welding for General Construction
IS	817	Code of Practice for Training and Testing of Metal Arc Welders.
IS	1182	Recommended Practice for Radiographic Examination of Fusion-Welded Butt Joints in Steel Plants.
IS	1363	Hexagon Head Bolts, Screws and Nuts of Product Grade `C' – Part 2 : Hexagon Head Screws Size Range M 5 to M 64
IS	1608	Method for Tensile Testing of Steel Products.
IS	1852	Specifications for Rolling and Cutting Tolerances for Hot Rolled Steel Products
IS	1974	Bare Wire Electrodes for Submerged Arc Welding.
IS	2062	Steel for General Structural Purpose and Specifications
IS	2598	Safety Code for Industrial Radiographic Practice.
IS	2595	Code of Practice for Radio-Graphic Testing.
IS	3589	Steel Pipes for Water and Sewage (168.3 to 2540 mm Outside Diameter)
IS	3600	Code of Procedure for Testing of Fusion Welded Joints and Weld- Metal in Steel.
IS	3613	Acceptance Tests for Wire Flux Combinations for Submerged Arc Welding.
IS	3658	Code of Practice for Liquid Penetrant Flaw Detection.
IS	5334	Code of Practice for Magnetic Particle Flaw Detection of Welding.
IS	5504	Specifications for Spirally Welded Pipes.
IS	5822	Code of Practice for Laying of Welded Steel Pipes for Water Supply.
IS	6419	Welding Rods and Bare Electrodes for Glass Shielded Arc Welding of Structural Steel
IS	6631	Steel Pipes for Hydraulic Purposes.
IS	7307	Approval Tests for Welding Procedures.
IS	7310	Approval Tests for Welders Working To Approved Welding Procedures.
IS	7343	Code of Practice for Ultrasonic Testing of Ferrous Welded Pipes and Tubular Products.
IS	10221	Code of Practice for Coating and Wrapping of Underground Mild Steel Pipeline.
IS	10748	Hot –Rolled Steel Strips for Welded Tubes and Pipes.
IS	12330	Specification for Sulphate Resisting Portland Cement.
ASTM	E-94	Recommended Practice for Radiographic Testing.
ASTM	E-109	Dry Powder Magnetic Particle Inspection.
ASTM	E-138	Wet Magnetic Particle Inspection.
ASTM	E-165	Liquid Penetrant Inspection.

Code	Code No	Title of the Code
AWS	A-5.1	Specification for Mild Steel Covered Arc Welding Electrodes.
AWS	A-5.17	Specification for Bare Mild Steel Electrodes and Fluxes for Submerged Arc Welding.
BS	639	Covered Electrodes for Manual Metal Arc Welding of Mild Steel and Medium Tensile Steel.

3. Inspection:
The pipes, valves and the specials shall be subjected to Third Party Inspection (TPI). The TPI agency shall have to be approved by OIL. The EPC Contractor to furnish QAP for approval of OIL/PMC. The EPC Contractor to arrange for the TPI at his own. For Inspection and TPI consideration of relevant codes have to be taken into account. If the test results are not in conformity with relevant Codes and Standards, such materials shall be rejected. All test reports/certificates to be furnished to OIL by the EPC Contractor.

4. Storage:
   a) The EPC Contractor to develop a Storage yard/ Location suitably located for execution of the jobs/ works under the scope of this Contract. OIL shall provide suitable plot(s) of land for said Storage yard/ Location.
   b) The safe and secure storage of all the items required for Project inclusive of Construction, Commissioning machinery and tools shall be under the scope of the EPC Contractor.
   c) Such Scope of storage also includes the specific requirements of item specific storage like , stipulated indoor storage, Air Conditioned Storage etc.
   d) OIL shall not be responsible for any pilferage of items from the Storage yard/ Locations as mentioned above. In such event the EPC Contractor to arrange the items at no additional cost and time implications to OIL.

5. Fabrication & Field Welding: The execution of the Field Fabrication and field welding jobs should progress as indicated below:
   a) Site clearance/Jungle cutting (wherever required)
   b) Levelling (wherever required)
   c) Preparation of approach road (wherever required)
   d) Transportation, Swabbing, Stringing and alignment of Pipes along the ROW.
   e) Trenching
   f) PWD Road Crossings
   g) Construction of River Crossings
   h) Crossing of Minor Water Bodies
   i) Welding and Fabrication at Site
   j) Night Capping
   k) Installation of Valves
   l) Construction of Thrust Block & Valve Chambers
   m) Wrapping Coating of Weld Joints
   n) Lowering
   o) NDT
   p) Hydraulic Testing
   q) Rework (if required)
   r) Back Filling of Trench

6. Clearing / Grading / Leveling / Buldozing of Pipeline Route:
THE EPC CONTRACTOR shall clear the Pipeline Route so as to make it suitable for laying the pipeline. Clearing means the removal of under growths and any other items encountered along the Pipeline Route. After clearing, the Pipeline Route shall be graded and leveled properly to the natural contour so that trenching operations can be carried out to provide an equal earth cover over the pipe line as per requirements and specifications.

Clearing / removal / disposal of farm corps, undergrowths, trees, any other items on the ROW segment/ work area, Grading / Leveling / Bulldozing of existing/ new ROW segment for entire width to make a leveled contour. All labour, equipment, consumables etc. shall be arranged and supplied by the Contractor.

7. Pipe is to be unloaded from the trucks and lowered to the ground by means of suitable equipment. Dragging and skidding of pipe will not be permitted. In stringing pipes along the Pipeline Route, gaps shall be left between adjacent lengths of pipe at suitable intervals and at all well defined trails to permit the free passage of livestock or vehicles during the time interval between stringing and other construction operations.
   Manual stringing of pipe joints in sand bags along the ROW. Cleaning the inside of the pipe by manually or any other suitable means prior to welding. Checking of pipe ends by gauging tool. Pipe ends to be checked/ repaired if required for welding. The tools and tackles required are to be provided by the Contractor.

8. Trenching:
   a) THE EPC CONTRACTOR shall dig the pipeline trench on the stacked centering of the pipeline.
   b) THE EPC CONTRACTOR shall by any method that may be necessary or directed, dig the pipeline trench on the cleared and graded pipeline route. Suitable crossings shall be provided and maintained over the open trench, where necessary, to permit the OIL or his tenants to move stock or equipment from one side of the trench to the other.
   c) The width specified shall be measured at the bottom of the trench.
   d) The bottom and sides of the finished trench shall be uniformly graded and must be free of loose rock, hard clods, large gravel, protruding roots, or rock projections, bush skids, sticks, welding rods, or other hard objects and debris which are liable to cause damage to the coating when the pipe is lowered in.
   e) In cases where tea bushes, paddy, trees or valuable growing timber is encountered in the pipeline route and in locations where in the opinion of the OIL/PMC's REPRESENTATIVE/S use of trenching machinery may result in unnecessary damage or injury to the property crossed by the pipeline route, THE EPC CONTRACTOR may be required to excavate the trench manually at no extra cost.
   f) THE EPC CONTRACTOR'S attention is called to marshy and high water-table conditions which may require the use of pumps, well points or other means of dewatering. No additional compensation shall be due to THE EPC CONTRACTOR in such occasions.
   g) THE EPC CONTRACTOR shall also be responsible for locating and protecting any other pipelines or underground structures falling on the same Pipeline Route. He should exercise sufficient care to avoid damage to the pipelines / cables arising out of its activities on the existing Pipeline Route.
   h) If damage specified above occurs, repair shall forthwith be made / carried out by THE EPC CONTRACTOR at its expense under the direction and to the satisfaction of the COMPANY. Reports shall be made to OIL by THE EPC CONTRACTOR of any damage or any other incidents relating to interference with adjacent structures.
   i) THE EPC CONTRACTOR shall be responsible for making all necessary arrangement, to remove bail or pump water from the trench or from wet area, if required, before lowering the pipe into the trench, without any extra cost to OIL.
   j) Excavation of open trench along the ROW up to a maximum depth of 1.5 m. The bottom & sides of the trench should be smoothly finished to accommodate the welded section of the pipe without any strain. This shall include all the trenching jobs along the ROW irrespective of the quality of earth like slushy or water logged area or normal soil. This item excludes all crossings. In case of multiple pipelines in the same trench, width of the trench shall be as per site condition or as directed by the OIL.
   k) Excavation of earth / trench cutting of suitable depth in places for identification of under ground pipeline / cables and other facilities and backfilling after identification. Cross trenching shall be carried out as directed by company / Engineer in charge. Measurement shall be on length of the trench required for identification. The report of the same shall be submitted in the prescribed format.

9. Welding Specifications:
    1. All the site Weldings should generally conform to IS 5822, IS 4353, IS 9595 and IS 816. The weld quality should be of radiography standard. The Electrodes to be used shall be finalized during Detailed Engineering.
    2. Qualification of Welders: EPC Contractor has to arrange for Welder's Qualification Test (WQT) for Welders, Welding Procedure, Welding Rod proposed to be used as per API 1104. EPC Contractor has to collect the test piece from the company's pipe yard and make the test piece for welders test. Third party inspection agency shall be engaged by EPC Contractor and the credential of the TP have to be submitted. WQT procedure format, Welding rod Qualification format, radiography format and destructive test format shall be approved by the company . All the relevant document such as welding rod, machine have to be submitted before starting of the job. All machinaries equipment has to be arranged by the EPC Contractor at no extra cost to the company.

       After WQT, the Inspection Agency should recommend the welders that are to be engaged, procedure to be adopted and the electrodes to be used. If any change is required, the EPC CONTRACTOR has to take prior approval of the Company after recommendation from TPI.

       The following documents have to be submitted by the EPC CONTRACTOR after recommendation from the Inspection Agency
       i) Recommended Procedure
       ii) Recommended electrodes
       iii) Recommended welders that are to be engaged

    3. The stringer bead must approach full and complete penetration throughout the periphery of the weld and preferably build up a small reinforcement at the root. The #Hot Pass# or second bead shall be run completely around the pipe immediately after the stringer bead has been run and cleaned. No two beads shall be started at the same point. All slag and scale shall be removed by power tools from each bead for visual inspection immediately after each bead is run. Welding shall be continuous and uninterrupted during a pass. While the welding is in progress care should be taken to avoid any kind of movement of the components, shocks, vibrations and stresses to prevent occurrence of weld cracks.
    4. Inspection of Weld Joints:
        i. Radiographic examination (maximum 30% of the weld joints) of weld joints shall be carried out by the Inspection agency engaged by the EPC CONTRACTOR. Radiography reports issued by the Inspection Agency along with the radiography films shall be submitted to PMC/OIL for acceptance.
        ii. EPC Contractor shall engage qualified Radiographer having valid certificate from BARC (Bhaba Atomic Research Centre) and shall use approved remote Camera. The EPC Contractor shall also comply with all the latest norms relating to radiation safety as stipulated by BARC
    5. Repair of Welds: With the prior permission of OIL, welds which do not comply with the standards of acceptability shall be repaired, the joint cut out and re-welded at the cost of THE EPC CONTRACTOR entirely including the radiography cost. Repairs are limited to a maximum 30% of the weld length.
10. Coating of Field/Weld Joints:
        i. All coated pipes, however, has uncoated areas of three to six inches from each end to prevent the coating from interfering with the welding process. Once the welds are made, the uncoated area including the weld joint shall be coated before the pipeline is lowered into the trench.
        ii. Field joint anti-corrosion coating material shall be heat shrinkable wraparound sleeve. Documentary evidence of conformance to specification shall be submitted to the Company for acceptance of the supply prior to application. Materials shall be stored in sheltered storage away from direct sunlight.

iii. Application of Heat shrinkable joint sleeve on weld joint by cleaning of exterior surface of pipes by sand blasting/ suitable means and subsequent priming of cleaned surfaces. The Heat shrinkable joint sleeve shall then be wrapped around the welding joint by applying heat and proper pressure by suitable means.

iv. Application of Heat shrinkable joint sleeve on weld joint by Cleaning of exterior surface of pipes by sand blasting and subsequent priming of cleaned surfaces. The Heat shrinkable joint sleeve shall be supplied by EPC Contractor. All equipment materials for cleaning and sand blasting should be arrange by the EPC Contractor welded pipeline shall be done in conformity to the code AWWAC-203. The coated pipe shall be subjected to Holiday Detection test for perfection. Defective section of the pipes shall be repaired at EPC Contractor's cost. The Holiday testing shall be carried out by Company's personnel or Third party Inspectors. The EPC Contractor shall provide assistance during the testing operation.

v. Holiday Testing: All the joint coatings shall be tested for defects by Holiday Test at 12-15KV and 5% of the joint coating shall be tested at random for peel strength. Holiday and the peel test including repair of the peel test location shall be done by the EPC Contractor at no extra cost to the COMPANY. All defects shall be repaired at EPC Contractor's cost. Providing the services of Holiday inspection. The job involvement is providing the holiday detector machine with all accessories for inspection of coating of the pipe. The pipeline Holiday inspection shall be carried out by the EPC C Contractor's personnel at minimum 15 KV. All defects shall be repaired at EPC Contractor's cost

vi. If a field joint coating is detected to be unacceptable after holiday test the EPC Contractor shall, at his own cost:
- Determine the cause of the faulty results of the field coating.
- Mobilize the expert of manufacturer, if required.
- Test to the complete satisfaction of the Company, already completed field coatings.
- Stop field coating until remedial measures are taken against the causes of such faults, to the entire satisfaction of the Company.

a) EPC EPC Contractor shall replace all joint coating found or expected to be unacceptable.
b) EPC EPC Contractor shall, at his own cost repair all areas where the coating has been removed for testing by the Company.
c) The Company shall be entitled to check the joint sleeve coating before burial with suitable means and if coating defect in any joint is established, the EPC Contractor shall be responsible for repairing the coating and retesting it at no cost to the Company.

11. Testing of Pipeline Coating:

i. Prior to laying of the pipe lines, coating defects shall be identified by holiday test and recorded. Any coating defect detected by holiday test shall be repaired by the EPC Contractor at no extra cost to the OIL.

ii. Before lowering of the pipeline into the trench the EPC Contractor shall carry out holiday test under the supervision of OIL/PMC's representative/s. All holidays and defective coating disclosed by visual inspection and holiday detector tests shall be repaired by THE EPC CONTRACTOR to the satisfaction of the OIL/PMC's representative/s at no extra cost to OIL.

iii. Detail specification of the Holiday Test Machine shall be submitted to the Company for acceptance prior to deployment for holiday test.

12. Casing End Seal: Heat Shrinkable type Casing End Seal, Compatible with coal tar enamel/ 3LPE coating as per ANSI/ AWWAC203-91. Suitable for underground use on casing. Material:- Heat shrinkable, thick walled synthetic rubber with fibre-glass reinforcement and adhesive sealant. Type:- open type with pre-attended zipper of non-corrosive material having a covering flap with adhesive sealant. Heat shrinkable wraparound sleeve shall consist of radiation cross-linked, thermally stabilized, ultraviolet resistant semi-rigid polyolefin backing with a uniform thickness of high shear strength thermoplastic / co-polymer hot melt adhesive. The joint coating system shall consist of a solvent free epoxy primer applied to the pipe surface prior to sleeve application. The backing shall be provided with suitable means (thermo-chrome

paint, dimple, or other means) to indicate the desired heat during shrinking in field is attained. The sleeve shall be supplied in pre-cut sizes to suit the pipe diameter and the requirements of overlap. The heat shrinkable wraparound sleeve shall have the required adhesive properties when applied on various commercial pre-coating materials.

13. Lowering Pipe Into Trenches:
    i. Lowering of the coated & wrapped pipe to the bottom of the previously prepared trench without causing damage to the coating & wrapping. The bottom of the trench shall be smoothly contoured to accommodate pipe without causing strain to the pipe. The trench shall be inspected by the Company's representative before lowering the pipe. Any damage to the coating wrapping during handling shall be repaired at the contractor's cost. Contractor must arrange water pump to drain out the water from the trench before lowering the pipe. This item excludes all crossings
    ii. The welded pipe line shall be lowered into the trench as soon as possible after the coating is applied, tested and approved. When uncoated pipeline is laid, lowering shall be done after completion of the welding process. It is preferred that if trench, weather and coating conditions permit, the pipe be lowered immediately following the joint coating and testing, rather than being allowed to remain on skids for long.
    iii. Lowering of the coated & wrapped pipe to the bottom of the previously prepared trench without causing damage to the coating & wrapping. The bottom of the trench shall be smoothly contoured to accommodate pipe without causing strain to the pipe. The trench shall be inspected by the Company's representative before lowering the pipe. Any damage to the coating wrapping during handling shall be repaired at the contractor's cost. Contractor must arrange water pump to drain out the water from the trench before lowering the pipe. This item excludes all crossings.
    iv. At the time of lowering in, the trench must present an even and smooth bottom and be entirely free of roots, caving, loose rock, welding rods or other debris. Should water be present it shall be pumped out at no extra cost before lowering so that the trench may be seen to conform to the specification there of. If necessary, such pumping shall be done in sections formed between previous backfill and temporary earth dams placed in the trench. The vertical and lateral bends of the lowered line must fit the trench. THE EPC CONTRACTOR shall, at its expense do whatever hand work is necessary to ensure these proper clearances.
    v. Coated pipe shall not be handled or moved by means of cables or chains or by prying with skids or bars, but by lifting hoist equipped with belt slings.

14. Backfilling and Dressing of Trench:
    i. The back filling operations shall follow as closely as possible to lowering in of the pipe, provided that the pipe has been lowered to its correct depth. No trench shall be back filled unless the pipe has a proper fit therein and has the required space for cover. The OIL's/PMC's representative/s shall have the right to require uncovering of the pipe at certain locations for examination. The cost of uncovering and refilling shall be borne by THE EPC CONTRACTOR. After the trench has been initially filled, earth shall be neatly crowned over the trench.
    ii. When the trench has been dug through drive way, streets, roads, drains, canals, embankments etc. all backfill shall be thoroughly compacted to their original contour.
    iii. After lowering the pipe the trench should be backfilled with previously cut out earth including ramming without watering so that the pipeline is covered. The top of the backfilled trench shall be 150 mm over the original level for visual identification & settlement in future.
    iv. Following the installation and back filling of the pipeline, THE EPC CONTRACTOR shall clear the right-of-way and its surrounding ground, and shall dispose of all waste materials, debris resulting from its operations.

15. Hydraulic Testing:

i. After the back filling operation has been completed, hydrostatic test shall be performed on the entire length of the pipeline, i.e. all welds have been accepted and pipeline has been laid and back filled according to the specifications. The test media shall be fresh water. The water to be used shall not be contaminated and free from sand / silts. After completion of all pre-requisites for testing and obtaining approval from the OIL/PMC's representative/s, the whole length of the pipeline shall be filled with water.

ii. The charts from the pressure recording instruments during the pressurizing and test operations shall be preserved for OIL as official records of the tests. The charts shall be properly identified and signed by OIL/PMC as being true records of the test involved. All failures shall be numerically and chronologically numbered and reported with appropriate description and date. Failures on the line disclosed by loss of pressure shall be located and repaired by THE EPC CONTRACTOR. Cost of such repairs shall be borne by THE EPC CONTRACTOR except when the failure results from defective pipe or fittings. After any leaks or failure disclosed by the pressure test have been repaired, the test shall be repeated until the specified test pressure can be satisfactorily maintained.

iii. The hydrostatic test shall be considered as positive if pressure has kept a constant value throughout the test duration except for change due to temperature effects.

iv. All necessary precautionary measures shall be taken by THE EPC CONTRACTOR during the period of hydrostatic testing.

v. All pumps, suction and delivery lines, water required for the job to be arranged by the EPC CONTRACTOR at his own expense.

vi. The Pressure and duration of the Testing shall be finalized during detailed engineering.

vii. THE EPC CONTRACTOR will de-pressurize the pipe line by bleeding after testing.

viii. The contractor shall engage sufficient number of competent people over the entire line to keep vigilance on the line during the test. In case of failure, the contractor shall locate it and report to the OIL/PMC's representative. Any failure due to contractor's bad workmanship shall be rectified at contractor's cost. The contractor shall also repeat the pressure test free of charge. The detailed report shall be submitted.

16. Tipling River Crossing: The crossing of Tipling River by the pipe line should be done by means of construction of a steel bridge as below:

a) Design features: The design process encompasses the whole range of activities from initial selection of the basic form of the bridge , through the sizing of individual elements to detailed numerical checking against recognized criteria.
Adequacy of structural performance is measured against three basic criteria: strength, fatigue endurance and deformation performance. The first step in the design process is to identify and understand the client and project requirements (this includes obtaining the relevant standards). A key aspect of those requirements is the bridge loading.

b) Design basis: BS 5400 adopts a limit state approach, in which "nominal loads" are multiplied by 'load factors' to derive 'design loads'.These design loads are then applied to the structure in isolation or in combination to determine the most adverse internal forces (bending moments, shears etc) which are in turn utilized to calculate resultant "design load effects"

c) Loads: The loading shall confirm to the IS standard IS 800:2007, various Dead load, live load etc.
The design shall be carried out as per IS 800:2007 and the design shall be vetted by any Indian Institute of technology / Indian Institute of science.

d) Materials: The steel confirm to IS 800:2007.The provisions are applicable to the steels commonly used in steel construction, namely, structural mild steel and high tensile structural steel.

e) All the structural steel used in general construction, coming under the purview of this standard shall before fabrication conform to IS 2062.

f) Structural steel other than those specified may also be used provided that the permissible stresses and other design provisions are suitably modified and the steel is also suitable for the type of fabrication adopted.

g) Foundation: Before execution of the structure, specified geotechnical investigation shall be carried out. The footing shall be done as per the specifications recommended by the experts. The material used for construction shall confirm BIS standards.

h) Specification for Fabrication and Erection of Steel Bridges:

Code	Code No	Title of the Code
IS	34	Basic carbonate of lead for paints.
IS	51	Zinc chrome for paints.
IS	57	Red lead for paints and other purposes.
IS	75	Linseed oil, raw and refined.
IS	77	Linseed oil, boiled for paints.
IS	102	Ready mixed paint, brushing, red lead, non-setting, priming.
IS	104	Ready mixed paint, brushing, zinc chrome, priming
IS	123	Ready mixed paint, brushing, finishing, semi gloss,for general purposes to Indian Standard colours.
IS	209	Zinc ingot.
IS	210	Grey iron casting
IS	549	Split pins.
IS	808	Dimensions for hot rolled steel beam, coloumn, channel and angle sections
IS	814	Covered electrodes for manual metal-arc welding of carbon and carbon manganese steel
IS	816	Code of practice for use of metal-arc welding for general construction in mild steel
IS	822	Code of procedure for inspection of welds
IS	887	Animal tallow
IS	958	Temporary corrosion preventive grease, soft film, cold application
IS	962	Code of practice for architectural and building drawings
IS	1030	Carbon steel castings for general engineering purposes
IS	1148	Hot rolled steel rivet bars (upto 40mm dia) for structural purposes
IS	1149	High tensile steel rivet bars for structural purpose.
IS	1363	Hexagon head bolts, screws and nuts of product grade C
IS	1364	Hexagon head bolts, screws and nuts of product grade A and B.
IS	1367	Technical supply conditions for threaded fasteners.
IS	1458	Railway bronze ingots and castings.
IS	1673	Mild steel wire cold heading quality.
IS	1730	Steel plates, sheets, strips and flats for structural and general engineering purposes-dimensions
IS	1745	Petroleum hydrocarbon solvents
IS	1852	Rolling and cutting tolerances for hot rolled steel products
IS	1875	Carbon steel billets, blooms, slabs and bars for forging
IS	1929	Hot forged steel rivets for hot closing (12 to 36 mm diameter).
IS	2002	Steel plates for pressure vessels for intermediate and high temperature service including boilers.
IS	2004	Carbon steel forging for general engineering purposes.
IS	2016	Plain washers.
IS	2062	Hot Rolled Low, Medium & High Tensile Structural Steel.
IS	2074	Ready mixed paint, air drying, red oxide-zinc chrome, priming
IS	2339	Aluminium paint for general purposes, in dual container
IS	2590	Primary aluminium ingots for remeltingforgeneralengineering purposes.

Code	Code No	Title of the Code
IS	2638	Flat split cotters.
IS	3063	Fastners-single coil rectangular section spring washers
IS	3502	Steel chequered plates.
IS	4899	Ferritic and martensitic steel casting for use at low temperatures.
IS	5369	General requirements for plain washers and lock washers.
IS	5372	Taper washers for channels.
IS	5374	Taper washers for I beams.
IS	5666	Etch primer.
IS	5905	Sprayed aluminium and zinc coatings on iron and steel.
IS	6586	Recommended practice for metal spraying for protection of iron steel.
IS	6610	Heavy washers for steel structures.
IS	7215	Tolerances for fabrication of steel structures
IS	7283	Hot rolled bars for production of bright bars and machined parts for engineering applications.
IS	9954	Pictorial surface preparation standards for painting of steel surfaces
IS	9595	Metal-arc welding of carbon and carbon manganese steels-recommendations.

i) The bridge shall be constructed/designed as per the recent code of practice and specification. Any code / specification not available in Indian Standards , Equivalent foreign codes such as AASHTO , BS codes , euro codes, Anto codes shall be adopted.

17. Hooking up and Handing Over: The Pipe Line is to be hooked up to the Pontoon Type Raw Water Plant and 8 MGD WTP as advised by OIL/PMC or as finalized during detailed engineering. The Pipe Line complete in all aspects after all tests and inspections to be handed over to OIL with all stipulated certificates and documents.

SECTION – V

Project Title:

DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, SUPPLY, CONSTRUCTION AND COMMISSIONING ON LSTK BASIS OF PONTOON TYPE RAW WATER IN-TAKE PLANT AT DULIAJAN, ASSAM, INDIA

SCOPE OF WORK

ELECTRICAL ENGINEERING

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SECTION III: ELECTRICAL ENGINEERING

PART I - INTRODUCTION AND BRIEF SCOPE OF WORK

1.0 Introduction

The Scope of work of Electrical Engineering shall consist of design, detailed engineering, procurement of materials, supply, fabrication / manufacturing, inspection, testing, installation and Commissioning all the equipment as per equipment list, SLD/P&IDs enclosed and in accordance with Design basis.

The electrical Scope of work includes the complete electrical design package, such as RMU Yard, Transformer Yard, Electrical Panel room ,high mast/Area lighting, street lighting, indoor lighting, HVAC (if required), equipment earthing.

The main electrical power requirement of the Raw Water intake plant shall be catered to by OIL's captive power. The electrical power is to be tapped from the existing overhead 11 KV feeder at Tipling. There shall be 2 nos. of 11kV feeders to be taken to Raw water intake plant. One of the feeder shall be directly laid from Tipling to the Raw water intake plant and the second feeder shall be from Tipling to the Raw water plant through an 11KV RMU to be installed at Balighat area. The approx. distance from Tipling to the Raw water plant is approximately 2.0 km and from Balighat to raw water plant is approximately 1.6 km. Suitably rated separate Diesel Generating (DG) Sets for catering to the process and certain lighting loads shall have also to be installed for catering to power supply in case of any power failure.

All electrical works including design, procurement, testing, installation (inclusive of the underground cable laying), commissioning and approval from CEA (Central Electricity Authority) required for Raw water intake plant shall be under the scope of the LSTK Contractor. All connections with required termination kit for both the feeders shall be in the scope of the contractor however OIL shall provide power shutdown to existing 11Kv feeder.

The electrical power system shall consist of High Voltage 11KV, 50Hz, 3-Phase and Low Voltage network operating on a 415/240 volt, 3 Phase, 50 Hz (+5%). Transformer (11KV/415V, 1250 KVA 100% Stand-by) with neutral earthed system will be used for stepping down the voltage for end use. OIL HT network will be tapped for power. Fault levels for all equipments shall be suitably rated with fault levels of 35KA, 25KA, 18KA and 12 KA for 1-3 seconds at various levels of voltage.

The Complete Electrical System should be as:

- High Voltage 11KV, 50Hz, 3-Phase.
- Low Voltage network is operating on a 415/240 volt, 3 Phase, 50 Hz (+5%).
- Transformer 11KV/415V, neutral solid earthed system is adopted.
- Diesel Generators Three phase 415V, 50 Hz
- NB: Raw Water Intake Plant with 2 Nos. 250 KW each working and 2 Nos. 250 KW standby motors are considered.

STATUTORY REQUIREMENT FOR WORK:

1. The contractor should have valid Electrical Contractor License issued or recognized/endorsed by State Licensing Board, Govt. of Assam. In case license expires during contract period the same shall be renewed by the contractor. The contract may be terminated if the license is not renewed.
2. In case the contractor/firm does not possess Electrical Contractor License, he/the firm may form a consortium with another person/firm who/which possesses valid Electrical Contractor License issued or recognized/endorsed by State Licensing Board, Govt. of Assam. In such a case, the partner having the valid Electrical contractor license shall be responsible for executing the electrical portion of the contract as per stipulations detailed in the tender. The relevant portion of BEC/BRC shall be referred to in this context.
3. Contractor shall employ work persons with valid wireman permit (covering relevant portions), issued/recognised by State Licensing Board, Govt. of Assam to carry out all electrical jobs and shall deploy supervisor holding valid Electrical supervisor's competency certificate (covering relevant portions), issued/recognized/endorsed by State Licensing Board, Govt. of Assam for supervision of electrical jobs.
4. Validity of all certificates/permits/licenses mentioned above shall be reckoned as on the original bid closing date.
5. Quality of jobs carried out by the Contractor shall be of high standard and should be as per the norms of BIS, NEC, CEA Regulations and other electrical standards recognized by the company."

The following table details the Electrical Power Demand:

Sl. No.	Designation	Power Demand in KW	Transformer Capacity in KVA	Generator Capacity in KVA
				For Process Critical Equipment and Lighting load
1.	**Raw Water Intake Plant**	750 KW	1250KVA	500 KVA (Minimum)

1.1 Item Description

The following minimum items / equipment have been suggested in the FEED by the PMC for the Pontoon Type Raw Water Intake Plant w.r.t Electrical Engineering. For equipment details please refer to tentative Bill of Quantity (BOQ).

Sl. No.	Description	Quantity	Details
	I. Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of 11 KV System		
1.	11 kV Ring Main Unit (RMU)	01 (One) No.	Design, Procurement/ Fabrication Supply, installation, testing, inspection and commissioning of 11 KV, 630A, 25KA, 4 Way

			Extensible, Outdoor, Motorized RMU Comprising of 4 VCB TYPE: VVVV+M. SF6 insulated, 11kV extensible Outdoor Motor Operated ring main unit contained within a metal clad enclosure having degree of protection to IP-54, suitable for Outdoor use, free standing. Auxiliary power supply for motor and Indication shall be self-contained in the RMU. NB: The RMU is to be installed at Balighat area
2.	11 kV HT Panel	01 (One) No.	Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of 11 kV Indoor Switchgear at Raw water intake plant, weather proof Indoor Panel with IP52 or better protection grade with 3ph ,50 cycle VCB panel conforming to IEC 62271-200 suitable for Indoor installation. Necessary adopter/BUS trunk panel shall be supplied along with breaker panel.
3.	DCDB and Battery Charger Panel	01 No.	Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of Batteries (110 V, 150 AH), Battery Chargers & D.C.D.B. Battery charger (trickle/boost) shall be Dual float cum Boost charger (FCBC) complete with transformer, rectifier, semiconductor devices, resistors, indicating instruments (ammeter/ voltmeter) on AC and DC sides, lamps, selector switches, etc., The continuous rating of the bridge shall be around 20 A for 180 AH and transformer rated for 100 VA continuously. The battery charger shall be such that if one FCBC fails, the other one will be able to take the full on -line load as well as battery charging current.
	II. Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of Transformers		
1.	1250 KVA Transformer	02 (Two) Nos.	Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of Oil immersed naturally cooled continuous duty with Copper winding 1250 KVA

			11000/415 volts 3 Ph 50Hz DYn. 11 vector group Distribution Transformer fitted with the all requisite accessories suitable for outdoor installation. The Distribution Transformer should conform to IEC 60076: Power transformers.
III. Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of LT Panel, MCC Panel and Capacitor Panel			
1.	Main LT Panel	01 No.	Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of 415V Main LT Indoor Switchgear Panel with IP52 or better protection grade Suitable for 3ph ,50 Hz supply fitted with ACB and MCCB conforming to IS:8623suitable for Indoor installation with the necessary accessories. Incomer Feeder with ACB Outgoing feeder with ACB Outgoing feeder with MCCB Area lighting feeder with timer and Contactor
2.	Capacitor Panel	01 No.	Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of Capacitor Panel. The panel shall be adequate to handle System impedance. Timers, automatic power factor controller unit of suitable capacity shall be provided with 6 taps (contactors) which can switch on the individual bank of capacitor such that the power factor shall not be less than 0.9 lag. The panel shall be complete with required bank of capacitors. The connection of the APF panel shall be such that when working on D.G set, the supply to this panel shall be switched off. The capacitor banks shall be suitable for operating pumpsets in solo or parallel operation.
3.	Backwash Pump MCC Panel	01 No.	Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of 415V Back wash pump LT Switchgear MCC Indoor Panel with IP52 or better protection grade suitable for 3ph ,50Hz supply fitted with ACB's and MCCB's conforming to

			IS:8623 suitable for Indoor installation with the necessary accessories. Incomer with feeder with MCCB Outgoing feeder with MCCB
4.	Pontoon MCC Panel	02 Nos.	Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of 415V Pontoon pump supply LT Switchgear Panel with IP52 or better protection grade suitable for 3ph, 50 Hz supply fitted with ACBs and MCCBs conforming to IS: 8623 suitable for Indoor installation with the necessary accessories. Incomer Feeder with MCCB Outgoing feeder with MCCB
IV. Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of Motors and Starters			
1.	EMD Centrifugal Raw water pumpsets	4 Nos.	
2.	EMD Back wash Pumps	2Nos.	
3.	Digital Soft Starter	06 Nos.	Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of Digital Soft Starter, Indoor Type, Suitable for 3 Phase, 415-volt, 50 Hz, 250 KW Motor and should have capacity to restrict the initial drawing current 2.5 to 3 times of the motor. The soft starter (panel) shall have incomer MCCB, main contractor, bypass contactor, overload relay, semiconductor fuses and other protection features for motor and the soft starter. The soft starters shall conform to IS/IEC 60947-4-2. Digital Soft Starter are for EMD Centrifugal Raw water pumpsets -04 Nos and EMD Back wash Pumps -02 Nos
V. Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of Emergency Diesel Engine Generator Set with AMF Panel			
1.	Diesel Engine Generator	01 No.	Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of

			Diesel Engine Generator . Indicative minimumrating : 500 KVA,400V, 3ph, 50HzDiesel Engine Generator based on plant critical load. Rating to be finalized during Detailed Engineering.
2.	DG AMF Panel	01No.	Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of AUTO MAINS FAILURE (AMF) Panel for indicated minimum 500 KVA at 0.8 pf 415V 50Hz 3-Ø DG set. The AMF panel shall have only DG breaker and additional cable to be laid for EB power failure sensing/ interlocking with the EB breaker of Main LT panel.
VI. Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of Cable HT			
1.	11 KV, 3CX 240Sqmm Aluminum armored XLPE cable	5.5 KM (Requirement indicated is approximate, to be finalized during Detailed Engineering base on site conditions)	Design, Procurement/ Fabrication, Supply, Installation, Laying, Testing and Commissioning of 2nos. 11 kV 3Cx 240sqmm incomer cable to be laid underground from 11kV overhead feeder at Tipling to 11 kV HT Panel located at Raw water intake plant.
2.	11 KV, 1CX120 Sqmm Aluminum armored XLPE cable	5.5 KM (Requirement indicated is approximate, to be finalized during Detailed Engineeri	Design, Procurement/ Fabrication, Supply, Installation, Laying, Testing and Commissioning of 2nos. 1Cx120sqmm PVC insulated Aluminum Conductor as earth wire to be laid along with Power cable as continuity conductor.

		ng base on site conditions)	
3.	11 kV , 1Cx240sqmm Copper armored XLPE cable	As required (Meter) (To be finalized during Detailed Engineering base on site conditions)	Design, Procurement/ Fabrication, Supply, Installation, Laying, Testing and Commissioning of Copper conductor, armored cable to be laid in pucca trench inside the substation where trench shall be filled with sand. This cable shall be used from HT panel to HT side of transformer.
VII. Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of LT Cable			
1.	LT power and Control cables with Copper and Aluminium cores	As Required (Meter)	The LV power cables shall be 1100V grade, single/multi core stranded Copper/Aluminum conductor, extruded XLPE/PVC insulated with extruded PVC inner sheath, armoured and overall sheath with extruded Flame Retardant Low Smoke (FRLS) PVC compound (Type ST-1). These cables shall conform to IS 7098 (Part I) for XLPE and 1554(part 1) for PVC insulation. The control cables shall be 1100 V grade, multi core, stranded annealed high conductivity copper with extruded PVC insulated inner sheath, armoured and overall sheath with extruded Flame Retardant Low Smoke (FRLS) PVC compound (Type ST-1).
2.	From Transformer to LT Panel incomer	As required	Size:3RX3.5CX240Sqmm Copper armored cable or as per IS Standard_IS 7098 (Part I) . In case of conflict the IS Standard shall prevail.

3.	EDG Set to ATS Panel BreakerATS Breaker to LT Panel incomer	As required	Size:3RX3.5CX300Sqmm Aluminium armored cable or as per IS Standard_IS 7098 (Part I). In case of conflict the IS Standard shall prevail.
4.	From LT panel to incomer of Pontoon Motor MCC Panel	As required	Size:2RX3.5CX400 Sqmmaluminium armored cable or as per IS Standard_IS 7098 (Part I) . In case of conflict the IS Standard shall prevail.
5.	Pontoon motor MCC Panel to Starter	As required	Size:2RX3.5CX240 Sqmm aluminum armored cable or as per IS StandardIS 7098 (Part I) . In case of conflict the IS Standard shall prevail.
6.	Pontoon Motor Starter to Pontoon Motor	As required	Size:4RX3.5CX240 Sqmm aluminum armored cable or as per IS Standard_IS 7098 (Part I). In case of conflict the IS Standard shall prevail.
7.	LT panel to incomer of Backwash Motor MCC panel	As required	Size:3RX3.5CX240 Sqmm aluminum armored cable or as per IS Standard_IS 7098 (Part I) . In case of conflict the IS Standard shall prevail.
8.	Backwash Motor MCC panel to Starter	As required	Size:2RX3.5CX240 Sqmm aluminum armored cable or as per IS StandardIS 7098 (Part I) . In case of conflict the IS Standard shall prevail.
9.	Backwash starter to Backwash Motor	As required	Size:2RX3.5CX185Sqmm aluminum armored cable or as per IS StandardIS 7098 (Part I) . In case of conflict the IS Standard shall prevail.
10.	From LT panel to Lighting VTPN DB	As required	Size:1RX3.5CX50Sqmm aluminum armored cable or as per IS StandardIS 7098 (Part I) . In case of conflict the IS Standard shall prevail.
11.	From VTPN DB to SPNDB	As required	Size:1RX3.5CX25Sqmm aluminum armored cable or as per IS StandardIS 7098 (Part I) . In case of conflict the IS Standard shall prevail.
12.	LT Panel to Area light DB	As required	Size:1RX3.5CX25 Sqmm aluminum armored cable or as per IS StandardIS 7098 (Part I) . In case of conflict the IS Standard shall prevail.
13.	Area Light DB to Area Light	As required	Size:1RX3.5CX25 Sqmm aluminum armored cable or as per IS StandardIS 7098 (Part I).

			In case of conflict the IS Standard shall prevail.
14.	Control Cable(Copper armored)	As required	1).Size:10CX2.5Sqmm 2).Size:7CX2.5Sqmm 3).Size:4CX2.5Sqmm 4).Size:2CX2.5Sqmm or as per IS StandardIS 7098 (Part I) . In case of conflict the IS Standard shall prevail.
	VIII. Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of Earthing System		
1.	Chemical Earth Electrode	1 Set	Supply and burying suitably rated Chemical electrode with suitable chemical for soil treatment and providing masonry enclosure size 600mmx 600mm x600mm with RCC cover plate having 2nos. metallic hooks for lifting cover and funnel type arrangement for watering pipe etc. complete as required - Minimum Qty.- 15 Nos. The no. of earth electrodes may be more. The value of earth resistance to be maintained for each substation when connected all the earth electrodes together <1 Ohm.
2.	Chemical for Earth Electrode	As required	Extra chemical for filling soil earthing electrode as required.
3.	Earth Bus	As required	Providing and fixing earth bus of 50mm x 6 mm G.I strip on surface for connection etc. As required
4.	Aluminium Cable for Earth Electrode Connection	As required	Providing and laying of single core 120sqmm, PVC insulated, aluminium conductor for connection from earth electrode as required.
	IX. Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of Building and outside Electrification and Illumination		
1.	Lighting Distribution Panel	03 No.	Indoor Panel with IP52 or better protection grade with 3ph, 50 Hz supply with Four pole incomer MCCB and outgoing with MCBs of adequate capacity. Panel conforming to IS/IEC-8623, 60947, 12640.
2.	Electrification of substation Building	As required	The wiring of substation building is required to be carried out by PVC insulated, PVC sheathed, armoured , copper conductor, fire retardant , low smoke, 1.1 KV grade cable

			for different sizes with all accessories ~~as given below:~~
	X. Design, Procurement/ Fabrication, Supply, Installation, Testing and Commissioning of Safety Equipment		
1.	Providing & fixing danger plates made of mild steel at least 2mm thick & vitreous enamelled white on both sides & with inscriptions in signal red colour on front side as read in triangular languages	1 SET	a. High Voltage(11kV)- size 250mm x 200mm b. Medium Voltage(440Vz – size 200mm x 150mm
2.	Providing and fixing carbon dioxide (CO2) type fire extinguishers confirming to IS 2878-1976 and cylinders fully charged of following capacity. (a) 4.5KG	1 SET	
3.	Providing of set of 4 Nos. 9.5 Litre capacity GI bucket painted in post office red colour with prior coat of red oxide paint and written with white paint 'FIRE' and mounted on MS angle iron frame with bracket of appropriate size & capacity I/c filling sand etc.	1 SET	

4.	Providing First Aid Box as approved by St. John Ambulance Brigade/Indian Red Cross conforming to IS 2217-1963	1 SET	
5.	Supply & fixing shock treatment chart duly mounted on a wooden frame with 5mm thick glass as reqd. (approximate front area 1.20sq.metre)	1 SET	
6.	Providing of insulating mats 1 mtr. wide and 3mm thick suitable for 11KV working voltage as per IS 15652/2006	1 SET	
7.	Providing of insulating mats 1 mtr. wide and 2mm thick suitable for 1000V working voltage as per IS 15652/2006	1 SET	
8.	Lock out Tag out for all VCBs, ACBs and MCCBs	1 SET	

Note: The concept Plant lay out drawings/ SLDs are attached for reference purpose.

Drawing Nos:

1. SECON/OIL/WS/EE/SLD-01
2. SECON/OIL/WS/EE/LP-01
3. SECON/OIL/WS/EE/BS-01
4. SECON/OIL/WS/EE/BS-02

1.2 Detailed Engineering Deliverables

The deliverables of Electrical Engineering detailed engineering are broadly defined hereunder. [The LSTK/EPC Contractor shall add any additional item(s) for satisfactory and efficient completion of the project].

1.3 Drawings to be Submitted

The tender specifications shall indicate for a particular job the reference drawings to help the contractor to work out the tender.

The tender specifications indicate, for a particular scope of work, the requirement of submission of all electrical drawings, such as schematics, single line diagram, wiring diagram, GA drawings, protection schemes; calculation of sizing of equipment, rated current, fault current, earth fault current, earthing schematic, illumination calculation for both outdoor and indoor etc.

The drawings and documents, as above, shall be submitted in stages. A tentative single line diagram of substation is attached for understanding knowing the scheme of RMU, HT transmission cable, HT Panel, Transformer and LT Panel.

1.3.1 Drawings to be Submitted for Approval

The contractor shall submit the following drawings within 60 days of the award of the work or as specified in tender document which shall be approved by OIL.

(i) Civil drawings of the building to be submitted for approval.
(ii) Details of foundations for the equipment
(iii) General arrangement drawing of 11kV RMU, H.T Panel, Transformers, LT panels, Earthing, Cable route etc. including details of grouting of channels / bolts of various equipment.
(iv) All panels' schematics & wiring diagram including control wiring.
(v) Cable layout between RMU, HT panel boards, transformers & LT panel etc.
(vi) Earthing Layout
(vii) Substation Layout including lighting and provision for HVAC (If required)
(viii) Single line diagram comprising of HT side, LT side, Transformer, DG set, RMU, Lighting DBs etc.
(ix) Schematics of HT panel, LT panel including all MCC panels, Lighting DBs, DC power and Lighting control
(x) Bar-chart indicating general program for
(i) Civil work
(ii) Electrical work plan for supply, installation, testing and commissioning and handing over.
(xi) Any other drawing or data that may be necessary for the job along with complete bill of material must be submitted to OIL for approval.

The manufacture of panel should start after approval of the drawings by OIL.

1.3.2 Drawings to be submitted while handing over installation

Three Four Sets of complete drawings comprising the following shall be submitted by the contractor while handing over the installation.

(i) Equipment layout drawing (s) giving complete details of the entire equipment.
(ii) Electrical drawings for the entire electrical equipment showing cable sizes, equipment capacities, switch-gear's ratings, control components, control wiring etc.
(iii) Schematic diagram of the entire sub-station installation.
(iv) The following drawings needs to be submitted:-

- GA, Front and interior layout showing all the components
- Wiring drawings and terminal connections
- Installation details including manuals
- Equipment maintenance and instruction manuals
- Electronic equipment manuals and settings
- Fuse ratings and characteristic curves
- Equipment and component datasheets
- Weights and measurements
- Schematics
- Equipment specifications
- Motor datasheets
- Circuit breaker settings
- Line diagrams
- Battery details including amp-hour ratings
- Relay settings and relay discrimination curves
- Data sheets and environment limitations
- HVAC requirements (if required)
- Manufacturing data books
- Spare parts lists etc.

- Earthing layout drawing
- Any other Drawing required for complete Engineering /Design/ execution / commissioning.

1.4 Documents to be Submitted

1.4.1 Documents to be Submitted with BID

Schematics and General arrangement drawings of the RMU, HT panel, LT Panel, Transformer and DG Set, panel room, tentative equipment ratings, plinth layout for all equipment etc.

(a) RMU

(i) Detail as per technical specification mentioned in Annexure I.

(ii) Copy of report of type tests done on similar RMU at CPRI/NABL accredited laboratory.

(iii) An undertaking from the panel manufacturer stating that in the event of an order on the party bidder the panel manufacturer will supply the RMU through the party bidder as per specifications of the tender and order.

(b) HT Panel

(i) Detail as per technical specification mentioned in Annexure I.

(ii) Copy of report of type tests done on similar panel & VCB at CPRI/NABL accredited laboratory.

(iii) An undertaking from the panel manufacturer stating that in the event of an order on the party bidder the panel manufacturer will supply the panel through the party bidder as per specifications of the tender and order.

(c) LT Panel

(i) Detail as per technical specification mentioned in Annexure I

(ii) Type test certificate from reputed laboratory accredited by National Accreditation Board for testing and calibration Laboratories (NABL) or CPRI India for Short time current withstand test (50 kA for 1 sec), ingress protection and temperature rise test of the panel.

(iii) Deviation of offer from tender specifications with justification and backup documents from principal wherever required. All deviations shall be subjected to acceptance by OIL in writing.

(d) Transformer

(i) Detail as per technical specification mentioned in Annexure I.

(ii) The transformer shall be type tested and following CPRI/NABL accredited laboratory Type test certificates on similar transformer of specified rating should be furnished along with the quotation. These type test certificates should not be more than 5 (five) years old on the date of bid opening. Recommended list of spares with part no. & price for maintenance of panels shall be provided with the supply (not considered for evaluation).

1.4.2 Documents to be Submitted before and with Supply

The successful bidder shall submit the following sizing/calculation documents within 60 days of award of contract for prior approval and before approval/supply of equipment.

(a) Calculations

(i) Sizing of equipment- pontoon pump drive motors, soft starters, auxiliary motors (filter backwash pumps etc.)
(ii) Calculation of rated current, busbar size and incoming and outgoing breakers of LT panel & HT panel
(iii) Cable sizing and cable sizing calculations
(iv) Fault current calculations on LT and HT, RMU, HT cable
(v) No load loss, copper loss, temp. rise calculations on transformers
(vi) Earth resistance and earth fault current calculations
(vii) Illumination calculation for both outdoor and indoor
(viii) DG set sizing calculations (critical load EDG set)

The successful bidder shall obtain prior approval for the following documents which are to be submitted with supply of the equipment. All documents shall be submitted within 60 days of award of work. OIL shall require minimum 60 days' time for approval of drawings and documents. The approval time may increase depending upon clarifications required from the bidders.

(b) RMU

(i) Four sets of installation, testing and commissioning & operation manual
(ii) Four sets of literature of main components like protection & auxiliary relays
(iii) Four copies of general arrangement, schematic diagram and wiring diagrams.

(iv) Two copies of foundation drawings.

(v) Four sets of routine test reports containing result of tests done at manufacture's work during inspection.

(vi) Four copies of Guarantee certificate duly signed by the contractor/vendor.

(vii) Recommended list of spares with part no. & price for maintenance of panel (not considered for evaluation).

(c) HT Panel

(i) Four sets of installation, testing and commissioning & operation manual of the Panels and Vacuum Circuit Breaker (VCB).

(ii) Four sets of literature of main components like protection & auxiliary relays

(iii) Four copies of general arrangement, schematic diagram and wiring diagrams.

(iv) Two copies of foundation drawings.

(v) Four sets of routine test reports containing result of tests done at manufacture's work during inspection.

(vi) Four copies of Guarantee certificate duly signed by the contractor/vendor.

(vii) Recommended list of spares with part no. & price for maintenance of panel (not considered for evaluation).

(d) LT Panel

(i) Four sets of installation, testing and commissioning & operation manual of the Panel and Air Circuit Breaker (ACB) and MCCB.

(ii) Four sets of literature of main components like protection & auxiliary relays

(iii) Four copies of general arrangement, schematic diagram and wiring diagrams.

(iv) Two copies of foundation drawings.

(v) Four sets of routine test reports containing result of tests done at manufacture's work during inspection.

(vi) Four copies of Guarantee certificate duly signed by the contractor/vendor.

(vii) Recommended list of spares with part no. & price for maintenance of panel (not considered for evaluation).

(e) Transformer

(i) Four sets of installation, testing and commissioning & operation manual of the transformer(s).

(ii) Four copies of general arrangement and schematic diagram.

(iii) Two copies of foundation drawings.

(iv) Four sets of routine test reports containing result of tests done at manufacture's work during inspection.

(v) Four copies of Guarantee certificate duly signed by the contractor/vendor.

(vi) Recommended list of spares with part no. & price for maintenance of transformer (not considered for evaluation)

1.4.3 Documents to be submitted before and after Commencement of Installation and Commissioning

(i) Copies of all documents for routine, acceptance and type test certificates of the equipment carried out

(ii) The details of Pre Dispatch Inspection (If any) at manufacturers premise shall be furnished to OIL before installation of the equipment.

(iii) "As-built" drawings for all installed and commissioned equipment such as HT panels, LT panels, lighting panels, power DB panels, motor starter panels, pontoon lighting and power panels. This is essential as operational requirement and site conditions may require changes in drawings which were already approved. Once the field modifications have been executed, these shall be incorporated in the respective drawings and these modified drawings shall be marked as "As-Built" drawings and approved by PMC and OIL. Quantities of these "as-built" drawings will be same as "approved" drawings.

1.5 Procurement Datasheet

The LSTK CONTRACTOR should develop Procurement Data Sheets for procurement of Bought out Items. Such Procurement Data Sheets are to be approved by PMC/ OIL. They will also furnish Quality control System programs ("Quality Assurance Programme/Quality Control Programe") for the bought out items to PMC/OIL.

1.6 Design Guidelines

The LSTK CONTRACTOR shall ensure good engineering/international standards practice which is to be accepted by OIL/PMC in all respect of all the Electrical Engineering activities for the project.

Standard International / Indian Standard Codes, unless otherwise specified herein, shall be applicable for the project. In all cases, the latest revision of the codes shall be referred to.

1.8 Detailed Scope of Work

The detailed scope of work of for Electrical Engineering for this project is as hereunder

(1) Design of the complete electrical Power System
(2) 11kV Ring Main Unit
(3) 11 kV Indoor Switchgear Units
(4) Step down Transformers complete with associated auxiliaries as specified.
(5) 415 V Switchgear, APFC Panel, MCC and DB
(6) Diesel Generator (for critical system loads)
(7) Main Medium Voltage Electrical Panels
(8) Electric Motors, Starters and Protection
(9) Starter
(10) Electrical Motor
(11) Cables
(12) HT power cable
(13) Power Cables
(14) Low Voltage Cables
(15) Control and Instrumentation Cables
(16) Cable Duct/trenches including HT cable
(17) Minimum Separation of Cables
(18) Building lighting and power Services (including area and street lighting)
(19) Building wiring Systems
(20) Area and street illumination wiring
(21) Low Voltage Switchgears

1.9 General

(1) Scope
(2) Service Conditions
(3) Normative references
(4) Definition
(5) Switchboard types
(6) Switchboard Ratings
(7) General Requirements
(8) Required Structures
(9) Rating Plate
(10) Circuit Breaker types
(11) MCCB
(12) Indicating instruments and Meters
(13) Luminaires for both indoor and street/area lighting
(14) Street Lighting
(15) Switchboard Assembly Small Wiring
(16) Indicator Lights
(17) Socket Outlet

PART II: TECHNICAL SPECIFICATIONS FOR ELECTRICAL WORKS

CHAPTER - 1: DISTRIBUTION TRANSFORMERS

1.0 General and Service Conditions

Oil immersed naturally cooled continuous duty with Copper winding 1250 KVA 11 kV /415 volts 3 Ph, 50Hz DYn 11 vector group Distribution Transformer fitted with all requisite accessories suitable for outdoor installation. The Distribution Transformer should conform to IS: 2026/EC 60076: Power Transformers.

Normal service conditions. The transformers shall be installed at outdoors shall be suitable for continuous operation at the below site conditions.

(a) Maximum altitude: 1000 m (ASL)
(b) Site altitude: 150 mtrs.
(c) Maximum ambient air temperature: (+) 50^0 C
(d) Minimum ambient air temperature: (-) 10^0 C
(e) Monthly average temperature of the hottest month: 40^0 C
(f) Yearly average temperature: 30^0 C

1.1 Standards

The distribution transformers shall confirm to the latest edition of following international standards:

(a) IEC 60076/ IS:2026 Latest Edition: Power transformers
(b) IEC 60137: Insulated bushings for alternating voltages above 1000 V
(c) IEC 60228: Conductors of insulated cables
(d) IEC 60296: Specification for unused mineral insulating oil for transformers and Switchgear
(e) IEC 60354: Loading guide for oil-immersed power transformers
(f) IEC 60507: Artificial pollution tests on high-voltage insulators to be used on a.c. systems
(g) BS 171: Power transformers
(h) BS 6436: Specification for ground mounted distribution transformers for cable box or unit substation connection
(i) IS:10118(Part-1)-Latest EditionCode of practice for selection, installation and maintenance of switchgear and control gear: installation.
(j) IS:3043- Latest Edition Code of practice earthing .
(k) IS: 7098/II/85: XLPE Insulted HT

1.2 Rating

(a) The capacity of transformer shall be 1250 kVA
(b) The nominal primary voltage shall be 11 kV, 50 Hz and the highest voltage for equipment shall be 12 KV.
(c) The nominal secondary voltage shall be 415/240 V, 50 Hz. The neutral point shall be earthed.
(d) The primary winding connection shall be Δ connection (3-phase 3-wire) and the secondary winding

connection shall be Y (3-phase 4-wire) connection. Vector group shall be Dyn 11.

(e) The normal voltage ratio of the transformers at principal tapping shall be 11 kV /415 Volts.

(f) Type of insulation shall be Oil.

1.3 Required Structure

Type: The transformers shall be conservator type.

1.4 Off Circuit Tapping

The HV winding of the transformers shall have 5 tapping positions; they are principal tapping and ± 2.5% × 2 tapping positions operated by an off-circuit tapping switch clearly marked position indicator. Tapping position shall be visible at the safe distance. Tap changer shall have locking device.

Switching position of No. 1 shall correspond to maximum plus tapping. The contacts of the tap changer shall be of robust and shall have sufficient surface area. Insulating sleeves for the transformer tapping's shall be in crepe paper or better.

1.5 Cooling

Cooling system of the transformers shall be natural circulation of oil and air (ONAN).

1.6 Core

(a) The core shall be constructed of the best quality low loss, cold-rolled grain-oriented steel laminations confirming with the latest edition of IEC 60404. The core shall be assembled in a manner which reduces vibration and minimize inherent noise. Both sides of individual stampings shall be coated with an insulating material which shall be resistant against oil and temperature. The complete core shall be effectively earthed.

(b) The flux density in any part of the core shall not exceed 1.72 Tesla at nominal voltage and frequency. Thickness of a lamination shall not exceed 0.3 mm (M5).

(c) The core plates shall be insulated from one another to minimize the core loss and the core shall be held together by bolts and clamping plates all of which shall be adequately insulated. The completed core shall be provided with lifting eyes to facilitate its removal from the transformer tank and shall be adequately braced and supported to prevent movement during transit or service. It shall be possible to repair the active part easily.

1.7 Windings

(a) The windings shall be made of best soft drawn copper having a conductivity of 99.9% and complying with the requirements of the latest editions of relevant parts of IS 2026. The windings shall be designed to meet the three fundamental requirements: mechanical, thermal and electrical.

(b) The windings shall be capable of sustaining short circuit forces on the transformer as required in clause of this specification.

(c) All windings shall be fully insulated according to IEC 60076 for standard insulation level and for a system highest voltage of 12kV. And windings shall be wound with adequate bracing and securing tapes in order to achieve a strong, self-supporting structure. Adequate cooling ducts shall be

provided to ensure that temperature rise is within the permissible limits at normal operating conditions.

(d) The HV and LV windings shall be separated without difficulty for replacing each winding.

(e) Mounting of the winding to the transformer case shall be of vibration resistance pad placed uniformly in all direction.

1.8 Cable Boxes

(a) The transformer shall have HV and LV cable boxes. The HV and LV cable boxes shall be mounted on opposite sides of the tank and arranged for cables entering vertically from bottom.

(b) All cable boxes shall be completely/hermetically sealed and provided with sealing glands to suit cables. HV cable box shall be bolt connected type and suitable for terminating HV cable (Size to be confirmed by OIL).

(c) The cable boxes on the transformer shall be suitable for the above arrangement and shall be complete with all necessary fittings, suitable cable lugs, glands, armour clamp, etc. The cable boxes shall be suitable for approved type of heat shrinkable and pre-molded terminations.

(d) Both cable boxes should have detachable gland plates so as to comfortably terminate cables as per the above specifications.

1.9 Earthing Terminal

The transformer shall have provisions of neutral earthing (brought out terminal on the LV side) and body (equipment) earthing. Earthing terminal shall be parallel groove clamp type or I bolt type. The terminal shall have provisions to connect the earthing conductors of sufficient size for conducting calculated fault current. Transformer shall have provision for double earthing at two separate and distinct points as per IS: 3043.

1.10 Fittings

The transformer shall be completely assembled with all its fittings and supplied with first fill of oil. All bolts, nuts and all metal portions exposed to atmosphere continuously shall be treated suitably to withstand the weather conditions.

The fittings on transformer shall be offered and the following shall be considered as the minimum requirements.

(a) Off load tap changer
(b) Conservator vessel with oil filling hole and cap
(c) Breather with silica gel
(d) Oil level gauge
(e) Buchholz relay
(f) Marshalling box for connection of relay and temperature transmitter terminals (should be compatible with 240 V auxiliary source voltage
(g) Oil temperature indicator
(h) Tank earthing terminal
(i) Lifting lugs for lifting of whole transformer
(j) Valve at the bottom of the tank for oil filtering and drain
(k) Oil sampling cock
(l) Bi-directional rollers

(m) Lifting Hooks for easy loading and unloading of transformer at site

1.11 Silica Gel

Silica gel breather shall be liberally designed and shall contain sufficient quantity of gel to avoid the need for frequent replacement of the gel. The silica gel shall be free from toxic components.

1.12 Tank

(a) The transformer shall not leak of oil. Tank shall be fabricated of excellent quality mild steel. The tank shall be designed so that the completed transformer can be lifted and transported without deformation or oil leakage. The tank shall withstand pressures developed during normal and abnormal operation of the transformer without permanent deformation. The tank shall be electrically welded and tested for leaks.

(b) The cooling radiators shall be of pressed steel, electrically welded, and independently pressure tested. Radiators shall be welded to the main tank.

(c) The top cover of tank and radiator shall be designed in such a way that water does not accumulate. There shall be an oil level mark inside the tank that indicates proper oil level at 25^0 C of ambient temperature.

(d) The transformer undercarriage shall be provided with bi-directional rollers to allow longitudinal and transverse movement on flat surfaces.

1.13 Tank Finish

(i) The painting process of steel parts shall ensure that no corrosion takes place under severe climatic conditions. Prior to the painting of the tank, the cover and oil conservator shall be sandblasted or short-blasted for removal of mill and welding scale. The painting shall be made with a single coat of one-pack epoxy paint. The finishing paint shall be made with two or three coats.

(ii) The primer coat shall contain rust inhibitor, both oil and heat resistant. Secondary coats shall contain resistant components of salt spray, chemicals and humidity.

(iii) Minimum thickness of coats shall not less than average 60^0 C and shall not less than 80% at any point. The outside color of the tank shall be painted in grey.

1.14 Gaskets

All the gaskets used for sealing the tanks and connected external parts shall be made of NBR (Nitrile (Acrylonitrile) Butadiene Rubber) or better that totally prevents the leakage of oil and ingress of humidity and air to the oil and windings under all operating conditions. The minimum thickness shall be 6 mm. The gaskets shall not have any joint and shall withstand insulation oil. It shall not have variation of characteristics caused by temperature variation.

1.14.1 Short Circuit Impedance

The minimum short circuit impedance shall comply with this specification.

1.14.2 Minimum Short Circuit Impedance

The guaranteed short circuit impedance shall be stated by the supplier. The tolerance shall be ±10.0% of the declared value at principal tapping and ± 15.0% of the declared value at other tapping's.

1.14.3 Temperature Rise

The transformers shall be capable of carrying their full normal rated current continuously under the worst temperature conditions. Temperature rise of top oil shall not exceed 50^0 C as measured by thermometer and temperature rise of winding shall not exceed 55^0 C as measured by resistance.

1.14.4 Duty under Faults

The transformers shall be capable of sustaining a three-phase symmetrical short circuit on the LV side with the fault power maintained on the HV side without damage or distress at least 2 seconds.

1.14.5 Load and No-Load Losses

Load loss and no-load loss shall be stated by the supplier and shall not exceed the values of specification. Tolerance shall not exceed +15% of no-load loss, +15% of load loss and +10% of total loss.

1.14.6 No-Load Current

No-load current shall not exceed its specification. Tolerance shall not exceed +30% of the declared value.

1.14.7 Voltage Drop

The maximum voltage drop shall not exceed its specification. All values shall be measured at 1.0 power factor, 100% load and adjusted to 75^0 C.

1.14.9 Efficiency

The minimum efficiency shall be equal or exceed its specification. All values shall be measured at 1.0 power factor, 100% load and adjusted to 75^0 C.

1.14.10 Bushing

The electrical characteristics of bushings shall meet the requirements of IS 2099.

1.14.11Sound Level

All transformers with their accessories shall be designed and manufactured to reduce noise and vibration to acceptable level. The transformer shall be subjected to sound level measurement as per IEC 60076-10.

1.14.11 Insulation Oil

The transformer shall be supplied with being filled with mineral insulation oil. The characteristics of insulation oil shall meet the IEC 60296. The oil shall not be contaminated by Poly Chlorinated Biphenyls (PCB).

1.15 Testing and Inspection

The following tests shall be performed in conformation with Clause 10 of IS 2026 (Part 1) (2011).

1. Routine Test

(a) Measurement of winding resistance
(b) Measurement of voltage ratio and check of phase displacement
(c) Measurement of short-circuit impedance and load loss
(d) Measurement of no-load loss and current
(e) Dielectric routine tests IS 2026 (Part 3);

2. Type Tests

(a) Temperature-rise test [see IS 2026 (Part 2)];
(b) Dielectric type tests [see IS 2026 (Part 3)].

3. Special Tests

(a) Measurement of insulation resistance to earth of the windings, and/or measurement of dissipation factor (tan δ) of the insulation system capacitances.
(b) Determination of sound levels (see IS13964)

NOTE:

1. All routine tests shall be performed at manufacturer's site which shall be witnessed by designated personnel from OIL .
2. The transformer will be considered acceptable if all test results comply within tolerable limits as per IS 2026 (Part 1)

1.16 Rating Plates

The transformer shall be provided with a rating plate of weatherproof material, fitted in a visible position and clearly readable at safety distance when cables are connected, showing the appropriate items indicated below but not limited. The characters shall be English roman letters and Arabic numeral characters.

Symbols and text shall be indelibly molded, stamped or engraved in a plate material and they shall be at least 4.0 mm high. If not contrasting in colour, they shall be grooved at least 0.5 mm high.

- Kind of transformer
- Applicable IS standard
- Manufacturer's name
- Manufacturer's serial number
- Year of manufacture
- Number of phases
- Rated power in KVA
- Rated frequency in Hz
- Rated voltages and tapping range of HV(KV) and LV(V)
- Rated currents of each tapping of HV and LV in A

- Drawing of vector group
- Short-circuit impedance, measured value in percentage
- Type of cooling
- Total mass
- Mass of insulating oil
- Insulation level of HV and LV
- Temperature rises of top oil and windings
- Insulating liquid
- Normal operation conditions: Ambient temperature, altitude
- OIL's P.O. no. and date.

1.17 Marking

Following markings shall be easily visible when the transformer is in service and the entries shall be indelibly marked. The characters shall be English capital roman letters and Arabic numeral characters.

(a) Rated power: Rated power and its unit shall be of salient character on middle position of tank wall on HV side. Size of character shall be enough large to read it from safety distance when the transformer is connected with cables. The salient part shall be painted with red color indelible paint.

(b) Terminal symbol: HV terminal symbol shall be 1U, 1V and 1W from left side. LV terminal symbol shall be 2N, 2U, 2V and 2W from right side and indelibly marked in front of terminal bushings.

(c) Earthing terminal marking shall be marked adjacent to earthing terminal.

1.18 Packing and Delivery

The supplier shall provide packing of the transformers as is required to prevent their damage or deterioration during transit to their final destination and long period of storage. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit and open storage.

(a) The transformers and its components shall be shipped from the factory to the specified site.

(b) The transformer shall be wrapped up in proper thickness of vinyl sheet to prevent ingress of humidity. The enough amount of dehumidifying agent shall be inside.

(c) The transformer shall be on a wooden pallet and the base of transformer shall be tied to the pallet with galvanized steel bolts and nuts. Wooden box shall cover the whole transformer and shall be connected to the pallet without looseness or disconnection.

(d) The pallet and packing case shall be suitable for handling by forklift truck and they shall have enough strength and thickness for protection of transformer.

(e) Packing case size and weights shall take into consideration, where appropriate, the remoteness of the transformer's final destination and the absence of heavy handling facilities at all points in transit.

(f) The parts of a transformer shall be packaged by one set even though the numbers of transformers to be supplied are plural.

(g) Each shipment shall include a detailed packing list identifying all items by part number, including hardware.

(h) All material shall be carefully loaded for protection during shipment.

(i) Small parts and fasteners shall be carefully boxed, crated, bagged or otherwise containerized and protected for shipment.

(j) All materials shall be arranged to allow safe unloading at the site.

(k) There shall be handling instruction to minimize damage.

The outer packing must be clearly marked on at least four (4) sides as follows.

(a) Name of the procuring department

(b) Name of the supplier

(c) Contract description and number

(d) Final destination

(e) Gross weight

(f) Any special lifting instructions

(g) Any special handling instructions

(h) Any relevant pollution or environment classifications

1.19 Document and Certificate

The transformers and all associated materials quoted by the supplier shall be approved. The quantity of documents and certificates submitted shall be not less than three copies. The transformer shall conform to the latest edition of IEC including Clause 1.16 of this specification or any other equivalent international standards. The design and construction of transformer shall be subjected to the approval.

1.20 Information to be Provided with the BID

Technical descriptions, data sheets, catalogues and other information shall be submitted with the BID and those which are submitted shall be sufficient to enable to evaluate thoroughly the proposal as to its compliance with the requirements of this specification.

The minimum requirement is as follows:

(a) Detailed summary of difference with this specification

(b) The Technical Data Sheet shall be provided by supplier

(c) Material safety data certificates of all chemical materials used for manufacturing such as insulating fluid, painting, gasket and gas, etc.

(d) Detailed drawing of all components in A3 or A4 size

(e) Detailed handling, installation and maintenance manual & schedule for good operation

(f) Brochures and catalogues containing outline dimensions, main electrical and mechanical data, etc.

(g) Applicable design specification and standards in English language

~~(h)~~ Test certificates approved by Statutory Organized (wherever required) .

(i) Quality control system and relevant certificate.

1.21 Documents to be Approved

The supplier shall furnish all relevant technical information, drawings etc. to owner for approval prior to the start of supply. Offers without Technical Data Sheet completely filled in will be rejected.

(a) Vendor(s) details/ Reference list

(b) Technical Data Sheet

(c) Tests schedule and procedures

(d) Transportation schedule and storage conditions

(e) Drawings of materials (All drawings shall be in A3 or A4 size with approved title block)

1.22 Documentation

All documents supplied under this specification shall be documented to the extent that the end user can easily understand its theory of operation, performance, installation and maintenance for the product. All documents shall be submitted being filed in order to approve and reorder later. Language in all documents and drawings shall be written in English and dimensions shall be used in metric SI-units.

CHAPTER -2: 11KV RING MAIN UNIT

2.0 Ring Main Unit (RMU)

(a) This specification is intended to cover the design, Engineering, manufacture, assembly, testing at manufacturer's works, supply in properly packed condition for transport to site, Erection, site testing and commissioning of outdoor 11kV RING MAIN UNIT

(b) The system shall be complete in all respect including all accessories required for efficient and trouble-free operation .

(c) All the ratings, indications, protections, annunciation & accessories indicated in SLD/Datasheet/specifications are minimum requirements & Contractor to provide any additional accessories / components / ratings to suit the actual requirements & for successful commissioning of 11kV kV RMU along with its integration with SCADA system, which shall be part of RMU & placed in the same enclosure.

(d) Equipment Manufacturer s person shall supervise- equipment commissioning activities to be carried out by Contractors personnel. The same shall be considered in Contractor s offer.

(e) All the requirements of this specification are to be considered in conjunction with other sections of the specifications.

(f) The RMU shall have both mechanical and electrical interlock between the incomers

(g) PT of the RMU shall be of sufficient VA rating to accommodate a LED lamp for illumination. Provision shall also be kept for fixing the LED lamp.

2.1 Applicable Codes and Standards

The design, material, construction, manufacture, inspection and testing of Switchgear shall comply with all currently applicable statutes, regulations and safety codes in the locality where the Equipment will be installed. The Equipment shall also conform to the latest applicable standards. The Equipment shall conform to the latest standards specified. In case of conflict between the standards and this specification, this specification shall govern.

HV switchgear and control gear-AC Metal	IEC 62271-1
Enclosed switchgear and control gear	
HV switchgear and control gear-AC Metal	IEC 62271-200
Enclosed switchgear and control gear	
Circuit Breakers	IS / IEC 62271-100
Disconnectors & Earthing Switches	IEC 62271-102
Metal Enclosed switchgear	IS : 3427 / BSEN:60298 / IEC:298 / IEC 265
Current Transformers	IS : 2705 / BS : 7626 / IEC:60044-1
Voltage Transformers	IS : 3156 / BS : 7625 / IEC: 186 / IEC:60044-2
Arrangement for Switchgear Bus bars, Main	IS : 5578, 11353
Connections and Auxiliary wiring	

Busbar Support insulators	IS: 2544 / BS : 3297 / IEC : 273
Degree of Protection	IS : 13947 (Part 1) / IEC : 947-1 / IEC : 60529
Electrical Relays for Power system protection	IS : 3231, 3842 / BS : 142 / IEC : 255
Electrical Indicating Instruments	IS:1248/BS:89/IEC:51
High Voltage Fuses	IS: 9385 / BS : 2692 / IEC : 282
AC Electricity Meters	IS : 722, 8530 / BS : 5685 / IEC : 145, 211
Specification for copper rods and bars forelectrical purposes	IS : 613
Code of practice for phosphating iron and steel	IS : 6005 / BS : 3189
Alternating current Switches for voltages above1000 V	IS: 9920 / IEC : 129, 265 & 298
Low voltage fuses	IS : 13703 / BS 1362 / IEC 269
Toggle switches	IS : 3452 / BS : 3676
Code of practice for selection, installation and maintenance of switchgear and control gear	IS : 10118
Control switches/ Low voltage switchgear and control gear	IS:6875/BSEN 60947/IEC : 947
HV Cable Termination	IEC 62329
Communication Protocol	IEC 61850
Communication port	RS 485 / RJ 45
High Voltage Test Techniques	IEC 60060
HV switchgear and control gear-AC Switch Fuse combination	IEC 62271-105
Insulation	IEC 600071
Installation	IEC 61936-1
Voltage Detecting Device	IEC 61243-5

Notes:

(a) In the event of any conflict between the codes and standards referred to in the specification and the requirement of this specification, latter shall govern.

(b) All parts of main circuit to which access is required or provided shall be capable of being earthed prior to becoming accessible. This does not apply to removable parts which become accessible after being separated from the switchgear and control gear. The cables shall be earthed by an earth switch with short-circuit making capacity in compliance with IEC 62271-102. Circuit breaker shall not be closed in case Earth Switch is closed. The earth switch shall be fitted with its own operating mechanism and manual closing shall be driven by a fast-acting mechanism, independent of operator action. Mechanical interlocking systems shall prevent access to the operating shaft to avoid all operator errors such as closing the earth switch when cable is charged. An anti-reflex mechanism on the operating lever shall prevent any attempts to reopen immediately after closing of the switch or earth switch.

(c) Every cubicle shall be equipped with a mimic diagram reproducing the single line diagram and with clear indicators to show the position of the switches. The lever operating direction shall be clearly indicated in the mimic diagram. The position indicators shall give a true reflection of the position of the main contacts. They shall be clearly visible to the operator. The Contractor shall provide a marking plate showing RMU's main electrical characteristics.

(d) Each panel shall be provided with FPI system mounted on the front panel. Provision to check the synchronization of phases with the use of external device shall be provided(If required).

(e) All the protection relay, master trip relay, annunciation panels, indication lamps, indicating meters etc. shall be mounted on the panel LV made of CRCA metal enclosure mounted on the RMU switchboard panel.

2.2 Outdoor Enclosure

The Outdoor enclosure shall be made up of CRCA of 2 mm thickness or galvanized of 1.6 mm thickness, high tensile steel which must be tropicalized to local weather conditions; grit/sand blasted, thermally sprayed with Zinc alloy, phosphate or should follow the 7tankpre-treatment process and be subsequently Painted with epoxy based powder paint. The overall paint layer thickness shall be not less than 80 microns.

(i) The metal base shall ensure rigidity for easy transportation and installation.

(ii) The protection degree of the Enclosure shall be IP54. The enclosure should have two access doors one for the operation and relay monitoring and other for the cable access. The doors shall be provided with proper interlocking arrangement for safety of operator.

(iii) All doors shall be provided with locking facility or it shall not be possible to open or remove them before doors used for normal operation have been opened. When they are closed, they shall provide the degree of protection specified for the enclosure.

(iv) The doors shall open outward at an angle of at least 90 Deg& be equipped with a device able to maintain them in an open position. Ventilation openings if provided, shall be so arranged or shielded that same degree of protection as specified for enclosure is obtained.

(v) All metallic components shall be earthed to a common earthing point. It shall be terminated by an adequately sized terminal intended for connection to the earth system of the installation, by way of flexible jumpers/strips & Lug arrangement. The continuity of the earth system shall be ensured taking into account the thermal & mechanical stresses caused by the current it may have to carry.

(vi) There shall be an arrangement for internal lighting activated by associated switch.

(vii) Labels for warning shall be specified in min three languages including English, Hindi and Local Language. All the labels and Manufacturer s operating instructions etc. shall be durable & clearly legible. They should be located within operating height of the equipment.

(viii) The paints shall be carefully selected to withstand tropical heat and rain. The paint shall not scale off or crinkle or be removed by abrasion due to normal handling.

2.3 SF6 Gas

The SF6 gas shall comply with IEC 376, 376A and 376B and shall be suitable in all respects for use in 11kV panels under the operating conditions. The SF6 shall be tested for purity, dew point air hydrolysable fluorides and water content as per IEC 376,376A and 376B and test certificate shall be furnished to the owner indicating all the tests as per IEC 376 for each Lot of SF6 Gas. The stainless-steel vessel shall be type tested for pressure test.

2.4 Vacuum Circuit Breaker for Transformer Feeder Control

(i)The Vacuum circuit breakers shall be of the maintenance free.

(ii)The Vacuum circuit breaker must be with stored energy spring in combination with 3 positions disconnector with position ON-OFF-EARTH. This disconnector shall be mechanically interlocked with the VCB position & should not be operated when the VCB is in ON condition.

(iii)The circuit breakers shall have at least 2 positions: Open-disconnected and closed and shall be constructed in such a way that natural interlocks prevent all unauthorized operations. They shall be fully mounted and inspected in the factory.

(iv)The Circuit Breaker shall have closing and shunt trip coil. Closing and opening operation of the Circuit Breaker shall be done from remote. Spring charging shall be done with motorized spring operating mechanism. Motor shall be suitable for 24V DC supply.It should be feasible to retrofit the motor at site. The circuit breaker shall be fitted with a mechanical indicator on the panel front facia for indicating VCB ON/OFF positions. It shall be fitted with manual spring charging with a local system for manual tripping by an integrated push button. The operating mechanism shall be compatible for remote/SCADA operation.

(v)There shall be provision for testing of cable without opening the cable connections.

(vi)In case cables are to be tested with front door open, doors shall have interlocks such that doors can be opened only with earth switch in closed position. Termination boots as approved by the OIL s should have a proper opening to facilitate the testing. The opening shall be covered by means of removable protection cap.

(vii)The cable compartment cover must be interlocked with the switch position in all the feeders. The cable compartment cover shall open only when the load break isolator / VCB is in earth position. This ensures the complete safety of operator accessing the cables.

(viii)In case of front door opened, it shall not be possible to operate the breaker. All panel covers shall be provided with anti-vandal screw bolts so that opening of panel covers is only possible with special tools, which shall be provided by the Contractor.

(ix)This is required to prevent pilferage. The cable cover door shall be pad lockable and shall be Tamper and full Arc proof. The circuit breaker and earth switch shall be lockable in the open or closed positions by padlocks. Breaker shall have mechanical endurance of at least 2000 operations.

(x)An operating mechanism can be used to manually close the circuit breaker and charge the mechanism in a single movement. It shall be fitted with a local system for manual tripping by an integrated push button. There will be no automatic re-closing.

(xi)The circuit breakers should be able to carry the rated current continuously under site conditions without exceeding the permissible temperature rises for design ambient temperature outside the switchgear cubicle as mentioned in design criteria.

(xii)Following Indications shall be provided for each VCB unit-

(a) On
(b) Off
(c) Trip

2.5 Relay

(i) All relays shall be numerical relays and have protection O/C, S/C & E/F (50, 51, 50N, 51N) & trip circuit supervision relay is inbuilt in. Lockout relay shall be separate & not as element of numerical relays.

(ii) Contact multiplication shall be done by auxiliary relays instead of contactors in case the primary protection relays offered by Contractor do not have adequate number of contacts for protection/interlock schemes. Also, all necessary auxiliary relays as required to meet the OIL'S final control/protection/interlock schemes shall be provided by the Contractor.

(iii) All relays shall be numerical type and shall be supplied with latest version software without any extra cost. It should be possible to set relay, view fault parameters, download information from relay to computer connected for SCADA system. All relays in RMUs shall be on Modbus communicating directly with FRTU of RMU. Test terminal block for testing shall be provided. Relays shall be suitable for 1A CT secondary rating.

(iv) Relays shall include necessary auxiliary transformers, A/D & D/A converters, CPU modules for measuring and processing functions, power supply modules with regulator and DC/DC converters and suitable front end man-machine interface.

(v) All Numerical protection relays shall be looped through MODBUS up to FRTU for further communication with SCADA.

(vi) The Ethernet Switch shall be suitably located in the Bus PT Panel with proper fitments and shall be easily accessible for accessing the same.

(vii) All Smart meters shall be connected through appropriate Protocol as decided by the Contractor based on the SMART GRID requirements.

(viii) Connections of all RS 485 ports shall be done using 3 core twisted & shielded 1.5 sq.mm Cu cable.

(ix) In order to fulfil the requirements of SCADA system, if provisions of additional auxiliary relays are necessary, then the same shall be provided by the VENDOR at no extra cost to the Employer.

(x) All relays shall have clear identification on the associated panel by well-written inscription plates. Where indications are provided by flag relays or LEDs, these shall also be specifically identified by permanently fixed inscription adjacent to them.

(xi) The relays shall be suitable for application intended. The final relay ranges of each relay shall be decided at detailed engineering stage, if it is found that the offered relay range is not suitable for

the intended application, the Contractor shall change the relay of appropriate range without any commercial / delivery implications whatsoever. The relay shall be subject to approval of OIL'S representative.

(xii) Vendor shall furnish recommended relay settings with backup calculations. PMC/OIL Shall furnish all interface data for this purpose.

2.6 Metering Panel

(i) Separate panel shall be provided for metering. Smart meter shall be provided for metering.

(ii) Metering panel shall include potential transformer V/√3/V/√3V/√3, class 0.2, 50VA for 11 kV RMU and smart meter. Smart meter shall be communicable type.

(iii) There shall be no gap between RMU and metering panel.

(iv) Refer Smart Meter Specification for more detail.

2.7 Current Transformers

(i) Current transformers for metering shall be bar primary cast resin/ ring type (class of insulation B or better) suitable for operation on 11 kV, 50 Hz System.

(ii) Rated VA burden for metering CT's and protection CT's shall not be less than 2.5VA or 120% of total VA burden whichever is higher.

(iii) The accuracy class for metering CT shall be 0.2s & for Protection CT's it shall be Class 5P20 or as per statutory requirement whichever is more stringent.

(iv) It shall be responsibility of Contractor to ensure that CT's are suitable for correct and satisfactory operation of relays connected across them.

(v) Short time current rating and momentary withstand rating of CT's shall be as specified in this specification.

(vi) Secondary connection of CT and VT shall be made through disconnecting type terminals with necessary shorting and earthing facility.

2.8 Bushings and Cable Terminations

(i) All the bushings shall be in accordance to the relevant IEC standards, shall be of same height from the ground and protected by a cable cover.

(ii) Each cable compartment shall be provided with three welded maintenance free outside cone bushings of adequate sizes to terminate the incoming and outgoing cables along with a terminal block (TB) located at convenient accessible location so as to wire all inputs & outputs up to the terminal block (TB). The bushings shall be conveniently located for proper bend so as to allow easy working and termination of cables.

(iii) Bushings shall be conveniently located so as not to interfere with the cable termination.

(iv) Necessary dry Right-angle terminal Boots shall be provided with cable testing facility for all the terminations.

(v) Clamping arrangement of suitable insulating material such as HDPE shall be provided to hold the cable.

(vi) Provisions shall be suitable for the HT XLPE insulated, armoured/unarmoured, Aluminium /Copper conductor cables.

(vii) It shall be possible to test the cable without disconnecting them from the cable bushing.

2.9 Extensibility

(i) Each combination of RMU shall have the provision for extension on at least on one side for load break isolators / breakers in future, necessary plug-in/ bolted type bus bar link.

(ii) Single extensible isolator/circuit breaker shall be individually housed in separate SF6 gas enclosures. There should not be any gap between the extended RMUs and both these RMUs shall be flushed with each other. The extension busbar links shall be of plug-in type without any gas handling at site. The extension busbar links shall be totally enclosed in between the 2 RMUs allowing the RMUs to be flushed with each other. The busbar links shall be protected with silicon insulation to avoid any ageing effect & also to provide the protection from harsh climatic conditions.

2.10 Earthing

The RMU shall be equipped with an earth bus securely fixed along the base of the RMU. The size of earth busbar shall be to suit SC rating. Provision shall be made on end of RMU for connecting the earth bus to the main earth grid by minimum 2 connections.

2.11 Voltage Indicator Lamps

Each feeder shall be equipped with a capacitive voltage detection system (CVD) on the front to indicate whether or not there is voltage in the cables. The capacitive dividers will supply low voltage power to the lamps. These devices shall be in compliance with IEC 61243-5 standard.

2.13 SCADA Features

(i) The switches and breakers are to be fitted with motors for remote operation.

(ii) Necessary terminals shall be provided inside the RMU for interface with SCADA RTU/Ethernet Switch.

(iii) Following minimum features shall be enabled in SCADA -

(a) Remote control for Load Break Switches and circuit breakers

(b) Position indicator for Load Break Switches, Circuit Breakers and Earthing Switches

(iv) Remote monitoring and Control of Fault indication system FPI status and reset SF6 gas pressure status (indication & annunciation).

2.14 General

(i) Panel illumination lamp shall be LED with fixture & shall be provided with door limit switch.

(ii) All unused auxiliary contacts of circuit breakers, protection, auxiliary, control relays shall be wired up to terminal block.

(iii) Each control wire shall be with identification ferrule of Terminal No., component designation and cross ferruling on both sides.

(iv) Insulated sleeves shall be provided for control wires.

(v) Feeder and board name plates to be provided at front and rear of switchboard.

(vi) Stud type terminals and ring type lugs shall be used for control cables.

(vii) Printed ferrules (tubular type- cut to size after printing) white with black lettering shall be provided. Printing shall be done with the indelible ink.

(viii) It shall be entirely the responsibility of the Contractor to ensure that characteristics f CTs, VTs and all other devices offered by him are such as to be suitable for the purpose for which they are intended.

(ix) AC fail & DC fail annunciation shall be included in the annunciation.

(x) All the wiring shall be able to withstand the tropical weather conditions. All wiring shall be carried out with 1.1kV grade, multi-stranded (Class 5) copper conductor wires with FRLS P.V.C insulation.

(xi) All control wiring shall be done with 1.5sqmm size grey colour wires.

(xii) All CT wiring shall be done with min 2.5sq mm size wires with phase colour coding.

(xiii) Panel wiring shall be securely supported, neatly arranged readily accessible and connected to equipment terminals, terminal blocks. The cables shall be uniformly bunched and tied by means of PVC belts and carried in a PVC carrying trough.

(xiv) The terminal blocks should be stud type for controls and disconnecting link type terminals for CT leads with suitable spring washer and lock nuts.

(xv) 20% spare terminals and contacts to be provided for each terminal strip for each panel for future interconnection and interlocks.

(xvi) Additional coloured ferrule to be provided for all panels.

(xvii) Caution name plate, Caution Live Terminal shall be provided at all the points where the terminals are likely to remain live and isolation is possible only at remote end i.e. incomer to the switchboard.

(xviii) Danger notices in three languages (Hindi, English, Assamies) and in line with the requirements of IS 2551 shall be riveted & not pasted at appropriate locations of the switchgear.

(xix) 24V DC supply for protection circuit, motor & indications/annunciations shall be through in built battery & battery charger system placed in each RMU. Battery hall be sized such that minimum 3 hr. back up is ensured for all operation, protection &indications of RMU as well FRTU.

2.15 Routine Test

(i) Contractor shall also include cost towards factory testing of switchgear as per IEC 62271-1/200/203/204/100 in presence of OIL'S representative.

(ii) Test at factory as follows but not limited to, Power frequency high voltage test as per IEC 60060 & IEC 60071.

(iii) DC resistance test as per IEC 60228.

(iv) HV test on control circuit

(v) CT/PT testing as per IEC 60044. Primary injection test shall be carried out as a part of acceptance test before dispatch of the switchgear panels.

(vi) Operational & interlock test like Close / trip / auto trip operation with electric supply (with given voltage tolerances)

(vii) Spring charging of motor (Electric as well as manual)

(viii) Manual close / trip test

(ix) Breaker closing /opening analysis

(x) Interlock & anti pumping operation

(xi) Checking of filling pressure

(xii) Checking of gas tightness

(xiii) Checking of partial discharge on individual components

(xiv) Contractor shall also assist by carrying all test sets/kit accessories required for site test and also following site tests but not limited to, Operational & interlock test for open/close operations, tripping, interlocks & anti-pumping.

(xv) Insulation resistance test - Megger For 1Min with 2.5/5 kV.(taking value for 10 sec & 60 sec)

(xvi) Power frequency withstand test

(xvii) Relay setting as per relay co- ordination and off line relay testing.

(xviii) Acceptance testing of individual relays over complete range.

(xix) Panel system communication test (For Data Acquisition & Monitoring System only)

(xx) Any other tests deemed necessary by the Employer.

(xxi) Vendor shall submit his standard format for testing and commissioning of all individual relays and equipment s along with vendor drawings to be submitted by him to enable proper testing and commissioning at site

2.16 Type Test

(i) The Contractor shall furnish type test certificates and descriptive & illustrative technical literature along with all catalogues for circuit breaker, HT panel and other equipment s supplied by him along with the bid.

(ii) The Contractor/supplier shall submit Type Test report (not older than five (5) years) from CPRI or other independent agency for OIL'S/ Engineer s review.

(iii) Contractor shall quote separately the Unit price as well as time required for following type tests separately as asked in the schedule- Ingress protection test.

(iv) Heat run test.

(v) Lightning impulse voltage withstand test.

(vi) Short time withstands current

(vii) Internal arc withstands 18.4kA for 1sec

(viii) Checking of partial discharge on complete unit.

2.17 Drawings and Data

(i) Technical Documents to be submitted along with the BID;

(ii) Confirmation to the specifications including Make list.

(iii) Technical GTP as per asked in Data Sheet.

(iv) Descriptive & illustrative technical literature along with all catalogues for circuit breaker, HT panel and other equipment.

(v) Type test certificates (from CPRI or equivalent agency), not older than five (5) years from the date of submission of this BID for similar rating for the following tests;

(vi) Short circuit test

(vii) Internal Arc Test

(viii) Heat run test

(ix) Impulse test

(x) Endurance test

(xi) A matrix of relay model offered with its parameters, Binary/ Analogue I/p –O/ps (IOs), coil voltage, port etc., offered/ considered for each element [with reference to each type of feeder panel(Incomer, Outgoing, Bus coupler, BPT etc.)] for each 11kV Switchboard.

(xii) Tentative GA with dimensions and weight.

(xiii) Details of sub-Contractors, if any.

(xiv) Other submissions as asked for in the specification.

(xv) Any additional enclosure as per Contractor.

(xvi) Documents to be submitted after receipt of Order/LOI for review and Approval.

(xvii) All documents under this item shall be provided by Contractor-

(xviii) Detail execution plan highlighting the procurement, construction, internal testing, and inspection and delivery activities.

(xix) Quality Plan for procurement, manufacturing and inspection.

(xx) Design Calculations for Bus bar sizing, CT Sizing of all type etc. for each Switchboard along with a copy of relevant standard referred for the same.

(xxi) Guaranteed Technical Parameters

(xxii) Equipment GA & Section drawings with dimensions, clearances, locations of components-CT, Terminals, etc. of each type of switchboard with component layouts like LV Compartment, etc with general notes.

(xxiii) Base frame and Foundation GA drawings with dimension and details.

(xxiv) Electrical Control drawing for all panels with general notes like sizes, type, Material details and other details.

(xxv) Catalogue reference, Technical parameters and O&M manual/ write up of all bought out items.

(xxvi) Test certificates of all bought out components progressively as they are procured.

(xxvii) Bill of material along with make, quantity, model no and ratings.

(xxviii) Upon completion of the installation, the Contractor shall furnish a complete set of drawings in soft copies as per Schedule of Distribution.

(xxix) All the Type Test certificates to prove the compliance with the requirements.

2.18 Ratings & Requirements

Refer following table for details of 11kV RMU requirements-

Sl. No.	DESCRIPTION	RATING
1.	Rated Voltage	11 kV
2.	Highest System Voltage	12 kV
3.	Frequency	50 Hz
4.	Design Ambient Temperature	45 Deg C
5.	power frequency withstand capacity	28 kV
6.	Basic Insulation Level	28 kV RMS,75kV peak
7.	Bus bar rating	630A
8.	Short Circuit Rating	18.4kA for 1sec
9.	Insulating Medium	SF6
10.	Type of breakers	VCB

Sl. No.	DESCRIPTION	RATING
11.	Rated operating Sequence	O-0.3min-CO-3min-CO
12.	Bus bars	Electrolytic Copper (Silver plated at Joints)
13.	Temperature Rise	Complying with IEC 62271-1
14	Motors	24V DC operated motors or suitable shall be installed on the Isolator and CB function and to be flitted in/from the front LV compartment side.
14.	Power Supply	Necessary arrangement required for DC Power supply for Three (3) Hr backup to take care of the DC load requirements within the RMU & FRTU.
16.	RMU Type	Outdoor type.

CHAPTER - 3: 11 KV INDOOR SWITCHGEAR UNITS

3.0 General

This specification is intended to cover the design, engineering, manufacture, assembly, testing at manufacturer's works, supply in properly packed condition for transport to site, erection, site testing and commissioning of 11 kV indoor Switchgear.

11 kV 3ph, 50 Hz outdoor Switchgear, weather proof Indoor Panel with IP52 or better protection grade with VCB panels (6 nos.: two incomers for EB Supply and one incomer for DG Supply, 3 outgoing and one bus coupler)conforming to IEC 62271-200 suitable for Indoor installation. Necessary control gear and adapter/bus trunk panel shall be supplied along with breaker panel.

All the ratings, indications, Busbar, protections, annunciation & accessories indicated in SLD/Datasheet/specifications are minimum requirements & Contractor to provide any additional accessories / components / ratings to suit the actual requirements & for successful commissioning.

The system shall be complete in all respect including all accessories required for Efficient and trouble-free operation.

I. All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) / IEC as given below except where modified supplemented by this specification.

Codes	Name of Standard
IS : 226	Structural steel (standard quality)
IS : 375	Switchgear bus bars, main connections and auxiliary wiring, marking and arrangement
IS :722	AC electricity meters
IS : 728	Galvanized steel structures
IS :2099	Specification for bushings for alternating voltages above 1000 volts
IS 2147	Degree of protection
IS : 2516	Alternating current circuit breakers
IS : 2544	Specification for porcelain post insulators for systems with nominal voltages greater than 1000 volts
IS : 2705	Current transformer specification
IS : 3043	Code of practice for earthing
IS : 3156	Voltage transformers specification
IS : 3231	specification for electrical relays for power system protection
IS : 3427	A.C. metal enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV.
IS : 4710	Switches and switch isolators above 1000 V but not exceeding 11000 V.
IS : 5082	Specification for wrought aluminum and aluminum alloy bars, rods, tubes and selections for electrical purposes.
IS : 6875	Control switches push buttons
IS : 8084	Specification for interconnecting bus-bars for ac voltage above 1 kV up to and including 36 kV
IS : 8686	Specification for static protective relays

Codes	Name of Standard
IS : 9046	Specification for ac contactors for voltages above 1000 V up to and including 11 000 V
IS : 9224	Low voltage fuses
IS : 9385	HV fuses
IS :9431	Specification for indoor post insulators of organic material for system with nominal voltages greater than 1000 volts upto and including 300 kV
IS : 9921	Alternating current disconnectors (isolators) and earthing switches for voltages above 1000 V
IS : 10601	Dimensions of terminals of high voltage switchgear and control gear
IS : 11353	Guide for uniform system of marking and identification of Conductors and apparatus terminals.
IS : 13118	Specification for high voltage ac circuit breakers
IEC 6044-1	Current transformer
IEC 6044-2	Voltage transformer
IEC 6056	High voltage alternating current circuit breakers
IEC-60099-1	Non-linear resistor type gapped arrestor for AC systems
IEC-60099-4	Metal oxide surge arrestor without gap for AC system
IEC 60129	A.C. disconnectors and earthing switches
IEC 60255	Electrical Relays
IEC-60298	High voltage metal enclosed switchgear and control gear.
IEC 60529	Degrees of protection provided by enclosures
IEC-62271-100	High voltage alternating current circuit breakers.
CEA	CEA regulations

II. Equipment and material conforming to any other standard which ensures equal or better quality may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

III. The electrical installation shall meet the requirements of CEAregulationsas amended up to date and relevant IS Code of Practice. In addition, other rules and regulations applicable to the work shall be followed.

3.1 Design Criteria

I. All 11kV Switchgear shall be suitable for an ambient temperature of 45 °C and relative humidity of 87%. The Switchgear shall be suitable for operation in a highly polluted environment.

II. All 11kVSwitchgear shall be suitable for following voltage & frequency variations as follows:

Voltage Variation		(±) 10%
Frequency Variation		(+) 3% to (-)5%
Combined Variation of Voltage & Frequency		10% (absolute sum)

For DC System		(+)10% to (-)15%

III. 11 kV switchgear shall be Indoor, metal clad, floor mounted, Single front and fully draw out type. Design and construction shall be such as to allow extension at either end. These shall be Aluzinc/ CRCA sheet metal enclosed and assembled to form a rigid, free-standing floor mounted structure. Vertical units shall be assembled to form a continuous line up of panels

IV. All 11 kV Circuit breaker shall be draw out type & should have Service, Test and Disconnected positions with positive indications for service & test positions. It shall be possible to charge the springs manually, if, required

V. Local/remote selection shall be provided for all incoming/Outgoing Circuit Breaker modules. Incoming/Outgoing breaker shall be closed at service position from remote and at test position from Local (Switchgear).

VI. Control and Indication voltage level shall be 110V DC.

VII. Maximum system fault level 11kV buses shall be 18.3kA for 1 sec. Switchgear should be rated for internal arc rating for 11 kV, 18.6kA for 1Sec. Switchgear should be tested for Breaker, Cable and Busbar chamber for AFLR IAC for 1Sec.

VIII. 11 kV System shall be solidly earthed.

IX. Surge arrestor shall be provided for each Incomer & Transformer feeder.

X. The switchgear will be located in a clean but hot humid and tropical atmosphere.

XI. For continuous operation at specified ratings, temperature rise of the various switchgear components shall be limited to the permissible values stipulated in the relevant standards and this specification.

XII. The switchgear and components thereof shall be capable of withstanding the mechanical forces and thermal stresses of the short circuit current without any damage or deterioration of material.

XIII. The Panel shall have synchronising check facility in the incomers.

XIV. All the numerical relays shall have communication on two ports, local front port communication to laptop and a second port with [IEC 61850 protocol] to communicate with SCADA.

3.2 Specific Requirements

(a) Construction

11 kV switchgear shall have following minimum features.

I. 11 kV switchgear shall be of indoor, metal clad, single front, single tier, floor mounted, horizontal draw out type with vacuum circuit breaker and free-standing type. The Panels shall be suitable for cable entry at bottom and bus duct connection at top.

II. Panel shall have incomer connections suitable for 3C x 240 sq. mm. XLPE 11KV cable

III. All frames and load bearing members shall be fabricated using mild steel structural sections or pressed and shaped cold rolled sheet steel of thickness not less than 2 mm.

IV. Frame shall be enclosed in Aluzinc/ cold rolled sheet steel of thickness not less than 2 mm. Doors and Covers shall also be of Aluzinc/cold rolled sheet steel of thickness not less than 1.6 mm. Removable gland plates of thickness 3mm (hot/cold rolled sheet steel) or 4 mm (nonmagnetic material)shall be provided for all panels. Suitable removable type lifting hooks and / or jacking pad shall be provided on each panel or shipping section for ease of lifting of switchgear. These hooks when removed shall not leave any opening in the panels.

V. Each breaker shall be housed in a separate cubicle, complete with an individual front access door. Each vertical section shall have a removable back cover. The vacuum-interrupter, circuit-breaker and the switchgear panel shall be of the same make.

VI. The switchgear enclosure shall confirm to the degree of Protection of the IP-42. However, degree of protection of LV chamber shall be IP-52. No louvers/Opening shall be provided on the top of panel. All the other louvers if provided shall have very fine brash or GI mesh screen.

VII. Paint shade for complete panels shall be [RAL 7032] for extreme end covers for all board.

VIII. The working zone shall be restricted to [750mm to 1800mm] from floor level. Total height of the switchgear panels shall not exceed [2600 mm].

IX. Metallic barriers shall be provided between vertical sections and also between adjacent modules to ensure prevention of accidental contact with live parts during routine inspection/maintenance of functional units or cable terminations of one or more functional units when working on those of adjacent units. These barriers shall have insulating inserts as necessary for taking the interconnections etc.

X. A nameplate with switchgear designation shall be fixed at the top of the central panel. A separate nameplate giving feeder details shall be provided for each compartment. A separate nameplate giving details of bus section shall also be provided for switchgear having more than one bus section.

XI. Name plate shall be provided for each equipment (lamps, push buttons, switches, relays, auxiliary contactor, etc) mounted on the switchboard. Special warning plates one each on each feeder of a shipping section shall be provided on removable covers of doors giving access to cable terminals and busbar. Name plate size shall be minimum of 20x75 mm for Instruments/devices and 40x50 mm for panels. Thickness shall be minimum 3 mm.

XII. Two 110V DC feeders shall be provided for control, Indication and annunciation of breaker operated module at any one cubicle. Further distribution to all verticals shall be in the scope of bidder.

(b) Bus and Bus Taps

I. The main buses and connections shall be of high conductivity Copper. Control and auxiliary buses shall be of electrolytic copper/copper wires.

II. Bus bars and connections shall be fully insulated for working voltage with adequate phase / ground clearances. Insulating sleeves for bus bars and shrouds for joints shall be provided.

III. Bus insulator shall be flame-retardant, non-hygroscopic, track resistant type with high creepage surface. This shall be of non-carbonizing material such as epoxy bonded fiberglass. Bus bars shall be color coded for easy identification. Standard type tested design without bus support insulator is also acceptable.

IV. The bus bar supports shall be able to withstand stresses due to maximum short circuit and also take care of any thermal expansion.

V. Bus bars shall be color coded for easy identification and so located that the sequence R-Y-B shall be from left to right, top to bottom or front to rear, when viewed from the front to switchgear assembly.

VI. The continuous rating of the main bus bars shall be same as that of the incomer circuit breaker and shall carry this continuous current without exceeding the temperature of [90 °C]. For silver plated joints maximum temperature shall be limited to [105 °C] in line with IEC standard.

VII. The busbar chamber shall be provided with inter panel barrier with epoxy cast seal off bushings through which the buses will pass through so as to prevent fire from one panel to another.

VIII. The bus bar section shall be of ample capacity to carry the rated current of `1000A, continuously without excessive heating and for adequately meeting the thermal and dynamic stresses in the case of short circuit in the system up to full fault MVA.

(c) Circuit Breaker

The circuit breaker shall be of vacuum type.

The breakers shall be capable of Making & Breaking the short time current in accordance with the requirement of ISS 13118 / IEC 60056 conform to latest amendment thereof and shall have 3 phase rupturing capacity of 31.5KA at 11 kV. The continuous current rating of breaker shall not be less than 630A for all items.

The circuit breakers shall be fully draw-out type, having service, test and disconnected positions with positive indicators for service & test positions.

The breakers shall have motor operated spring charged mechanism. It shall be possible to charge the springs manually, if, required. Breakers shall be trip free and shall have an anti-pumping device. The operating duty cycle shall be 0 -0.3 sec-CO-3 min.-CO.

For motor, spring charging shall take place automatically after each breaker closing operation. One open-close-open operation of the circuit breaker shall be possible after failure of power supply to the motor.

Automatic safety shutters shall be provided to ensure the inaccessibility of live parts after the breaker is drawn out. There shall be distinct overall door for the breaker compartment and shall be lockable. There shall be a provision of LOTO.
Truck shall have distinct service, Test and Isolated positions. It shall be possible to close the breaker compartment door in isolated position also. The truck and breaker frame shall get earthed while the truck is being inserted in the panel and positive earthing of the truck and breaker frame shall be maintained in all positions.

Outgoing breakers shall be suitable for switching transformers at any load.

Mechanical safety interlocks shall be provided to prevent the circuit breaker from being racked in or out of the service position when the breaker is closed.

Racking in the circuit breaker unless the control plug is fully engaged

Breakers shall be adequately de-rated to account for design ambient temperature and temperature inside the cubicle.

Equipment and component rating and quantities shall be suitably selected according to the requirements with adequate margin.

Closing and tripping coil shall operate satisfactorily under the following conditions.

- Closing Coil: 85% to 110% of rated voltage.
- Tripping Coil : 70% to 110% of rated voltage

Closing coil and tripping coil must be rated for continues current and interchangeable.

Bus coupler breaker shall have provision for synchronization of the bus sections along with all the accessories such as synchroscope, trip/off/close switch and indication lamps etc

3.3 Current Transformers

Current Transformers shall be cast-resin type. All secondary connections shall be brought out to terminal blocks where wye or delta connection shall be made. They shall have sufficient thermal and mechanical capacity to withstand the maximum momentary current rating of the breakers.

CTs shall have polarity makings indelibly marked on each transformer at the lead terminations and at the associated terminal block. Facility shall be provided for short circuiting and grounding the CT secondary at the terminal blocks. Secondary terminals shall be provided with protective cap.

CT terminal block shall be disconnecting type and suitable for round type lugs with facility for testing and short circuiting of individual CT.

All CTs shall be provided with supports independent of busbar/ busbar supports. The CTs shall be located in such a way that they can be easily approached for maintenance without necessitating shutdown of adjacent feeders.

CTs shall be provided with disconnected type test links in both secondary leads for carrying out current and phase angle measurement.

Accuracy class of CT shall be 5P20 for protection, PS for differential protection and 0.2 for incomer & 1.0 for outgoing metering.

CT VA shall be as per design requirement with minimum value of 15VA.

3.4 Voltage Transformer

Voltage transformers (VT) shall be cast-resin type with an accuracy class of 0.2 for line metering & 0.5 for bus metering and 5P for protection.

VTs shall be of the single-phase type. VTs shall be protected on their primary side by fuse and by MCB (with auxiliary contacts) on the secondary sides. VT ratio: 110/√3:110/√3:110/√3 (2 winding secondary).

It shall be possible to replace VTs without having to de-energies the main busbars.

VTs shall be provided with disconnected type test links in both secondary leads for carrying out current and phase angle measurement.

3.5 Secondary Wiring

- The switchgear shall be fully wired at the factory to ensure proper functioning of control, protection and interlocking schemes.

- MCB/Fuse and links shall be provided to permit individual circuit isolation from bus wires without disturbing other circuits. All spare contacts of relays, switches and other devices shall be wired up to terminal blocks.
- Secondary wiring within the switchgear shall be carried out in a neat and systematic manner and securely held in position (either loomed or run in conduit/trunking). Wherever wiring passes through compartment, it shall be run in conduit/trunking, if metallic shall be bonded to the main earth busbar.
- Wiring shall be done with flexible, 1.1kV grade, PVC insulated switchboard wires with stranded copper conductors of 2.5 mm2 for CT & PT circuits and 1.5mm2 for control circuit wiring (applicable for internal panel wiring).
- Each wire shall be identified, at both ends, with permanent markers bearing wire numbers as per bidder's wiring diagrams. Wire terminations shall be made with crimping type connectors with insulating sleeves, wire shall not be spliced between terminals.

3.6 Terminal Blocks

Terminal blocks shall be of 1100 V grade, stud type with marking strips. Terminals for CT secondary leads shall have provision for easy shorting, earthing and shall be suitable for connecting 2 cables of 2.5 mm2 copper.

Sufficient terminals shall be provided on each terminal block to ensure that not more than two outgoing wires are connected per terminal. All spare contacts of auxiliary relays, timers etc. shall be wired up to the terminals. 20% spare terminals shall be provided on each terminal block.

Terminal blocks shall be located to allow easy access. Wiring shall be grouped such that the individual wires of a cable can be connected to consecutive terminals.

3.7 Ground Bus

A ground bus, rated to carry maximum fault current, shall extend full length of the switchgear. The ground bus shall be provided with two-bolt drilling with G.I. bolts and nuts at each end to for connection to the grounding conductor / flat.

Each unit shall be connected directly to the ground bus. The frame of each circuit breaker and draw out V.T. unit shall be grounded through heavy multiple contacts at all times except when the primary disconnecting devices are separated by a safe distance.

C.T. & V.T. secondary neutrals shall be earthed through removable links so that earth of one circuit may be removed without disturbing others. All hinged doors shall be earthed by flexible copper bride

3.8 Control & Indication

The circuit breaker shall be wired up for local & remote operation. Each breaker shall be equipped with following:

Remote selector switch with pistol grip handle and key interlock for breakers with motor wound spring charging mechanism. In Remote position, the breaker can be operated in service position with all interlock and protections. In Local position, the breaker shall be operated from switchgear only in test position.

Each cubicle shall be provided with Auto/ Manual Switch. Trip selection switch and Trip-Neutral-Close (TNC) switch.

Circuit breaker shall be indicated electrically. The following indication color shall be used.

Breaker closed	-	Red
Breaker opened	-	Green
Spring Charged	-	White
Breaker Auto trip	-	Amber

Phase indicators in incomer breakers- Red/Yellow/Blue

- However, any other indication shall be provided as per OIL s requirements.
- Lamps shall be LED type with resistance for low voltage glow protection. Lamp and lens shall be replaceable from the front.
- Breakers shall be controlled locally and/or remotely as per plant operational requirement. Necessary Interposing relays & feedback signal shall be provided based on the SCADA, placed at MRSS, IO list.
- Breaker control supply shall be of 110 V DC. Breaker spring charging motor shall be suitable for 240V AC.

3.9 Cable Termination

Switchgear shall be designed for cable entry from the bottom. Sufficient space shall be provided for ease of termination and connection.

3.10 Painting

All sheet steel surfaces shall be chemically cleaned, degreased and pickled in acid to produce a smooth, clean surface free of scale, grease and rust. After cleaning, the surface shall be given a phosphate coating followed by a coat of high-quality primer and baking in the oven.

The paint shade shall be subject to OILs approval. Sufficient quantity of touch up paint shall be furnished for application at site.

3.11 Relays, Protection & Metering

The hardware design for protection and associated equipment shall use latest state– of–the-art technology and shall generally be integrated numerical/digital, modular in nature. Where design is

based on numerical technology, adequate self-testing/monitoring/ diagnostic facilities shall be provided.

All numerical relays, auxiliary relays and devices shall be of types, proven for the application; satisfying requirements specified elsewhere and shall be subject to OIL's approval. Numerical Relays shall have appropriate setting ranges, accuracy, resetting ratio, transient overreach and other characteristics to provide required sensitivity to the satisfaction of the Owner. All numerical relays shall be compatible with IEC 61850.
All protective relays shall be in draw out or plug-in type / modular cases with proper testing facilities. Necessary test plugs / test handles shall be supplied loose and shall be included in supplier s scope of supply.

All AC operated relays shall be suitable for operation at 50 Hz. AC voltage operated relays shall be suitable for 110 Volts VT secondary and current operated relays for 1 amp CT secondary. All relays and timers shall be rated for control supply voltage as mentioned elsewhere under parameters and shall be capable of satisfactory continuous operation between 80-120% of the rated voltage. Voltage operated relays shall have adequate thermal capacity for continuous operation.

Multifunction meters shall be provided for incomer of 11 kV Switchgear and shall able to communicate with SCADA. The accuracy class of CT and VT for MFM shall be 0.2.

Provision shall be made for easy isolation of trip circuits of each relay for the purpose of testing and maintenance.

All protective relays and alarm relays shall be provided with one extra isolated pair of contacts wired to terminals exclusively for future use.
The relay shall be designed to perform satisfactorily under highly noisy electrical environment. Sufficient degree of high frequency disturbance immunity and impulse voltage withstand capacity shall be built into electronic designs as stipulated in relevant standards.

All protections shall be furnished complete with necessary auxiliary, supervisory, lock out relays. Suitably separate sets of single-phase auxiliary C.T with multiple taps shall be provided with relay whenever required.

Visual and audible alarm annunciation shall be initiated in the event of operation of protective/supervisory relay. D.C supply shall be supervised by DC supervision relays.

Trip circuit shall be supervised by Trip circuit supervision.

Tripping shall be done through high speed lock out relays.

All meters/ instrument shall be flush mounted on front panel, at least 96 mm2 size with 90-degree linear scales and accuracy class of 2.0.

Interposing relays for ON/OFF command or any other command shall be as per system requirement.

For alarm and Indication at SCADA as Located end necessary contacts shall be at switchgear end.

Interposing relays for ON/OFF command or any other command shall be as per system requirement.

The relays shall have the following tools for fault diagnostics:

Fault Record: The relay shall have the facility to store at least 100 last fault records with information on cause of trip, date, time, trip values of electrical parameters.

Event Record: The relay shall have the facility to store at least 1000 time stamped event records with 1ms resolution.

Disturbance records: The relay shall have capacity to store at least 50 disturbance record waveforms at 1 sec.

Event log, trip log and disturbance record should go in to history.

The relay settings shall be provided with adequate password protection.

3.12 Protection and Metering

3.12.1 For Incomers

- Instantaneous and Inverse time phase over current relay (50,51)Inverse time Earth fault current relay (51N)
- Directional inverse time phase over current relay (67)
- Directional inverse time Earth fault current relay (67N)
- Bus-bar differential relay (87B)- only for 11kV switchgear
- Reverse blocking mechanics- only for 11kV switchgear
- Under voltage Protection (27)
- Over voltage Protection (59)
- Fault Disturbance Recorder (DR)

3.12.2 For Bus Coupler

- Instantaneous and Inverse time phase over current relay (50,51)
- Instantaneous and Inverse time Earth fault current relay (51N)
- Reverse blocking mechanics- only for 11kV switchgear

3.12.3 Transformer Feeders

- Instantaneous and Inverse time phase over current (50,51)
- Inverse time Earth fault current (51N)
- Instantaneous Earth fault current (50N)- for Transformer feeder (delta connected HV winding)
- Transformer differential relay (87T)
- Reverse blocking mechanics-
- Distance to fault locator (DFL)

3.12.4 Metering In Incomer and Outgoings

- Current in all the three phases (Metering at Switchgear end)
- Voltage of all three phases
- MWH
- MW
- MVARH
- Frequency
- Power Factor
- Synchro. Check

3.13 Tests

3.13.1 Type Test

For each type & rating of 11 kV Switchgear, the Bidder shall submit the reports of all the type tests as per relevant standards and carried out within [last five] years from the date of bid opening for Owner s approval. These reports should be for the tests conducted on the switchgear similar to those proposed to be supplied under this contract and the test(s) should have been conducted at an independent laboratory.

In case the Bidder is not able to submit report of the type test(s) conducted within last five years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Bidder shall conduct all such tests under this contract free of cost to the Owner and submit the reports for approval.

3.13.2 Routine Test

All equipment shall be completely assembled, wired, adjusted and routine tested as per relevant IS / IEC Standards at manufacturer's works in the presence of consultant /purchaser or his representative. However, the following minimum routine tests shall be conduct.

Power-frequency voltage tests on the main circuit
Dielectric tests on auxiliary and control circuits
Measurement of the resistance of the main circuit
Partial discharge measurement
Mechanical operation tests
Heat Run test
Pressure tests of gas-filled compartments
Tests of auxiliary electrical, pneumatic and hydraulic devices
Verification of correct wiring

3.13.3 Test Witness

The tests shall be carried out in presence of the Owner’s representative, for which a minimum 10days notice shall be given by the Bidder. The Bidder shall obtain the Owner’s approval for the type test procedure before conducting the type test. The test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.

3.13.4 Test Certificates

Certified copies of all tests carried out at works and at site shall be furnished in requisite no. of copies for approval of the Owner. The equipment shall be dispatched from works only after receipt of Owner's written approval of shop test reports.

3.14 Drawing & Documents

Drawings, data & manuals for the motors shall be submitted as indicated below.

[General Arrangement drawings and cross-section showing constructional features & cable entry with bottom view with opening] Bill of Materials.

Technical Data sheet and Catalogue.

Foundation drawing details with bottom view of switchgear.

Descriptive write-ups and literature for the main equipment offered including relays, meters, etc.

Control Schematics & Wiring diagram.

Inspection and Test Plan (ITP).

Suggestive list of protective relays.

Transport/shipping dimensions and weights].

3.15 Ratings & Requirements

11 kV Switchgear shall comply with the particulars indicated in the following tables.

Table 2.0

Sl. No.	DESCRIPTION	UNIT	DATA
1.0	**General**		
1.1	Name of Manufacturer		*[By Bidder]*
1.2	Place & Country of manufacture		*[By Bidder]*
2.0	**Switchgear Details**		
2.1	Rated voltage(Nom/Max), phases & frequency		11 kV, 3 Phase, 3 wire, 50 Hz.
2.2	System neutral earthing		Solidly Earthed
2.3	Voltage & frequency variation	%	+/-10%, -5%to +3% Hz.
2.4	Rated frequency Insulation Level	Hz	50Hz
2.4	power frequency Voltage Impulse withstand Voltage		28 kV RMS,75kV peak
2.5	Continuous current rating of busbars under site reference ambient temp.		*[As per Project requirement]*
2.6	Reference ambient temperature		45□C
2.7	Maximum temperature of bus bars and droppers/connectors under site conditions specified		Continuous current without exceeding the temperature of 90°C. silver plated joints maximum temperature shall be limited to 105 °C.

Sl. No.	DESCRIPTION	UNIT	DATA
2.8	Short circuit current withstand for busbars and droppers		
a	Short time	kA (rms)	18.3 kA for 1 sec
b	Dynamic Rating	kA (peak)	46kA
c	Intern Arc AFLR	Ka	25 Ka for 1Seca
2.9	Whether busbars have been insulated	Yes	Required
2.10	Type of insulation		*[By Bidder]*
2.11	Material of bus bar supports		*[By Bidder]*
2.12	Switchgear designation		[As per project specific]
2.13	Bus bar material		Copper
2.14	Fully draw out (FD)/ Fixed (F)		FD / Single front
2.15	Entry –Top (T)/Bottom (B)		Bottom for cables.
2.16	Degree of protection		IP-42 and for LV chamber shall be IP-52
2.17	Color finish shade	Interior	Siemens Grey
		Exterior	RAL 7032
2.18	Earthing bus	Material	GI
2.19	Minimum clearances in air of live parts	mm	As per standard
3.0	**Circuit breakers**		
3.1	Maker's name		
3.2	Voltage, frequency & no. of phases , poles		11kV,50hz,3 phase,3 pole
3.3	Rated operating duty		O-0.3sec-CO- 3min -CO
3.4	Circuit breakers type		VCB
3.5	Short circuit withstand current for 1 sec. Duration	kA	18.3 at 11kV
3.6	Rated making current	kAp	100
3.7	Rated current at site reference ambient temp	A	*[By bidder]*
3.8	Type of operating mechanism		Spring charged motor and manual
3.9	Minimum no. of auxiliary Contacts for purchaser s use		6NO,6NC
3.10	Control voltage Spring charging motor	V AC/ DC	230V AC
3.11	Closing Coil		
a	Voltage	V	110 V
b	Permissible Voltage Variation	%	85% to 110%

Sl. No.	DESCRIPTION	UNIT	DATA
c	Closing Current at rated Voltage	A	Within Limit
3.12	Opening Coil		
a	Voltage	V	110 V
b	Permissible Voltage Variation	%	85% to 110%
c	Closing Current at rated Voltage	A	Within Limit
3.13	Operating time		
	Opening time	ms	<65
	Breaking time	ms	<15
	Total tripping time	ms	<80 (total break time)
	Total Closing time	ms	<80 ms
3.14	Number of breaks per pole		One
4.0	**Contactor**		
	Voltage class	kV	12
	Short time Rating		*[By bidder]*
	Duty		AC3
5.0	**Fuse**		
	Voltage class	kV	11 kV
	Rupturing capacity	kAp	100
6.0	**Current Transformer**		
a	Make		*[By bidder]*
b	Type		Resin Cast
c	Rated frequency		50Hz
d	Class of Insulation		*[Class E]*
6.1	CT for differential protection		
	Class		PS class
	Secondary resistance at 75 ^{0} C		*[By bidder]*
	Knee Point Voltage		*[By bidder]*
	Excitation Current		<30mA
6.2	CT for Metering		
	Class		*0.2 for incomers, 1 for outgoings*
	Secondary resistance at 75 ^{0} C		*[By Bidder]*
6.3	CT for Protection		
	Class		*[5P20]*
7.0	**Voltage Transformer**		
a	Make		*[By Bidder]*
b	Type		Resin Cast
c	Rated frequency		50Hz
d	Class of Insulation		*[Class E]*
e	Voltage ration		*[By Bidder]*
8.0	**Meters**		
a	Make		*[By Bidder]*
b	Type		*[By Bidder]*
8.1	**Voltmeter**		
a	Make		*[By Bidder]*

Sl. No.	DESCRIPTION	UNIT	DATA
b	Type		*[By Bidder]*
c	Applicable standards		As specified in the specification.
d	Accuracy class		Class 0.2 for line, Class 0.5 for bus
8.2	**Ammeter**		
a	Make		*[By Bidder]*
b	Type		*[By Bidder]*
c	Applicable standards		As specified in the specification.
d	Accuracy class		Class 0.2 for incomers, Class 1.0 for outgoing
9.0	**Indicating lamps**		
a	Make		*[By Bidder]*
b	Type		*[By Bidder]*
c	Voltage	V	As specified in the specification.
d	Wattage of lamp	W	*[By Bidder]*
10.0	**Push buttons**		
a	Make		
b	Type		As specified in the specification
c	Contact rating	A	*[By Bidder]*
11.0	**Space heater**		
a	Make		
b	Type		As specified in the specification.
c	Rated voltage	V	As specified in the specification.
d	Power rating	W	*[By Bidder]*
12.0	**Wiring and terminal blocks**		
a	Voltage grade		1.1 kV
b	Insulation		*[By Bidder]*
c	Minimum size of conductor for:		
	Power wiring	Sq. mm	2.5 for CT & PT for internal panel wiring only and 4 for external wiring
	Control wiring	Sq. mm	1.5 (for internal panel wiring only)
d	Type of terminal blocks:		
e	I) For Withdraw able Type		Sliding type
	II) For Fixed Type		Stud & nut type
f	Minimum current rating of terminal blocks	A	10
13.0	**Relays**		
a	Make		

Sl. No.	DESCRIPTION	UNIT	DATA
b	Model Number		
c	Parameter		Catalogue shall be furnished by the b idder.

CHAPTER - 4: 415V SWITCHGEAR, APFC PANEL, MCC AND DB

4.0 General

This specification is intended to cover the design, Engineering, manufacture, assembly, testing at manufacturer's works, supply in properly packed condition for transport to site, Erection, site testing and commissioningof 415V Switchgear, APFC PANEL, MCC and DBs.

The system shall be complete in all respect including all accessories required for efficient.

4.1 Codes and Standards

All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) / IEC as given below except where modified and/or supplemented by this specification.

Codes	Name of Standard
IS : 1248	Direct acting indicating analogue electrical measuring instruments and their accessories
IS: 2551	Danger notice plates
IS :2705	Current transformers-specification
IS :13925	Shunt Capacitors for AC Power Systems
IS :3156	Voltage transformer specification
IS :3231	Specification for electrical relays for power system protection
IS: 8084	Specification for interconnection busbars for AC voltages above 1kV up to and including 36kV.
IS :8623	Specification for low-voltage switchgear and control gear assemblies
IS :8686	Specification for static protective relays
IS :10118	Code-of practice for selection installation and maintenance of switchgear and control gear.
IS :12021	Specification for control transformers for switchgear and control gear for voltages not exceeding 1000 V AC
IS : 13947(Part 1)	Specification for low-voltage switchgear and control gear
IS : 13947 (Part 2)	Specification for low-voltage switchgear and control gear –part 2: circuit breakers
IS : 13947(Part 4)	Specification for low-voltage switchgear and control gear part:4 contactors and motor feeders
IS : 13947 (Part 5)	Low-voltage switchgear and control gear specification Part 5 : control circuit devices and switching elements
IEC 61439	Low voltage switchgear and control gear assemblies.
CEA	CEA regulations for installation and operation of meters 2006.
CEA	Standard technical specifications for main plant package

Equipment and material conforming to any other standard which ensures equal or better quality may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

The electrical installation shall meet the requirements ofCEA as amended up to date and relevant IS Codes of Practice. In addition, other rules and regulations applicable to the work shall be followed.

4.2 Design Criteria

(a) All 415V Switchgear, MCC and DB shall be suitable for site conditions as detailed in Para 5.1.1.

(b) All 415V Switchgear, MCC and DB shall be suitable for following voltage & frequency variations as follows:

Voltage Variation:	(±) 10%
Frequency Variation:	(+) 3% to (-)5%

Combined Variation of Voltage & Frequency:	10% (absolute sum)
For DC system:	-15% to +10%

(c) 415 V switchgear & MCCs shall be of indoor, single front. ACB feeder may be of single tier/two tier configuration depending upon rating. These shall be CRCA sheet metal enclosed and assembled to form a rigid, free-standing floor mounted structure. Vertical units shall be assembled to form a continuous line up of panels. Compartmentalized multi-tier configuration shall be provided.

(d) For 415 V switchgear & MCCs Feeders rated more than 630A shall be equipped with Air Circuit Breaker (ACB). Outgoing/Incoming feeders rated upto 630 A shall be MCCBs. All incoming/outgoing breakers shall be 4 pole (except motor feeder breakers).

(e) For DBs Incomer rated more than 630A shall be ACB. Incomer upto 630A shall be MCCB

(f) All ACB shall be draw out type & should have Service, test and disconnected positions with positive indications for service & test positions. All ACBs should be capable of motorized spring charging. It also shall be possible to charge the springs manually, if, required. Spring charged/discharged condition shall indicated in ACB.

(g) Local/remote selection shall be provided for all incoming/Outgoing ACB module. Incoming/Outgoing breaker shall be closed at service position from remote (SCADA) and at test position from Local (Switchgear).

(h) Two out of three breaker logic shall be considered for switchgear/MCC. However mechanical interlock shall be considered for incomer of MCCB operated DBs. Also, Local/remote selection switch shall be provided for all motor modules for control from Remote (SCADA). Also for breaker operated motor, breaker shall be closed in Test position from local (Switchgear).

(I) All motors shall be provided with Emergency stop push button and shall have Remote Control station.

(j) Control circuits shall operate at suitable voltage of 240V AC. Necessary control supply transformers having primary and secondary MCCB/MCB shall be provided for each MCC, 2 x 100% per section. The auxiliary bus bars for control supply shall be segregated from bus bars. This control supplies shall be monitored.

(k) All the numerical relays shall have communication on two ports, local front port communication to laptop and a second port with [IEC 61850 protocol] to communicate with SCADA.

(l) There shall be a provision of LOTO in each MCCB, ACB etc.

4.3 Protection Systems

Numerical relay-based protection systems for various parts of the power supply system are proposed. The following protection systems shall be used:

415V System

(1) 415 V Incomer Feeders

- Over current & Earth fault protection;
- Under voltage relay.
- Differential Relay

(2) LV Motors

Motors less than 15 KW

- Single phasing preventor.
- Motor Protection Circuit Breaker
- Earth leakage protection relay with CBCT

Motors above 15kW up to 100kW

- MCCB with separate bimetallic overload relay and single-phase preventer.
- MCCB shall have built-in protection of o/c, s/c, instantaneous s/c and ground fault protection (LSIg).

Motors 100kW and above (including soft starter driven motors)

Comprehensive motor protection relay providing the following protection:

- Thermal Overload;
- locked rotor;
- Phase Over current (50/51);
- Earth fault (50N/51N);
- Over voltage & under voltage;
- phase loss/reversal;
- Negative sequence;
- Protection for repeated and prolonged starts;
- restart inhibition;
- Single phasing preventor;
- MCCB

4.4 Pump Drives

All pumps shall be provided with the following additional protection, as per requirement:

- Dry run protection;
- Temperature protection (Submersible pumps)
- Moisture entry protection (Submersible pumps)
- Over pressure (positive displacement pumps)

For 415 V switchgear & MCCs Feeders rated more than 630A shall be equipped with Air Circuit Breaker (ACB). Outgoing/Incoming feeders rated upto 630 A shall be MCCBs.

For DBs Incomer rated more than 630A shall be ACB. Incomer upto 630A shall be MCCB. Outgoing feeder may be MCCB/MCB depending upon the bus fault level.

All ACB shall be draw out type & should have Service, test and disconnected positions with positive indications for service & test positions. It shall be possible to charge the springs manually, if, required.

Local/remote selection shall be provided for all incoming/Outgoing ACB module. Incoming/Outgoing breaker shall be closed at service position from remote (SCADA) and at test position from Local (Switchgear).

Two out of three breaker logic shall be considered for switchgear/MCC. However mechanical interlock shall be considered for incomer of VCB operated Panels. Also, Local/remote selection switch shall be provided for all motor modules for control from Remote (SCADA). Also for breaker operated motor, breaker shall be closed in Test position from local (Switchgear).

All motors shall be provided with Emergency stop push button.

Control circuits shall operate at suitable voltage of 110V AC or 110V DC. Necessary control supply transformers having primary and secondary MCCB/MCB shall be provided for each MCC, 2 x 100% per section. However, breaker shall operate on 110V DC. The auxiliary bus bars for control supply shall be segregated from bus bars. This control supplies shall be monitored.

All the numerical relays shall have communication on two ports, local front port communication to laptop and a second port with [IEC 61850 protocol] to communicate with SCADA.

4.5 Design Criteria for Capacitor Banks

The capacitor banks shall be complete with all parts that are necessary or essential for efficient operation. Such parts shall be deemed to be within the scope of supply whether specifically mentioned or not.

The capacitor bank may comprise of suitable number of single phase units in series parallel combination. However, the number of parallel units in each of the series racks shall be such that failure of one unit shall not create an overvoltage on the units in parallel with it, which will result in the failure of the parallel units.

The complete capacitor banks with its accessories shall be metal enclosed (in sheet steel cubicle), indoor floor mounting and free standing type.

The assembly of the banks shall be such that it provides sufficient ventilation for each unit. Necessary louvers may be provided in the cubicle to ensure proper ventilation.

Each capacitor unit/bank shall be fitted with directly connected continuously rated, low loss discharge device to discharge the capacitors to reduce the voltage to 50 volts within one minute in accordance with the provisions of the latest edition of IS : 2834.

All panels of capacitor banks with MCCBs, Contactor, minimum 8 stage automatic power factor correction relay enclosed in IP 42 compliant CRCA Sheet Steel enclosure.

Capacitors shall be double layer All poly Polypropylene (APP) type having following specifications and conform to IS 13925:

(a) Supply 3phase, 3 wire

(b) Rated voltage 415 V
(c) Rated frequency 50 Hz.
(d) Permissible overvoltage 1.1 Vn
(e) Permissible over current: 1.5 In
(f) Temperature category: 50 deg c

The capacitors shall have Low Dielectric Loss of 0.5 W/kVAR.

All capacitors shall be provided with 7% de-tuned filter along with all accessories and protections.

Any change in rated voltage level of the capacitor bank due to the filter or otherwise shall be considered by the vendor. The indicated rating of capacitor banks are at rated voltage of 415V.

The banks shall be switched ON and OFF in both Auto as well as Manual mode.

All necessary auxiliary contactors of suitable duty along with feeder accessories are included in scope. All power Contactors for capacitor switching shall be of required duty.

Manual operation shall be done with recess type panel mounted ON/OFF pushbutton with delay timer.

Minimum current rating under site conditions, of circuit breakers, Contactors, and cables shall be at least 150% of rated capacitor current.

Capacitors shall be mounted in such a way that heat dissipation is proper and the capacitors are accessible for maintenance and inspections.

Capacitor switching and automatic power factor correction panel shall be designed in such a way that power factor of 0.98 lagging shall always be maintained. Timings to cut in capacitors shall be provided in such a manner to facilitate capacitor discharging before next switching and shall also avoid hunting due to temporary fluctuations of load. The timer shall be provided in both auto and manual mode.

The Automatic power factor correction panel and capacitor panel are integral type, prewired including power connections. Due consideration shall be given for adding/ removal of capacitor or other components and maintenance considerations. Contractor shall submit GA drawings of capacitor and capacitor control panel, with description of power factor control panel with its components.

Each unit shall satisfactorily operate at 130% of rated KVAR including factors of overvoltage, harmonic currents and manufacturing tolerance. The units shall be capable of continuously withstanding satisfactorily any overvoltage up to a maximum of 10% above the rated voltage, excluding transients.

4.6 Unit Protection

Each capacitor unit shall be individually protected by a MCCB Breaker suitably rated for load current and short circuit capacity, so that a faulty capacitor unit shall be disconnected by the breaker

without causing the bank to be disconnected. Thus, the breaker shall disconnect only the faulty unit and shall leave the rest of the units undisturbed.

The Inputs to the APFC system is Voltage input from two phases and current input from the third phase. Out of two phases of voltage one phase voltage is taken as Reference 0 and other phase voltage as 440 V. APFC need to be installed CT (Current Transformer) on the third phase at main incomer ACB after transformer, which will give signal to the APFC Relay. Based on this inputs the ASIC (Application Specific Integrated Circuit) OR Call it as Microprocessor internal to the APFC Relay will give output signal to relay outputs which will energize coil of the contactor so that the contactor come in line connecting the capacitor bank in circuit. However this is step correction means PF is corrected in steps. The Voltage rise due to connection of capacitor banks is marginal. There will be no frequency correction with APFC System.

4.7 Specific Requirements

Construction

All 415V switchgear, MCC and DBs shall have following minimum features.

All 415V switchgear, MCC and DBs shall be metal enclosed, indoor, floor mounted and free standing type. The panels shall be suitable for cable entry at bottom.

Between 415V Switchgear and transformers, cable is considered. Hence switchgear shall be suitable for this connection of 3 x 240 sq. mm Copper armored cable at each.

All frames and load bearing members shall be fabricated using mild steel structural sections or pressed and shaped cold rolled sheet steel of thickness not less than 2 mm.

Frame shall be enclosed in cold rolled sheet steel of thickness not less than 2 mm. Doors and covers shall also be of cold rolled sheet steel of thickness not less than 1.6 mm. Removable gland plates of thickness 3mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material) shall be provided for all panels. Suitable removable type lifting hooks and / or jacking pad shall be provided on each panel or shipping section for ease of lifting of switchgear. These hooks when removed shall not leave any opening in the panels.

Each breaker shall be housed in a separate cubicle, complete with an individual front access door. Each vertical section shall have a removable back cover.

The switchgear enclosure shall confirm to the degree of protection IP-54 (for outdoor). For indoor, enclosure shall confirm to IP52, however for Busbar chamber of switchboards rated above 1600A, degree of protection shall be IP-42.

The switchgear panel shall be powder coated with shade RAL 7032 (Siemens Gray) as per IS with minimum thickness 80 microns with structured finish.

The switchgear assembly shall comprise a continuous, line-up of single / multi tier cubicles. The installations of circuit breakers however shall be limited to the bottom two tiers only. Working height shall be limited to 250 mm to 1800 mm from the floor level.

Metallic barriers shall be provided between vertical sections and also between adjacent modules to ensure prevention of accidental contact with live parts during routine inspection/maintenance of functional units or cable terminations of one or more functional units when working on those of adjacent units. These barriers shall have insulating inserts as necessary for taking the interconnections etc

A nameplate with switchgear designation shall be fixed at the top of the central panel. A separate nameplate giving feeder details shall be provided for each compartment. A separate nameplate giving details of bus section shall also be provided for switchgears having more than one bus section.

Name plate shall be provided for each equipment (lamps, push buttons, switches, relays, auxiliary contactor, etc) mounted on the switchboard. Special warning plates one each on each feeder of a shipping section shall be provided on removable covers of doors giving access to cable terminals and busbars. Name plate size shall be minimum of 20x75 mm for Instruments/devices and 40x50 mm for panels. Thickness shall be minimum 3 mm.

For MCC/DB a full height vertical cable chamber with cable supports shall be provided in each section to facilitate unit wiring.

2x100%, 415V/110V AC control transformer shall be provided for control, Indication and annunciation supply for contactor operated motor feeder. All the necessary auxiliary and main contactor shall be provided suitable for this control supply.

Two 110V DC feeders shall be provided for control, Indication and annunciation of breaker operated module.

Compartment door shall be interlocked with main power isolating device for safety with provision for defeating it by authorized person.
Supplier shall provide total 20% or minimum one (1) no. spare feeder of each type & rating with respect to total requirement of the switchgear.

Motors of rating 30 kW and above shall be provided with anti- condensation heaters. Necessary provision for supply of motor space heating shall be considered in the switchgear.

The incoming connection to transformer of more than 1000kVA and inter-connecting sections between switchboards shall preferably be of cable.

It should be possible to carryout maintenance on a feeder with adjacent feeders alive.

4.7.2 Bus and Bus Taps

All MCC and DB buses shall be 3 phase, 4 wire design. The neutral bus shall be same size as phase buses.

The main buses and connections shall be of high conductivity Coppersized for specified current ratings with temperature rise limited [to 45ºC over ambient temperature of 45ºC].

Silver plating shall be done on copper bar wherever copper to copper and copper to aluminum contacts are envisaged. All connection hardware shall be non-magnetic and shall have high corrosion resistance.

Adequate contact pressure shall be ensured by means of two bolts connection with plain & spring washers and locknuts. Temperature rise shall not exceed 105 degree for siliver plated joints over an ambient temperature of 45 degree.

Bus bars and connections shall be fully insulated for working voltage with adequate phase / ground clearances. Insulating sleeves for bus bars and shrouds for joints shall be provided.

Bus insulators shall be flame-retardant, track resistant type with high creepage surface. All buses and connections shall be supported and braced to with stand the stresses due to maximum short-circuit current and also to take care of thermal expansion.

Bus bars shall be color coded for easy identification and so located that the sequence R-Y-B shall be from left to right, top to bottom or front to rear, when viewed from the front to switchgear assembly.

Power shall be distributed to each module or compartment by a set of vertical bus bars. The vertical bus bars shall run behind the modules. Necessary tee off connectors shall be used for distributing auxiliary supply to each vertical panel. Rubber grommets shall be used for all wire entries to make the entries dust and vermin proof.

The clearance between the individual bare phase power bus bars and between the phase and earth bus bars in air shall be not less than 25.4 mm.

Three phase, neutral and continuous earth bus shall be provided. Bus bar and tapping shall be provided with color coded PVC sleeves.

4.7.3 Air Circuit Breaker

All Circuit Breakers for incoming feeders and Bus couplers shall be four poles; single throw, motor operated and air break type. Circuit breaker for outgoing feeders shall be triple pole, single throw and air break type.

However for supply feeders it shall be four pole.

Circuit Breakers shall be draw out type having Service, Test & Disconnected positions with positive indication for each position.

Circuit breakers of identical rating shall be physically and electrically interchangeable.
Bolted disconnected links shall be provided for all outgoing feeders for isolation of neutral, if necessary.

For motor wound mechanism, spring charging shall take place automatically after each breaker closing operation. One open – close – open operation of the circuit breaker shall be possible after failure of power supply to the motor when the spring is charged after a closing operation.

Mechanical safety interlock shall be provided to prevent the circuit breaker from being racked in or out of the service position when the breaker is closed.

Automatic safety shutters shall be provided to fully cover the female primary disconnects when the breaker is withdrawn.

Each breaker shall be provided with an emergency manual trip, mechanical ON-OFF indicator, an operational counter and mechanism to indicate spring charge / discharge condition.

In addition to the auxiliary contacts required for normal breaker operation and indication, each breaker shall be provided with followings for interlocking purpose:-

Position / cell switch with 4 No + 4 NC contacts.

Limit / auxiliary switches shall be convertible type that is facility for changing N.O. contact to N.C. and vice-versa.

Mechanical stopper to prevent accidental falling while withdrawing.

Breaker cannot be racked in from isolated to test position with the door open together with provision for defeat of this interlocking, however, the door can be closed only when the breaker is brought back to isolated position. Insertion of breaker into Service position not possible if the shutters are not free.

Door can be opened only when breaker is OFF and is in Isolated position. Remote closing of breaker not permitted with door open.

Anti pumping relay / device to ensure that there can be only one closing operation for each closing command.

Suitable trolley arrangement shall be provided for breaker/starter modules. Two trolleys per switchgear room shall be provided so that top most breaker module of all types, sizes and rating can be withdrawn on trolley and lowered for maintenance purpose.

Closing and tripping coil shall operate satisfactorily under the following conditions.

Closing Coil: 85% to 110% of rated voltage.

Tripping Coil: 70% to 110% of rated voltage.

4.7.4 APFC PANEL

APFC Panel of 100 KVAR is required for power factor correction. Configuration of APFC panel shall be (1x50 kVAR+1x25kVAR+2x10kVAR+1x5kVAR).

Power capacitor and control panel shall be housed in metal enclosed cubicle. Power capacitor shall be housed in the lower compartment and capacitor control panel at top compartment.

The control equipment including capacitors shall be mounted in a panel of cold rolled sheet steel. The panel shall be of indoor type.

Bus bars shall be of aluminium conductor and high conductivity.

Isolating switch

Contactor with overload element

APFC Relays responsive to current/voltage/KVAR/PF as specified for automatic switching shall be of microprocessor based suitable for state board Electricity with reduced power factor.
Sequencing devices, timers and auxiliary relays for automatic sequential switching of the capacitors in and out of the circuit.

Auto-manual selector switches

Push button for opening and closing the power circuit.

Red and green cluster LED lights for capacitors ON/OFF indication

Protective numerical relays to protect the healthy capacitor units when one unit fails in a series connection.

Space heater and cubicle lighting as per the requirements.

4.8 Contactors, MCCB and MPCB

Incomers for MCCs and DBs rated below 630A shall be MCCB.

Incomer and bus coupler rated below 630A shall be mechanically Interlocked.

Motor starter contactors shall be of air break, electromagnetic type. Suitable for DOL, Star-Delta, Soft, VFD starting of motor, and shall be of utilization category AC-3 for ordinary and AC-4 for reversing starters. DC contactor shall be of DC-3 utilization category.

The contactors shall be three pole, air break type designed for duty class III category A.C. –3 with non-bouncing silver / silver alloy.
Each contactor shall be provided with two (2) normally open and two (2) normally closed auxiliary contacts unless otherwise specifically stated. Rating shall be decided by the bidder.

Reversing contacts shall be electrically and mechanically interlocked.

Contactors with delayed dropout feature shall be provided for some essential auxiliaries. These contactors shall not dropout on power failure if the voltage is restored within 3 seconds.

4.9 Electronic Over Load Relays

Electronic overload relays shall conform to IEC:292-1 and shall be triple pole, ambient temperature compensated with adjustable setting, inverse time lag, built in single phase preventer and hand/auto reset type provided as per requirement along with necessary command, feedback cable, coupling relays etc.

Provided with 1 NO and 1NC contact of rating same as the auxiliary contact of the contactors.

The relay shall be able to withstand prospective short circuit current without damage or injurious heating till the motor protection MCCB/MPCB clears the fault.

Relays may be direct acting or CT operated, depending on current rating. CTs shall be included in the scope of supply.

4.10 Bus Transfer Scheme

Incomer 1 & 2 (Grid main Transformer 1 & 2) & Incomer of respective DG shall be interlocked such that generators are closed only when incomer 1 & 2 are open. Incase power supply is not available from mains, the same shall be provided from DG of respective Transformer bus coupler
Shall be close if necessary keeping Incomer 1 & 2 are open.

Under normal condition the total power required for the Pontoon Type Raw Water In-take plant is fed from mains. In case, power supply is not available from grid mains, the same shall be closed if necessary keeping incomer 1 & 2 open.

DG Operation Logic: In case of power failure, the under-voltage relay of incomer 1 or 2(mains) shall give a start command to DG set sequentially.

Automatic bus transfer scheme.

	1	2	3	4
1	ON	ON	OFF	OFF
2	ON	OFF	ON	OFF
3	OFF	ON	ON	OFF
4	OFF	OFF	OFF	OFF
5	OFF	OFF	ON	ON

4.11 Current Transformer

The accuracy class for metering CT shall be 0.2s & for Protection CTs it shall be Class 5P10 and CT burden shall be minimum 15VA or as per statutory requirement whichever is more stringent.

All secondary connections shall be brought out to terminal blocks where wye or delta connection shall be made.

CTs shall have polarity makings indelibly marked on each transformer at the lead terminations and at the associated terminal block. Facility shall be provided for short circuiting and grounding the CT secondary at the terminal blocks. Secondary terminals shall be provided with protective cap.

CT terminal block shall be disconnecting type and suitable for round type lugs with facility for testing and short circuiting of individual CT.

All CT's shall be provided with supports independent of busbars / busbar supports. The CT's shall be located in such a way that they can be easily approached for maintenance without necessitating shutdown of adjacent feeders.

CTs shall be provided with disconnected type test links in both secondary leads for carrying out current and phase angle measurement.

4.14 Secondary Wiring

The switchgear shall be fully wired at the factory to ensure proper functioning of control, protection and interlocking schemes.

Fuse /MCB and links shall be provided to permit individual circuit isolation from bus wires without disturbing other circuits. All spare contacts of relays, switches and other devices shall be wired up to terminal blocks.

Secondary wiring within the switchgear shall be carried out in a neat and systematic manner and securely held in position (either loomed or run in conduit / trunking). Wherever wiring passes through compartment, it shall be run in conduit / trunking, if metallic shall be bonded to the main earth busbar.

Wiring shall be done with flexible, 1.1/0.650kV grade, PVC insulated switchboard wires with stranded copper conductors of 2.5 mm2 for CT & PT circuits and 1.5mm2 for control circuit wiring.

Each wire shall be identified, at both ends, with permanent markers bearing wire numbers as per bidder s wiring diagrams. Wire terminations shall be made with crimping type connectors with insulating sleeves, wire shall not be spliced between terminals.

4.15 Terminal Blocks

Terminal blocks shall be 660V grade box-clamp type with marking strips, similar to 10 mm2 or equal. Terminals for C.T. secondary leads shall have provision for shorting.

Not more than two wires shall be connected to any terminal. lf more than two wires at one terminal are required, separate terminals with function wise shorting links shall be provided. Spare terminal equal in number to 20% of active terminals shall be furnished.

Terminal blocks shall be located to allow easy access. Wiring shall be so arranged so that individual wires of an external cable can be connected to consecutive terminals.

4.16 Ground Bus

A ground bus, rated to carry maximum fault current, shall extend full length of the switchgear and size 50X6mm.The ground bus shall be provided with two-bolt drilling with G.I. bolts and nuts at each end to for connection to the grounding conductor / flat.

Each unit shall be connected directly to the ground bus. The frame of each circuit breaker and V.T. unit shall be grounded through heavy multiple contacts at all times except when the primary disconnecting devices are separated by a safe distance.

C.T. & V.T. secondary neutrals shall be earthed through removable links so that earth of one circuit may be removed without disturbing others. All hinged doors shall be earthed by flexible copper bride.

4.17 Space Heater

Each vertical section shall be provided with thermostat controlled space heater 5A, 3 pin socket plug.

In addition, motor feeders rated 30 KW and above shall be wired up for feeding the motor space heater through suitably rated breaker auxiliary NC contact and/or contactor.

Cubicle heater, Motor heater, and Plug socket circuit shall have individual switch fuse units/MCB.

4.18 AC Distribution Boards (ACDBs)

AC Distribution Boards shall have MCCB/MCB at incomer depending upon the short circuit rating. Distribution Boards may be fed from switchgear and shall have two incomers. AC distribution Boards shall be of two types - one with 415V, 4-wire, triple pole and neutral (TPN) outgoing feeders and the other with 240V, 2-wire, single pole and neutral (SPN) outgoing feeders.

For small loads, MCB boards with TPN MCB as incomer and TPN/SP MCBs for outgoing may be considered. The feeder rating and quantity shall be as per requirement.

Board shall be single front, metal clad, front matched, dust and vermin proof, fixed type, compartmentalized and extensible on both sides.

Bus bars shall have same cross section throughout the length. Rating of the neutral bus bar shall be same as phase. Earth bus bar shall run in bottom chamber throughout the length of the Board.

Switches/MCBs/RCBOs shall be hand operated, air break, quick make, quick break type conforming to applicable standards.

The feeders shall be protected for short circuit by fuse and the MCB shall be provided with overload/short circuit protective device for protection under overload and short circuit conditions. Switch shall have provision for locking in both fully open and closed positions.

MCBs/RCBOs shall be provided with locking facility.

Receptacle units shall consist of socket outlet with associated switch, neon indicating lamp and plug. The socket outlet and switch or MCB shall be flush mounted within a stove enameled / galvanised 1.2 mm thick CRCA sheet steel enclosure with Perspex /insulating cover. The box may be recessed into or mounted on a wall as per requirements of project layouts.

The outdoor type receptacles shall be housed in a 2 mm thick CRCA sheet steel epoxy painted enclosure with gasketed, hinged door having locking arrangement. The enclosure shall be with rain

canopy and removable gland plate entry from bottom. Composite receptacle with switch modules housed in a box shall be with degree of protection IP 65.

Single phase receptacles shall be associated with a MCB of same current rating and the receptacle shall become live only when the associated MCB is in ON position.

Three phase receptacles shall be associated with a TPN switch housed in the same enclosure. The receptacle shall become live only when the associated switch is in ON position and it shall not be possible to withdraw the plug with the switch in ON position.
The plugs shall be provided with cord grips to prevent strain and damage to conductors/wires at connection and entry points.

Junction boxes with terminals shall be supplied for branching and terminating lighting cables when required for outdoor areas, 3 phase receptacles etc.

The junction boxes shall be dust and vermin proof and shall be fabricated from 1.2 mm to 2 mm CRCA sheet steel depending on the size of the junction box and shall be complete with removable cover plate with gaskets, two earthing terminals each with nut, bolt and washer. Boxes shall be additionally weather proof when specified.

The boxes shall have provision for wall, column, pole or structure mounting and shall be provided with cable/conduit entry knock outs, terminal blocks, HRC fuses, as indicated in the Project drawing.

The terminal blocks, with specified number of terminals, shall be mounted securely on brackets welded to the back sheet of the box. The terminals shall be 650 V grade, one piece construction complete with terminals, insulation barriers, galvanised nuts, bolts and washers and provided with identification strips of PVC. The terminals shall be made of copper alloy and shall be of box clamp type.

The boxes shall be hot dip galvanized /painted with one shop coat of red oxide zinc chromate primer followed by a finishing coat of paint as specified.

4.19 DC Distribution Boards

DCDBs shall have two incomers and a bus coupler. Incomers and outgoing feeders of DCDBs shall be MCB/MCCB modules. They shall be fixed type and floor mounted. Other constructional features shall be similar to ACDB.

- 110DC system is envisaged for protection and control.
- Batteries shall be 110V maintenance free and shall be complete with battery, battery charger with boost and trickle charging facilities, necessary controls, indications and distribution load.
- Battery charger shall be such that if one FCBC fails the other FCBC will be able to take the full on-line load as well as battery charging connect.
- The battery room shall be provided with acid proof tile flooring, corrosion proof lighting fixtures, exhaust fan and wash basin.

The feeder rating and quantity shall be as per requirement.

4.20 Control & Indication

The circuit breaker shall be wired up for local & remote operation. Each breaker cubicle shall be equipped with following:

Remote selector switch with pistol grip handle and key interlock for breakers with motor wound spring charging mechanism. In Remote position, the breaker can be operated in service position with all interlock and protections. In switchgear position, the breaker shall be operated from switchgear only in test position with only protection (no interlock).

Two (2) heavy duty, oil-tight, push buttons for Trip & Close.

Circuit breaker shall be indicated electrically. The following indication colour shall be used.

Breaker open	-	GREEN
Breaker closed	-	RED
Spring Charged	-	WHITE
Breaker Auto Trip	-	AMBER

However, any other indication shall be provided as per owner s requirement.

Lamps shall be LED type with resistance for voltage protection. Lamp and lens shall be replaceable from the front.

For all MCCB feeders, trip indication lamp shall be provided on front of the compartment.

For all starters, ON, OFF and trip indication lamps shall be provided on front of the compartment.

4.21 Relays, Protection & Metering

The hardware design for protection and associated equipment shall use latest state– of–the-art technology and shall generally be integrated numerical/digital, modular in nature. Where design is based on numerical technology, adequate self testing/monitoring/diagnostic facilities shall be provided.

All numerical relays, auxiliary relays and devices shall be of types, proven for the application; satisfying requirements specified elsewhere and shall be subject to Purchaser's approval. Numerical Relays shall have appropriate setting ranges, accuracy, resetting ratio, transient overreach and other characteristics to provide required sensitivity to the satisfaction of the Owner.

All protective relays shall be in draw out or plug-in type / modular cases with proper testing facilities. Necessary test plugs / test handles shall be supplied loose and shall be included in supplier s scope of supply.

All AC operated relays shall be suitable for operation at 50 Hz. AC voltage operated relays shall be suitable for 110 Volts VT secondary and current operated relays for 1 amp CT secondary. All relays and timers shall be rated for control supply voltage as mentioned elsewhere under parameters and shall be capable of satisfactory continuous operation between 80-120% of the rated voltage. Voltage operated relays shall have adequate thermal capacity for continuous operation.

Energy meters shall be provided for incomer of 415V Switchgear and MCC and shall able to communicate with SCADA. Accuracy class shall not be less than 1.0S.

Provision shall be made for easy isolation of trip circuits of each relay for the purpose of testing and maintenance.

All protective relays and alarm relays shall be provided with one extra isolated pair of contacts wired to terminals exclusively for future use.

The relay shall be designed to perform satisfactorily under highly noisy electrical environment. Sufficient degree of high frequency disturbance immunity and impulse voltage withstand capacity shall be built into electronic designs as stipulated in relevant standards.

All protections shall be furnished complete with necessary auxiliary, supervisory, lock out relays. Suitably separate sets of single phase auxiliary C.T with multiple taps shall be provided with relay whenever required.

Visual and audible alarm annunciation shall be initiated in the event of operation of protective/supervisory relay.

- D.C supply shall be supervised by DC supervision relays.
- Trip circuit shall be supervised by Trip circuit supervision.
- Tripping shall be done through high speed lock out relays.

All meters/ instrument shall be flush mounted on front panel, at least 96mm2 size with 90^0 linear scales and accuracy class of 2.0.

Interposing relays for ON/OFF command or any other command shall be as per system requirement.

For alarm and Indication at SCADA end necessary contacts shall be provided at switchgear end.

Metering and protection shall be as per below table:

(a)	**Incomers**	
	Protections	**Metering**
i	Time graded short circuit protection	
ii	Over current protection(51)	Multifunction meter or Manager for Local Current (single phase) indication and Measurement Voltage Measurement for all three phases of KW, Kwhr, frequency
iii	Earth fault protection(51N)	
Iv	Differential Relay(87)	
(b)	**Bus coupler**	
	Protections	**Metering**
i	Over current protection (51)	Local Current (single phase) indication.
ii	IDMT Earth fault protection(51N)	
iii	Earth leakage protection	

(c)	**Contactor controlled motor feeders [90kW and above motor only]**	
	Protections	**Metering**
i	Time graded short circuit protection including instantaneous trip Local Current indication and remote.	Indication through transducer.
ii	Over current protection	
(d)	**[Motor Feeders [of 132KW and above only)]**	
	Protections	**Metering**
	Composite motor protection to cover a minimum of protections such as over current, short circuit, earth fault, Earth Leakage,locked rotor, Negative phase sequence, thermal overload etc.	Local Current indication and remote indication through transducer.
[Other feeders]		
(a)	**Bus PT / Line PT Modules**	
	Protections	**Metering**
	Under voltage protection	[Voltage – phase to phase,]
	Fuse failure protection	
(b)	**Motor feeders (MPCB/MCCB with Contractors)**	
	Protections	**Metering**
	MCCB built-in LSIg protection,Electronic Overload relay (with single phase preventor), short circuit protection (through fuse/ MCCB/ MPCB as specified), Earth Leakage protection	
(c)	**Incoming feeders for ACDB/DCDB**	
	Protections	**Metering**
	MCCB built-in LSIg, protection Overload and Short circuit protection (if MCCB)	[Voltage (single phase and, Phase Current (1 Phase)] Local indication only.
(d)	**Outgoing feeders of ACDB/DCDB**	
	Protections	**Metering**
	Short circuit protection (through fuse/MCCB)	

4.22 Tests

4.22.1 Type Test

For each type & rating of 415V Switchgear, the Bidder shall submit for Owner s approval the reports of all the type tests as per relevant standards and carried out within last five years from the date of bid opening. These reports should be for the tests conducted on the switchgear similar to those proposed to be supplied under this contract and the test(s) should have been conducted at an independent laboratory.

In case the Bidder is not able to submit report of the type test(s) conducted within last five years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Bidder shall conduct all such tests under this contract free of cost to the Owner and submit the reports for approval.

4.22.2 Routine Test

All equipment shall be completely assembled, wired, adjusted and routine tested as per relevant IS / IEC Standards at manufacturer's works in the presence of consultant /purchaser or his representative.

The minimum tests shall be conducted are as follows:

1. Measurement of insulation resistance of Circuit Breaker in closed and open positions.
2. Measurement of mili-volt drop across Circuit Breaker main contacts and other joints.
3. Measurement of Circuit Breaker/Contactor operating time for close & open at nominal voltage and 80% of rated voltage.
4. Measurement of resistance, IR value and drop-off/pick-up voltage of close and trip coils.
5. Healthiness of limit switch contacts.
6. Spring charging motor functional checks.
7. Verification of phase sequence and checking of clearances of busbars between phase to phase and phase to earth.
8. Measurement of milli-volt drop across busbar joints
9. Torque tightness test.
10. High voltage test on busbar.
11. Measurement of CT/PT polarity, ratio and knee point voltage.
12. Electrical and mechanical interlock checks.
13. Secondary injection of all protection relays by using service settings and simulation of all protection functions.
14. Secondary injection of all metering circuits.
15. Functional tests to demonstrate the specified control and interlocks

4.22.3 Test Witness

The tests shall be carried out in presence of the Owner’s representative, for which a minimum 7 days notice shall be given by the Bidder. The Bidder shall obtain the Owner’s approval for the type test procedure before conducting the type test. The test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.

4.22.4 Test Certificates

Certified copies of all tests carried out at works and at site shall be furnished in requisite no. of copies for approval of the Owner. The equipment shall be dispatched from works only after receipt of Owner's written approval of shop test reports.

4.23 Drawing & Documents

Drawings, data & manuals for the motors shall be submitted as indicated below

1. [General Arrangement drawings and cross-section showing constructional features & cable entry with bottom view with opening.
2. Bill of Materials.

3. Technical Data sheet and Catalogue.
4. Foundation drawing details with bottom view of switchgear.
5. Descriptive write-ups and literature for the main equipment offered including relays, meters, etc.
6. Control Schematics & Wiring diagram.
7. Inspection and Test Plan (ITP).
8. Suggestive list of protective relays.
9. Transport/shipping dimensions and weights].

CHAPTER - 5: DIESEL ENGINE GENERATOR

5.0 General

1. Generators are designed for use as Standby power supply in case of main power failure. Diesel Engine Generator set is generally housed acoustic enclosure otherwise mentioned. The Diesel Engine Generator should be mounted on a skid frame with anti-Vibration floor pads. The Generator foundation is to be isolated from the room floor slab and main building foundations. Mounting of Diesel Engine Generator set should follow manufacturer's instructions.
2. Stand-by Diesel Engine Generator 500 KVA (minimum rating), 415V, 3ph, 50Hzwith Automatic main failure shall be installed.
3. Unless specified otherwise, the engine shall have a continuous rated output and shall be sufficient to run all site loads. The engine shall be capable of running at 10% overload for a period of 1 hour in any 12 hours.
4. DG sets of any other approved make along with the following accessories/ specifications. The emission level of the DG shall conform to CPCB-II norms. Note: - The contractor shall be responsible to obtain all necessary permissions, certifications, N.O.C. etc., from the concerned authorities,

including necessary statutory fees like inspection fees, drawing approval fees, energy meter &calibration test fees, etc., and all necessary approvals to ensure the job complete as per approved design and specifications.

5. Supply, Installation, testing and commissioning of following DG alternator of any other Board approved make and engine of any other Board approved make and shall confirm to IS 4722: 1992 or IS 13394: 1992 along with the following specifications.
6. Excitation: Self excited, self-regulation, PMG, class H insulation, wave form distortion shall be less than 2%, transient voltage dip shall be less than12%, Transient recovery shall be less than 1 second, voltage regulation shall be +/- 0.5% to +/- 1% from no load to full load at lagging power factor of 0.1 to 0.8, epoxy get coating for all windings, sustained short circuit shall be 4 times the full load current for 3 seconds, the over load capacity shall be 1.1 X rated full load current for 1 hour in every 12 hrs of continuous operation at full load. The alternators shall be SPDP with IP 22or better degree protection as per IS 4691/85 (reaffirmed 2004). The alternator should be suitable to take unbalanced load as per IS :13364 (Part-2) 1992 (Reaffirmed 2003).
7. Automatic voltage regulator shall be +/- 0.5% to +/- 1% from no load to full load, 3 phases, separate auxiliary winding is required to accept nonlinear lad, under frequency roll off to avoid over excitation under low speed, external voltage adjustment and solo operation.
8. Supply, installation testing and commissioning of following DG engine. The engine shall confirm to the following specification: Aspiration shall be turbocharged, PM:1500, residential silencer, electronic governor, water cooled, prime mover: suitable BHP and with safety controls for high temperature/low lube oil pressure, fuel efficient consumption, complete with radiator, water temperature gauge, air cleaner, lube oil fitter, fuel fitter, silencer, 12/24V electric starting system comprising of starter motor, battery charging unit, instrument panel consisting of starting switch, battery charging ammeter, lube oil pressure gauge etc. The Engine shall confirm to IS10000/2:1980 (reaffirmed 2006)

5.1 Acoustic Enclosure

Acoustic enclosure suitable for indoor application and shall be approved by the Pollution Board of Concerned state. The noise level shall be less than 75db at a distance of 1meter from the Enclosure. Then closure shall be pre- fabricated modular type, outer surface shall be made out of 1.6 mm thick CRCA corrugated sheets, filled with high efficiency sound absorbing bonded rock wool, layer of rigid polyurethane tissue paper covered with GI perforated sheet, suitable fan louvers/fans for good ventilation, two sliding doors for easy access, see through window for observation, painting to be carried out with two coats of surface, oven dried conforming to IS 5, etc., complete

5.2 Batteries and Battery Chargers

(i) Batteries shall be sealed lead-acid. A fully automatic battery charging system shall be provided.

(ii) A battery monitoring system shall be provided to give early indication of a pending failure of the battery system. Adequate ventilation must be provided to prevent buildup of corrosive gases.

(iii) The Generator sets should also be provided with suitable diesel tank for storing the fuel for generator operation.

(iv) Galvanized steel shall not be used for any part of the fuel system. PVC conduits only shall be used.

(v) The Local Authority and Fire Service must be consulted, regarding the sitting of tanks holding large quantities of fuel.

5.3 Fire Precautions

Suitable fire extinguishers shall be located convenient to operate during emergency in the Diesel-Engine Generator Room. Tool cupboard, complete with all special tools required to carry out maintenance on the Generator and connected Panels should be provided.

5.4 Earthing System

Earthing Systems shall include:

(i) Earth electrodes of steel cored copper bonded of 12mm Dia, 2.5 M length to be provided for body earthing.

(ii) Generator neutral earthing to be provided with 600x600x3 Copper Earth plate.

(iii) Earth bonding conductors (Protective Bonding Conductors) connecting all exposed metal conductive parts not used in electrical circuit are to be connected to the earth bar.

(iv) The value of resistance to earth shall be equal or less than 5 Ohm.

5.5 Approval

Contractor shall be responsible to obtain all necessary permission, certification, NOC etc. from concerned authorities, including necessary statutory fees, energy meter & calibration test fees etc. and all necessary approvals to ensure the job complete as per approved design and specifications.

CHAPTER - 6: DG AMF PANEL

6.0 DG AMF Panel

DG AMF panel suitable for 415 V, 3 phase, 4 wire, 50 Hz. The panel shall be generally of floor mounting sheet metal enclosed, flush / projected front with aluminum Bus bars of 200 Amps capacity. Separate Earth bus bars to be provided through out the length of the panel. The DG breaker shall be accommodated in modular basis in a separate vertical section. The AMF panel shall have only DG breaker and additional cable to be laid for EB power failure sensing / interlocking with the EB breaker of main power distribution panel. The painting process shall conform to relevant IS code for pretreatment of sheet steel with 7 tank process and powder coated finish.

Adequate space shall be provided all-round the panel and in the back for easy cable bending and terminations. Bus bar shall colour coded insulated sleeves or insulated heat resistant paint. The panel shall be fabricated only after the approval of fabrication drawings by consultant. The manufacturing process of DG panel shall strictly conform to latest code of practice. Sufficient louvers with blowers to be provided for maintaining inside temperature. Removable gland plates of 3 mm thick shall be provided at the bottom. Panel shall be illuminated with lamp and door limit switch.

The AMF Panel shall be comprising of the following:

(i) 2 No. of 800 A, 4 pole, power contractor with 4 No + 4 NC aux, Contact/ 415V AC coil and one set of backup 700 A HRC links/base.

(ii) 800A, 50 KA, TPN + E Al bus bars with colour coding.

(iii) 800/5/5A, 20/15VA, Class-1/10P10 resin cast CTs

(iv) Microprocessor based AMF module

(v) Note: - The contractor shall be responsible to obtain all necessary permissions, certifications, N.O.C, etc; from the concerned authorities, including necessary statutory fees, Energy meter & Calibration test fees, etc; and all necessary approvals to ensure the job complete as per approved design and specifications

(vi) 1 No. of 96 Sqmm, 0-300 A Ammeter with ASS and suitable CTs

(vii) 1 No. of kwh meter of MECO make, 3 phase, 4 wire, for unbalanced loading, flush type, with calibrated CTs

(viii) Ammeter / Voltmeters selector switch.

(ix) 1 No. of 96 Sq.mm Digital meter to read KW/KVA/PF

(x) 1 No. of 45 - 50 - 55 HZ, 96 Sq.mm, vibrating

Chapter - 7: STARTERS

7.0 Starters

The starter cubicles are required to form part of a motor control and circuit connections, protection devices etc., shall comply with the relevant clauses of IEC 60439-1 for switchboards. The cubicles shall be easily accessible for maintenance purposes and shall be damp and dustproof with protection IP44. Each motor starter shall be of a rating to carry the full load current of its rated duty at its most severe load conditions.

7.1 Types of Starters for Motors

The selection of starters shall be made according to the rating of the motor used with the equipment the selection shall be done as follows:

Up to 5 KW	:	Direct On Line Starter
Above 6 KW to 50 KW	:	Star-delta Starters (Automatic type)
Above 50 KW to 100 KW	:	Auto Transformer Starter (Automatic type)
Above 100 KW	:	Soft Starters

7.1.1 The following equipment shall be provided in each starter section

(i) All starter feeders shall have individual ammeter with selector switch.
(ii) 1-Set Motor protection equipment in accordance with the Employer's Requirements.
(iii) Any additional equipment/instruments required by the OIL.
(iv) The following equipment along with PVC enclosed component labels shall be mounted on the front of each starter cubicle door:
(v) 1 No. Ammeter in motor circuit, fitted with suppressed scale to read motor running and starting current.
(vi) 1 No. Pilot lamp "Motor in Operation" (lamp initiated by the final contact stage).
(vii) 1 No. Pilot lamp "Overload Tripped".
(viii) 1 No. Overload reset push button.
(ix) 1 No. Selector switch.
(x) 1 Set Stop/Start push buttons for operation under hand control.

7.2 Soft Starter

7.2.1 Soft starter panel module shall be indoor type; metal clad with separate metal enclosed compartments for

(i) Control, metering and current transformers for differential protection.
(ii) Shorting (by pass) arrangement
(iii) Power cable termination
(iv) Push button with indicating lamps

7.2.2 The enclosure of the soft starter shall have a rigid construction with adequate supports. All the construction details shall be as specified for LT switchgear and panel.

7.2.3 The soft starter including all its components, protection and indication devices shall be mounted in one support or frame. The materials of construction shall be properly prepared and treated against corrosion.

7.2.4 The soft starter module shall be suitable for floor mounting and free-standing type, or mounting inside a panel.

7.2.5 The degree of protection shall be as specified on the soft starter specification sheets and reference should be made to IEC529 for degrees of protection standards.

7.2.6 The controller must have a minimum of 100 mm free space above and below the unit and 50 mm to the left and right of the unit to permit good air flow for cooling purposes. When forced cooling is provided it shall cause extra pollution on the controller's electronic card.

7.2.7 Starter shall achieve smooth starting by torque control for gradual acceleration of the drive system thus preventing jerks and extending the life of equipment. Starting current shall be limited to 3.0 times the full load current of the motor.

7.2.8 The cable compartment shall house all power cable connections along with associated cable terminations.

7.2.9 Each cubicle shall be fitted with a label in the front and rear of the cubicle, indicating the panel designation, rating and duty. Each relay, instrument, switch, fuse and other devices shall be provided with separate labels.

7.2.10 Caution name plate with inscription “Caution - Live Terminals” shall be provided at all points where the terminals are likely to remain live and isolation is possible only at remote end, e.g. incoming terminals of main disconnecting switch.

7.2.11 Starting of motor shall be either from soft starter panel located near to motor or shall be from motor module or from PLC. Necessary wiring diagram shall be provided considering starting interlock, trip circuit, starting and running mode signal.

7.3 Electrical Supply

The soft starter shall be suitable to operate on the mains supply system as specified in the general requirement specification for electrical equipment.

7.4 Performance

Maximum current rating: The soft starter shall have a nominal current of 1.3 times the full current of the controlled motor for standard duty applications. (Standard) duty applications are those which do not exceed 230 seconds at 3 times the motor nominal current per hour including starting, stopping or braking.

For severe duty applications the soft starter shall be derated to suit the requirements of the application. The manufacture is to state the maximum nominal current ratings of the soft starter.

In the case of the ambient temperature exceeding 40 oC around the soft starter, the soft starter Shouldbe derated by 1.2 % for each o C over 40oC up to 60oC maximum.

Current Limit Range: The manufacture shall specify the current range of his proposed soft starter

Operating characteristics: The soft starter shall comply to the following operating characteristics
Allow the output limit current to be adjusted from 150 to 700% of the normal current rating of the soft starter.

Allow adjustable acceleration times up to 60 seconds
Digital outputs for switching reversing contracts on the motor
Integrated thermal overload protection

7.5 Assemblies

When mounted in an enclosure, the soft starter shall be provided with a suitably rated incoming AC Magnetic Circuit Breaker, suitable for isolation. A thermal magnetic Circuit breaker should be in the case where the soft starter is completely by passed using a bypass contactor.

An AC contactor should be located on the incoming side of the soft starter. This contactor should be of an AC3 type contactor for use on motor circuits.

An external operator handle is to be attached to the isolator. The drive display module is to be located remotely from the controller on the door of the panel.

A bypass contactor, should be supplied and connected so that the AC soft starter energies this contactor at the required time in the start cycle. If possible, thermal protection should still be connected through the soft starter, if this is possible, a thermal magnetic circuit breaker should be used, as discussed above.

7.6 Soft Starter Protection

The Soft Starter shall be provided with the following protections

- Thermal Overload
- Locked Rotor
- Phase over Current (50/51)
- Earth fault (50N/51N)
- Over voltage & Under voltage
- Phase loss/Reversal
- Negative sequences
- Protection for repeated and prolonged starts
- Restart inhabitation
- Single phasing preventer
- MCCB

The protection should be provided as specified on the Soft starter Specification Sheet. The manufacture should supply details of all protection devices on the proposed equipment.

Fuses should be supplied for type 2 co-ordination. These should be of the fast-acting type for protection of the thyristors.

7.7 Direct Motor Thermal Protection

- Pump motors shall be provided with embedded thermal switches or thermistors with a protective relay operating in the contactor circuit.
- Thermistor protection on motors fitted with internal thermal devices shall be arranged such that in the event of device operation, a lock out function is operated, to prevent automatic re-start upon temperature reduction. The tripped indication shall also operate.
- Thermostat protection relays shall be ambient temperature compensated and have external manual reset Works.
- All motor starters should have static over current, Earth fault release along with the Thermal release.

7.8 Electric Motors

- Motors at 45°C ambient shall be of the squirrel cage induction type suitable for soft starting with starting current not exceeding 2.5 times full load current unless specified in the relevant Section as an alternative arrangement.
- All motors shall be equipped with thermistors and anti-condensation heaters in the windings.
- All motors shall be suitable for operation at 415 Volts, 3 phases 50 Hz. supply and shall comply with EN or IEC Standards.

7.9 LV Capacitor Banks

- Capacitors shall comply with BS 1650. They shall be low loss (approximately 0.15 W/KV Hr) and of impregnated polypropylene film construction.
- Capacitors shall be provided with HRC fuses and inrush current inductors if required.
- Each capacitor shall be fitted with discharge resistors and shall bear a label clearly warning of the need to allow a discharge time after isolation prior to working on the capacitor.
- The starter cable box shall provide provision for the connection through the motor protection relay.

7.10 Emergency Stop Push Buttons

- Emergency stop push buttons of the mushroom headed, stay put type shall be provided adjacent to pump motors in all pump stations. Once operated, the motor shall remain locked out until both the push button twist to release mechanism, and the “emergency stop reset” push button on the control panel have been operated.

- The emergency stop push button shall be direct acting on the motor circuit, i.e. no intermediate devices shall be utilized. The works personnel shall mount emergency stop push buttons on a suitable framework arrangement at a height of 1m and in a position to be accessible for emergency operation.

CHAPTER - 8: CABLES

8.0 General

All cables shall be of suitable voltage grade, with stranded Aluminum conductors, selected for the climatic conditions specified and shall be derated by the approved factors laid down in the latest issue of relevant standards. The selection of all cables and derating factors shall be based on the following:

Ground Temperature	:	+30°C
Thermal Resistivity of soil	:	150°C Cm/W
Cable depth Low Voltage Cables	:	0.9 meters
Cable depth, Control and Instrumentation	:	1 meter

8.1 Power and Control Cables

This specification is intended to [cover the design, engineering, manufacture, assembly, testing at manufacturer's works,] supply in properly packed condition for transport to site, Erection, site testing and commissioning] of 1100V grade three/single core XLPE insulated unarmoured cable having stranded Aluminium, copper wire screen and extruded PVC or PE over sheath complete with all accessories for efficient and trouble-free operation.

8.2 Codes and Standards

All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) / IEC as given below except where modified or supplemented by this specification

Sl. No.	Standard Number	Description
1	IS: 2982	Copper conductor in insulated cables and cords.
2	IS: 3961	Recommended current ratings for cables.
3	IS: 3975	Mild steel wires, strips and tapes for armouring cables
4	IS: 5609	Specification for low frequency wires and cables with PVC insulation and PVC sheath
5	IS:5831	PVC insulation and sheath of electric cables
6	IS: 6380	Specification of elastomeric insulation of sheath of electric cables.
7	IS:7098(Part II)	XLPE insulated PVC sheathed cables for working voltage from 3.3kV up to and including 11kV
8	IS: 8130	Conductors for insulated electric cables and flexible cords
9	IEC: 60	High voltage test techniques
10	IEC: 71	Insulation co-ordination
11	IEC: 60228	Conductors of insulated cables
12	IEC: 60229	Tests on cable over sheaths
13	IEC: 60230	Impulse tests on cables and their accessories
14	IEC: 60287	Calculation of the continuous current rating of the cables (100% load factor).
15	IEC: 60288	Nominal cross sectional area and composition of conductor of insulated cables.
16	IEC-331	Fire resisting characteristics of electric cables
17	IEC: 332-1	Test on electric cables under fire conditions.
18	IEEE: 383	Standard for type test for class IE electric cables, filled splices and connection for nuclear power generation station
19	IEC: 60502	Extruded solid dielectric insulated power cables for rated voltages from 1kV upto 30kV.
20	IEC: 60 540	The methods for insulations and sheath of electric cables and cords(elastomeric and thermoplastic compounds)

Sl. No.	Standard Number	Description
21	IEC-754-I	Test method for acid gas generating
22	NEMA-WC-5	Thermoplastic insulated wires and cables for transmission and distribution of electrical energy.
23	ASTM-D-2843	Standard test method for density of smoke from burning/decomposition of plastics.
24	ASTM-D-2863	Test for determination of oxygen index.
25	DIN/VDE0273	Cross linked Polyethylene Insulated Cables.
26	DIN 46391	Cable Delivery Drums

Equipment and material conforming to any other standard, which ensures equal or better quality, may be accepted subject to approval of the Owner. In such case, copies of the English version of the standards adopted shall have to be submitted along with the bid.

The electrical installation shall meet the requirements of Indian Electricity Rules as amended upto date and relevant IS Codes of Practice. In addition, other rules and regulations applicable to the work shall be followed.

8.3 Design Criteria

The cables shall be installed in hot, humid tropical atmosphere with ambient temperature of 45°C.

All MV cables shall be suitable for operation under the following voltage & frequency variations:

Voltage Variation	:	(±) 10%
Frequency Variation	:	(+) 3% to (-)5%
Combined Variation of Voltage & Frequency	:	10% (absolute sum)

MV cables shall 11 kV of earthed grade suitable for use in solidly earthed system, stranded & compacted electrolytic aluminium conductor, extruded semi conducting screen over conductor, XLPE insulated, unarmoured as required, semi-conducting followed by copper tape screened, extruded PVC, Type ST–2 inner sheathed, overall FRLS, PVC outer sheathed, conforming to IS 7098 (Part II), IEC 60502 for constructional details and tests.

The LV power cables shall be 1100V grade, single/multi core stranded Aluminum conductor, extruded XLPE/PVC insulated with extruded PVC inner sheath, armoured and overall sheath with extruded Flame Retardant Low Smoke (FRLS) PVC compound (Type ST-1). These cables shall conform to IS 7098 (Part I) for XLPE and 1554(part 1) for PVC insulation.
The control cables shall be 1100 V grade, multi core, stranded annealed high conductivity copper with extruded PVC insulated inner sheath, armoured and overall sheath with extruded Flame Retardant Low Smoke (FRLS) PVC compound (Type ST-1).

The continuous and short time current carrying capacity of XLPE insulated cables shall be based on maximum operating temperature of 900C and 2500C respectively.

The continuous and short time current carrying capacity of PVC insulated cables shall be based on maximum operating temperature of 700C and 1600C respectively.

MV & LV power cables shall be sized taking into account the following derating factors:

Max Ambient air temperature
Max Ambient ground temperature
Grouping of cables/Method of laying
Depth of laying for cable buried in ground.
Soil thermal resistivity for cable buried in ground.
MV cables shall be chosen taking into account the following factors:

8.3.1 System Fault Level

- Maximum time for fault clearance (i.e, operating time of the backup protection relays plus the time of operation of the circuit breakers).
- Full load current of the circuit.
- Short circuit current and duration (for breaker protected cables) Installation conditions.
- Voltage drop under normal running and starting condition. Voltage drop at motor terminals shall be within permissible limit during starting & normal running. i.e 5% during steady state and 15% during transient or starting at motor terminal.
- The cable should withstand the maximum fault current corresponding to the particular voltage level for the minimum time before the fault is cleared.
- Consideration shall also be given to limit the cable to the nearest standard sizes instead of using too many types.

8.4 Specific Requirements

8.4.1 Type of Cable

(i) The MV cable shall be multi core/ single core XLPE insulated type as specified.

(ii) LV power cables shall be 1100V grade, heavy duty, stranded aluminium conductor, XLPE/ PVC insulated, extruded black FRLS PVC inner sheathed, unarmoured and overall FRLS extruded black PVC outer sheathed (Type ST-1) cables conforming to IS: 1554 (Part 1) for PVC insulation and IS 7098(Part 1) for XLPE insulation.

(iii) Control Cables shall be 1100 V grade, heavy duty with annealed high conductivity stranded copper conductor, PVC insulated, FRLS PVC inner sheathed, armoured and FRLS extruded black PVC outer sheathed (Type ST-1) cables conforming to IS : 1554.

(iv) LV power cables of size above 35 sq. mm may be provided with XLPE insulation. Bidder shall clearly indicate the type of insulation provided in the technical bid.

(v) The instrumentation cables shall be annealed, tinned stranded copper conductor, 0.5 mm2, twisted into pairs, overall screened (L1 type) for digital signals, individual and overall screened (for L2 type) for low level analogue signals, individual triplet and overall screened (type L3), PVC insulated, inner PVC sheathed, GS wire armoured and overall sheathed with FRLS PVC. The insulation shall be strippable manually as well as by mechanical stripping devices without damage to the conductor.

(vi) Lighting Wires shall be 1100 V grade, single core, stranded, copper conductor, PVC insulated wires conforming to IS 694 / IEC 60227 Part 1 to 5 / IEEE-719. Minimum cross section of copper wires shall be 2.5 mm2 for lighting circuits and 4 mm2 for receptacle circuits.

8.4.2 Conductor

The cable conductor shall be made from standard Aluminum/Copper (as specified in SOQ) to form compact conductor having a resistance within the limits specified.

8.4.3 Conductor Shield

The conductor having a semi-conducting screen shall ensure perfectly smooth profile and avoid stress concentration. The conductor screen shall be provided over the conductor by applying non-metallic semi conducting tape or by extrusion of semi conducting tape or by extrusion of semi-conducting compound or a combination of the two. The semi conducting polymer shall be cross linked for XLPE cables**.**

8.4.4 Insulation

The insulation of the MV cables shall be XLPE type and LV power and control cables shall be [XLPE/PVC] type. It shall be designed and manufactured for the specified system voltage. The manufacturing process shall ensure that insulation shall be free from voids. The insulation shall withstand mechanical and thermal stresses under steady state and transient operating conditions. The extrusion method should give a very smooth interface between semi conducting screen and insulation. The insulation of the cables shall be of high standard quality.

8.4.5 Insulation Shield

A non magnetic semi conducting shield shall be put over the insulation to confine electrical field to the insulation. The XLPE cable insulation shield shall be strippable.

The metallic layer of the insulation shield shall be grounded at least at one location in the cable's run. In the case of single conductor cable, care should be taken with regard to ampacity when grounding at more than one point.

For all the cables having insulation shield, it shall have some form of stress relief measure at every splice at termination. This can be stress cones, moulded devices, heat shrink or cold shrink kits. All kits must be suitable for the voltage class and cable size.

8.4.6 Inner Sheath

The sheath shall be suitable to withstand the site conditions and the desired temperature. It shall be of adequate thickness and applied by a continuous process to produce a sheath of consistent quality free from all defects. PVC sheath shall be extruded with FRLS properties.

8.4.7 Outer Sheath

Outer sheath shall be extruded layer of FRLS PVC compound (ST-1).Sheath shall be resistant to water, Ultra Violet radiations, fungus, termites and rodent attacks. The color of the sheath shall be black.

8.4.8 Packing

[Cables shall be supplied in non-returnable drums]. Drum lengths shall be such so that cable joints are totally avoided. The drums shall be of heavy construction. *[All wooden parts* shall *be manufactured from seasoned wood.]* All ferrous parts used shall be treated with suitable rust preventive finish or coating to avoid rusting during transit or storage. *[Wooden cable drum shall be treated by immersing in copper-nitrate solution.]*

The ends of each cable length shall be sealed before shipment. Heat shrinkable cable cap shall be used for this purpose.

[A label shall be securely attached to each end of the reel indicating the Purchaser's order number, Owner's identification mark, length, type, voltage grade, conductor size and number of cores of the cable.] A tag containing the same information shall be attached tothe leadings end of the cable inside. An arrow and necessary instructions shall be marked on the drum indicating the direction in which it should be rolled. Drum numbers are to be indicated on the cable drums. Drum length shall not be less than the following:

Power cables: 500m
Control cables: 1000m

8.5 Identification of Cores

MV & LV power cables shall be identified by color code. However LV control cables shall be identified by the number of its cores.

[Multi-core control cables shall have 20% spare core, minimum one spare.]

8.6 Constructional Requirements

Cable shall have suitable filters laid up with the conductors to provide a substantially circular cross section before the sheath is applied. Fillers shall be suitable for the operating temperature of the cable and compatible with the insulating material. All materials *shall* be new, unused and of finest quality.

Workmanship shall be neat, clean and of the highest grade.

8.7 Special Properties

All the above cables shall be conforming to the relevant Indian/IEC standard in general, with the following special properties:

Oxygen Index of the outer sheath shall not be less than 29, when tested as per ASTM-D-2863.

Halogen acid contents in outer sheath shall not be more than 20%, when tested as per IEC-60754.

The maximum smoke density in percent light absorption should not exceed 60% in case of PVC compound and 20% in case of fire survival cables, when tested as per ASTM-D-2843.

Swedish chimney test as per SS-4241475 class F3 and ladder test for flammability as per IEEE-383.

The cables shall be tested for resistance to Ultraviolet radiation. The retention values of tensile strength and ultimate elongation after test shall be minimum 60% of tensile strength.

Outer sheath of cable shall be subject to tests for water absorption. The methodology shall be as per IS 10810 part 33.

8.8 Joints and Terminations

Materials like cable termination kit /jointing kit etc. for a cable joint/termination shall be supplied by the contractor and shall perfectly match with the dielectric chemical and physical characteristics of the associated cables. The material and design concepts shall incorporate a high degree of operating compatibility between the cable and joints. The protective outer covering (jacket) used on the joints/terminations shall have the same qualities as that of the cable outer sheath in terms of ambient/operating temperature withstand capability and resistance to hazardous environments and corrosive elements. No joints shall be allowed unless the cable drawn length is exceeded.

8.9 Cable Identification

Cable identification shall be provided by embossing the following on the outer sheath:

a. Manufacturer's name or trade mark
b. Voltage grade
c. Year of manufacture
d. Type of insulation.
e. Type of outer sheath e.g. "FRLS" etc.
f. ISI marks
g. Nominal cross sectional area of the conductor & no of cores
h. Sequential marking
i. Owner’s identification mark

8.10 Cable Characteristics

8.10.1 Cable Installation

Core screen will be earthed at both ends and cables will be laid in duct buried underground.

In addition the Bidder shall advise rating/derating factors for variations in the above conditions as well for multiple circuits.

Permissible minimum bending radius of power cables during laying:

During pulling of power cables, the bending radius should not fall below the values listed.

In the case of single bends (placing cables in final position), the above values may be reduced to a minimum of 20 x cable outer diameter (Milliken and stranded conductors)

Cable route markers shall be provided at every 20 meters. At least one marker shall be provided if the length of the buried cable is less than 15 meters. Buried cables in trefoil formation shall be bound by plastic tapes of 1mm dia. Nylon cord every 750 mm.

Joint markers at each joint location shall identify joints in directly buried cables.

In each outdoor cable run, some extra cable length shall be kept at a suitable point to enable a straight through joint to be made should the cable develop fault at a later date.

Where cables cross roads and water, oil, gas or sewage pipes, the cables shall be laid in RCC hume pipes of minimum length 1000mm subject to an overlap of minimum 50mm.For road crossing, the pipe for the cable shall be buried at not less than 600mm unless otherwise noted in the drawings. even 15 x cable outer diameter (solid conductors)

During laying of power cables, particular attention must be paid to the permissible tensile force, as follows:

Permissible tensile forces when using cable pulling grips:

F = 2 x D2 in N for cables with copper wire sheath

F = 2 x D2 in N for cables with sheath.

D represents the cable outer diameter expressed in mm

Maximum recommended tensile forces when pulling eye is attached to the conductor:

Alu stranded: F = A x 30 N/mm2

Alu solid: F = A x 20 N/mm2

Alu Milliken: F = A x 30 N/mm2

Cu stranded: F = A x 50 N/mm2

Cu Milliken: F = A x 80 N/mm2

A represents the cross-sectional area of conductor expressed in mm2.

8.10.2 Sizes of UG Cables Required

Voltage Rating	Cross Sectional Area
11kV	3Cx240mm² Aluminium Cables, 1C x240sqmm Copper cable, 1Cx240mm² Aluminium Cables and as specified in SOQ
1.1kV	400mm², 300mm² and 240mm² Aluminium Cables and as specified in SOQ

8.10.3 Inspection

Before dispatch the cables offered shall be made available for inspection by the Engineer. Inspection may also be made at any stage of manufacture at the option of the purchaser and the cables found unsatisfactory due to the material used or poor workmanship shall be rejected.

The contractor shall guarantee free access to the places of manufacture to the Engineer at all times when the work is in progress. The contractor shall inform the Engineer in advance the time of starting of manufacture and the progress of manufacture of the cables offered by him so that arrangement can be made for inspection.

Inspection and acceptance of cables by the Engineer shall not relieve the contractor of his obligation of furnishing cables in accordance with the specification and shall not prevent subsequent rejection if such cables are later found to be defective.

The cables shall comply with type tests stipulated in prescribed section and the relevant standards. Test reports for all type tests shall be submitted with the tender.

All type and sizes of cables shall be subjected to routine and acceptance tests as stipulated in relevant standards without any extra cost to the purchaser. Cables should not be dispatched until the test reports are duly approved by the Purchaser or his authorized representative and specific instructions to despatch the inspected items issued.

The purchaser reserves the right of having any other special tests of reasonable nature carried out at site or at manufacturer's works or at any other place in addition to the aforesaid type and routine tests to satisfy himself that the cables comply with the specification, without any financial liability.
Six copies of test reports (or as indicated in the Schedule of Vendor Drawings) shall be supplied for approval. The reports shall indicate clearly the governing standards and the standard values specified for each test to facilitate checking of the test reports. Six bound copies of the test reports shall be submitted after approval of test reports along with the cables.

8.11 Tests

8.11.1 Type Test

For each type & rating of HV cables, the Bidder shall submit for Owner’s approval the reports of all the type tests as per relevant standards and carried out within [last five] years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been conducted at an independent laboratory.
In case the Bidder is not able to submit report of the type test(s) conducted within last five years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Bidder shall conduct all such tests under this contract free of cost to the Owner and submit the reports for approval.

The list of type tests are as follows**:**

1. Tests on conductor:
   - Annealing test (for copper)
   - Tensile test (for aluminum)
   - Wrapping test (for aluminum)
   - Conductor resistance test.
2. Mechanical Tests:
   - Test for armouring wires/strips
3. Tests on Insulation
   - Test for thickness of insulation and sheath
   - Physical tests for insulation and outer sheath:
   - Tensile strength and elongation at break

- Ageing in air oven
- Shrinkage test
- Hot deformation
- Loss of mass in air oven
- Heat shock test
- Thermal Stability
- Insulation resistance test

4. High voltage test (water immersion test)
5. High voltage test at room temperature
6. Flammability test

8.11.2 Routine Test

Cables shall be subject to acceptance and routine tests as per IS codes. Acceptance tests and FRLS test as specified earlier shall be conducted on cables and the same shall be witnessed by purchaser.

The FRLS test shall be carried out on one cable of each batch of compound used. Other acceptance tests shall be carried out on drums selected as per sampling plan as indicated in IS. Test certificates for routine acceptance and special tests shall be furnished by the Bidder for review and approval of purchaser.

8.11.3 Data and Manuals

The following drawings/documents and calculation as listed below but not limited to shall be furnished along with the bid for review

1) Cable datasheets and cross-sectional drawings
2) Cable sizing calculation
3) QAPs & Test Reports
4) Relevant catalogues
5) Estimated weight of cable and cable drum

8.11.4 Low Voltage Cables

Low Voltage Power Cable shall be single or multi-core type with Armoured Aluminum conductors, cross-linked polyethylene (XLPE) insulated, polyvinyl chloride (PVC) sheathed, 600/1100 Volt graded, conforming to the applicable codes and standards /BS5460.
Steel wire armoring is required for outdoor underground cables.

The cable shall be suitable for externally buried installations either directly into the earth or, where applicable, run in pre-laid underground cable conduit system. Unarmoured cable shall be used for internal cabling. Wiring for Light, Fans, Power sockets Wiring cables for use on lighting, ventilation etc. shall be 600/1100V grade and a minimum conductor size of not less than 1.5 sqmm cross sectional area and for power sockets 4 sqmm and shall be used. All conductors shall be stranded.

8.11.5 Control and Instrumentation Cables

Control Cables shall be multi-core type with copper conductors, cross-linked polyethylene (XLPE) or polyvinyl chloride (PVC) insulated, galvanized steel wire armored or unarmored, polyvinyl chloride (PVC) sheathed, 600/1100 Volt graded. Conductors for electrical control cable shall have a nominal

cross-sectional area of 1.5 sq.mm and shall be stranded, plain, annealed, uncoated copper, conforming to IEC 227, IEC 228.

Each cable shall have its individual cores identified along their entire length by permanently printed numerals or letters.

Where it is proposed to use junction boxes for the marshalling of control and instrumentation cables to a common item of equipment, etc., any such junction box shall be of the wall mounting type, purpose made, complete with double terminal blocks of the pressure plate pattern.

Steel wire armouring is required for underground cables.
All power cables shall be connected to switchboards and the like, in such a manner that the correct phase sequence, phase number and colour coding are preserved throughout the systems.

The PVC and XLPE insulated L.V. cables shall have their cores identified, as follows: Single core power cables shall have their cores identified as follows:

- No.1 Phase L1
- No.2 Phase L2
- No.3 Phase L3

The general routing of cables shall be as generally indicated on the Contract drawings but the final routes shall be those agreed with the Engineer prior to any cable installation work being carried out.

8.11.6 Cable Duct

Cables laid in duct shall be protected by covers, where direct buried cables pass under passage, the cables shall be installed in PVC pipe.

Minimum size of protective PVC pipe for LV cables should be 100mm dia, wherever it is required to cross roads or other underground utilities.

8.2.1 Minimum Separation of Cables

Where cables are laid directly in the same trench or run in adjacent ducts, the longitudinal spacing between cables of differing services shall be in accordance with the following table**.**

Service	HV Power	LV Power	Screened Telephone Signals	Mechanical Services
HV Power	Largest Diameter	500 mm	1400 mm (3.3/6.6KV) 1800 mm (11KV)	300 mm
LV Power	500 mm	Touching (single layer only)	600 mm	300 mm

CHAPTER - 9: BUILDING SERVICES

9.0 Technical Scope

This section covers the general technical requirements and measurement system of the various components in Internal Electrical Installation works.

9.1 Terminology

The definition of terms shall be in accordance with IS: 732-1989 (Indian Standard Code of Practice for Electrical Wiring), except for the definitions of “point”, “circuit”, and “sub-main wiring”, which are defined hereunder.

9.2 Point Wiring

9.2.1 Point Wiring

A point wiring (other than socket outlet point wiring)

- Shall extend from the controlling switch/MCB/controller to the corresponding point/device (lamps/luminaire/fan/exhaust fan/call bell etc.). Point/device refers to either single devices (like lamps, fans, etc.) or multiple devices controlled from one single switch/MCB/controller (like chandeliers, group of decorative lamps, etc.). Point wiring does not include switch which is covered under a separate item (supply and fixing of modular switch).
- Includes supply & fixing of all items as specified in BOQ, like device holders, wires, conduit/casing-capping, accessories like screws, rawl plug, outlet boxes, junction boxes, pull-through boxes etc., including metal/PVC boxes if any, provided with switch boards for loose wires/conduit terminations, bushed conduit or porcelain tubing where wiring cables pass through wall etc.
- Shall be measured in terms of number of “points” only. There shall be no linear measurement for point wiring, or for the number and size of wires used.
- Details of wire size, material, conduit/casing capping, colour of insulation as in BOQ.
- It is to be noted that point wiring is estimated to cover approximately 7.0 metre wiring on an average.

9.2.2 Light Plug Point (Socket Outlet Point) Wiring

A Socket (“*plug point*”) outlet point wiring

- Shall extend from the switchboard to the corresponding wall socket outlet. Sockets may include a single socket or multiple sockets (of same rating) in one module.
- Includes plug points (6A), and other similar wall outlets.

- Shall be reckoned as total length of wiring and shall be measured on linear basis along the run of wiring.
- Details of wire size, material, conduit/casing capping, colour of insulation as in BOQ

9.2.3 Circuit Wiring

Circuit wiring

- Shall extend from the distribution board up to the switch board/box
- Include all wiring accessories
- Shall be reckoned as total length of wiring and measured on linear basis along the run of wiring
- Details of wire size, material, conduit/casing capping, colour of insulation as in BOQ

9.2.4 Power Plug Point Wiring

Power plug point wiring

- Shall extend from distribution board to 5/6 A and 15/16 A 6 pin socket outlet
- Include all wiring accessories
- Shall be reckoned as total length of wiring and measured on linear basis along the run of wiring
- Details of wire size, material, conduit/casing capping, colour of insulation as in BOQ

9.2.5 Sub-Main Wiring

Sub-main wiring

- Shall extend from one main/distribution switchboard to another
- Shall be reckoned as total length of wiring and measured on linear basis along the run of wiring
- Includes all wiring accessories
- Details of wire size, material, conduit/casing capping, colour of insulation as in BOQ

9.3 Other Wiring Works

As per the details given in the BOQ.

9.4 System of Distribution and Wiring

9.4.1 Control at the point of entry of supply

There shall be a circuit breaker on each live conductor of the supply mains at the point of entry.

9.4.2 Distribution

The wiring shall be done on a distribution system through main and/or branch (sub-main) distribution boards. The system design as well as the locations of boards shall be as indicated in BOQ/drawings or as specified by the OIL Engineer-in-charge. Main distribution board (VTPN) shall be controlled by a circuit breaker. Each outgoing circuit shall also be controlled by a circuit breaker. The branch distribution board shall be controlled by a circuit breaker. Each outgoing circuit shall be provided with a miniature circuit breaker (MCB) of specified rating on the phase or live conductor.

The loads of the circuits shall be divided, as far as possible, evenly between the number of ways of the distribution boards, leaving at least one spare circuit for future extension.
The neutral conductors (incoming and outgoing) shall be connected to a common link (multilayer connector) in the distribution board and be capable of being disconnected individually for testing purposes.

'Power' wiring shall be kept separate and distinct from 'Lighting' wiring beyond the branch distribution boards.

9.4.3 Balancing of Circuits

The balancing of circuits in three wire or poly phase installations shall be arranged beforehand to the satisfaction of the OIL Engineer-in-charge.

9.4.4 Wiring System

- Wiring shall be measured only as per "point wiring" or “linear basis ", as explained above.
- Lights, fans and call bells shall be wired in the 'lighting' circuits.
- 5A/6A Socket outlet shall be wired in the light plug point circuit.
- 6/16A combined socket outlets and other power outlets shall be wired in the 'Power' circuits.
- The wiring throughout the system shall be such that there is no break in the neutral wire except in the form of linked MCCB's, MCB's, RCBO's etc.

9.4.5 Run of Wiring

The wiring shall be in concealed conduit/surface casing / capping as per BOQ. Due consideration shall be given for neatness, good appearance and safety.

9.5 Joints in Wiring

No bare conductor in phase and / or neutral or twisted joints in phase, neutral, and / or protective conductors in wiring shall be permitted. There shall be no joints in the through-runs of wires. There shall be no looping of earth wires and neutral wires between points. All light points, plug points etc. shall have their individual neutral and earth wires laid up to the switchboard or distribution board as the case may be.

9.6 Ratings of Outlets

MCBs / switches / controllers for devices like light fittings, ceiling fans, exhaust fan etc. shall be rated according to the corresponding device capacity.

RCCBs for household circuits and similar installations should be rated for 30 m. A tripping current. Socket Outlets shall be rated according to their intended use only.

9.7 Capacity of Circuits

'Lighting' circuit shall not have more than a total of 10 points of light, fan and socket outlets, or a total connected load of 800W per circuit, whichever is less. 'Power' circuit shall have only one outlet per circuit.

9.8 Conformity to CEA Regulations, 2010 and Standards

All electrical works shall be carried out in accordance with the provisions of CEA (Measures relating to safety and electric supply) Regulations 2010, National Electric code and National Building Code. The works shall also conform to relevant Indian Standards.

In all electrical installation works, relevant safety codes of practice shall be followed.

9.9 Testing of Wiring / Installation

Before/after and in stages, wherever required, OIL's engineer-in-charge shall inspect drawing of wires through conduits for correct size, quality, colour and continuity (absence of loops) from points to switchboards and other wiring items. Inspection will be done in stages, as work progresses.

In case of casing/capping type wiring or as per BOQ, wherever required by OIL's engineer-in-charge, capping shall not be fixed on the casing till the work has been inspected with the wires in position and approved. Inspection will be done in stages, as work progresses.

On completion of an electrical installation (or extension thereof) OIL's engineer-in-charge may require a test certificate for the installation/wiring job before energising the circuits. In such instances, contractor shall issue a test certificate, countersigned by certified supervisor under whose supervision the job was carried out.

The following tests should be carried out:

(i) Insulation resistance test
(ii) Earth continuity test
(iii) Earth electrode resistance test

All necessary test instruments shall be arranged by the contractor.

9.10 General Requirements of Components

9.10.1 Quality of Materials

All materials shall be of such design, size, material and make as to satisfactorily function under the rated conditions of operation and satisfy BOQ requirement.

9.10.2 Ratings of Components

All components in a wiring installation, conductors, switches and accessories shall be of appropriate ratings of voltage, current, and frequency, as indicated in BOQ.

9.10.3 Conformity to Standards

All components shall conform to relevant Indian Standard Specification, including amendments or revisions there of up to the date of tender acceptance.

9.10.4 General Notes

(a) Items shall be procured from the manufacturer or their authorized dealers only.

(b) All the items shall be brand new and shall bear BIS monogram, wherever specified.

(c) Item shall be guaranteed for a period of one year from the date of installation of materials against any manufacturing defect or workmanship.

9.11 Wires and Cables

9.11.1 Wiring

Conductors of wiring cables shall be of copper. The smallest size of conductor for various circuits including earthing shall be not less than as follows:

- 'Lighting': 1.5 sq. mm,
- 'Light Plug Point': 1.5 sq. mm,
- 'Circuit Wiring': 2.5 sq. mm (from MCB DB to switchboard),
- 'Power': 4 sq. mm,
- Circuit (Sub-Main): 10 sq. mm (from VTPN DB to SPN DB),

All wiring cables shall be FRLS, single core, multi-stranded, PVC insulated, unsheathed, 1100 V grade, BIS marked & FIA & TAC approved, with flexible conductor.

9.11.2 Cables

Cables shall be armoured, PVC insulated and PVC sheathed power cables of 1100 V grade. They shall be fitted on wall surface/ Tray/False ceiling/False floor as required, clamping shall be with 1 mm thick saddle, wherever required.

9.12 PVC Casing and Capping

9.12.1 PVC casing and capping shall be BIS marked.

9.12.2 Providing and fixing of PVC casing and capping include bends, elbows, tees, inside and outside corners, round blocks and painting

PVC casing and capping should be strong and properly fitted so as to hold wires laid in it up to 70% to its full capacity for all areas. It should be rigidly screwed at 150mm interval crosswise with suitable woodscrews of 25mm length turned in PVC sleeve inserted in neatly drilled holes of proper size and depth with cup washer to give proper grip over more surface area. It can be run whether in horizontal or vertical position as required.

9.12.3 Providing Earth Continuity Wires

The earth continuity wire shall be provided in the casing throughout the length of wiring. The size of earth continuity wire shall be same size with the main wire for circuits. All metallic parts, switchboards, light fittings and power sockets shall be connected to the earth wires and the connection shall be electrically and mechanically sound.

9.13 PVC Conduits

9.13.1 All rigid conduit pipes shall be of medium (or heavy) duty PVC conduit of good quality and be BIS marked.

9.13.2 The conduit wiring system shall be complete in all respects, including their accessories. Where a large number of control switches and/or fan regulators are required to be installed at one place, these shall be installed in more than one outlet box adjacent to each other for ease of maintenance.

9.13.3 Bunching of Cables

Cables shall always be bunched so that the outgoing and return cables are drawn into the same conduit. Where the distribution is for three phase loads only, conductors for all the three phases and neutral wire shall be drawn in one conduit.

Wiring shall be so designed such that individual conduits are not filled beyond 40% of their capacity.

9.14 Wiring Accessories

9.1.1 Control Switches for Points

Control switches (single pole switches) carrying not more than 16A shall be modular type complete with plate, as specified, and the switch shall be “ON” when the knob is down. Control switch shall be placed only in the live conductor of the circuit. No single pole switch or fuse shall be inserted in the protective (earth) conductor, or earthed neutral conductor of the circuit.

9.14.2 Socket Outlets

6/16 pin Socket outlets shall be of shutter type modular complete with plate. These shall be rated either for 6A, or 6/16A combined. Combined 6 pin (6A/16A) socket outlet shall be provided in 'power' circuits wherever specified. 6A Socket outlets shall only be of 5 pin type; the earth pin shall be connected to earth through protective (loop earthing) conductor. The control switches for 6A and 16A socket outlets shall be kept along with the socket outlets. Generally socket outlet shall be installed at a height of above 30 cm but below 130 cm from the floor level.

The layout of wiring shall be as approved by Engineer in Charge.

9.14.3 Switch Box Covers

These shall be modular type of suitable size.

9.14.4 Ceiling rose - Only one flexible cord shall be connected per ceiling rose. For multiple pendants, each pendant shall have its own rose, or a specially designed rose shall be used.

9.15 Fittings

Indoor type fittings specification:

Suspension mounts and batten mount LED luminaire with all accessories and lamps, ready for installation as per the following description.

i. Opticalsystem should provide all round glare and beam control.

ii. Luminaire shall be as follows:

a. 1x4 (300 x 1200) size suspension type LED panel luminaire for rooms
b. 4 feet long (1200 mm) LED batten luminaire for passage/corridor
c. 2 feet long (600 mm) LED batten luminaire for toilet/bathroom
d. Flood light (120 W) LED luminaire for area light
e. 9 W LED pin type bulb

iii. Luminaires shall be pre-wired up to the terminal block and fitted with High Performance driver (THD<10%) as standard, PF> 0.95; driver to conform to IS/IEC for safety/ performance.

iv. Luminaires shall be supplied with all standard accessories (including chains, brackets, mounting clamps etc.) for suspension and/or wall mounting.

v. Power supply: 230/240 V, 50 Hz, single phase

vi. The type of fittings shall be as specified in BOQ.

9.16 Pre-Wired MCB Distribution Boards

Pre wired MCB DB's shall be provided where specified.

The complete board shall be factory fabricated and shall be duly pre-wired, ready for installation at site.

The board shall be of wall mounted, cubicle type construction, fabricated out of 1.6mm thick sheet steel, with stove enamelled paint finish. The board shall be provided with a hinged cover of 1.6mm thick sheet steel on the front. Only the knob/dolly of the MCB's shall protrude out of the front covers through openings neatly machine made for the purpose. Knock out holes at the bottom, and detachable plate with knock out holes at the top of the board shall be provided.

VTPN and TPN DB shall also be provided with two nos. loose wire box and SPN DB shall be provided with one no. loose wire box as a compartment for the complete width and depth of the board, and of minimum height of 125mm in case of VTPN/TPN DB's, and 100 mm in case of SPN DB's.

Each distribution board shall be provided with a circuit list giving details of each circuit which it controls and the current rating of the circuit, and the size of the MCB. The board shall be complete with the following accessories:

(a) 100 A copper bus bar(s) for MCB DBs
(b) 250 A copper busbar for VTPN DB (fitted with 160A MCCB)
(c) Neutral link
(d) Common earth bar
(e) DIN bar for mounting MCB's
(f) Screw type terminal connectors suitable for incoming and outgoing cables.
(g) Earthing stud(s)

The board shall be fully prewired with single core PVC insulated copper conductors/insulated solid copper links, and terminated on to extended type terminal connectors, suitable for connections to the sizes of the respective conductors. All incoming and outgoing wiring to the pre wired MCB DB's shall be terminated only in extended terminal connectors to be provided within the DB. The terminal connectors shall therefore be so provided as to facilitate easy cable connections and

subsequent maintenance. Connectors (Terminal blocks) are to be provided. A common copper earth bar shall be provided within the loose wire box. The common neutral bar as well as the terminal connectors shall, however, be provided within the main compartment just below the loose wire box.

9.17 Miniature Circuit Breakers (MCBs)

'C' series MCB's shall be invariably used for all loads. Ratings (A), number of poles, type as MCB or isolator, etc. shall be as specified in the BOQ. The MCB's shall be of minimum 10KA rupturing capacity.

9.18 Switch Board Locations

Switch boards shall be located as indicated on the drawings or as instructed by OIL's engineer. Switchboards should not be installed in places likely to be exposed to the weather. However exact location will be as per suitable available spaces.

Unless otherwise specified, a switch board shall be installed so that its bottom is 1.30 m from the floor level. Switchboards shall be well clear of door openings and with an open (unimpeded) space in front of the switchboard for easy access.

Where it is required to terminate a number of casing capping or conduits on a board, it may be convenient to provide a suitable PVC adapter box for the purpose. Such boxes shall be provided with the prior approval of the Engineer-in-charge (Electrical) and this will not be paid for separately. No apparatus shall project beyond any edge of the panel.

9.19 Fans, Regulators and Clamps

Fans

Variable speed Ventilation ceiling fans and exhaust fans shall be provided in offices and switchgear rooms as per requirements. One Ceiling fan of 48" size shall be provided for each 10sqm or part thereof the area concern with including accessories..

Fans Regulator

Electronic modular type fan regulator shall be of approved makes. The fans, regulators etc., are to be procured from authorized dealer to ensure genuineness of the material.

9.20 Commissioning on Completion

After the entire wiring is completed, a joint inspection shall be carried out. The contractor shall rectify the defects pointed out by OIL during inspection. The works shall be tested by the contractor and contractor shall submit the test certificates duly signed by the competent persons. The system shall be energised only after OIL approves the work done and submission of test certificate.

CHAPTER - 10 EARTHING

10.0 General

The metal framework of all electrical and associated equipment, exposed building steelwork, metal enclosures and associated screenings, supports, doors and any other metalwork that is not normally

used to conduct electricity shall be effectively earthed at all times.

The maximum resistance of any earthing network shall not exceed 5 (five) ohms, unless specified otherwise.

10.1 Technical specifications of Earthing System

10.1.1 Scope

This section covers the general requirements of the earthing system for Electrical Equipment, Sub-station installation. G.I. Pipe earthing with G.I. strip and single core insulated cable.

10.1.2 Systems

Earthing system shall comprise of chemical earth electrode of minimum 80mm diameter of G.I pipe of 3mtrs length shall be used as an individual electrode.

Minimum quantity of Earth Electrodes shall be required as follows:

1. RMU: 2 Nos.
2. Transformer: For each transformer 2 separate and distinct earth electrodes shall be provided for neutral earthing 2 combined and distinct earth electrodes for body earthing
3. HV & LT panels shall be done to a common earth bus connected to two separate and distinct chemical earth electrodes.
4. Motors (Pontoon)
5. Motors(Backwash)
6. Other panels electrical equipments:

The no. of earth electrodes shall be more depends upon soil resistivity and the value of earth resistance which shall be not more than 5ohms when connected together.

10.1.3 Electrodes

Supply and burying a heavy duty, Chemical electrode with suitable chemical for soil treatment GI pipe, 3mtrs x 80mm, as an earth electrode, with accessories and providing masonry enclosure size 600mmx 600mm x600mm with RCC cover plate having 2nos. metallic hooks for lifting cover and funnel type arrangement for watering pipe etc. complete as required.

10.2 Location of Earth Electrodes

Normally an earth electrode shall not be situated less than 3 m from any building. Care shall be taken that the excavation of earth electrode may not affect the column footings or foundation of the building. In such cases electrodes may be farther away from the building. The location of the electrode earth will be a place where the soil has reasonable chance of remaining moist. As far as

possible, entrances, pavements and road ways, are to be definitely avoided for locating the earth electrode. The distance between two earth electrodes shall be min length of electrode.

10.3 Size of Earth Lead

The recommended sizes of G.I earth bus lead in case of sub-stations shall be 50mmx6mm.The minimum size of earth lead shall be PVC insulated 120sqmm of single core aluminium conductor cable. 2Nos. of 50x6mm GI strap shall be kept in each Pucca cable trench with no. of holes from there single core 120sqmm PVC insulated aluminium conductor cable can be connected to earth electrode and body of equipment

10.4 Workmanship

Good workmanship is an essential requirement to be complied with. The entire work of manufacture/fabrication, assembly and installation shall conform to sound Engineering practice. The work shall be carried out under the direct supervision of a person holding a valid supervisor's certificate of competency issued by the State Govt. for the type of work involved, employed by the contractor, who shall rectify then and there the defects pointed out by the Engineer-in-charge (Electrical) during the progress of work.

10.5 Commissioning on Completion

After the entire work is completed, a joint inspection shall be carried out. The contractor shall rectify the defects pointed out by OIL during inspection. The works shall be tested by the contractor and contractor shall submit the test certificates duly signed by the competent persons. The system shall be energised only after OIL approves the work done and submission of test certificate.

Section -VI

Project Title:
DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, SUPPLY, CONSTRUCTION AND COMMISSIONING ON LSTK BASIS OF PONTOON TYPE RAW WATER IN-TAKE PLANT AT DULIAJAN, ASSAM, INDIA

SCOPE OF WORK

INSTRUMENTATION

LIST OF UNITS

Symbol		Description
°C	:	Degree Celsius
AC	:	Alternating current
cm/s	:	Centimeter per second
dB(A)	:	Decibels, sound intensity level
Hz	:	Hertz
K	:	Kelvin
kV	:	Kilo volt
kVA	:	Kilo volt ampere
kwh	:	Kilo watt hour
m^2	:	Square meter
MVA	:	Mega volt ampere
kW	:	kilowatt
MW	:	Megawatt
HP	:	Horsepower

Note1: In the following text wherever the "Contractor" word appears it refers to "Bidder".

GENERAL DESCRIPTION:

OIL is in the process of establishing a 8 MGD water treatment plant. As part of the overall system, Package 1 consists of the Pontoon Pumping System. There are two pontoons. Each pontoon has EMD pumps. In addition, DED pump is also provided in the system. The objective is to pump the raw water from the river to the treatment plant. This specification covers the basic instrumentation systems envisaged for the pumping system.

The specifications cover the following core aspects:

- Control Philosophy
- Instruments in field and their functionality
- Basic specifications of the PLC system to enable control

- Brief specifications of the safety and emergency protocols
- General conditions, standards and specific instructions to the Bidder and information to be provided by the Bidder / Contractors in his technical bid.

CODES AND STANDARDS

The general codes and standards to be followed are listed herein. However, Bidder has to apply the latest / updated codes and standards as applicable for each of the aspects of Instrumentation.

API RP 551:	Process Measurement Instrumentation
ASME B1.20.1:	Pipe Thread, General Purpose (Inch)
ASME B31.1:	Power Piping
ASME B40.1:	Gauge – Pressure Indicating Dial type – Elastic Element
ASME B 16.5:	Pipe Flange and Flange Fittings, NPS. Through NPS 24.
ASME B 16.47:	Large Diameter Steel Flange
IEC 60529:	Degree of Protection of Enclosures
IEC 61000-4-3:	Electromagnetic compatibility (EMC): Testing and measurement IEC
60332:	Test for Electrical Cables under Fire Condition
ISA S5.1:	Instrument Symbols and Identification
ISA S71.01:	Environmental Conditions for Process Management
	And Control System, Temperature and Humidity
ISA S75.01:	Flow Equations for Sizing Control Valves
IS 5571:	Guide for Selection of Electrical Equipment
IS 5572:	Classification of Hazardous Areas for Electrical Installations
ISO 5167:	Measurement of fluid flow by means of pressure differential devices
	Inserted in circular cross-section conduits running full.
ANSI B46.1:	Surface Texture (Surface Roughness, Waviness and Lay)
BS EN 837-1:	Pressure Gauges / Bourdon Tube Pressure Gauges

INSTRUCTIONS TO BIDDERS:

SCOPE OF WORK:

- The scope of work under this tender shall cover the execution of complete Job on LSTK basis with single point responsibility for selection and design of the system, Application Software programming, Detailed Engineering, Fabrication, Inspection, Simulation of complete system at contractor's works, Supply, Installation, termination, Field testing, Commissioning, 03 Months of Initial Operation (reliability run/ site acceptance test) and 1 Year Maintenance Service during Warranty and three (3) years comprehensive annual maintenance contract, Training and Documentation of the system with as built drawings in accordance with Specifications, Instructions and Terms & Conditions mentioned in this tender document and as per Standards & recommended engineering practices.

- Design, detailed engineering and Supply of new control panels with all necessary panel and field instruments, PLC system, hardware & software items and accessories as per specification

- Application software development for new PLC system.

- Testing, calibration and inspection of individual components and integrated system at Contractors works and offering for inspection.

- Wiring termination, Loop testing and calibration, PLC application software testing and commissioning of new control panel at site. (Contractors shall provide bar chart of activities.)

- Site acceptance test, One month continuous performance trial and Handing over the system after satisfactory one month performance to OIL. Contractors shall be responsible to carry out and complete any other jobs related to this project.
- Training to engineers and panel operators in batches at Contractors works and at site.

- As built drawings and documents as specified(3 nos. set of hard copies and 2 nos. sets in soft form)

Note:

- The Instrumentation and Control System provided in this scope shall be made suitable for integration with master control station (MCS) through MODBUS RTU (RS485).

- Details & functional requirement of existing system Interlock & operation will be given at the time of execution of the project.

GENERAL INSTRUCTIONS - TECHNICAL

The Contractors shall be responsible for selection of the correct/latest model nos./firmware etc. for the PLC hardware and instruments to suit specifications provided in this tender document. In case any change required at a later date to meet the specifications provided in this tender document, same shall be done by the Contractors without any price or delivery implication. Any firmware changes released by the Contractors between system installations and commissioning is to be done by the Contractors without any price implication**.** Also any firmware issues/upgrades is to be informed to OIL by Contractors as and when required.

Contractors shall provide along with the offer, complete technical details, relevant specification duly supported by technical catalogs/manuals in English language for the offered system components and the accessories. Offers shall be considered incomplete without above details/documents.

Contractors shall mark in the appropriate box to indicate deviations or no deviations.

Generally deviations shall not be accepted and reserves the right to reject the offer without any further clarifications. However deviations if any shall be provided clause wise, with justification on separate sheet and get it approved from OIL. OIL will approved the documents with consultation of OIL's Project Consultant.

Site information shall specify the environmental condition of the project site. All information specified herein shall be used for reference for the contractor's sound Engineering & Design.

Location : Assam

Ambient air temperature:

a) Maximum : 40.0 Deg. C
b) Minimum : 6.5 Deg. C
c) Average : 26.5 Deg. C
Reference Temperature : 50.0 Deg. C

For design of electronic

Equipment/ Devices

Relative Humidity %:

a) Maximum : 100% at 21 Deg. C
b) Minimum : 70% at 41 Deg. C
c) Average : 95% at 32 Deg. C

Rainfall

a) Maximum : 480 mm (in July)
b) Minimum : 27 mm (in November)

*It rains throughout the year.

Note: Any other data, if considered necessary, shall have to be generated by prospective bidders themselves as no additional data other than as already provided are available with OIL.

Contractors to furnish schematic drawings / sketches of the complete system giving details of each components, its make & model no. details, to be used along with auxiliaries if any. Contractors to furnish overall dimensions of the field and control room equipment etc.

Make/model no. details shall be provided for each component with de-codification details

Contractors shall quote for any special instruments, tools needed for the maintenance work.

The system shall be designed and engineered to achieve the highest degree of safety and reliability for operation and maintenance and to achieve the guaranteed performance, within scheduled time and without any extra cost.

While designing the system it is to be ensured that the following are complied with:

a. Industrial standards and practices.
b. Full safety and Reliability of complete integrated system.
c. Maximum accuracy of measurement and control.
d. Effective protection against adverse plant and weather conditions.

Contractors shall survey site condition, assess the job requirement & submit technically best and most competitive offer.

Contractor shall undertake the guarantee of back up engineering, maintenance support and supply of spare parts for 5 years from date of commissioning and shall undertake responsibility to help owner for any change/modifications that are required for better operation of the plant and maintenance of the equipment supplied.

Contractors to make own arrangement for boarding, lodging and to-fro travel to site of its personnel. OIL shall make arrangement for internal transportation within plant area only.

Contractors' quotation shall include a detailed specification sheet for each system components and accessories, which shall contain the following information:-

a) Make/model details with model de-codification details
b) Bill of materials with complete break up of all the hardware, spares, software needed for proposed PLC system along with make / model no., quantity installed etc.
c) Detailed specifications and original printed technical manuals of the offered components and accessories
d) All the details regarding type, construction, materials, accessories etc.
e) System architecture drawing, system lay out and detailed sketch showing all components from panel TB to display units
f) An interconnecting wiring diagram for the complete system showing locations of various units.
g) Consumption figures of electrical power, and other utilities
h) Overall dimensions of all system components in millimeters.
i) Reference customer list

APPROVAL OF DRAWINGS:

Contractors must submit detailed technical specifications along with all relevant technical catalogues for PLC along with all field instruments and all accessories with their offered model no along with the bid for technical evaluation.

Contractors shall submit all drawings/documents & bought out component for approval to OIL & OIL's Project Consultant, before finalizing them within six weeks from the date of PO/WO.

INSPECTION & TESTING:

Inspection shall be carried out by OIL at contractor works to verify specified performance of the systems in totality. No material or equipment shall be transported at site until they are tested and witnessed by OIL representative; during testing Contractors has to demonstrate complete functionality of Logic program by hardwired Simulation of I/0's .The application software must be completed before dispatch. Inspection includes testing of all main specifications of PLC system. All the certifications of the system are required. However, inspection does not relieve the contractor from his responsibility from overall satisfactory performance of system when commissioned.

I. Contractor shall give inspection call to OIL along with copy of test certificates of all standard preliminary tests carried out by contractor at least 10 days in advance for system & associated Hardware.

II. It shall be Contractor's responsibility to modify & incorporate the operational and diagnostic software in case any mal-operation gets revealed during testing and also during online operations after commissioning.

Testing of the system:

All the system functions shall be checked thoroughly for proper functioning. These shall include but not limited to the following tests:

a. Visual and mechanical
b. Complete system configuration loading
c. Demonstration of system functions and diagnostics
d. Checking of all system displays & key boards
e. Complete checking of logic system, loading of the user's program and check-out of results
f. Checking of the correct changeover of the back-up/redundant units in case of failure of the main units
g. Power consumption and UPS backup

INSTALLATION & COMMISSIONING SERVICES:

INSTALLATION:

Contractors shall responsible for installation of control panel with all hardware, accessories, all field instruments, necessary tubing, primary sensing element, Junction Boxes, cable glanding of all cables and termination of all field cables on JB/TB in new system after proper dressing, cross ferruling, power and signal connections etc.

LOOP CHECKING:

a. Loop checking shall be carried out by Contractors which shall include proper functioning and interconnection of all items in the loop.

b. All input signals shall be generated in the field and corresponding reading shall be checked at all corresponding displays.

c. All outputs shall be checked in the field, by physical verification of valve operation, checking operation of SOV, pick-up of electrical contractors.

COMMISSIONING:

- The Contractors shall be responsible for commissioning of the system in complete.
- This activity shall be carried out in a systematic manner so as to avoid any accident to plant and operating personnel.
- Any logic changes required for final commissioning shall be done by the Contractors at site without any additional cost.

SAFETY REGULATIONS:

Work is to be carried to out in the pontoon area. The contractor & his employees shall follow all the fire, safety & security regulations and shall organize his work so as to not to interfere with any existing running plant and other shutdown activities during shutdown. Before starting any work contractor shall apply well in advance, in any case not less than a day for safety permit for execution of such work to the engineer-in-charge, for taking such permits.

The contractor shall make arrangements to the satisfaction of engineer-in-charge, for taking precaution given in the permit, before starting the work. It shall clearly be understood that due to personal reasons, clearances, permits may take more than normal time to obtain and may be even withdrawn temporarily for plant's safety reasons during the progress of the

work. The contractor shall cater to such contingencies and no request for extension of time of claim for compensation of manner shall be entertained by engineer-in-charge on account of above. The working place should be kept clean during installation.

FINAL SITE ACCEPTANCE TEST:

OIL will take over the system from the contractor only after the final site acceptance test, which is defined as successful uninterrupted operation of the complete integrated system for continuous 3 month. During the test, to overcome any problem, contractor is to ensure the availability of the personnel at short notice.

Any of the system malfunctioning components shall be replaced/repaired free of cost. Once the system failure is detected, the acceptance test shall start all over again from the beginning. The zero date for the startup of final acceptance test shall start only after the completion of successful installation and system test at site in all respect. After fulfillment of the entire requirement stated in the contract, the contractor would be eligible for applying completion certificate.

The guarantee period shall be of one year and it shall commence from the date OIL takes over the system after one-month performance trial run.

DESIGN PHILOSOPHY

- The instruments and controls shall be complete in all respects and liberal to the extent of providing data on all operational variables necessary for safe, easy and efficient operation of the unit.

- Contractors shall not offer any proto type instrument. All instruments and control systems (PLC) offered shall have a well proven performance record of operating satisfactory in a similar unit for Contractors to provide customer reference list with details of such installations which should include following details.

  - Make & Model no., Range, service etc. details
  - Year of installation
  - User's name, address, contact person details, phone/fax/email details etc.

- The design of electronic instruments shall be in compliance with the electromagnetic compatibility requirement as per IEC 801 "Electromagnetic compatibility for industrial process measurement and Control equipment".

- The design of installation of PLC system shall incorporate provision for expansion by spare capacity i.e. 20% minimum additional equipment including 20% spare cable/tube entry points.

- In new control panel it is planned to have control for all interlocks using dual redundancy PLC system.

- In this system one PLC panel, 2 panel views & one workstation are envisaged. Contractors will supply dual redundant PLC system, one workstation & 2 panel views.

- List of analog & digital inputs & outputs for all equipment's to be provided. Logic to be considered for all trip loops including Stop & Emergency Stop push buttons.

- The equipment/system interlock/logic circuit and other operating requirement details to be implemented in PLC software shall be provided at the time of ordering.

- The annunciator sequence shall be of first out design and shall be implemented in PLC with display windows on MMI.
- Serial Communication to be established & configured in PLC side with master control station system through RS-485 (MODBUS protocol) / Equivalent
- Serial Communication to be established & configured in PLC

- Cable glands requirement (a lot) of double compression cable glands with check nut shall be supplied by Contractors. Exact quantity to be worked out during detailed engineering stage.
- POWER SUPPLY: Electrical power supply shall be provided at one point inside the battery limit as per the details provided below. Further distribution shall be in the scope of the contractor. If any other voltage levels are required, then all necessary conversions shall be in the scope of contractor.
- Only one cable for UPS 230 VAC supply shall come to individual panels. Necessary looping shall be done at panel end for redundant power supply unit by the contractor as :
- 230 VAC +/- 10%, 50 Hz +/- 3% through UPS
- Non UPS power 230 VAC for panel lighting / switch socket / fan
- 24 V DC power supply for field transmitters shall be through barriers/ isolators provided in the control panel which shall be in the scope of the contractor.

- All contacts to and from MCC shall be provided with relays and fuse protection circuit. Relays shall be 3NO + 3NC.

- Trip and alarm bypass provision shall be provided in software for all parameters with password protection.

- Power supply for control system shall be as follows :

Instruments and control 230V +/- 10% UPS
50 Hz +- 3% (floating neutral)
Switch over time 15 milli sec.

Input interrogation voltage: TX's (24 DC
Switches (potential free Contacts)
Interrogation voltage for outputs: 24VDC/ 230VAC 5A
Panel Lighting : 230VAC, 50 Hz

- Power feeder must be terminated in a separate distribution box**.** All further distribution to instruments, skids etc. in panel shall be in Contractors scope. Power distribution shall be such that all redundant components in the entire system shall be supplied from separate feeder.

- 24 V DC and any other power required shall be generated by Contractors using dual redundant power packs. Each redundant power pack alone shall be capable of meeting all the load requirements. It should have built in output short circuit protection and shall continue to supply the rated current. It should provide an alarm (visual & in form of potential free contact) to indicate its healthiness.

- Contractors must indicate max. UPS requirements in KVA including in rush current in his offer.

- Switch/MCB and fuse shall also be provided for incoming feeders. Fuse rating must be selected considering load of each consumer. Separate MCB and fuse must be provided for each major consumer. A minimum of 20% spare feeders shall be provided fuse rating wise.

- Power supply to individual instruments shall be provided with DPDT switch/MCB and protected with the help of fuses.

- Each field inputs and outputs shall be through high quality fuse terminals (polarity independent) with lamp/LED indication. Fuse shall be used for +ve looping terminal only.

- Contractors to provide write up for all control systems and shutdown systems to be executed by owner in their system along with single line control algorithm logic diagram.

CONTROL PHILOSOPHY

General:

Manufacturer/Supplier shall incorporate design features which maximize reliable long term operation, minimize false alarms and include automated or user initiated self-tests.
Manufacturer/Supplier shall ensure that loss of power and warm restart shall take plant equipment, process through retentive operation.

- Start-up condition shall be as per the equipment specification.
- Under normal operation control of the package shall be as per equipment specification.

Alarm and Shutdown Philosophy

- Local indication of all package unit alarms.
- For all trips and alarms, indication and audible device located in MCS and pump system local control panel
- Package shutdown routine to be discussed and finalized with OIL & OIL's Project Consultant.
- All shutdown initiators shall be provided with Alarms & Pre alarms, where remedial action can be taken. Remedial action shall be advised by Manufacturer/Supplier.
- An audible device shall be provided on Control Panels associated with package units, dB range shall be more than 85dB.

Interfacing Philosophy

Package Control Interface shall be hardwired for followings,

- ESD, Trip, Stop
- Auxiliary Start, Stop
- Speed Control

Whereas other monitoring and control shall be over Redundant serial communications link with cross linking if signals are numerous (e.g. >20), otherwise hard wired.
Where process measurements are repeated for display or other use at multiple locations, for example local panel and plant interface building, loops shall be designed in such a way that maintenance of one part of the loop does not affect the other parts.
As a special case, MCC interface (Only for the monitoring signals) can be over serial link.
Interfacing logic diagram of Electrical & Instrumentation Panel shall be approved by OIL & OIL's Project Consultant.
Emergency stop push buttons on UCP and LCP shall be properly protected against accidental /unintentional actuation. It shall have twin contact elements for configuring it in 2oo2 voting

system.
For motors, the Emergency Trip / Stop push buttons from LCP / Field shall be directly wired to the Sub-station. Contact derived from the electrical circuit shall be wired back to ESD PLC/PLC.
Equipment Trip should not be on motor RUN feedback, it shall be on live parameter like flow, speed etc.
"Pulse duration" for starting or stopping a motor from Package PLC to be well defined and tested.
Energy Suppression Devices shall be used for all Inductive DC outputs.
Packages controlled by a PLC shall use standard 4-20mA devices. For packages controlled by plant MCS, preference is for the use of Modbus serial communication technology.
Interfacing logic diagram of Electrical & Instrumentation Panel shall be approved by OIL & PMC.

Alarm Philosophy:

a) All trips shall have a pre-trip warning alarm in addition to alarm at the trip condition.
b) All warning alarms and trip alarms shall be annunciated on the panel view (Audible as well as visual).
c) First out sequence shall be provided as per Annexure-III.
d) Alarm and trip contact shall be such that it gets normalized upon acknowledged and shall again actuate for a new alarm/trip condition.

PONTOON PUMPING SYSTEM:

- There will be 2 Pontoon Pump House – Both Identical
- A Pontoon Pump House will consist of
  - 2 Electrical driven Pumps – 1 working and 1 Standby
  - 1 Diesel driven Pump
  - Provision for an additional Pump
  - Each Pump will have separate suction pipe
    - Pressure Transmitter in the suction pipe to measure Suction line Pressure
  - Each Pump will have delivery pipe connecting to a common header
    - Non-Return Valve and Gate Valve to be provided between pump and common header
    - Pressure Transmitter in the delivery pipe between Pump and NRV to measure Delivery line Pressure
  - Water Level Transmitter to measure pontoon rain and float Water level

- Flow Meter in Common delivery header to measure water flow and Volume with By Pass Arrangement.
- Motor Control Room and Control System Room in the Shore at a maximum distance of 10 Meters from both the Pontoon
- Ups And Heat Load Calculation To Be Submitted By Contractors And Based On The Requirement Shall Be Provide The Ups And Battery Back Up

- Control System Room shall consist of

a. PLC Panel
b. HMI display
c. Temperature and Humidity Sensor
d. UPS Power Supply + SMF Batteries
e. Power Supply Termination Box
f. Air Conditioner

MODE OF OPERATION

- Two Modes: Auto & Manual – Selection through Selector Switch
- Auto
  - Selector Switch to be set to Auto
  - Auto Start / Stop will be through PLC Panel Push Button Operation
  - During Auto Mode, Direct Pump Controls to be disabled
  - PLC will control total pumping operation as per the control system philosophy
  - Emergency Stop to be provided in the panel to stop the total operation
- When Pressed Auto Operation will be Stopped
- When Emergency Stop is released Auto Mode to be started pressing Auto Start button
- Manual
  - Selector Switch to be set to Manual
  - Complete Control of Pumps will be through Motor Control Panel buttons

CONTROL SYSTEM PHILOSOPHY

- Settings
- Target Flow (m3/hr)

- Minimum Flow
- Maximum Flow
- Suction Line Pressure (bar)
- Alarm Set Point
- Alarm Set Point Hysteresis
- Trip Set Point
- Delivery Line Pressure (bar)
- Alarm Set Point
- Alarm Set Point Hysteresis
- Trip Set Point
- Water Level (Meters)
- Alarm Set Point
- Alarm Set Point Hysteresis
- Trip Set Point
- Trip Set Point Hysteresis
- Pontoon Run Cycle Time (Minutes)
- Master Pump Cycle Time (Minutes)
- Diesel Driven Pump Maximum Idle Period (Hours)
- Diesel Driven Pump Idle Break Run Time (Minutes)

➢ Water Flow Monitoring & Action

- Pumping to be achieved based on the target set to the PLC
- By default, Master Pump to be in operation
- If Minimum Target Flow is not achieved
- Transfer Service to next Pontoon
- If Minimum Target Flow is not achieved
- Start Slave Pump
- If Maximum Target Flow is Exceeded
- Stop Slave Pump
- If both Master Pump and Slave Pump are in operation
- If Minimum Target Flow is not achieved

- Alarm to be initiated

➢ At Present 2 Pontoons are considered as One Master and One Slave

o Each Pontoon will work on rotation basis for the Pontoon Run Cycle Time

o In case of a Pontoon out of service, other Pontoon should work in stand-alone mode

➢ Within a Pontoon

o 2 Electrical driven Pump are considered as One Master and One Slave

- Each Pump should pump water on rotation basis for the Master Pump Cycle Time
- In case of a Pump out of service, other pump should work in stand-alone mode

o If 3rd Electrical driven Pump is provisioned, then consideration is One Master and Two Slave

- Each Pump will act as Master on rotation basis for the Master Pump Cycle Time
- In case of a Pump out of service, other 2 pump should work as One Master and One Slave
- In case of 2 Pump out of service, the remaining 1 pump should work in stand-alone mode

o 1 Diesel driven Pump is for Emergency Operation, which should be put in Service for Idle Break Run Time after every Maximum Idle Period

➢ Pump Power Supply Monitoring

o Any Pump Trip to be considered as Pump out-of-service

o Run Feedback False when Pump in Operation shall be considered as Pump out-of-service

o Respective Pump to be put back in Service through the HMI after thorough verification of its operation

➢ Pressure Monitoring & Action

o All Pressure Sensor will be in Live Monitoring

o When a Pump is in operation both Suction Pressure and Delivery Pressure to be considered for the Set Point based Actions

o Suction Pressure below Alarm Set point (or) Delivery Pressure above Alarm Set point

- Alarm to be initiated
- continue pumping

o Suction Pressure below Trip Set point (or) Delivery Pressure above Trip Set point

- Alarm to be initiated
- Stop Pump
- Set Pump as Out of Service
- If this Pump is running in Stand-alone mode
- Set Pontoon out of Service
- Transfer Service to Next Pontoon
- If One Slave Pump is in Service
- Set Stand-by Pump as Master in Stand-alone mode
- If Two Slave Pump is in Service
- Set Next Pump in turn as Master and another as Slave

➢ Level Monitoring & Action

o If Water Level is below Alarm Set point

- Alarm to be initiated
- Continue Pumping

o If Water Level is below Trip Set point

- Alarm to be initiated
- Stop Pumping
- Set this Pontoon out of service
- If the other Pontoon is in Service
- Transfer Service to Next Pontoon
- If Water Level raises above Trip Set point + Hysteresis
- Set this Pontoon back in service

- Emergency

o Each Pump to be provided with Emergency Button near the pump

- When Pressed that Pump shall be set as out-of-service
- Respective Pump to be back in Service through Panel HMI after thorough verification of the Pump

o Each Pontoon shall be provided with Emergency Button

- When Pressed that Pontoon shall be set as out-of-service
- When Emergency button is released the Pontoon will be back in service

o Control System Panel will be provided with Emergency Button

- When Pressed the Auto Operation will be Stopped
- When Emergency button is released, Auto Mode to be

- Diesel Driven Pump

o In case of Power Failure (or) In case of both Pontoon are out-of-service, Diesel Driven pumps to be put in service

o Each Diesel driven pump should pump water on time sharing basis

- In case of a Diesel Driven Pump get out of service, other Diesel Driven Pump should work in stand-alone mode

o Whenever a Pontoon is back in Service, Diesel Driven Pump should go to Stand-by Mode

Enclosures and Junction Boxes

All instrument housings and enclosures shall comply with increase protection to IP 65 or NEMA 4 & 4X (by exception)

a. Junction box certification shall be,

- EEx'd' for Explosion proof (E.P.) for EEx 'd" device connection
- EEx'e' for Intrinsically safe for IS device connection

b. Junction box material shall be,

- Fiber Glass (with SS316 NUT, Bolts, Plates and hinges) for intrinsically safe signals.
- Aluminum LM6 for Ex-proof JBs, Epoxy Painted

c. Removable gland plate shall be provided for purchaser connection, gland plate shall be drilled (fitted with certified plugs).

d. Junction boxes shall be segregated based different signal levels as below,

- ESD input and output separately
- Control
- Analogue input /output
- Digital input / output
- Serial communication links .

e. JB terminal shall be

- Klippon-type
- Blue for I. S.circuits
- Grey for non-I. S.circuits
- Terminals shall be spring loaded, not screwed type.
- % spare terminals for each JB : ..... 25.....

f. Cable entry shall be from bottom for multicore cables, whereas side entry for branch cables. All unused gland entries shall be closed with metallic plug. Cable glands shall be used for all field cables (at instruments and JB end), cable glands shall be Flameproof, double compression, Brass with Ni/Cr plated.

g. Isolated Instrument earth bus bar shall be used for signal earthling connection

h. The minimum number of terminals fitted within any junction box (for a 5 pair cable) shall be "15" to facilitate the termination of any cable screens; a bus bar, Kleppin Type "Ssch" or equal shall be installed as close to the terminal rails as is practical. For 10 pair and 20 pair cables, the number of terminals shall be 30 and 60, respectively. Terminals for triad cables shall be similar. Terminals shall be numbered consecutively, i.e. 1, 2, 3, 4, etc.

i. Junction Boxes shall have adequate space between terminals and sides of the box to facilitate easy cabling.

j. Junction boxes shall be provided with earthing connection stud outside of JB for connection to safety earth.

k. Junction Boxes shall be provided with sunshades.

CABLE AND WIRING

For cable types refer to Instrument Cable Specification. All cables shall be armored and shall be flame retardant to IEC-60332. All homerun cables from field junction boxes shall be routed above ground in cable tray.

a. Cable segregation shall be based on following criteria,

- Analogue from digital for required signals
- ESD
- ESD from Control
- I. S. from non I.S.

b. Voltage level segregation Instrument signal cables and alternating electrical power cables shall only cross at right angle. Parallel route of the signal cable and AC power cable shall be separated as per the API552 guidelines.

c. Where practical all cables are to be supported in trays restricted to one bank high, cable trays shall be open & of galvanized steel material.

d. Fiber glass cable tray shall be considered for potentially corrosive location such as pump system and river water application. Review confirmed

e. All field instruments shall be pre-wired to JB's at edge of skid(s) by package Manufacturer/Supplier, unless otherwise specified in Material Requisition.

f. All spare wires in multi-core cables shall be terminated in JB's. JB sizes must be suitable for incoming cables. Sufficient terminals shall be provided to terminate allcores.

g. Jumpers between terminals shall be accomplished using special links supplied by terminal manufacturer.

~~h.~~ Cable/wiring identification shall comply as per standard

i. All cables/wires shall be tagged at both ends.

j. Stranded wires shall be terminated with insulated bootlace lugs &ferrules.

k. Maximum number of wires per terminal is one.

l. All System cables, ribbon cables and data highway cables shall be within the Manufacturer/Supplier's scope.

m. System cables between equipment cabinets, termination and peripherals shall utilize plug and socket techniques to the maximum extent possible.

n. Manufacturer/Supplier shall check with size of incoming power cable and provide power terminals blocks of suitable size.

o. Cable Duct size shall be designed considering spares wires of cables, to avoid wire flooding in ducts. Cable duct shall be of standard color depending upon IS or None IS signals.

p. Inside panels main TBs nomenclature shall be as per field device names i.e. JB name, LCP name etc.

q. Manufacturer/Supplier shall provide 20 % spare (terminals, barriers, etc) and 20% spare space for termination with in system panel.

r. All internal and external wiring shall have cross ferruling reference.

s. UCP and LCP shall have physical separation between high voltage and low voltage wire routing and terminal blocks.

t. All electronic instrument body and Junction boxes shall be connected to the skid earth and subsequently to plant protective earth.

u. Conductor size of internal signal wiring shall be 1.0 sq. mm whereas all power cabling inside the cabinet shall be 2.5 sq.mm.minimum.

v. Manufacturer/Supplier shall check size of multi core / Pair cable and provide suitable opening in theJB.

Earthing

Manufacturer/Supplier shall provide all earth continuity links required for his equipment.

A. Protective Earth

a. A protective earth bar, bonded to framework, shall be provided in each equipment and termination cabinet.

b. It shall be used to provide earthing for power supply modules, metal equipment enclosures and doors, all electronic instrument body, junction box and cable tray shall be connected to protective earth.

c. All metal components shall be connected to the protective earth system.

d. Flexible conduits, cable armor, soldered joints or door hinges shall not be accepted as earth returns.

e. All earth connections shall be made direct to the earth point for each cabinet.

B. Instrument Earth

f. Instrument earth shall be totally separate from the protective earth and shall be of a very high integrity;

g. Separate Instrument earth busbar, mounted on insulators shall be provided in each equipment and termination cabinet. These shall be used to ground the relevant zero volt references and signal cable screens.

h. Signal cable screens and spare cores of all multicore cables shall be terminated on the Instrument earth bus bar via spare terminals.

i. Provision shall be made to terminate all individual shields and overall shields separately. Overall shields will be terminated on a bus-bar at the bottom of the panel near the cable entry; while earth bar for the individual shield will be run parallel to the terminal stacks.

GENERAL SPECIFICATIONS OF PLC PANEL:

1. For powering the instruments, panel shall be designed having power distribution box with copper bus bars (phase & neutral), and MCBs.

2. Panel shall be fabricated from cold rolled steel sheet of minimum 3mm thickness, which shall be suitably reinforced to prevent warping, and buckling. Panel plates shall be free from corrugations or deep indentations of any kind and shall be flat smooth. All edge shall be grounded smooth after fabrication. Panel shall be mounted on a channel fixed on floor and bolted by means of foundation bolts to be supplied along with panel.

3. Panel shall be equipped with single and rear access doors. Contractors to decide appropriate size of the panel depending on the hardware's installed inside and the cable entry. Doors

shall be equipped with lockable handles and concealed hinges with pull out type pins for easy door removal.

4. The finish shall include sand blasting, grinding, chemical cleaning, surface finishing by suitable filler and two coats of high grade lacquer with wet sanding between coats. Two coats of paint in panel color shall be given for non-glossy high satin finish. Panel face final color shall be RAL7032. Panel interior shall be pale cream : ISC No.- 352

5. The design of power distribution network shall be such that a single power fault in any instrument shall not affect and cause a trouble to the entire system i.e. individual group of instruments to be powered separately through MCBs + Fuse circuit the safe functionality and protection of the system.

6. Illumination (fluorescent lamps and door operated micro switches) and service cum switchboard shall be provided in panel, they should operate on 220 VAC.

7. Provision to store drawings shall be available within the panel.

8. Contractors shall submit one set of tentative panel drawing along with their offer.

9. In case of order, Contractors shall proceed for fabrication/ manufacture of the panel only after its drawings are duly approved by OIL.

10. After mechanical fabrication of cabinets, they shall be sand blasted/ chemically treated before providing two coats of epoxy paint with matt finish.

11. All metal parts of the cabinet including doors shall be electrically continuous and shall be provided with common grounding lugs.

12. Equipment within the panel shall be arranged in accessible and segregated manner respect to functions and shall be arranged in best workmanship manner for ease of maintenance and troubleshooting.

13. Cabinet Temperature sensor unit with alarm to be provided by the Contractors.

14. Provision shall be made to prevent electrostatic, magnetic and radio frequency effect wherever required with necessary shielding and grounding by Contractors.

15. Set of three keys to be provided for the panel & system by the Contractors.

16. System earthing for PLC to be separate from signal/panel earthing system.

17. Following design philosophy shall be followed while deciding the internal layout of the panel.

a) All internal wiring shall be housed in covered, nonflammable plastic raceways arranged to permit easy accessibility to various instruments for maintenance, adjustment, repair and removal.
b) Separate wiring raceways shall be used for power and signal wiring.
c) Color code for power, input & output signal wiring shall be different.
   1. Grey for inputs.
   2. Yellow-green for ground.
   3. Orange for output.
   4. White (+VE) and blue(-VE) for 24 Volts DC Supply.
   5. Red/black for control supply 230 Volts AC.
d) Distance between terminal strip and side of the cabinet parallel to the strips should be a minimum of 100 mm+ through width.
e) Distance between terminal strip and top of the cabinet should be a minimum of 100 mm.
f) Distance between two adjacent terminal strips should be a minimum of 100 mm+ through width.
g) Distance between cable gland plate and the bottom of the terminal strip should be a minimum of 300 mm.
h) Front instrument should be accessible by opening hinged front glass doors.
i) All doors should be provided with suitable handles and locking arrangement.
j) In any terminal not more than one wire should be connected Each I/O point of spare modules to be wired up to terminal block & must be documented properly.
k) All spare leads of the cables shall be terminated on spare terminals dully numbered and will be shown on the wiring drawing.

18. Open terminals shall generally be avoided. Terminal strips shall be of screw less terminals with spring loaded contacts suitable for 4.0 sq.mm. Wire.

a. Instead of external short link internal shorting links as per requirement of circuit should be used.

b. Single printed long ferrules are to be used which should be readable and fit tightly on wire. Standard Cross ferruling practice should be employed. Ferrules are yellow/White with black, marking.

c. A min. of 1.0 mm2 multi stranded PVC insulated copper conductor shall be used in general. All wiring shall be laid in the PVC throughs. No throughs shall be more than 70% full.

d. Power wiring and control wiring shall be separated by not less than 150 mm. The crossing, if unavoidable shall be as close to right angle as possible.

e. All cables should have proper tags & cable schedules with Tag should be documented.

f. Cabinet should have service plug for 230 V AC.

g. No process fluid of any kind, except instrument air, shall enter the panel cubicle.

h. Provision to switch off manually all types of power shall be provided in the panel.

i. The internal layout of the panels/cabinets shall be designed considering proper approach for each instrument, terminals and other accessories for maintenance, easy removal and on line calibration. Following point must be taken in to consideration while deciding the internal layout.

j. The Panel front layout shall be designed considering ease of operation. No push button shall be located below 600 mm.

k. The design of control panel shall incorporate provision for expansion by installing adequate spare capacity. Each panel shall be designed to accommodate the following additional equipments, as a minimum.

A. 20% additional power feeders each provided with switch
B. fuse assy.20% spare cable entry points.
C. 20% additional terminals blocks.

l. Suitable separate grounding arrangements should be provided for the panel and the PLC systems.

m. All Cable entries shall be from bottom.

n. Provision of pocket should be made available to store drawing in the panel on back of the door.

o. All the MCBs Terminals, PLC components like I/O module, CPU, power supply etc. Tag plate with description & no to be fixed.

19. Earth leakage current detectors are required for circuit going to the field SOVs through DO relay contact. One earth leakage detector shall be considered per DO card and shall be considered for all DO cards. Earth leakage detectors shall be rated for 125 A and capable of detecting leakage current upto 100mA with alarm contact output.
20. Panel shall have ammeter and voltmeter indications.

PROGRAMMABLE LOGIC CONTROLLERS (PLCS)

PLCs shall be configured to provide the control and safety functions for the package operation.

PLC shall be hot backup type with firmware redundancy. No separate programming via application program should be required to achieve redundancy PLC shall be of dual redundancy type .All Power supply, (system, I/O rack, interrogation etc.) and shall be hot redundant. Additional redundancy for Communication network shall be provided.

The software shall include the operating system and application program. The application program shall include software for performing functions like interlock and shutdown logic, programming/program modification, documentation etc. Two copies of application program and two set of licensed system software shall be supplied.

System programming tools, software and related accessories shall be mentioned with separate optional cost.
No two shutdown circuits shall be shared by same I/O module, unless specified otherwise
The following minimum requirements shall be applied to PLCs:

a. Redundant CPUs (Central Processing Unit) mounted in rack
b. Input/ Output Modules (mounted in local and remote rack)
c. Local Operator Interface (Panel mounted HMI or separate PC based HMI)
d. PLC Shall be time synchronized with the MCS
e. Redundant Communication Subsystem (I/O system and MCS Interface)
f. Separate redundant power supply to individual I/ O rack and processor. In case, barriers are powered from power rail/mother board, then power redundancy shall be maintained up to power rail/motherboard.
g. System software required to provide a complete operable solution e.g. For logic

development/modification, HMI and I/O scheduling etc.

Stop push button/Selector switches/Reset push buttons shall be independent of PLC system. One contact to go to PLC whereas other to be hardwired for STOP command to MCC/Hardwired console panel. First out alarm should be available.

Interrogation voltage for all inputs shall be 24vdc. All contacts supplied by purchaser to Contractors shall be potential free and shall be rated for 230 V AC, 5 Amp.

Contractors shall provide a complete interlock and shutdown scheme as required in the form of following documents.

- Logic diagrams
- Ladder diagram
- Write up

CPUs shall be redundant with simplex I/O modules used for Control applications
PLC systems shall be of modular design. Manufacturer/Supplier shall specify the expansion capabilities of their PLC systems. PLC systems shall allow on line modifications and card replacement.
For each package control system, self-diagnostic alarms shall be made available in Control room/Equipment room for hardware failure and maintenance/ troubleshooting.
Each PLC shall be provided with a programming devise such as a laptop, with necessary licensed software and HMI display. Manufacture shall provide password access to PLC program.
All relevant alarm/event logging and historical trending for all process and machine parameters to be provided.
Additional 'Confirm' key to be configured in HMI graphic for all actions (STOP) from HMI.

Interlocks and Shutdowns:

All interlock and shutdown logic shall be executed by Contractors using PLC. PLC should have status indication for I/O, watch dog etc.

The system shall be designed "fail safe" and shall meet the following requirements as a minimum.

a) All relays and solenoid valves shall be energized under normal conditions and shall de-energize under abnormal conditions.

b) STOP pushbutton (local and remote) contacts shall be wired in series with the final actuating device to ensure positive shutdown. First out alarm also to be provided for STOP operation.
c) If desired, because of operational or maintenance requirements, adequate trip by-pass facilities are to be provided with alarm and logging to indicate that the trip has been by passed. All trip bypass provision shall be provided in PLC software with password protection.
d) The electromagnetic relays shall be low power continuously rated type and shall have LED for status indication.
e) The relays shall be plug-in-type and their plug-in-bases shall have screwed terminals for interconnection. Lug type soldered connection shall not be acceptable.

Each relay shall have 3 numbers of 'NO' and 3 number of 'NC' contacts, as a minimum each suitable to drive the connected load. Out of these one 'NO' and one 'NC' contacts shall not be used.

All relays for contacts going to electrical circuit shall be with 2Change over contacts.

PROGRAMMABLE LOGIC CONTROLLER

CPU (Redundant), system power supplies for CPU & IO's to be redundant.

a. Communication Network
b. 1 No. of HMI for operator interface.
c. The I/O cards with the counts given below.

DESCRIPTION	TYPE OF CARD REQ	*ACTUAL QTY*	REQ QTY	CHANNEL TO CHANNEL ISOLATION REQ
DIGITAL INPUT	**24 DC V INPUT CARD**	**24**	**48**	**YES**
DIGITAL OUTPUT	**24 DC relay output, 2A**	**8**	**32**	**YES**
ANALOG INPUT	**4-20 mA**	**22**	**32**	**YES**
MEMORY MODULE		**1**		

ADDITIONAL HARDWARE:

DESCRIPTION	**QTY**	**REMARKS**
RELAY for DO(inside PLC panel)	Contractors to specify	
TERMINAL	Contractors to specify	All outputs to have fuse TB with LED indication.
PUSHBUTTONS WITHOUT LIGHT	Contractors to specify	WITH 2 NO AND 2 NC CONTACTS.
SELECTOR SWITCH WITH LED	Contractors to specify	2-position selector switch.-
LED indicator	Contractors to specify	
HOOTER (Electronic with adjustable volume & tone)	1	24VDC operated
SELECTOR SWITCH WITH LOCKING PROVISION	Contractors to specify	
Input Barrier(AI WITH DUAL OUTPUT)	Contractors to specify	
Input Barrier(DI WITH DUAL OUTPUT)	Contractors to specify	
MCB(DPDT)	As per the requirement	
Glass Fuses	As per the Requirement	
POWER SUPPLY with Diode O Ring FOR AI/DI (REDUNDANT ARRANGEMENT)	2	**Input : 230 VAC** **Output : 24 V DC**

INTERFACING WITH OIL D.C.S.

The PLC system should be provided with necessary systems so that integration with OIL Main Plant DCS

INSTALLATION MATERIALS:

All materials required for installing and interconnecting Contractors supplied items shall term part of Contractors scope.

Cable glands required for terminating all field cables and cables from MCC shall be under Contractors scope of supply. Exact no. of cable and size shall be informed during detailed engineering.

All cable glands shall be of nickel plated brass and they shall be double compression type with check-nuts suitable for armored cables.

Contractors shall supply a minimum of 20% cable glands as spare.

EARTHING:

Contractors shall provide separate earth bus bars, connections instrument/PLC and panel electrical earthing.

Any special earthing requirements for local panels, instruments etc. shall be indicated by Contractors during detailed engineering.

All circuit grounds, shields and drain wires shall be connected to the system ground bus which is isolated from AC mains earth. This bus shall typically be 25 mm wide and 6 mm thick of copper.

SPARES PHILOSOPHY:

Mandatory spares:

5% or one each type of the modules used in the system including CPU, memory, Power supply, I/O modules, etc.

Commissioning Spares:

All spares required for commissioning of the package system in the Contractors's scope of supply.

Normal Operation Spares:

Contractors shall supply complete spare parts list with make, model, part no. details for all instruments, modules, instrument accessories, hardware items etc. Contractors shall supply a list of recommended spares required for 5 years of continuous trouble free operation. These spares shall be quoted separately items wise / spare parts wise. The parts list shall be with part no., assembly no., drawing no. details etc. along with price break up for each spare.

PLC, WORK STATION & HARDWARE SPECS SHEET

SR. NO.	FEATURE	REQUIREMENT	CONTRACTORS
1	MODEL/TYPE QUOTED	Contractors to specify	
2	TYPE OF COMM.BUS & DISTANCE	COAXIAL COMM. CABLE /FIBER OPTIC CABLES	
	MAX. DISTANCE WITHOUT ANY REPEATER	Contractors to specify	
	MAX. DISTANCE WITH REPEATER	Contractors to specify	
	COMMUNICATION BUS SPEED	Contractors to specify	
	SOFTWARE COMM. LOAD IN NORMAL CONDITION	<20%	
	SOFTWARE COMM. LOAD IN WORST CONDITION	<30%	
	FUTURE MARGIN IN COMM. LOAD	>80%	
3	FUTURE SYSTEM EXPANDABILITY	Contractors to specify	
4	SYSTEM HARDWARE VERSION	Contractors to specify	
5	SYSTEM SOFTWARE VERSION	Contractors to specify	
6	OPENNESS OF THE SYSTEM	FULLY OPEN	
	HARDWARE WISE	OSI, PLATFORM INDEPENDENT	
	SOFTWARE WISE	OSI, PLATFORM INDEPENDENT	
	SYSTEM BOOT UP TIME	Contractors to specify	
	SYSTEM SELF BOOTABLE	YES	
7	SYSTEM CONFIGURATION / PROGRAMMING SOFTWARE		
	SOFTWARE	REQUIRED COMPLYING TO IEC61131-3 STANDARD	
	CAN BE DONE ON LINE & OFF LINE	YES	

SR. NO.	FEATURE	REQUIREMENT	CONTRACTORS
	SYSTEM CONFIGURATION DEVELOPMENT TOOL IN P.C.	YES	
	MAX. TAGS SUPPORTED BY THE SYSTEM	CONTRACTORS TO SPECIFY	
	ON LINE CONTEXT SENSITIVE HELP	YES, AT EACH LEVEL	
	ADDITION OR DELETION OF ANY I/O MODULE IN RUN TIME	YES	
	MODIFICATION OF CONTROL STRATEGY IN RUN TIME	YES	
	CHANGE OF ANY TAG NAME IN RUN TIME	YES	
	CHANGE OF ANY SOFTWARE CONNECTION IN CONTROLLER IN RUN TIME	YES	
	SECURITY	WITH DIFF. LEVEL OF PASSWORD FOR DIFF. CATEGORY OF OPERATION	
	PANEL VIEW SIZE	LCD DISPLAY, TFT WITH BACKLIT	
	TOUCHSCREEN	YES	
	COLOUR	YES, MIN 256 COLOURS	
	RESOLUTION	MIN 800 X 600 PIXELS	
	CONFIGURATION SOFTWARE REQUIRED	PLC CONFIGURATIONS/W SOE RECORDING S/W	
	TREND DISPLAY	REQUIRED.	
	STATISTICAL ANALYSIS REPORT	NA	
	INTEGRATED MEMORY (AVAILABLE FOR APPLICATION DATA)	CONTRACTORS TO SPECIFY	
	INTERFACE TO PLC	REDUNDANT	
	OPERATING SYSTEM	LATEST VERSION OF Windows..	
	PRINTER PORT	Not Required.	
	DISPLAY REFRESH RATE	MAX. 1 SEC.	
	LIMIT ON NOS. OF DYNAMIC POINT IN A SINGLE GRAPHIC	NO LIMIT	
	ANY OTHER LIMITATIONS	CONTRACTORS TO SPECIFY	
	TRENDS/RECORDING	REQUIRED	
	NO OF PARAMETERS FOR WHICH RECORDING REQUIRED	ALL	

SR. NO.	FEATURE	REQUIREMENT	CONTRACTORS
	SCANNING INTERVAL (SEE ANNEXUE-XI)	05 SEC/10SEC	
	HISTORY REQUIRED	30 DAYS	
9	PROGRAMMABLE LOGIC CONTROLLER		
	TYPE OF PROCESSOR / SPEED	32 BIT PROCESSOR or BETTER	
	USER RAM / UPGRADABLE UP TO	CONTRACTORS TO SPECIFY	
	CYCLE TIME FOR INPUT SCANNING	CONTRACTORS TO SPECIFY	
	CYCLE TIME FOR PROGRAM EXECUTION	CONTRACTORS TO SPECIFY	
	CYCLE TIME FOR OUTPUT WRITING	CONTRACTORS TO SPECIFY	
	REDUNDANCY OFFERED	REDUNDANT CPU	
	MOUNTING	CONTRACTORS TO SPECIFY.	
	REDUNDANCY TYPE	HOT REDUNDANT	
	REDUNDANCY CPU TAKE OVERTIME	NOT REQUIRED	
	CONTROLLER CAPACITY	CONTRACTORS TO SPECIFY	
	CONTROL ALGORITHMS RUNNING IN	MAIN CONTROL PROCESSOR	
	AUTO TUNING AS STANDARD FEATURE	YES	
	MAX. LOAD FOR PRESENT APPLICATION	40%	
	FUTURE MARGIN IN SOFTWARE	40%	
	SUPPORT FOR ALL STD. ALGORITHMS	YES , FOR ALL STD. TYPES AS SPECIFIED IN INQ. SPECS , INCLUDING SEQUENTIAL AND CONTINUOUS CONTROL AND MATHS, LOGIC FUNCITON	
	ON LINE MODIFICATION /ADDITION AND DELETION OF ANY LOOP OR LOOP TAG/REPALCEMENT OF MODULE	YES	
	CONTROLLER BUS SPEED	CONTRACTORS TO SPECIFY	
	SELF BOOTABLE	YES	

SR. NO.	FEATURE	REQUIREMENT	CONTRACTORS
	CONTROL CONFIGURATION FACILITIES	PC BASED , SUPPORTED BY MOUSE AND KEY BOARD WITH ALL TYPES OF EDITING FEATURES AND ON LINE CONTEXT SENSITIVE HELP	
	AUTOMATIC CONTROLLER UPLOAD FACILITY	CONTRACTORS TO SPECIFY	
	DOWNLOAD / BOOT TIME	MIN / CONTRACTORS TO SPECIFY.	
10	DIGITAL INPUT CARD		
	NO. OF CHANNEL	16/32/CONTRACTORS TO SPECIFY	
	INTERROGATION VOLTAGE	24 VDC	
	CHANNEL STATUS LED	YES , PER CHANNEL	
	INDIVIDUAL CHANNEL ISOLATION	YES, >1000V DC AS PER IEC	
	OVER CURRENT PROTECTION	YES , WITH ALARMS	
	LOOP CURRENT	MAX. 2 AMP.	
	SURGE WITH STAND CAPACITY	YES , AS PER IEC	
	SCAN RATE	CONTRACTORS TO SPECIFY	
	REDUNDANCY	NO	
11	DIGITAL OUTPUT CARD		
	NO. OF CHANNEL	16/32/CONTRACTORS TO SPECIFY	
	DRIVING VOLTAGE	24 V D.C.	
	CHANNEL STATUS LED	YES, PER CHANNEL	
	INDIVIDUAL CHANNEL ISOLATION	OPTICALLY ISOLATED	
	EARTH FAULT DETECTION CKT.	YES, WITH ALARMS	
	OVER CURRENT PROTECTION	YES, WITH ALARMS	
	MAX LOOP CURRENT	2 AMP.	
	SURGE WITH STAND CAPACITY	YES, AS PER IEC STANDARD	
	SCAN RATE	CONTRACTORS TO SPECIFY	
	SHORT CIRCUIT PROTECTION	YES, WITH ALARMS	
	PROTECTION AGAINST BACK EMF.	YES	
	REDUNDANCY	NO	
12	ANALOG INPUT CARD (FOR LOAD CELL, SPEED &		

SR. NO.	FEATURE	REQUIREMENT	CONTRACTORS
	REMOTE SETPOINT)		
	NO. OF CHANNEL	08/16 Nos/Contractors to specify	
	INPUT TYPE	4-20 mA	
	DRIVING VOLTAGE	SUITABLE.	
	CHANNEL STATUS LED	YES, PER CHANNEL	
	CHANNEL ISOLATION	YES, GALVANICALLY ISOLATED	
	TYPE OF ADC /RESOLUTION	65,535 PARTS OVER RANGE OR BETTER	
	ACCURACY	0.05 % OR BETTER	
	SCAN RATE	50 cycles / second or better.	
	CONFIGURATION SOFTWARE	REQUIRED	
	INMOTION WEIGHING	NA	
	CALIBRATION	Contractors to specify	
	REDUNDANCY	NO	
13	ANALOG OUTPUT CARD	NA	
	NO. OF CHANNEL	NA	
	OUTPUT TYPE	NA	
	DRIVING VOLTAGE	NA	
	CHANNEL STATUS LED	NA	
	CHANNEL ISOLATION	NA	
	EARTH FAULT DETECTION CKT.	NA	
	OVER CURRENT PROTECTION	NA	
	TYPE OF ADC /RESOLUTION	NA	
	ACCURACY	NA	
	SCAN RATE	NA	
	REDUNDANCY	NA	
14	REDUNDANCY OFFERED AT		
	I/O	NO	
	CPU	YES	
	INTERNAL BUSES	YES	
	COMM. MODULE	YES	
	MAIN NODE BUS	YES	
	POWER SUPPLY	YES	
15	SYSTEM CLOCK		
	TIME SYNCHRONISATION METHOD OF WORK	CONTRACTORS TO	

SR. NO.	FEATURE	REQUIREMENT	CONTRACTORS
	STATION AND PLC	SPECIFY	
	STABILITY OF CLOCK	+/- 1 SEC PER DAY or BETTER	
	TEMPERATURE EFFECT	MINIMUM	
16	GRAPHICAL TREND AND STATISTICAL REPORT ON WORK STATION		
	GRAPHICAL TREND	REQUIRED	
17	SYSTEM DIAGNOSTICS		
	I/O MODULE	YES , UPTO IND. CHANNEL STATUS	
	CONTROLLER	YES , INCLUDES ALL MODULE, COMPRISING OF CONTROLLER SUB SYSTEM	
	ANY TYPE OF MINOR SOFTWARE AND HARDWARE ERROR	YES	
	ROUTINE SYSTEM DIAGNOSTICS	YES	
	ANY INTERNAL OR EXTERNAL COMM. ERROR	YES	
	MAJOR HARDWARE FAILURE	YES	
	MAJOR SOFTWARE FAILURE	YES	
	SYSTEM REDUNDANT COMPONENT CHANGEOVER	YES	
	ANY OTHER TYPE OF DIAGNOSTIC OFFERED	CONTRACTORS TO SPECIFY	
18	COMPLETESYSTEM COLD START UP TIME	MIN. / CONTRACTORS TO SPECIFY	
19	SYSTEM SELF BOOTABLE	YES , WITHOUT ANY USER INTERVENTION	
20	MAKE / MODEL OF CABINET	PANEL ENCLUSRE ALL OTHER ACCESSORIES AS MENTIONED IN INQ. SPECS	
21	INTERNAL WIRING OF PANELS		
	DIGITAL INPUTS WIRING SIZE /COLOR	1.0 SQ. MM MULTI STRAND , SILVER COATED , TEFLON INSULATED/STD	
	DIGITAL OUTPUTS WIRING SIZE /COLOR	0.75 SQ. MM MULTI STRAND , SILVER COATED , TEFLON INSULATED/STD	

SR. NO.	FEATURE	REQUIREMENT	CONTRACTORS
	ANALOG INPUT WIRING SIZE / COLOR	0.75 SQ. MM MULTI STRAND , SILVER COATED , TEFLON INSULATED/STD	
	230 V AC SUPPLY WIRING SIZE / COLOR	1.5S Q. mm	
	24 V DC SUPPLY WIRING SIZE / COLOR	1.5 SQ. mm MIN or HIGHER AS PER LOAD , MULTISTRAND, COPPER WIRE/STD	
22	INTERPOSING RELAYS FOR DIGITAL OUTPUT.	Hermetically Sealed	
	SUPPLY VOLTAGE	24 V D.C.	
	CONTACT RATING	230 VAC/5A	
	INBUILT DIODE/LED	YES	
	NOS. OF CONTACTS	3 NO/ 3 NC	
	MOUNTING ARRANGEMENT	PLUG-IN TYPE & DIN RAIL MOUNTED	
	OTHER LIMITATIONS	CONTRACTORS TO SPECIFY	
23	TYPE OF TERMINATIONS		
	ANALOG INPUT	SPRING FIT , SIZE AS PER REQUIREMENT	
	DIGITAL INPUT	SPRING FIT , SIZE AS PER REQUIREMENT	
	DIGITAL OUTPUT	SPRING FIT, FUSE TB WITH LED, WAGO MAKE, SIZE AS PER REQUIREMENT	
24	POWER SUPPLY WITH BUSBAR SIZING CALCULATION	YES	
25	TAGGING / FERRULING / COLOR CODING AS PER REQUIREMENT	YES,	
26	POWER SUPPLY AVAILABLE AT SITE	230 VAC, 50 Hz	
27	TYPE OF POWER SUPPLY (EXTERNAL)		
	FRONT PANEL DIGITAL INDICATIONS	NO	
	FRONT PANEL CURRENT AND VOLTAGE ADJUSTMENT	NO	
	PARALLELING WITH DIODE CKT.	YES	
	COOLING FANS	YES	
	OTHER FEATURES	CAPACITY>200%	

SR. NO.	FEATURE	REQUIREMENT	CONTRACTORS
	SHORT CIRCUIT PROTECTION	YES	
	LIMITATIONS	CONTRACTORS TO SPECIFY	
28	LOOPING FOR ANY SUPPLY		
	110 V DC	NOT ALLOWED	
	24 V DC	NOT ALLOWED	
29	POWER CONSUMPTION	CONTRACTORS TO SPECIFY	
30	POWER CONSUMPTION CALCULATIONS SHEET	REQUIRED	
31	HEAT DISSIPATION LOAD	CONTRACTORS TO SPECIFY	
32	HEAT DISSIPATION LOAD CALCULATIONS SHEET	YES	
33	MAX. AMBIENT TEMP. ALLOWED	50 deg C	
34	POWER SUPPLY REDUNDANCY	YES	
	24 V DC FOR ANALOG LOOPS	REQUIRED	
	24 V DC FOR DIGITAL LOOPS	REQUIRED	
35	POWER INTERRUPTION TOLERANCE OF SYSTEM	100 m SEC	
	FAT AGREEMENT	AS MENTIONED IN INQ. SPECIFICATIONS	
	SAT AGREEMENT	AS MENTIONED IN INQ. SPECIFICATIONS	
	DOCUMENTATION AS PER REQUIREMENT	AS MENTIONED IN INQ. SPECIFICATIONS	
	HARD COPIES	AS MENTIONED IN INQ. SPECIFICATIONS	
	SOFT COPIES IN SPECIFIED FORMAT	AS MENTIONED IN INQ. SPECIFICATIONS	
	CONTRACTORS 'S RESPONSIBILITY FOR ERECTION AND COMMISSIONING	AS MENTIONED IN ENQ. SPECS	
	DELIVERY PERIOD	MINIMUM	
	WARRANTY PERIOD / LIMITATIONS	AS MENTIONED IN INQ. SPECIFICATIONS	
	UNIT RATES OFFERED	YES	
	TRAINING	AS MENTIONED IN INQ. SPECS	

INSTRUMENT LIST:

PUMP HOUSE-01

	TAG	LOCATION	QTY	TYPE	RANGE	UNIT
1	LIT101	PANTOON AREA	1	Ultrasonic	**0-10**	M
2	PIT103	P101A SUCTION	1	Piezoresisitive	0-3	bar g
3	PG103	P101A SUCTION	1	Bourdon	0-3	bar g
4	PIT105	P101B SUCTION	1	Piezoresisitive	0-3	bar g
5	PG105	P101B SUCTION	1	Bourdon	0-3	bar g
6	PIT107	P101C SUCTION	1	Piezoresisitive	0-3	bar g
7	PG107	P101C SUCTION	1	Bourdon	0-3	bar g
8	PIT101	P101D SUCTION	1	Piezoresisitive	0-3	bar g
9	PG101	P101D SUCTION	1	Bourdon	0-3	bar g
10	PIT104	P101A DISCHARGE	1	Piezoresisitive	0-10	bar g
11	PG104	P101A DISCHARGE	1	Bourdon	0-10	bar g
12	PIT106	P101B DISCHARGE	1	Piezoresisitive	0-10	bar g
13	PG106	P101B DISCHARGE	1	Bourdon	0-10	bar g
14	PIT108	P101C DISCHARGE	1	Piezoresisitive	0-10	bar g
15	PG108	P101C DISCHARGE	1	Bourdon	0-10	bar g
16	PIT102	P101D DISCHARGE	1	Piezoresisitive	0-10	bar g
17	PG102	P101D DISCHARGE	1	Bourdon	0-10	bar g
18	PIT109	COMMON HEADER	1	Piezoresisitive	0-10	bar g
19	FIT 101	COMMON HEADER	1	Multi variable	0-3000	m3/hr
20	P101D	DIESEL DRIVEN PUMP	1	DIESEL DRIVEN		
21	P101A	ELECTRICAL DRIVEN PUMP	1	SOFT STARTER		
22	P101B	ELECTRICAL DRIVEN PUMP	1	SOFT STARTER		
23	P101C	ELECTRICAL DRIVEN PUMP	1	SOFT STARTER		

PUMP HOUSE-02

	TAG	LOCATION	QTY	TYPE	RANGE	UNIT
24	LIT201	PANTOON AREA	1	Ultrasonic	**0-10**	M
25	PIT203	P201A SUCTION	1	Piezoresisitive	0-1	bar g
26	PG203	P201A SUCTION	1	Bourdon	0-1	bar g

27	PIT205	P201B SUCTION	1	Piezoresisitive	0-1	bar g
28	PG205	P201B SUCTION	1	Bourdon	0-1	bar g
29	PIT207	P201C SUCTION	1	Piezoresisitive	0-1	bar g
30	PG207	P201C SUCTION	1	Bourdon	0-1	bar g
31	PIT201	P201D SUCTION	1	Piezoresisitive	0-1	bar g
32	PG201	P201D SUCTION	1	Bourdon	0-1	bar g
33	PIT204	P201A DISCHARGE	1	Piezoresisitive	0-10	bar g
34	PG204	P201A DISCHARGE	1	Bourdon	0-10	bar g
35	PIT206	P201B DISCHARGE	1	Piezoresisitive	0-10	bar g
36	PG206	P201B DISCHARGE	1	Bourdon	0-10	bar g
37	PIT208	P201C DISCHARGE	1	Piezoresisitive	0-10	bar g
38	PG208	P201C DISCHARGE	1	Bourdon	0-10	bar g
39	PIT202	P201D DISCHARGE	1	Piezoresisitive	0-10	bar g
40	PG202	P201D DISCHARGE	1	Bourdon	0-10	bar g
41	PIT209	COMMON HEADER	1	Piezoresisitive	0-10	bar g
42	FIT201	COMMON HEADER	1	Multi variable	0-3000	m3/hr
43	P201D	DIESEL DRIVEN PUMP	1	DIESEL DRIVEN		
44	P201A	ELECTRICAL DRIVEN PUMP	1	SOFT STARTER		
45	P201B	ELECTRICAL DRIVEN PUMP	1	SOFT STARTER		
46	P201C	ELECTRICAL DRIVEN PUMP	1	SOFT STARTER		

Note: All the process parameters & instruments measurement ranges, Quantity, Input/ Output count as recommended by consultant in the document have been reviewed. However,

onus of these instrumentation parameters ranges, Quantity, Input/ Output count shall be in the scope of the EPC/LSTK contractor while designing the final specification documents. The following documents can be considered for reference.

ADDITIONAL TECHNICAL SPECIFICATIONS

1. **CONTROL SYSTEM ARCHITECTURE:**

   Refer Annexure-I

2. **PANEL DRAWING:**

   Refer Annexure-II

3. **LOCAL OPERATOR, INSTRUMENT JUNCTION BOX & ANNOUNCATOR @ PUMP HOUSE DRAWING**

   Refer Annexure-III

4. **CONTROL ROOM LAYOUT:**

   Refer Annexure-IV

5. **PID DRAWING**

   Refer Annexure-V

6. **INSTRUMENT DATASHEET**

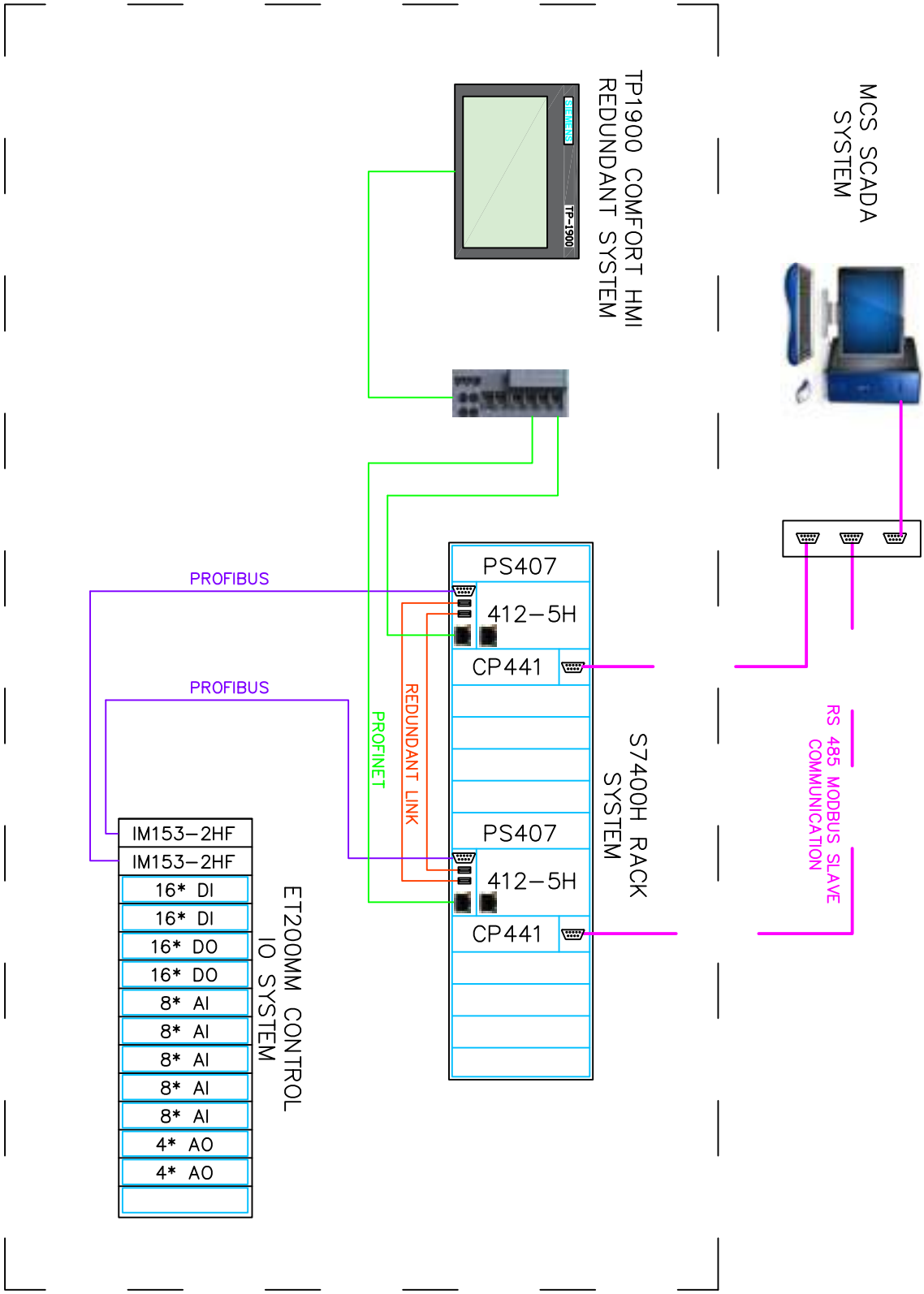
   Refer Annexure-VI

7. **IO COUNT DETAILS:**

   Refer Annexure-VII

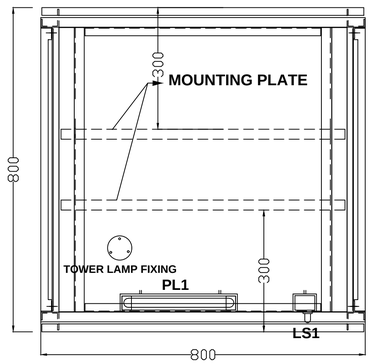
Annexure-I

SYSTEM ARCHITECTURE

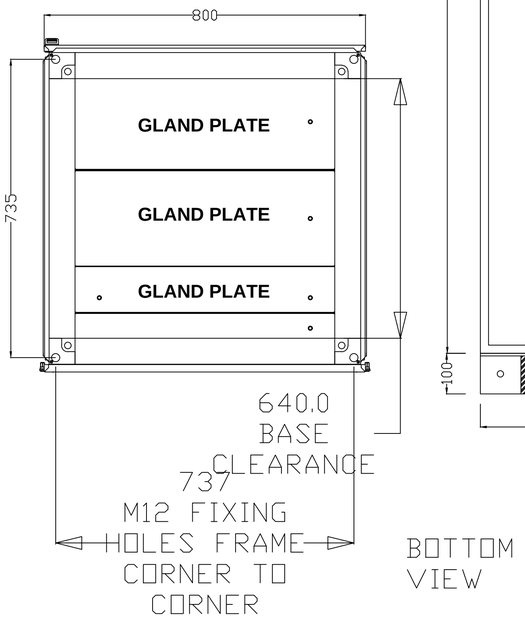


Annexure-II

TOP VIEW

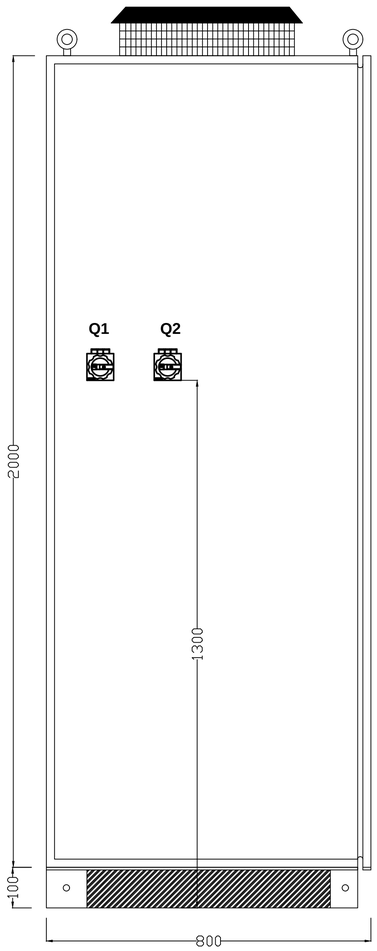


BOTTOM VIEW

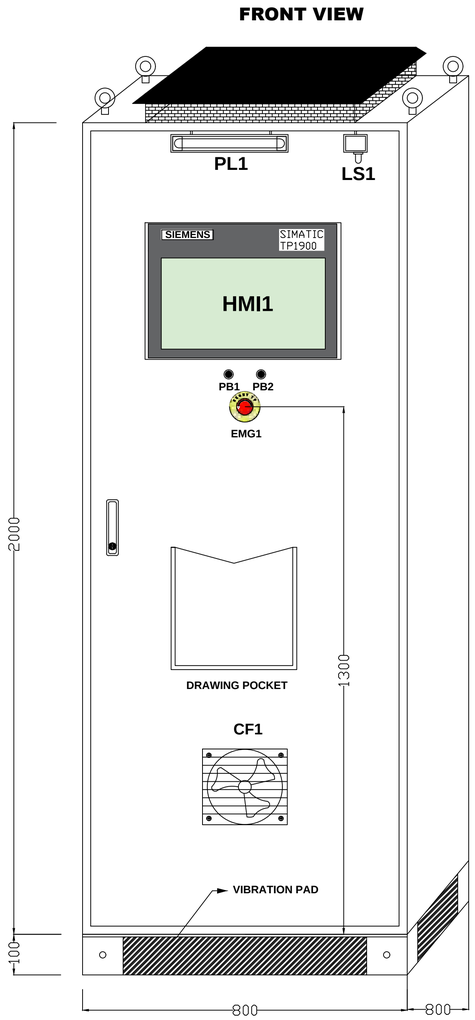


BOTTOM VIEW

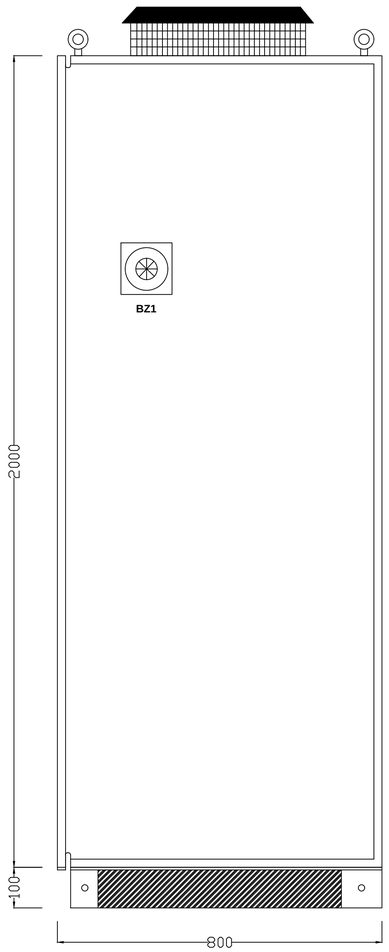
LHS VIEW



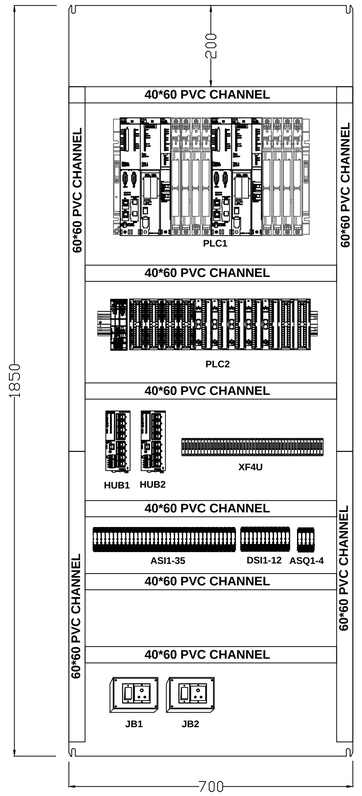
FRONT VIEW



RHS VIEW



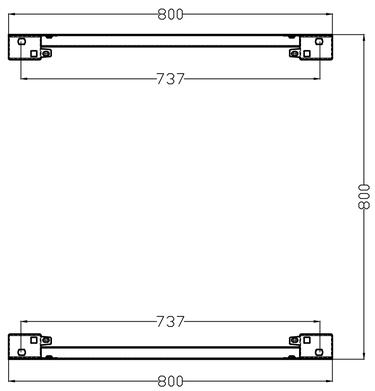
INTERNAL VIEW



CONTROL PANEL LEGENDS

SYMBOL	DESCRIPTION
PLC1	S7-400H REDUNDANT PLC SYSTEM
PLC2	ET-200M CONTROL I/O SYSTEM
HUB1	SCALANCE SWITCH-1
HUB2	SCALANCE SWITCH-2
ASI1-35	ANALOG I/P SIGNAL ISOLATOR
ASQ1-4	ANALOG O/P SIGNAL ISOLATOR
DSI	DIGITAL I/P SIGNAL ISOLATOR
JB1	JUNCTION BOX1
JB2	JUNCTION BOX2
XFU	FUSE TERMINALS
Q1	INPUT POWER ISOLATOR 32A
Q2	INPUT POWER ISOLATOR 32A
PL1	PANEL LAMP1
LS1	DOOR LIMIT SWITCH1
CF1	COOLING FAN
EF1	EXHAUST FAN
HMI1	TP1900 COMFORT HMI

PLINTH VIEW



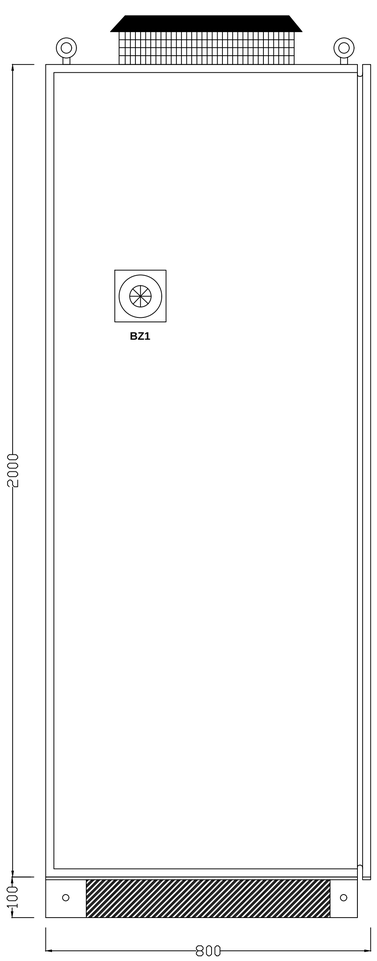
NOTE:

ALL DIMENSIONS ARE IN mm
ENGRAVED NAME PLATES USED FOR ALL COMPONENTS

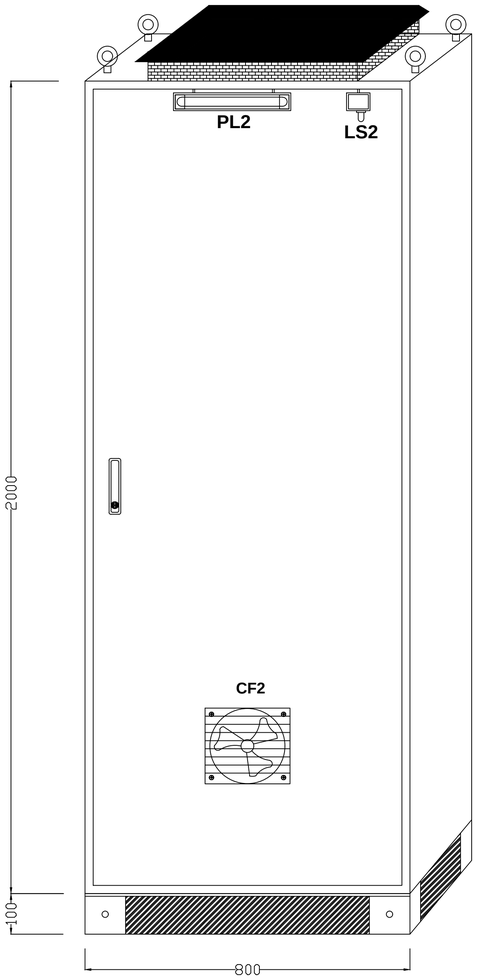
PANEL BOX SIZE :2000mmX800mmX800mm-1Nos
PANEL COLOUR: TEXTURED RAL 7035(SIEMENS GRAY)
PLINTH COLOUR: TEXTURED RAL 7022(DARK GRAY)
PROTECTION: IP55
MATERIAL : MS 1.6MM
DOOR : MS 2MM
PANEL MAKE: RITTAL
CABLE DUCT COLOUR : BLUE AND GRAY

BACK SIDE VIEW

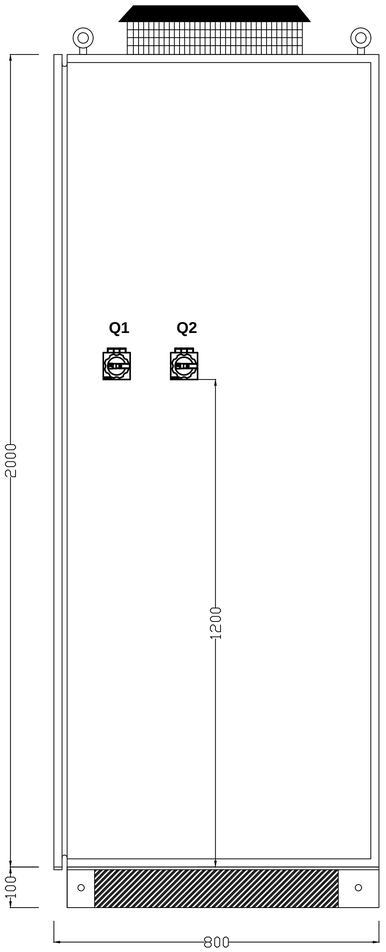
LHS VIEW



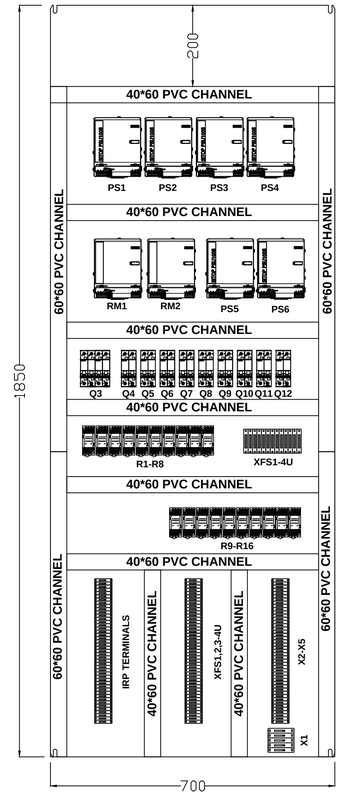
FRONT VIEW



RHS VIEW



BACK SIDE VIEW



CONTROL PANEL LEGENDS

SYMBOL	DESCRIPTION
PS1	SITOP PSU100S 20A
PS2	SITOP PSU100S 20A
PS3	SITOP PSU100S 20A
PS4	SITOP PSU100S 20A
RM1	SITOP MODULAR REDUNDANCY
RM2	SITOP MODULAR REDUNDANCY
PS5	SITOP PSU100S 10A
PS6	SITOP PSU100S 10A
Q1	INPUT POWER ISOLATOR 32A
Q2	INPUT POWER ISOLATOR 32A
Q3	ELCB 32A,100mA
Q4,Q5	MCB DP 20A
Q6-Q7	MCB DP 10A
Q8	MCB DP 6A
Q9,Q10	MCB SP 2A
XFS1-4U	FUSETERMINALS
R1-R8	CONTROL RELAY
R1-R10	INTERPOSING RELAY
PL2	PANEL LAMP2
LS2	DOOR LIMIT SWITCH2
XFS2-4U	MARSHELLING FUSE TERMINALS
X1	INPUT TERMINALS
X2-X5	MARSHELLING TERMINALS
IRP	IRP TERMINALS

MOUNTING PLATE SIZE :1850mmX700mmX3mm THICKNESS-1Nos

MATERIAL : MS 3MM

PANEL MAKE : RITTAL

NOTE:

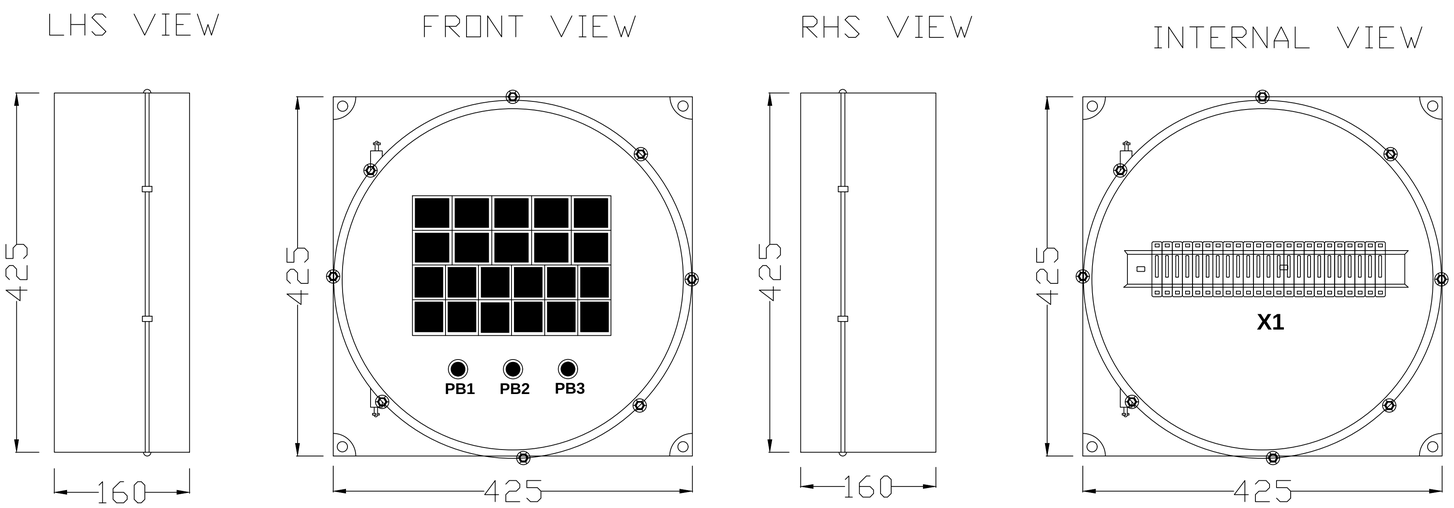
ALL DIMENSIONS ARE IN mm

ENGRAVED NAME PLATES USED FOR ALL COMPONENTS

Annexure-III

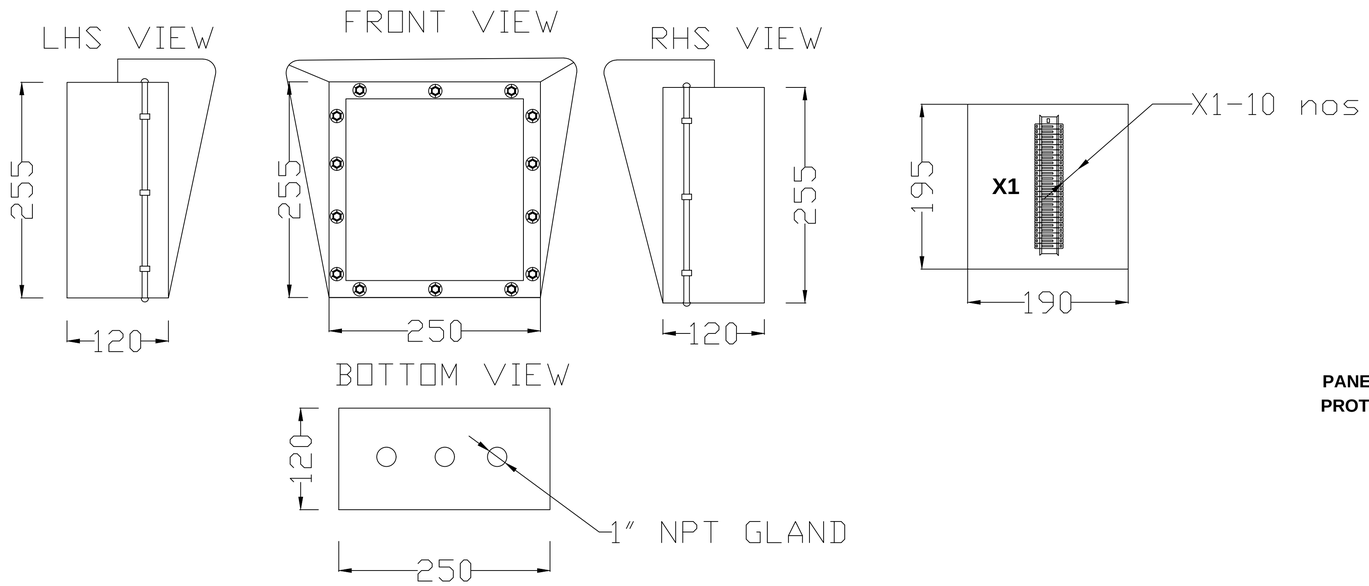
ALARM ANNUNCIATOR PANEL

LRC-LACP



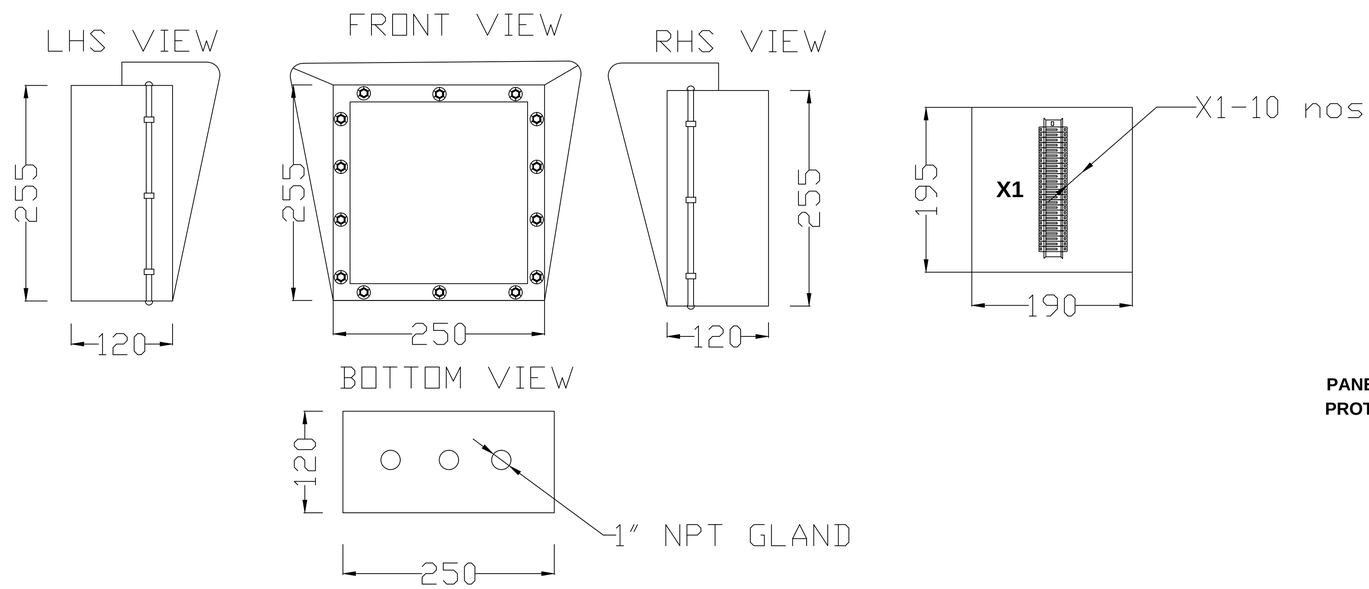
PANEL BOX SIZE :425mmX425mmX160mm-1Nos
PROTECTION: IP69 FLAMEPROOF ZONE IIA / IIB/ II C

JUNCTION BOX FOR FIT101 & FIT201



PANEL BOX SIZE :255mmX250mmX120mm-1Nos
PROTECTION: IP69 FLAMEPROOF

JUNCTION BOX FOR LIT101 & LIT201



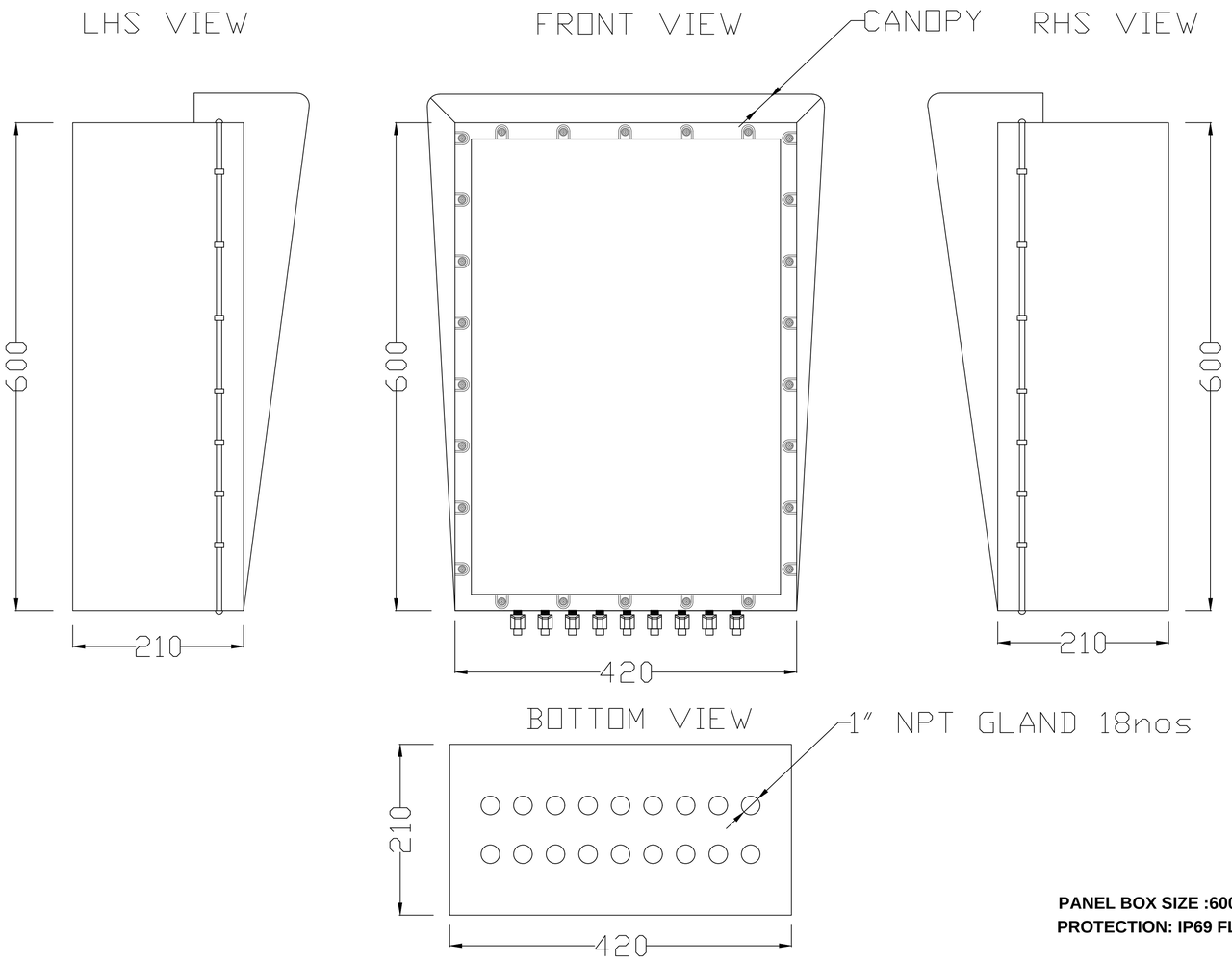
PANEL BOX SIZE :255mmX250mmX120mm-1Nos
PROTECTION: IP69 FLAMEPROOF

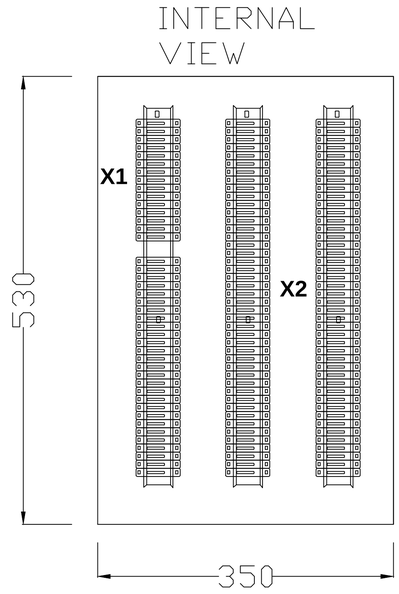
NOTES:

1. Wall mounting provision
2. Canopy should be provide from supplier
3. External earthing stud should be provide from supplier
4. Name plate & Tag plate

NOTE:
ALL DIMENSIONS ARE IN mm

JUNCTION BOX FOR PIT SIGNALS





DESCRIPTION

SYMBOL	DESCRIPTION
X1	4SQmm CONNECTORS 10Nos(bus supply)
X2	4SQmm CONNECTORS 70Nos(bus supply)

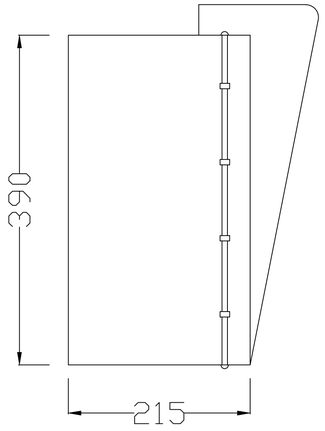
PANEL BOX SIZE :600mmX420mmX210mm-2Nos
PROTECTION: IP69 FLAMEPROOF

NOTES:

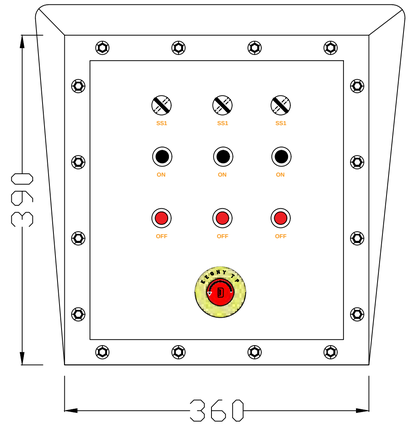
1. Wall mounting provision
2. Canopy shouldl be provide from supplier
3. External earthing stud should be provide from supplier
4. Name plate & Tag plate

NOTE:
ALL DIMENSIONS ARE IN mm

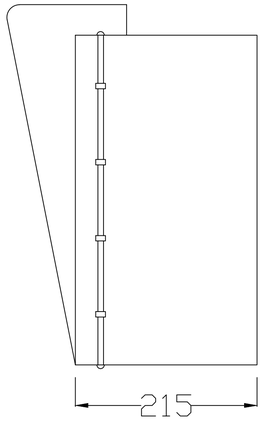
LHS VIEW



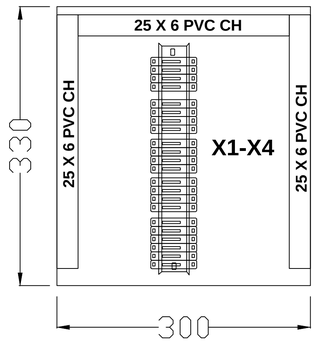
FRONT VIEW



RHS VIEW

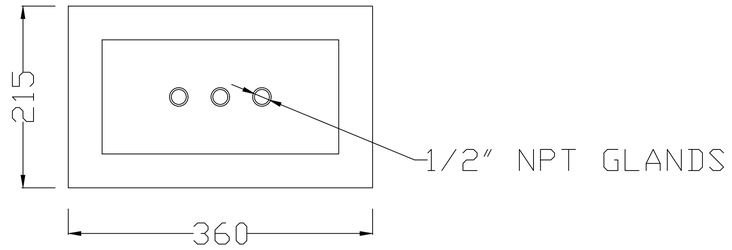


INTERNAL VIEW

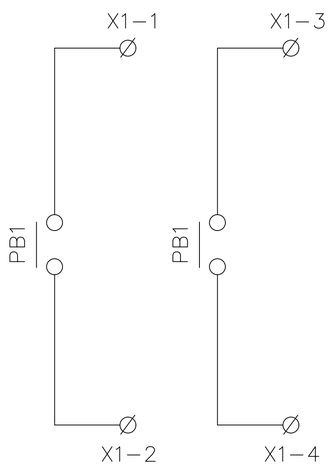


PANEL BOX SIZE :390mmX360mmX215mm-1Nos
PROTECTION: IP67 WATER PROOF
PANEL MAKE : RITTAL

BOTTOM VIEW

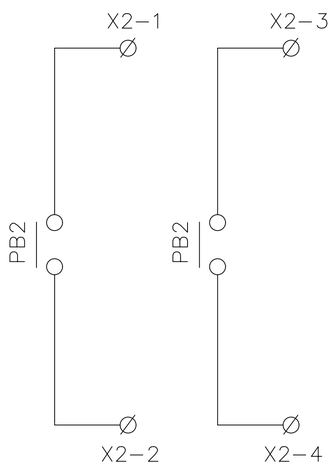


START



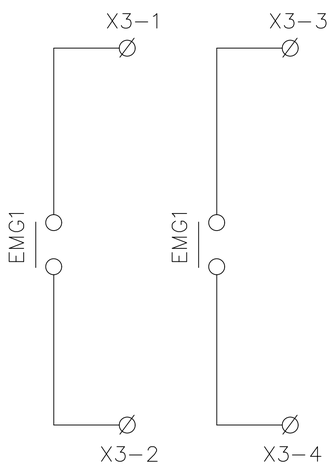
24V DC SUPPLY

STOP



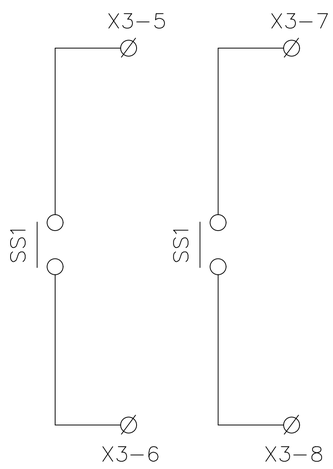
24V DC SUPPLY

EMG1



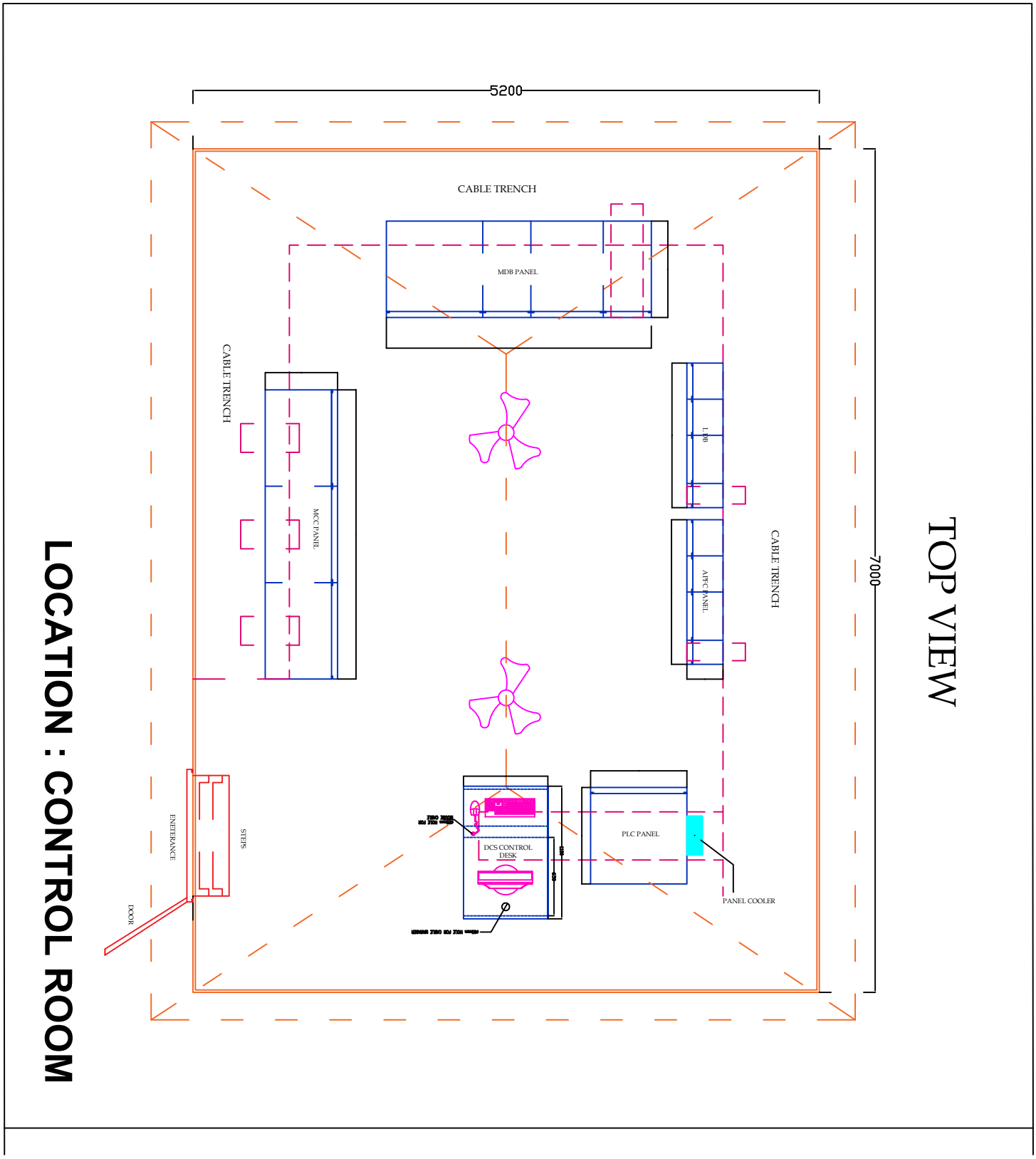
24V DC SUPPLY

SS1

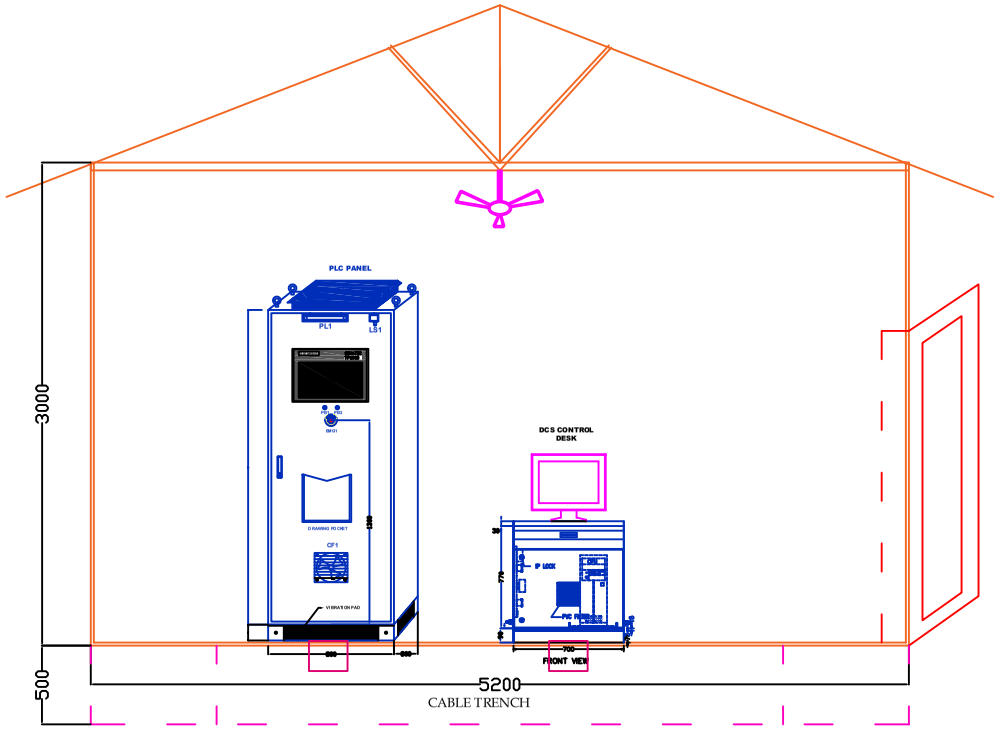


NOTE:
ALL DIMENSIONS ARE IN mm
ENGRAVED NAME PLATES USED FOR ALL COMPONENTS

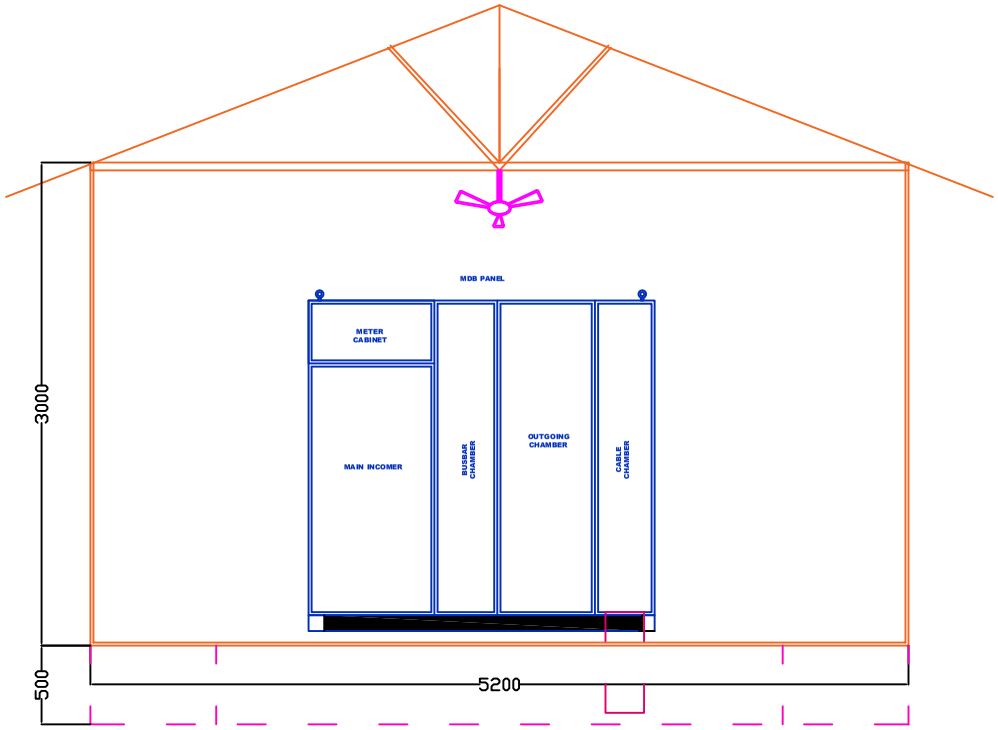
Annexure-IV


LOCATION : CONTROL ROOM
TOP VIEW
5200
7000
CABLE TRENCH
MDB PANEL
CABLE TRENCH
MCC PANEL
LDB
APFC PANEL
CABLE TRENCH
PLC PANEL
DCS CONTROL DESK
PANEL COOLER
ENTERANCE
STEPS
DOOR

RHS VIEW



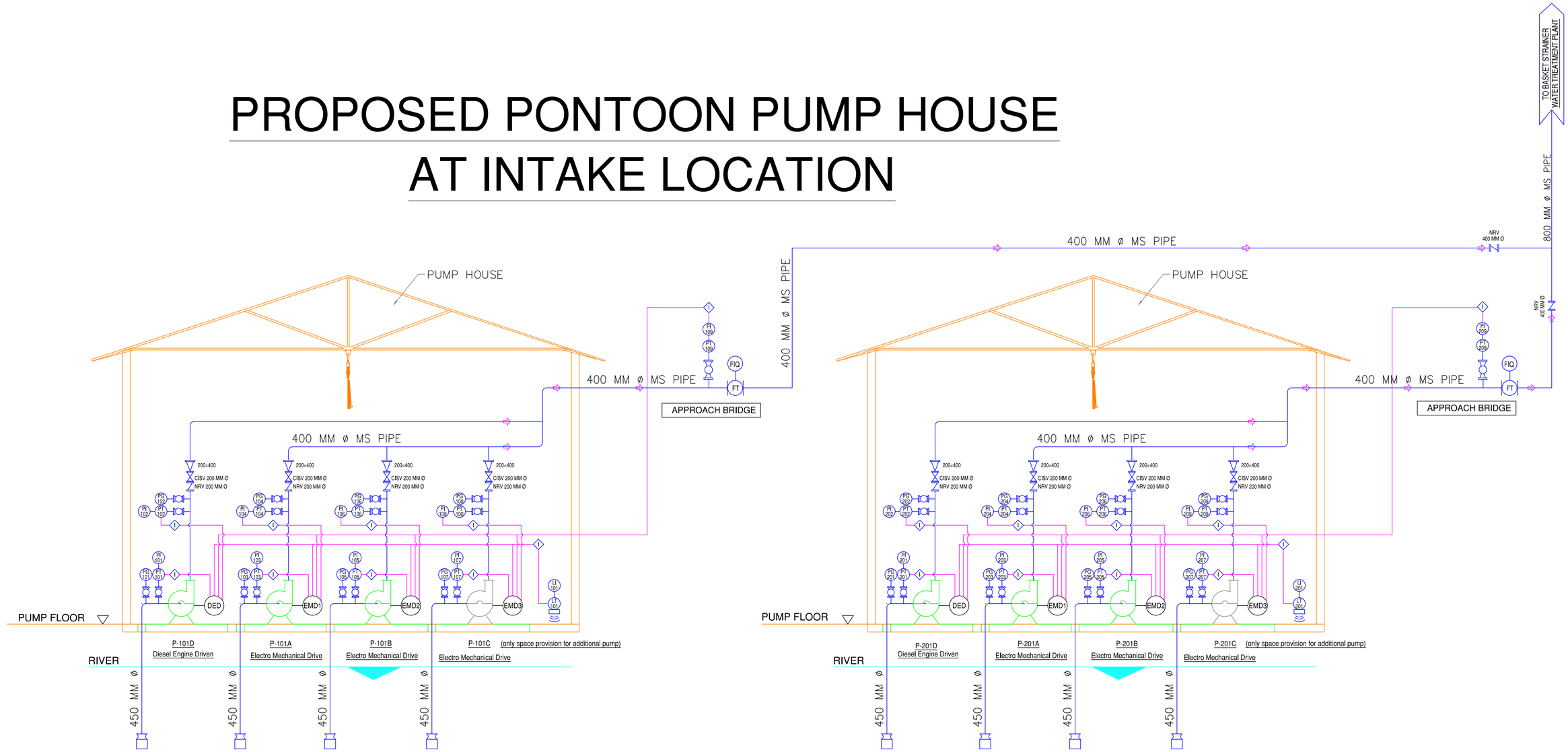
LHS VIEW



LOCATION : CONTROL ROOM

Annexure-V

PROPOSED PONTOON PUMP HOUSE AT INTAKE LOCATION



PONTOON PUMP HOUSE-1

PONTOON 1 :

P101 A/B 1W+1SB 295.58 LPS @ 56mwc, 250 Kw
P 101 C (Space provision + piping arrangement + E&I arrangement provided)
P 101 D (standby DIESEL DRIVEN pump, 295.58 LPS @ 56mwc)

IMPORTANT NOTE:

THE DIESEL DRIVEN PUMP COULD ALSO BE LOCATED ELSEWHERE AND NOT INSIDE THE PUMP ROOM

PONTOON PUMP HOUSE-2

PONTOON 2 :

P201 A/B 1W+1SB 295.58 LPS @ 56mwc, 250 Kw
P 201 C (Space provision + piping arrangement + E&I arrangement provided)
P 201 D (standby DIESEL DRIVEN pump, 295.58 LPS @ 56mwc)

Annexure-VI

DATASHEET FOR PRESSURE GAUGE (Pump Suction)			
	DESCRIPTION	**UNIT**	**SPEC**
GENERAL	Tag No		P-101,103,105,107,201,203,205 & 207
	Location		Raw water pump suction
	Make		
	Qty	NOS	8 Nos
	Area Classification		SAFE
	Amb Temperature	Deg C	10/45 Deg C
PROCESS	Process Fluid		River water
	Viscocity	cp	0.9
	Density	Kg/m3	1000
	Normal Pressure	bar	0.5
	Max Pressure	bar	3
GAUGE	Type		Bourdon
	Dial Size	mm	150
	Case Materai		SS 316
	Bezal Ring		Bayonet Type
	Pressure Element type		Bourdon
	Wetting Parts		MONEL
	Pressure Element Material		MONEL
	Socket Material		MONEL
	Process Connection		1/2" (NPT)
	Movement Material		SS 304
	Accuracy		(+ or - 1% FSD)
	Over range Protection		130% FSD
	Operatig Range		0.3
	Instrument Range		3
	Safety Feature		Blow out Disc
ACCESSORIES	Snubber		Required
	Snubber MOC		MONEL
	Manifold		2 Valve Manifold
	Manifold MOC		MONEL
	Manifold connection		1/2" NPT

Annexure-VI

DATASHEET FOR PRESSURE GAUGE (Pump Discharge)			
	DESCRIPTION	**UNIT**	**SPEC**
GENERAL	Tag No		P-102,104,106,108,202,204,206 & 208
	Location		Raw water pump suction
	Make		
	Qty	NOS	8 Nos
	Area Classification		SAFE
	Amb Temperature	Deg C	10/45 Deg C
PROCESS	Process Fluid		River water
	Viscocity	cp	0.9
	Density	Kg/m3	1000
	Normal Pressure	bar	5.4
	Max Pressure	bar	5.6
GAUGE	Type		Bourdon
	Dial Size	mm	150
	Case Materai		SS 316
	Bezal Ring		Bayonet Type
	Pressure Element type		Bourdon
	Wetting Parts		MONEL
	Pressure Element Material		MONEL
	Socket Material		MONEL
	Process Connection		1/2" (NPT)
	Movement Material		SS 304
	Accuracy		(+ or - 1% FSD)
	Over range Protection		130% FSD
	Operatig Range		5.6
	Instrument Range		10
	Safety Feature		Blow out Disc
ACCESSORIES	Snubber		Required
	Snubber MOC		MONEL
	Manifold		2 Valve Manifold
	Manifold MOC		MONEL
	Manifold connection		1/2" NPT

Annexure-VI

DATASHEET FOR LEVEL INDICATING TRANSMITTER		
DESCRIPTION	**UNIT**	**SPEC**
Tag No		LI-101, LT-101 & LI 201, LT 201
Service		River water
Location		Pontoon Pump house-01 & 02
Make		
Model		
Qty		2
Nozzle size	mm	100
Nozzle length	mm	150
Area Classification		SAFE
Fluid type		Liquid
Operating pressure		Atmosphere
Operating Temperature		Ambient
Design temperature	Deg C	(- 30 to +70)
Viscocity	cp	0.9
Density	kg/m3	1000
Min/Max measuring Level		
Sensor type		Non contact type
Accuracy		(+/- 0.1%)
Repeatability		(+/- 1 mm at 5 m distance)
Mounting		Direct to the Top of the Nozzle
Connection type /Size		Flange/100 NB
Rating		150#
Process Flange material		PVC
Antenna MOC		PVDF
Operating Temperature effect		Automatic internal temp compensation
Nut & Bold MOC		SS 316
Type		Top Mounted,ultrosonic,non contact type,SMART
Function		Level Measurement
Output Signal		4- 20 mA with HART
Electrical connection		1/2" NPT
Power supply		24V DC ,2 wire
Enclosure Protection		IP 66
Electrcal Protection		Class B
Transmitter Heat MOC		wetted part: PVDF
Housing MOC		Polyurethene -covered Aluminium
Local indication		Provided

Annexure-VI

DATASHEET FOR PRESSURE INDICATING TRANSMITTER (Pump Suction)			
	DESCRIPTION	**UNIT**	**SPEC**
GENERAL	Tag No		PI & PT-101,103,105,107,201,203,205 & 207
	Location		Raw water pump suction
	Make		
	Qty	NOS	8 Nos
	Area Classification		SAFE
	Amb Temperature	Deg C	10/45 Deg C
PROCESS	Process Fluid		River water
	Viscocity	cp	0.9
	Density	Kg/m3	1000
	Normal Pressure	bar	0.5
	Max Pressure	bar	3
TRANSMITTER	Type		Pressure indicating Transmitter.SMART / HART protocal ,2 wire
	Pressure sensor element type	mm	Isolating Diaphragm ,capacitive type
	Pressure sensor element MOC		hastolloy
	Body material		SS 316
	Process Connection		1/2" NPT F
	wetted O ring MOC		Graphite filled PTFE
	Housing MOC		Polyurethene -covered Aluminium
	Instrument Range	Bar	(0-3)
	Turn down ratio		(100:1)
	Output Signal		4-20 mA HART
	Enclosure class		IP 65
	Power supply		24V,DC.2 wire
	Electrcal connection		1/2" NPT
	Area Classification		SAFE
	Response time		100ms
	Accuracy		0.065%
	Stability		(+/- 0.125% of URL)
	Overrange protection		1500 PSI
	Temperature effect		(+/- 0.035%URL + 0.125% span
	Manifold type		1/2"NPT F X 1/2" NPT F
	Manifold MOC		MONEL
	Connection		1/2" NPT
	Mounting Bracket		Provided
	Mounting Bracket MOC		MONEL
	LCD indicator		Provided
	Surge protection device		Provided

Annexure-VI

DATASHEET FOR PRESSURE INDICATING TRANSMITTER (Pump Discharge)			
	DESCRIPTION	**UNIT**	**SPEC**
GENERAL	Tag No		PI & PT-102,104,106,108,109,202,204,206 ,208 & 209
	Location		Raw water pump suction
	Make		
	Qty	NOS	10
	Area Classification		SAFE
	Amb Temperature	Deg C	10/45 Deg C
PROCESS	Process Fluid		River water
	Viscocity	cp	0.9
	Density	Kg/m3	1000
	Normal Pressure	bar	5.4
	Max Pressure	bar	5.6
TRANSMITTER	Type		Pressure indicating Transmitter.SMART / HART protocal ,2 wire
	Pressure sensor element type	mm	Isolating Diaphragm ,capacitive type
	Pressure sensor element MOC		hastolloy
	Body material		SS 316
	Process Connection		1/2" NPT F
	wetted O ring MOC		Graphite filled PTFE
	Housing MOC		Polyurethene -covered Aluminium
	Instrument Range	Bar	(0-3)
	Turn down ratio		(100:1)
	Output Signal		4-20 mA HART
	Enclosure class		IP 65
	Power supply		24V,DC.2 wire
	Electrcal connection		1/2" NPT
	Area Classification		SAFE
	Response time		100ms
	Accuracy		0.065%
	Stability		(+/- 0.125% of URL)
	Overrange protection		1500 PSI
	Temperature effect		(+/- 0.035%URL + 0.125% span
	Manifold type		1/2"NPT F X 1/2" NPT F
	Manifold MOC		MONEL
	Connection		1/2" NPT
	Mounting Bracket		Provided
	Mounting Bracket MOC		MONEL
	LCD indicator		Provided
	Surge protection device		Provided

Annexure-VI

DATASHEET FOR FLOW INDICATING TRANSMITTER			
	DESCRIPTION	**UNIT**	**SPEC**
GENERAL	Tag No		FT101 & FIT 201
	Location		Raw water pump suction
	Make		
	Qty	NOS	2
	Area Classification		SAFE
	Amb Temperature	Deg C	10/45 Deg C
PROCESS	Process Fluid		River water
	Viscocity	cp	0.9
	Density	Kg/m3	1000
	Normal Pressure	bar	5.4
	Max Pressure	bar	5.6
TRANSMITTER	Type		Multivariable Flow meter
	PT 100 RTD sensor		hastolloy
	Body material		SS 316
	Process Connection		1/2" NPT F
	Housing MOC		Polyurethene -covered Aluminium
	Instrument Range	m3/h	0 to 3000
	Turn down ratio		(100:1)
	Output Signal		4-20 mA HART
	Enclosure class		IP 65
	Power supply		24V,DC.2 wire
	Electrcal connection		1/2" NPT
	Area Classification		SAFE
	Accuracy		(+/- 1%)
	Manifold MOC		MONEL
	Connection		1/2" NPT
	Mounting Bracket		Provided
	Mounting Bracket MOC		MONEL
	LCD indicator		Provided

Annexure-VII

CONTROL PANEL ARRANGEMENTS WITH SIEMENS S7_400H REDUNDANT PLC, WINCC SCADA MONITORING AND CONTROL AUTOMATION PACKAGE SUITABLE FOR PONTOON PUMP HOUSE SYSTEM					
S.NO	**MATERIAL NAME**	**SPECIFICATON**	**MAKE**	**SYMBOLS**	**QTY**
	S7400H REDUNDANT PLC SYSTEM				
1	CPU412-5H PN/DP, 1MB F. S7-400H/F/FH	6ES7412-5HK06-0AB0	SIEMENS	PLC1	2
2	SIMATIC S7-400H, UR2-H RACK, 18 SLOTS	6ES7400-2JA00-0AA0	SIEMENS		1
3	SYNC SUBMODULE V6 FOR PATCH CABLES UP TO 10 M [TWO MODULES REQUIRED PER H CPU]	6ES7960-1AA06-0XA0	SIEMENS		4
4	SIMATIC S7-400H, PATCH CABLE FO 1M FOR SYNC-MODULE	6ES7960-1AA04-5AA0	SIEMENS		2
5	SIEMENS MAKE PLC BATTERY 3.6V1.95AH	6ES7971-0BA00	SIEMENS		4
6	SIMATIC S7-400, POWER SUPPLY PS407: 10A, WIDERANGE, 120/263E0SV7 4U0C7, 5-0VK DAC0/21	6ES7407-0KA02-0AA0	SIEMENS		2
7	SIMATIC S7, MEMORY CARD FOR S7-400, LONG VERSION, 5V FLASH-EPROM, 4 MBYTE	6ES7952-1KM00-0AA0	SIEMENS		2
8	CP441 COMMNICATION MODULE	6ES7441-1AA05-0AE0	SIEMENS		2
	ET200M CONTROL I/O SYSTEM				
	REQUIRED CONTROL I/OS : DI-20/DQ-20/AI-6/AQ-6 + 20%SPARE	**PROPOSED CONTROL I/OS : DI-32/DQ-32/AI-8/AQ-8**			
1	Redundancy bundle, 2 x IM153-2 HF + bus module for ET 200M	6ES7153-2AR04-0XA0	SIEMENS	PLC2	1
2	ET200M, MOUNTING RAIL, 620 MM	6ES7195-1GG30-0XA0	SIEMENS		1
3	Active bus module for 2 modules 40 mm wide	6ES7195-7HB00-0XA0	SIEMENS		4
4	16 CHANNEL DIGITAL INPUT CARD 16 X24 V DC	6ES7321-1BL00-0AA0	SIEMENS		3
5	16 CHANNEL DIGITAL OUTPUT CARD 16 X24 V DC	6ES7322-1BL00-0AA0	SIEMENS		2
6	8 CHANNEL ANALOG INPUT CARD 8 X 4-20MA/0-10V DC/T/C	6ES7331-7KF02-0AB0	SIEMENS		3
7	FRONT CONNECTOR 20 PIN	6ES73921AJ000AA0	SIEMENS		8
8	TP1900 COMFORT	6AV2124-0UC02-0AX1	SIEMENS	HMI	1
	COMMUNICATION ACCESSORIES				
1	BUS CONNECTOR PROFIBUS WITH PG SOCKET	6ES79720BB420XA0	SIEMENS	COMMUNICATION ACCESSORIES	2
2	BUS CONNECTOR PROFIBUS W/O PG SOCKET	6ES79720BA420XA0	SIEMENS		4
3	PROFIBUS STANDARD CABLE	6XV18300EH10	SIEMENS		10
4	IE FC RJ45 PLUG 180 2X2 - pack of 10	6GK1901-1BB10-2AB0	SIEMENS		2
5	IE FC TP Standard Cable GP 2 x 2 (Type A)	6XV1840-2AH10	SIEMENS		100

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6	SCALANCE XC206-2	6GK5206-2BB00-2AC2	SIEMENS	HUB 1	1
	POWER SUPPLY WITH REDUNDANT				
1	SITOP PSU100S 20A STABILIZED POWER SUPPLY INPUT: 120/230 V AC OUTPUT: 24 V/20 A DC	6EP1336- 2BA10	SIEMENS	PS1-PS4	4
2	SITOP MODULAR REDUNDANCY MODULE INPUT/OUTPUT: 24 V DC /40 A FIT FOR DECOUPLING OF 2 SITOP POWER SUPPLY MODULES WITH MAX. 20 A OUTPUT CURRENT EACH	6EP1961- 3BA21	SIEMENS	RM1-RM2	2
	SCADA SYSTEM AND SOFTWARE OPTIONAL PACKAGES				
	WINCC SCADA SOFTWARES				
1	WINCC 7.5 RT 512 POWER TAGS	6AV6381-2BD07-5AX0	SIEMENS	SCADA SOFTWARES	1
2	SIMATIC STEP 7 V5.6,FLOATING LICENSE	6ES78104CC110YA5	SIEMENS		1
3	SIMATIC CFC V9.0	6ES7658-1EX58-0YA5	SIEMENS		1
4	COMMUNICATION PROCESSOR CP1623	6GK1162- 3AA00	SIEMENS		1
	LRC PLC AND MARSHALLING IRP CABINET ARRANGMENTS				
S.NO	**MATERIAL NAME**	**SPECIFICATON**	**MAKE**	**SYMBOLS**	**QTY**
1	INPUT POWER ISOLATOR	3LD2203-0TK53	SIEMENS	Q1, Q2	2
2	ELCB 32A,100MA	5SU1444-1RC32	SIEMENS	Q3	1
3	EARTH DETECTOR	5SU13541RC06	SIEMENS	Q4-Q9	6
4	MCB DP 20A, 10KA	5SL4220-7RC	SIEMENS	Q10, Q11	2
5	MCB DP 6A, 10KA	5SL4206-7RC	SIEMENS	Q12-Q14	3
6	MCB DP 4A, 10KA	5SL4206-7RC	SIEMENS	Q15, Q16	2
7	MCB DP 2A, 10KA	5SL4206-7RC	SIEMENS	Q17- Q20	4
8	PUSH BUTTON GREEN	3SU1050-0AB40-0AA0	SIEMENS	PB1	1
9	NO ELEMENT	3SU1400-1AA10-1DA0	SIEMENS		1
10	PUSH BUTTON RED	3SU1050-0AB20-0AA0	SIEMENS	PB2	1
11	NO ELEMENT	3SU1400-1AA10-1DA0	SIEMENS		1
12	PUSH BUTTON YELLOW	3SU1050-0AB30-0AA0	SIEMENS	PB3	1
13	NO ELEMENT	3SU1400-1AA10-1DA0	SIEMENS		1

Annexure-VII

14	3 POSITION SELECTOR SWITCH_KEY	3SU1050-4BL01-0AA0	SIEMENS	SPARE	1
15	NO ELEMENT	3SU1400-1AA10-1DA0	SIEMENS		2
16	3 POSITION SELECTOR SWITCH	3SU1052-2BL20-0AA0	SIEMENS	SPARE	1
17	NO ELEMENT	3SU1400-1AA10-1DA0	SIEMENS		2
18	EMERGENCY STOP	3SU1051-1HB20-0AA0	SIEMENS	EMG1	1
19	NC ELEMENT	3SU1400-1AA10-1EA0	SIEMENS		2
21	INDICATION LAMP RED 24V AC/DC	3SU1051-6AA20-0AA0	SIEMENS	SL1	8
22	INDICATION LAMP GREEN 24V AC/DC	3SU1051-6AA40-0AA0	SIEMENS	SL2-SL3	8
23	ILLUMINATION MODULE	3SU1401-1BB20-1AA0	SIEMENS		8
24	ILLUMINATION MODULE	3SU1401-1BB40-1AA0	SIEMENS		8
25	SURGE ARESSTER	5SD74321	SIEMENS	SPD1-SPD3	3
26	3 COLOUR TOWER LAMP WITH SIREN 24VDC	8WN2224-6MJ00	SIEMENS	TL1	1
27	CONTROL RELAY SSR	2961105	PHONEIX	SSR1-10	10
28	CONTROL RELAY WITH BASE 24VDC,3C/O	MY4N-GS 24VDC/PYF011A-N	OMRON	R1-R16	32
29	ANALOG SIGNAL ISOLATOR	KFD2-STC4-EX1.20	P&F	ASI1-38	24
30	DIGITAL SIGNAL ISOLATOR	KFD2-SR2-EX1.W.LB	P&F	DSI1-56	32
32	HOOTER AUDIO ALARM 24VDC	24VDC,3TONE,10DB	L&T GIC	BZ1	1
33	TERMINAL CONNECTOR	284-104	WAGO	X2	5
34	TERMINAL CONNECTOR BLUE / GREY	281-101	WAGO	X3-X5	200
35	END PLATE		WAGO		20
36	END CLAMP		WAGO		20
37	FUSE TERMINALS +24V DC GREY	281-611	WAGO	XFS1-4U	10
38	FUSIBLE TERMINAL WITH LED INDICATION FOR DI	281-611	WAGO	XFS2-4U	40
39	FUSIBLE TERMINAL WITH LED INDICATION FOR DO	281-611	WAGO	XFS3-4U	20
40	END PLATE		WAGO		5
41	POWER TERMINAL FOR INCOMING	281	WAGO	X1	4
42	2.5 SQMM POWER CABLE	4520025U100	LAPP KABLE		30
43	1.5 SQMM POWER CABLE	4520011U100	LAPP KABLE		200
44	1 SQMM CONTROL CABLE	4510043U100	LAPP KABLE		200
45	PVC CHANNEL 25*60	TBWDN2560LG	TRINITY TOUCH		8
46	PVC CHANNEL 45*60	TBWDW4560LG	TRINITY TOUCH		6
47	PVC CHANNEL 60*60	TBWDN6060LG	TRINITY TOUCH		4

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48	MCB CHANNEL	TBLS-35/7.5/PERFORATED/1M	TRINITY TOUCH		20
49	PANEL THERMOSTAT	3110	RITTAL	TH1	2
50	DRAWING PLAN POCKET	4116000	RITTAL		2
51	PANEL LED LAMP	9790698	RITTAL	PL1	2
52	DOOR LIMIT SWITCH 1NO+1NC	4127010	RITTAL	LS1	2
53	POWER JUNCTION BOX WITH SWITCH & SOCKET(5A)		RITTAL	JB1-JB2	2
54	PANEL INDOOR ENCLOSURE IP55 FRONT & REAR ACCESS	2115(H)*1200(W)*800(D)MM	RITTAL		1
55	COOLING WITH FILTER & FAILIURE ANALYSER	SZ3326.107/ 3326.207	RITTAL	CF1-CF2	2
56	TERMINAL ENCLOSURE	EB1577.500	RITTAL		4
57	WIRING ACCESSORIES				1

	LRC_LCS FOR MOTOR START/STOP EMERGENCY CONTROL				
S.NO	**MATERIAL NAME**	**SPECIFICATON**	**MAKE**	**SYMBOLS**	**QTY**
1	PUSH BUTTON GREEN	3SU1050-0AB40-0AA0	SIEMENS	PB1	1
2	NO ELEMENT	3SU1400-1AA10-1DA0	SIEMENS		1
3	PUSH BUTTON RED	3SU1050-0AB20-0AA0	SIEMENS	PB2	1
4	NO ELEMENT	3SU1400-1AA10-1DA0	SIEMENS		1
5	EMERGENCY STOP	3SU1051-1HB20-0AA0	SIEMENS	EMG1	1
6	NC ELEMENT	3SU1400-1AA10-1EA0	SIEMENS		2
7	3 POSITION SELECTOR SWITCH_KEY	3SU1050-4BL01-0AA0	SIEMENS	SPARE	1
8	NO ELEMENT	3SU1400-1AA10-1DA0	SIEMENS		2
9	PUSH BUTTON HOLDER	3SU1550-0AA10-0AA0	SIEMENS		4
10	AMMETER WITH DCS COMMUNICATION	50/1A, MI, CLASS 1,240 *SCALE,6.6KV	RISHABH	AM1	1
11	TERMINAL CONNECTOR GREY	281-101	WAGO	X1-X3	20
12	FUSIBLE TERMINAL WITH LED INDICATION	281-611	WAGO	XFS1-4U	2
13	1 SQMM CONTROL CABLE	4510043U100	LAPP KABLE		30
14	PVC CHANNEL 25*60	TBWDN2560LG	TRINITY TOUCH		1
15	MCB CHANNEL	TBLS-35/7.5/PERFORATED/1M	TRINITY TOUCH		1
16	FLP PANEL ENCLOSURE	390(H)*360(W)*2150(D)MM	FCG		1
17	WIRING ACCESSORIES				1

Annexure-VII

	LRC_LACP LOCAL ANNUNCIATION AND CONTROL PANEL				
S.NO	**MATERIAL NAME**	**SPECIFICATON**	**MAKE**	**SYMBOLS**	**QTY**
1	ANNUNCIATER MODULE	24V DC 24 WINDOW	ACCSYS	AN1	1
2	TERMINAL CONNECTOR GREY	281-101	WAGO	X1-X3	50
3	FUSIBLE TERMINAL WITH LED INDICATION	281-611	WAGO	XFS1-4U	5
4	1 SQMM CONTROL CABLE	4510043U100	LAPP KABLE		100
5	PVC CHANNEL 25*60	TBWDN2560LG	TRINITY TOUCH		3
6	MCB CHANNEL	TBLS-35/7.5/PERFORATED/1M	TRINITY TOUCH		1
7	FLP PANEL ENCLOSURE	660(H)*380(W)*170(D)MM	FCG		1
8	WIRING ACCESSORIES				1

	SCADA PC SYSTEM AND MONITOR				
1	22" LED MONITOR	LE2201 SERIES	HP	MONITOR	1
2	PC SYSTEM	Z4 G4 SERIES TOWER	HP	CPU	1
3	PC ENCLOSURE SYSTEM		RITTAL/REPUTED		1

	INSTRUMENT JUNCTION BOX FRP : TOTAL QUANTITY - 15NOS				
S.NO	**MATERIAL NAME**	**SPECIFICATION**	**MAKE**	**SYMBOLS**	**QTY**
1	TERMINAL CONNECTOR	284-104	WAGO	X1	2
2	TERMINAL CONNECTOR BLUE/GREY	281-101	WAGO	X2	10
3	END PLATE		WAGO		4
4	END CLAMP		WAGO		4
5	FUSE TERMINALS +24V DC GREY	281-611	WAGO	XFS1-4U	2
6	1 Sq mm 4 Core Cable		LAPP		5
7	TERMINAL ENCLOSURE FRP	300(H)*200(W)*120(D)	STAHL		1

MANDATORY SAPRES

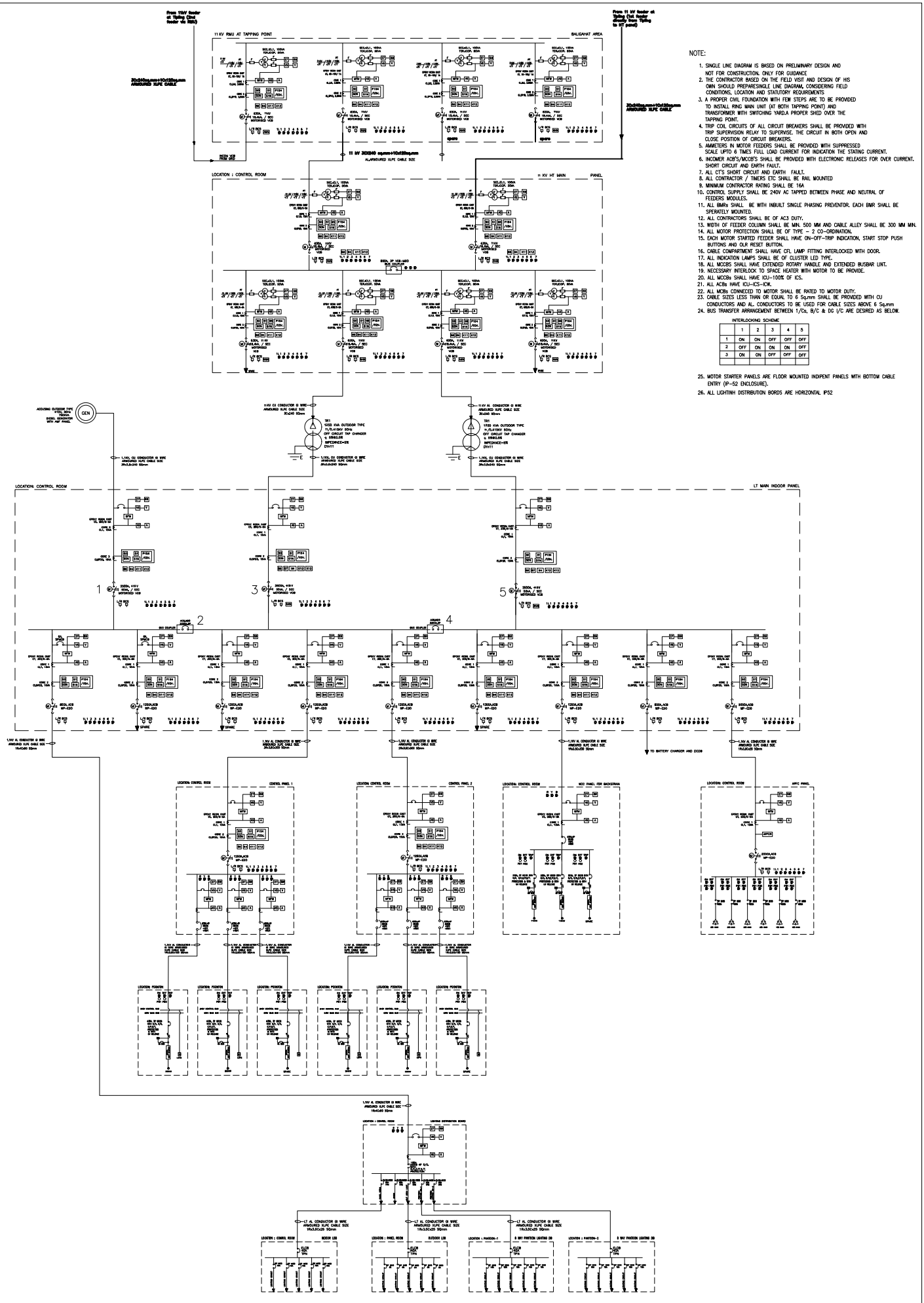
SIEMENS S7_400H REDUNDANT PLC,HMI, WINCC SCADA MONITORING AND CONTROL AUTOMATION PACKAGE SUITABLE FOR CHLORINE COMPRESSOR SYSTEM _ RIL VMD				
S.NO	**MATERIAL NAME**	**SPECIFICATON**	**MAKE**	**QTY**

Annexure-VII

	S7400H REDUNDANT PLC SYSTEM			
1	CPU412-5H PN/DP, 1MB F. S7-400H/F/FH	6ES7412-5HK06-0AB0	SIEMENS	1
2	SYNC SUBMODULE V6 FOR PATCH CABLES UP TO 10 M [TWO MODULES REQUIRED PER H CPU]	6ES7960-1AA06-0XA0	SIEMENS	1
3	SIMATIC S7-400H, PATCH CABLE FO 1M FOR SYNC-MODULE	6ES7960-1AA04-5AA0	SIEMENS	1
4	SIEMENS MAKE PLC BATTERY 3.6V1.95AH	6ES7971-0BA00	SIEMENS	2
5	SIMATIC S7-400, POWER SUPPLY PS407: 10A, WIDERANGE, 120/263E0SV7 4U0C7, 5-0VK DAC0/21	6ES7407-0KA02-0AA0	SIEMENS	1
6	SIMATIC S7, MEMORY CARD FOR S7-400, LONG VERSION, 5V FLASH-EPROM, 4 MBYTE	6ES7952-1KM00-0AA0	SIEMENS	1
7	INTERFACE MODULE IF963-X27 WITH RS422/RS485 INTERFACE FOR PTP COUPLING WITH CP441 AB CP 441- AA05	6ES79633AA100AA0	SIEMENS	1
8	CP441 COMMNICATION MODULE	6ES7441-1AA05-0AE0	SIEMENS	1
	ET200M CONTROL I/O SYSTEM			
1	Redundancy bundle, 2 x IM153-2 HF + bus module for ET 200M	6ES7153-2AR04-0XA0		1
2	16 CHANNEL DIGITAL INPUT CARD - 16X24V DC	6ES73211BH020AA0	SIEMENS	1
3	16 CHANNEL DIGITAL OUTPUT CARD-16X24V DC	6ES73221BH010AA0	SIEMENS	1
4	8 CHANNEL INPUT CARD SM331, 8AI, 13BIT	6ES73311KF020AB0	SIEMENS	1
6	FRONT CONNECTOR 20 PIN	6ES73921AJ000AA0	SIEMENS	2
	COMMUNICATION ACCESSORIES			
1	BUS CONNECTOR PROFIBUS W/O PG SOCKET	6ES79720BA420XA0	SIEMENS	1
2	SCALANCE XC206-2	6GK5206-2BB00-2AC2	SIEMENS	1
3	Fiber-optic cable (62.5/125), standard cable, splittable, pre-assembled with 4 BFOC connectors, Length 3 m	6XV1820-5BH30	SIEMENS	1
	POWER SUPPLY WITH REDUNDANT			
1	SITOP PSU100S 20A STABILIZED POWER SUPPLY INPUT: 120/230 V AC OUTPUT: 24 V/20 A DC	6EP1336- 2BA10	SIEMENS	2
2	SITOP MODULAR REDUNDANCY MODULE INPUT/OUTPUT: 24 V DC /40 A FIT FOR DECOUPLING OF 2 SITOP POWER SUPPLY MODULES WITH MAX. 20 A OUTPUT CURRENT EACH	6EP1961- 3BA21	SIEMENS	1
	REMOTE OPERATING/MONITORING HMI PANEL			

Annexure-VII

1	TP1900 COMFORT	6AV2124-0UC02-0AX1	SIEMENS	1
2	COMMUNICATION PROCESSOR CP1623	6GK1162- 3AA00	SIEMENS	1
LRC PLC AND MARSHALLING IRP CABINET ARRANGMENTS				
S.NO	**MATERIAL NAME**	**SPECIFICATON**	**MAKE**	**QTY**
1	INPUT POWER ISOLATOR	3LD2203-0TK53	SIEMENS	1
2	ELCB 32A,100MA	5SU1444-1RC32	SIEMENS	1
3	MCB DP 20A, 10KA	5SL6220-7RC	SIEMENS	1
4	MCB DP 10A, 10KA	5SL6210-7RC	SIEMENS	1
5	MCB DP 6A, 10KA	5SL6206-7RC	SIEMENS	1
6	MCB SP 2A, 10KA	5SL6102-7RC	SIEMENS	1
7	CONTROL RELAY WITH BASE 24VDC,3C/O	MY4N-GS 24VDC/PYF011A-N	OMRON	2
8	ANALOG SIGNAL ISOLATOR AI	KFD2-STC4-EX1.20	P&F	2
9	DIGITAL SIGNAL ISOLATOR DI	KFD2-SR2-EX1.W.LB	P&F	2
10	ANALOG SIGNAL ISOLATOR AQ	KFD2-STC4-EX1.20	P&F	1
11	REDUNDANT POWER FEED MODULE	KFD2-EB2.R4A.B	P&F	1
12	PANEL THERMOSTAT	3110	RITTAL	1
13	PANEL LED LAMP	9790698	RITTAL	1
14	DOOR LIMIT SWITCH 1NO+1NC	4127010	RITTAL	1
15	POWER JUNCTION BOX WITH SWITCH & SOCKET(5A)		RITTAL	1
16	COOLING FAN WITH FILTER & FAILIURE ANALYSER	SZ3326.107/ 3326.207	RITTAL	1
17	WIRING ACCESSORIES			1
	LRC_LCS FOR MOTOR START/STOP EMERGENCY CONTROL			
S.NO	**MATERIAL NAME**	**SPECIFICATON**	**MAKE**	**QTY**
1	PUSH BUTTON GREEN	3SU1050-0AB40-0AA0	SIEMENS	1
2	NO ELEMENT	3SU1400-1AA10-1DA0	SIEMENS	1
3	PUSH BUTTON RED	3SU1050-0AB20-0AA0	SIEMENS	1
4	NO ELEMENT	3SU1400-1AA10-1DA0	SIEMENS	1
5	EMERGENCY STOP	3SU1051-1HB20-0AA0	SIEMENS	1
6	NC ELEMENT	3SU1400-1AA10-1EA0	SIEMENS	2
7	PUSH BUTTON HOLDER	3SU1550-0AA10-0AA0	SIEMENS	3
8	AMMETER	50/1A,MI,CLASS 1,240*SCALE,6.6KV	RISHABH	1
9	SOV BASED AUDIO ALARM 24VDC	24VDC,3TONE,10DB	REPUTED	1



NOTE:

1. SINGLE LINE DIAGRAM IS BASED ON PRELIMINARY DESIGN AND NOT FOR CONSTRUCTION. ONLY FOR GUIDANCE
2. THE CONTRACTOR BASED ON THE FIELD VISIT AND DESIGN OF HIS OWN SHOULD PREPARESINGLE LINE DIAGRAM, CONSIDERING FIELD CONDITIONS, LOCATION AND STATUTORY REQUIRMENTS
3. A PROPER CIVIL FOUNDATION WITH FEW STEPS ARE TO BE PROVIDED TO INSTALL RING MAIN UNIT (AT BOTH TAPPING POINT) AND TRANSFORMER WITH SWITCHING YARD.A PROPER SHED OVER THE TAPPING POINT.
4. TRIP COIL CIRCUITS OF ALL CIRCUIT BREAKERS SHALL BE PROVIDED WITH TRIP SUPERVISION RELAY TO SUPERVISE. THE CIRCUIT IN BOTH OPEN AND CLOSE POSITION OF CIRCUIT BREAKERS.
5. AMMETERS IN MOTOR FEEDERS SHALL BE PROVIDED WITH SUPPRESSED SCALE UPTO 6 TIMES FULL LOAD CURRENT FOR INDICATION THE STATING CURRENT.
6. INCOMER ACB'S/MCCB'S SHALL BE PROVIDED WITH ELECTRONIC RELEASES FOR OVER CURRENT. SHORT CIRCUIT AND EARTH FAULT.
7. ALL CT'S SHORT CIRCUIT AND EARTH FAULT.
8. ALL CONTRACTOR / TIMERS ETC SHALL BE RAIL MOUNTED
9. MINIMUM CONTRACTOR RATING SHALL BE 16A
10. CONTROL SUPPLY SHALL BE 240V AC TAPPED BETWEEN PHASE AND NEUTRAL OF FEEDERS MODULES.
11. ALL BMRs SHALL BE WITH INBUILT SINGLE PHASING PREVENTOR. EACH BMR SHALL BE SPERATELY MOUNTED.
12. ALL CONTRACTORS SHALL BE OF AC3 DUTY.
13. WIDTH OF FEEDER COLUMN SHALL BE MIN. 500 MM AND CABLE ALLEY SHALL BE 300 MM MIN.
14. ALL MOTOR PROTECTION SHALL BE OF TYPE – 2 CO–ORDINATION.
15. EACH MOTOR STARTED FEEDER SHALL HAVE ON–OFF–TRIP INDICATION, START STOP PUSH BUTTONS AND OLR RESET BUTTON.
16. CABLE COMPARTMENT SHALL HAVE CFL LAMP FITTING INTERLOCKED WITH DOOR.
17. ALL INDICATION LAMPS SHALL BE OF CLUSTER LED TYPE.
18. ALL MCCBS SHALL HAVE EXTENDED ROTARY HANDLE AND EXTENDED BUSBAR LINT.
19. NECESSARY INTERLOCK TO SPACE HEATER WITH MOTOR TO BE PROVIDE.
20. ALL MCCBs SHALL HAVE ICU–100% OF ICS.
21. ALL ACBs HAVE ICU–ICS–KW.
22. ALL MCBs CONNECED TO MOTOR SHALL BE RATED TO MOTOR DUTY.
23. CABLE SIZES LESS THAN OR EQUAL TO 6 Sq.mm SHALL BE PROVIDED WITH CU CONDUCTORS AND AL. CONDUCTORS TO BE USED FOR CABLE SIZES ABOVE 6 Sq.mm
24. BUS TRANSFER ARRANGEMENT BETWEEN 1/Cx, B/C & DG I/C ARE DESIRED AS BELOW.

INTERLOCKING SCHEME

	1	2	3	4	5
1	ON	ON	OFF	OFF	OFF
2	OFF	ON	ON	ON	OFF
3	ON	ON	OFF	OFF	OFF

25. MOTOR STARTER PANELS ARE FLOOR MOUNTED INDIPENT PANELS WITH BOTTOM CABLE ENTRY (IP–52 ENCLOSURE).
26. ALL LIGHTINH DISTRIBUTION BORDS ARE HORIZONTAL IP52

LEGEND :

- DISTRIBUTION TRANSFORMER
- GEN – GENERATOR
- MINATURE CIRCUIT BREAKER
- VACCUM/AIR CIRCUIT BREAKER
- 3000A BUS COUPLER
- CAPACITOR
- A – AMMETER
- V – VOLT METER
- MFM – MULTIFUNCTION MANAGER
- ASS – AMMETER SELECTOR SWITCH
- VSS – VOLT METER SELECTOR SWITCH
- CURRENT TRANSFORMER
- 50 – INSTAINTANEOUS OVER CURRENT RELAY
- 51 – INSTAINTANEOUS EARTH FAULT RELAY
- 50N – INVERSE TIME PHASE OVER CURRENT RELAY
- 51N – INVERSE TIME EARTH FAULT RELAY
- 67 – DIRECTIONAL INVERSE TIME PHASE OVER CURRENT RELAY
- 67N – DIRECTIONAL INVERSE TIME EARTH FAULT CURRENT RELAY
- 86 – MASTER TRIP RELAY
- 87T – TRANSFORMER DIFFERENTIAL RELAY
- 27 – UNDER VOLTAGE PROTECTION RELAY
- 59 – OVER VOLTAGE PROTECTION RELAY
- ANN – 8 WINDOW ANNUNCIATOR
- INDICATING LAMP
- PUSH BUTTON

ABBRIVATIONS :

A	–	AMPERE	C.T	–	CURRENT TRANSFORMER
AL	–	ALUMINIUM	ISC	–	SHORT CIRCUIT CURRENT
CU	–	COPPER	IP	–	INGRESS PROTECTION
KW	–	KILO WATTS	COS	–	CHANGE OVER SWITCH
KA	–	KILO AMPS	AMF	–	AUTOMATIC MAINS FAILURE
XLPE	–	CROSS LINKED POLY ETNYLENE	RMU	–	RING MAIN UNIT
DV	–	DIGITAL VOLTAMETER	TR	–	TRANSFORMER
DA	–	DIGITAL AMMETER	GEN	–	DIESEL GENERATOR
MFEM	–	MULTI FUNCTIONAL ENERGY METER	ACB	–	AIR CIRCUIT BREAKER
KVA	–	KILO VOLT AMPERE	MFEM	–	MULTI FUNCTIONAL ENERGY METER
KVAR	–	KILO VOLT AMPERE REACTIVE	O.C.	–	OVER CURRENT
MCCB	–	MOULDED CASE CIRCUIT BREAKER	S.C	–	SHORT CIRCUIT CURRENT
MCB	–	MINIATURE CIRCUIT BREAKER	E.F.	–	EARTH FAULT
SPN	–	SINGLE POLE NEUTRAL	A.R.	–	ARMOVERED
TPN	–	TRIPLE POLE NEUTRAL	B.C.	–	BUS COUPLER
FP	–	FOUR POLE	S.P.	–	SPARE
P.F	–	POWER FACTOR	VFD	–	VARIABLE FREQUENCY DRIVE

CLIENT	OIL INDIA LIMITED DULIYAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIYAJAN, ASSM
TITLE	SINGLE LINE DIAGRAM
SURVEY CONSULTANTS	SECON BANGLORE-66
SCALE	N.T.S
DWG. NO.	SECON/OIL/WS/EE/SLD-01
REV.	0

OIL INDIA LIMITED
FIELD ENGINEERING DEPARTMENT
Duliajan, Assam- 786 602

HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES
FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED,
DULIAJAN, ASSAM

INTAKE AND ALLIED WORKS ENGINEERING DRAWINGS

DOC. No. SECON/OIL/WS / Vol-III /September -19

PACKAGE-I: VOLUME-III

SEPTEMBER 2019

SECON
Plot No.147, 7B Road, EPIP, White Field,
Bangalore - 560 066
Website: http://www.secon.in

OIL INDIA LIMITED, ASSAM

INTAKE AND ALLIED WORKS PACKAGE-I

LIST OF DRAWINGS

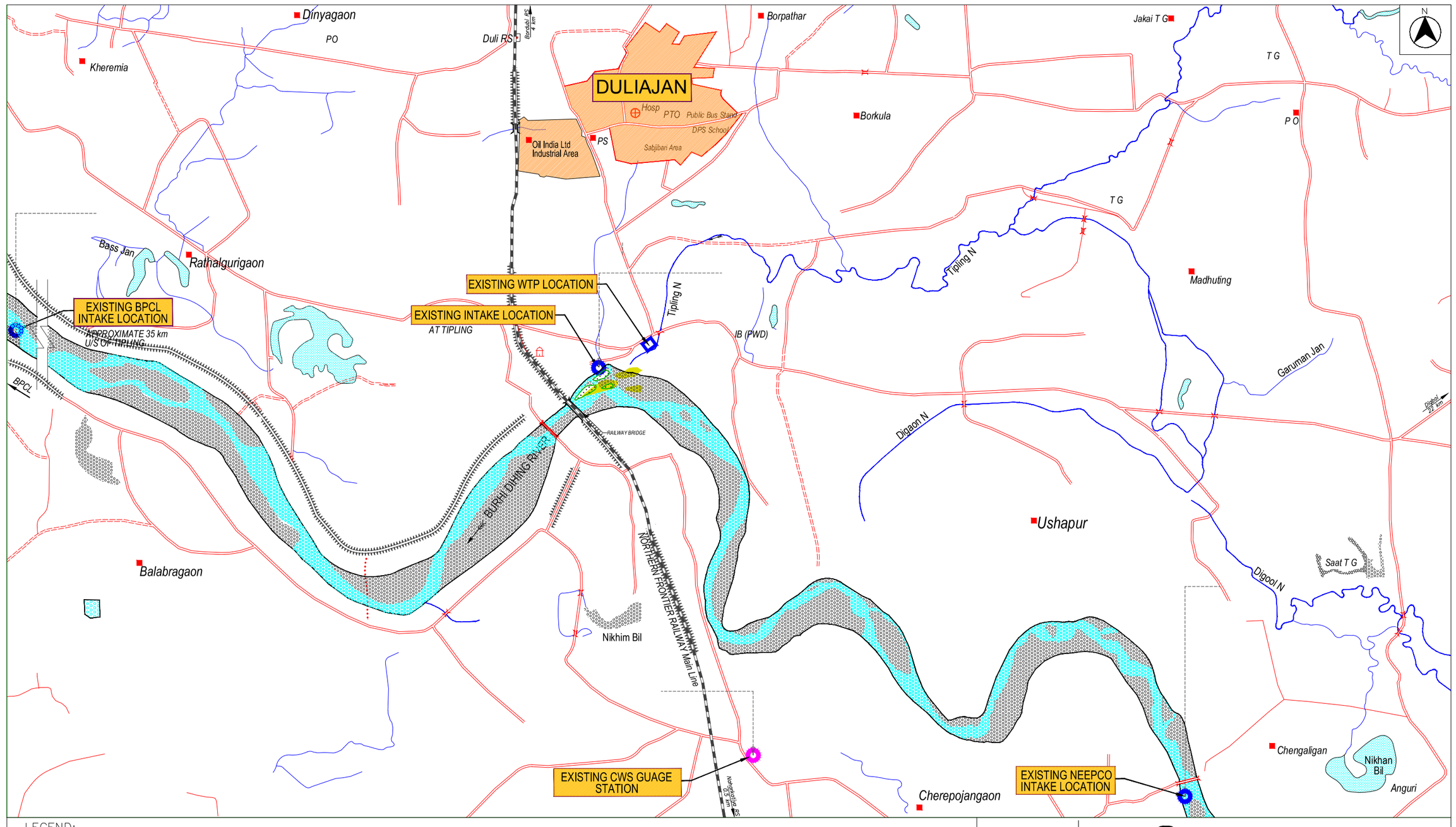
SL No.	TITLE	DRAWING Nos.
01	LOCATION MAP	SECON/OIL/WS/LM–01
02	TOPOGRAPHICAL SURVEY FOR PROPOSED INTAKE AND PROPOSED WTP	SECON/OIL/WS/TS–02
03	INTAKE AND ALLIED BUILDINGS BLOW UP SURVEY FOR INTAKE LOCATION	SECON/OIL/WS/BS–03
04	PONTOON PUMP HOUSE–CONCEPT PLAN	SECON/OIL/WS/CP–01
05	INTAKE AND ALLIED BUILDINGS LAYOUT PLAN GENERAL ARRANGEMENT	SECON/OIL/WS/LP–02
06	INTAKE AND ALLIED BUILDINGS OPERATOR CUM SECURITY ROOM ARCHITECTURAL DRAWING	SECON/OIL/WS/OS–03
07	INTAKE AND ALLIED BUILDINGS PANEL ROOM ARCHITECTURAL DRAWING	SECON/OIL/WS/PR–04
08	INTAKE AND ALLIED BUILDINGS SECURITY ROOM NEAR MAIN GATE ARCHITECTURAL DRAWING	SECON/OIL/WS/EE/SR–05
09	INTAKE AND ALLIED BUILDINGS COMPOUND WALL / BOUNDARY WALL GENERAL ARRANGEMENT	SECON/OIL/WS/CW–06
10	INTAKE AND ALLIED BUILDINGS PLAN AND SECTION EMBANKMENT BUND GENERAL ARRANGEMENT	SECON/OIL/WS/EB–07
11	INTAKE AND ALLIED BUILDINGS P & I DIAGRAM	SECON/OIL/WS/P&I–08
12	SINGLE LINE DIAGRAM INTAKE PONTOON PUMP HOUSE	SECON/OIL/WS/EE/SLD–01
13	SINGLE LINE DIAGRAM INTAKE PONTOON PUMP HOUSE	SECON/OIL/WS/EE/SLD–02

ABBREVIATIONS:

- LM – LOCATION MAP
- TS – TOPOGRAPHICAL SURVEY
- BS – BLOW UP SURVEY
- CP – CONCEPT PLAN
- LP – LAYOUT PLAN
- OS – OPERATOR/SECURITY ROOM
- PR – PANEL ROOM
- SR – SECURITY ROOM
- CW – COMPOUND WALL
- EB – EMBANKMENT BUND
- SLD – SINGLE LINE DIAGRAM

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	INTAKE AND ALLIED WORKS ENGINEERING DRAWINGS LIST OF DRAWINGS
CONSULTANTS	SECON BANGALORE - 66
SCALE: N.T.S	DWG. No.: SECON/OIL/WS/LD
	REV.: 0

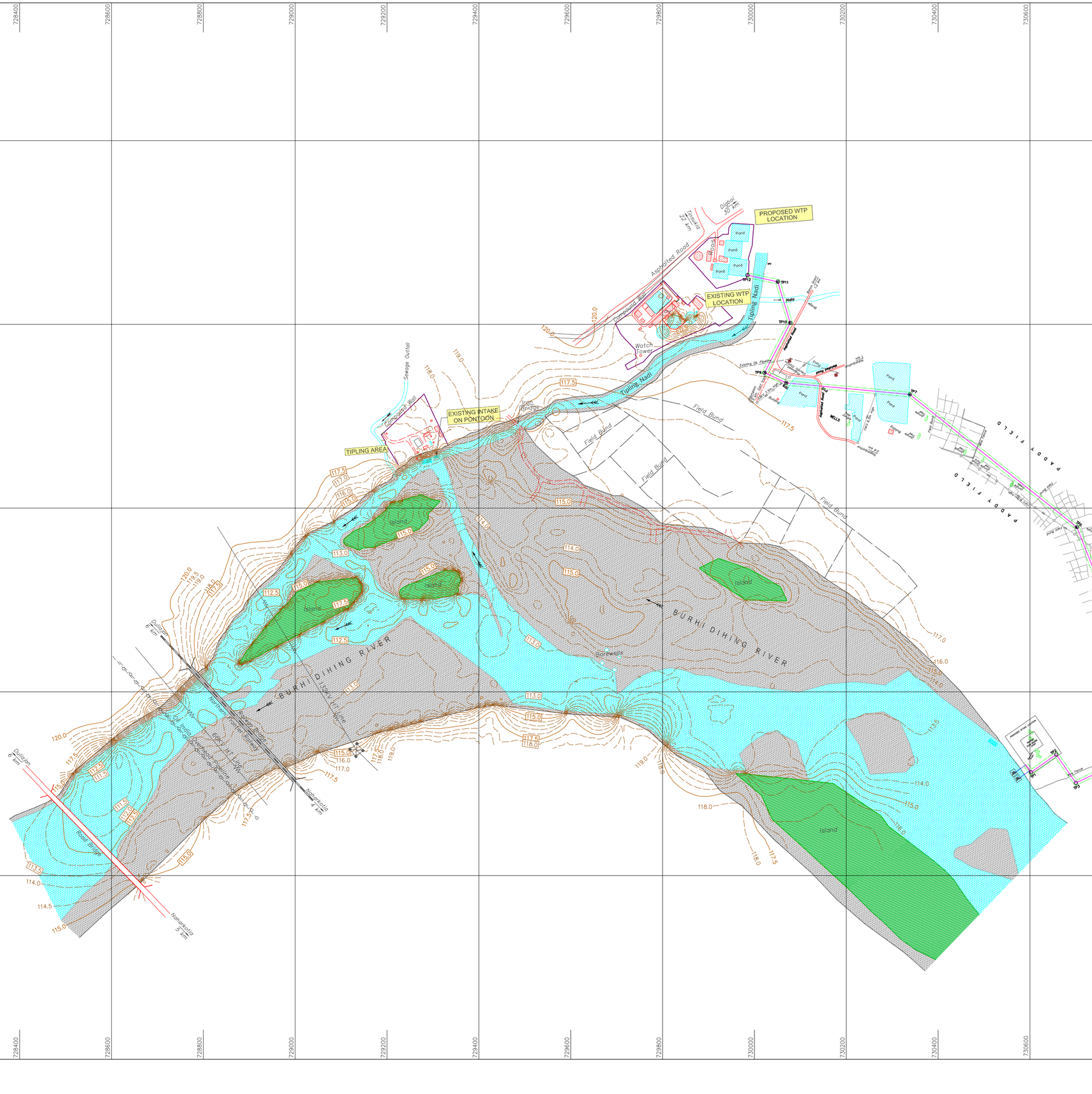
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LEGEND:

- EXISTING INTAKE LOCATION
- EXISTING WTP LOCATION
- OTHER ROAD
- UNMETALLED ROAD
- CWS GUAGE STATION
- RAILWAY LINE
- RIVER
- CITY/TOWN/VILLAGE
- STREAM
- HOSPITAL

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	CONSULTANCY SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SYSTEM TO OIL INDIA LIMITED, DULIAJAN, DISTRICT DIBRUGARH, ASSAM
CONSULTANT	SECON PRIVATE LIMITED BANGALORE – 66
TITLE	LOCATION MAP
DWG. No.	SECON/OIL/WS/LM–01 — SCALE: 1:50000



LEGEND

- Roads: Asphalted/Metalled. Cart-track. Foot-path.
- Buildings: Permanent; Temporary; Under Construction.
- Pylon. Transformer. Power line. Lamp post.
- River: dry with water channel; with rocks. Tidal river.
- Streams: perennial; non-perennial; Single line: defined.
- Drains: Large; Small. Canals: Double line; Single line.
- Trees: Ordinary; Coconut; Casuarina; Palmyra.
- Spot height.

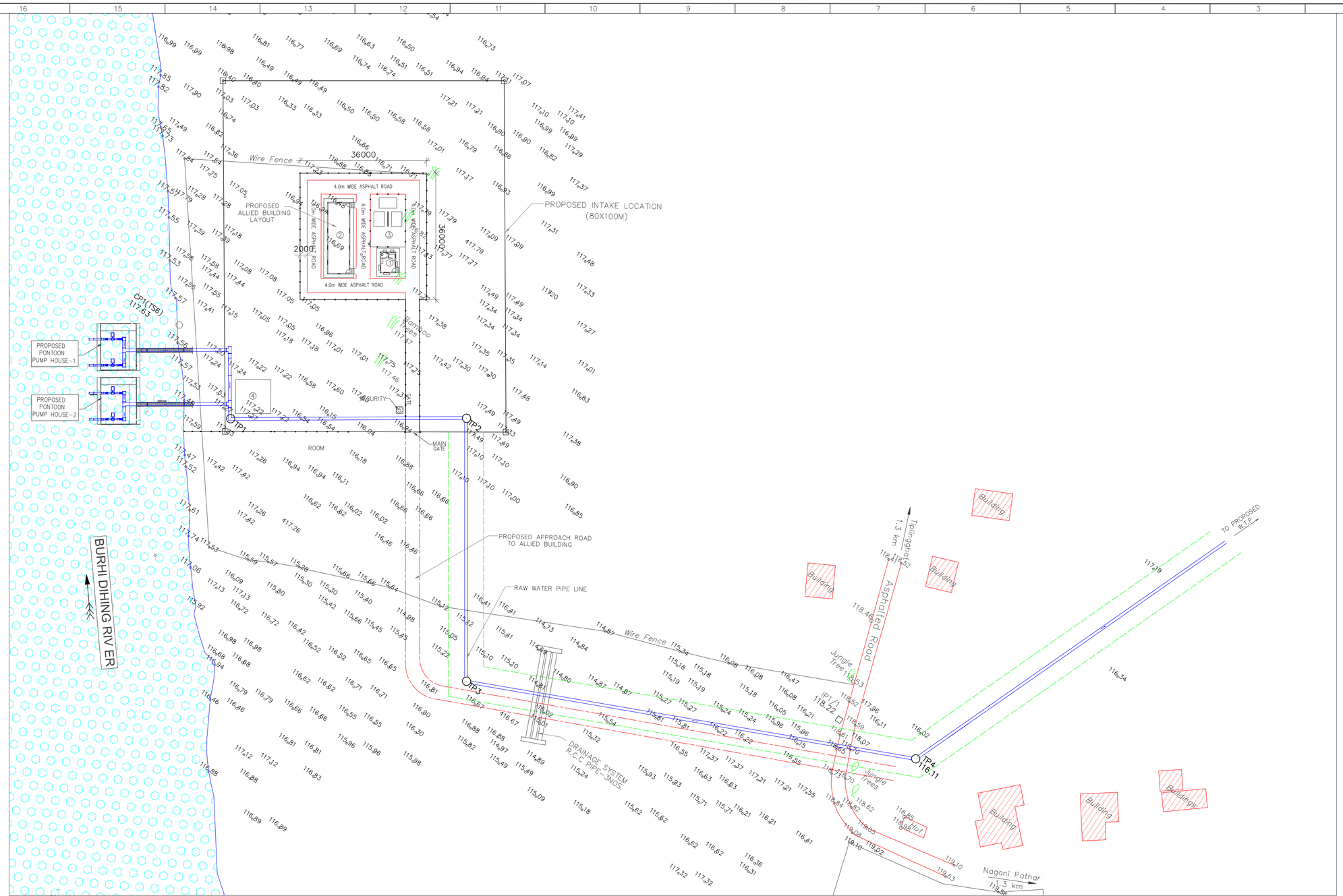
N

NOTE:

1. All Levels are based on Oil India Bench Mark value RL 119.448m engraved on platform Well No.NHK-43 near Golf ground at Duliajan.
2. All Co-ordinates are based on GPS Station S17 E 730660.301m, N 3025519.056m having RL 119.17m, engraved on top of Concrete Pillar, Left side of Road connecting to OCS-3.
3. All Co-ordinates are in terms of WGS 84 UTM Projection, falling in Zone 46N.
4. High Flood Level-122.690 m.

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	TOPOGRAPHICAL SURVEY FOR PROPOSED INTAKE AND PROPOSED WTP
CONSULTANTS	SECON BANGALORE - 66

SCALE	DWG. No.	REV.
1:4000	SECON/OIL/WS/TS-02	0



LEGEND

- Proposed pipeline with Turning point and Intermediate point. TP5 IP5
- Boundary: Village; District; Taluk.
- Pylon. Transformer. Power line with pole. Telephone line with pole.
- Arterial/Main Road. Other Roads. Unmetalled Road/Cart-track. Foot-path. 12
- Village Road Bridge. Syphon. Pump house. Temple. Graves. PH
- Buildings: Permanent; Temporary; Under Construction.
- Streams: Perennial; Non-Perennial; Single line: Defined; Undefined. Ponds.
- Hut. Well. Bore Well. Hand Pump. BW HP
- Embankment. Cutting with Relative height. Quarry. Hedge. 26
- Drains: Large, Small. Canals: Double Line; Single Line.
- Sheet rock. Rocky ground. Boulders.
- Contours with value. Field bund. Wire Fence. 5.00
- Trees: Ordinary; Coconut; Cactus; Casuarina; Palmyra; Banana.
- GPS Control. Permanent Bench marks. Traverse Station. GPS PBM TS

NOTE:

1. All dimensions are in metres, unless otherwise specified
2. All Coordinates are based on WGS84 datum, UTM system
3. Pipe Invert depth is from Ground level
4. Prior to the execution sbc needs to be confirmed by the contractor and to be executed as directed by the engineer in charge.
5. The oreientation of the allied building shall be confirmed by the contractor during execution and vetted by the engineer.
6. The arrangement of pipes such as inlet, delivery pipes are to be laid as per the site condition at the time of execution and as directed by the engineer incharge.

NOTE: The drawing is only for reference and not for construction

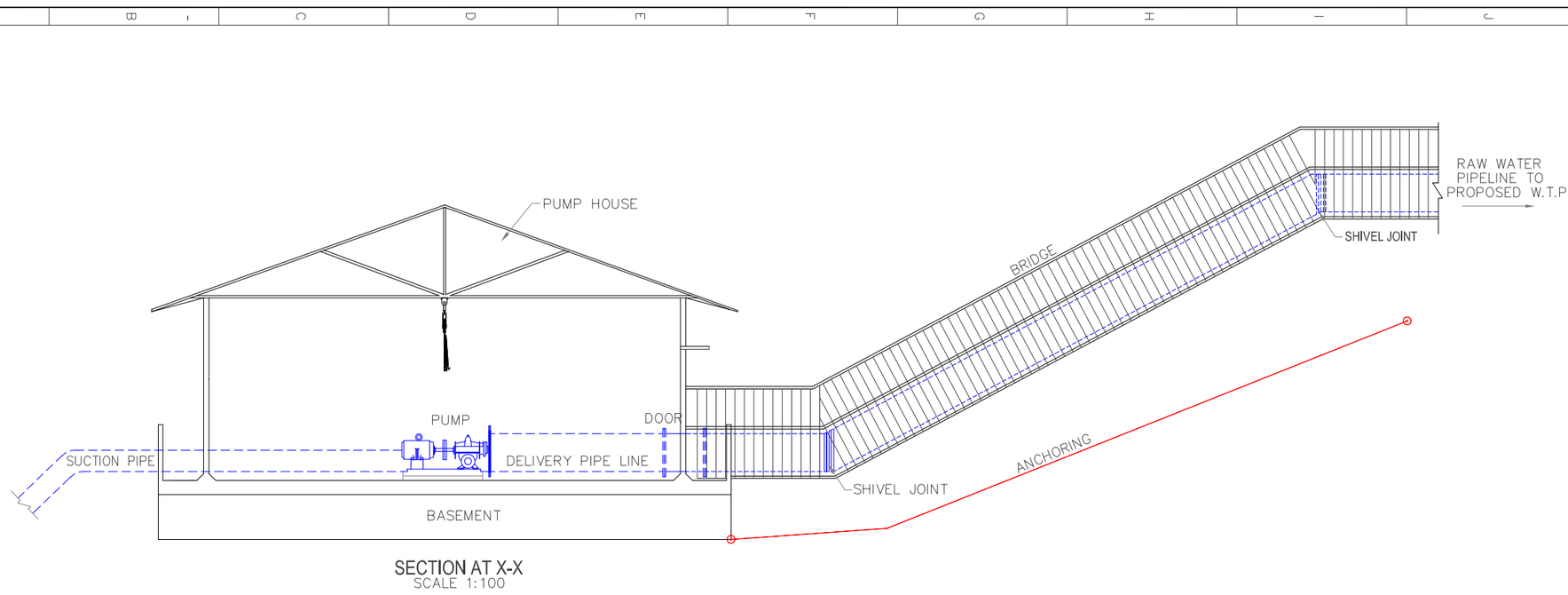
COMPONENTS DETAILS

SL NO	DESCRIPTION	SIZE (m)
1	OPERATOR CUM SECURITY ROOM	6.00 X 4.50
2	PANEL ROOM	20.00 X 6.00
3	SPACE FOR GENERATOR CUM TRANSFORMER YARD	15.00 X 10.00
4	DIESEL UNIT	10.00 X 10.00
5	SECURITY ROOM	2.00 X 2.00

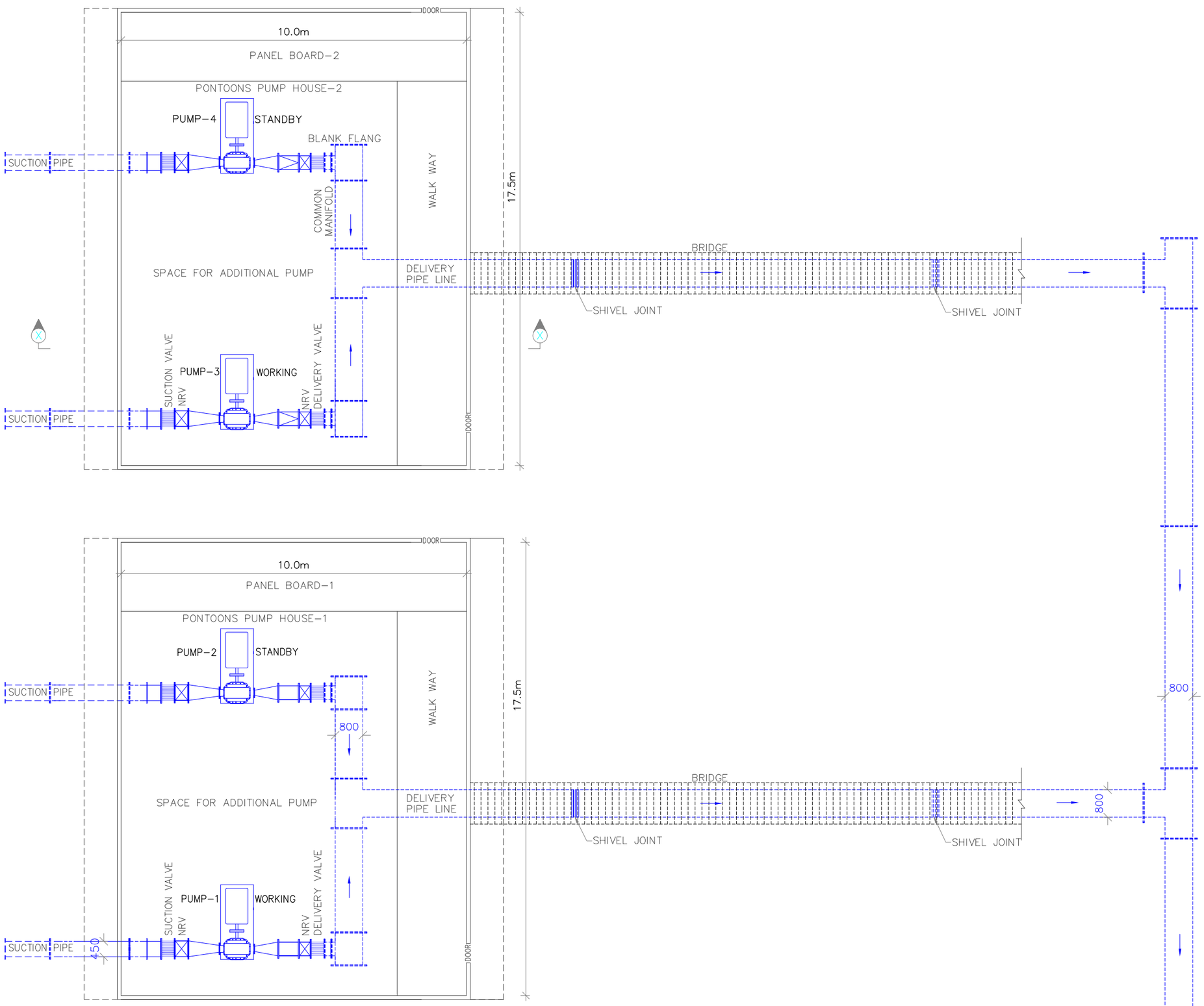
CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	BLOW UP SURVEY FOR PROPOSED INTAKE LOCATION
SURVEY CONSULTANTS	SECON BANGALORE - 66
SCALE	1:1000
DWG. No.	SECON/OIL/WS/BS-03
REV.	0

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SECTION AT X-X
SCALE 1:100



PLAN
SCALE 1:100

SL NO.	TYPE OF PUMPS	DUTY CONDITION	DISCHARGE IN lps	PUMPING HEAD IN m	POWER IN Kw
01	HSC CENTRIFUGAL PUMP	2 WORKING + 2 STAND BY PUMPS+ SPACE FOR 2 ADDITIONAL PUMPS	295.58	56.0	250.0

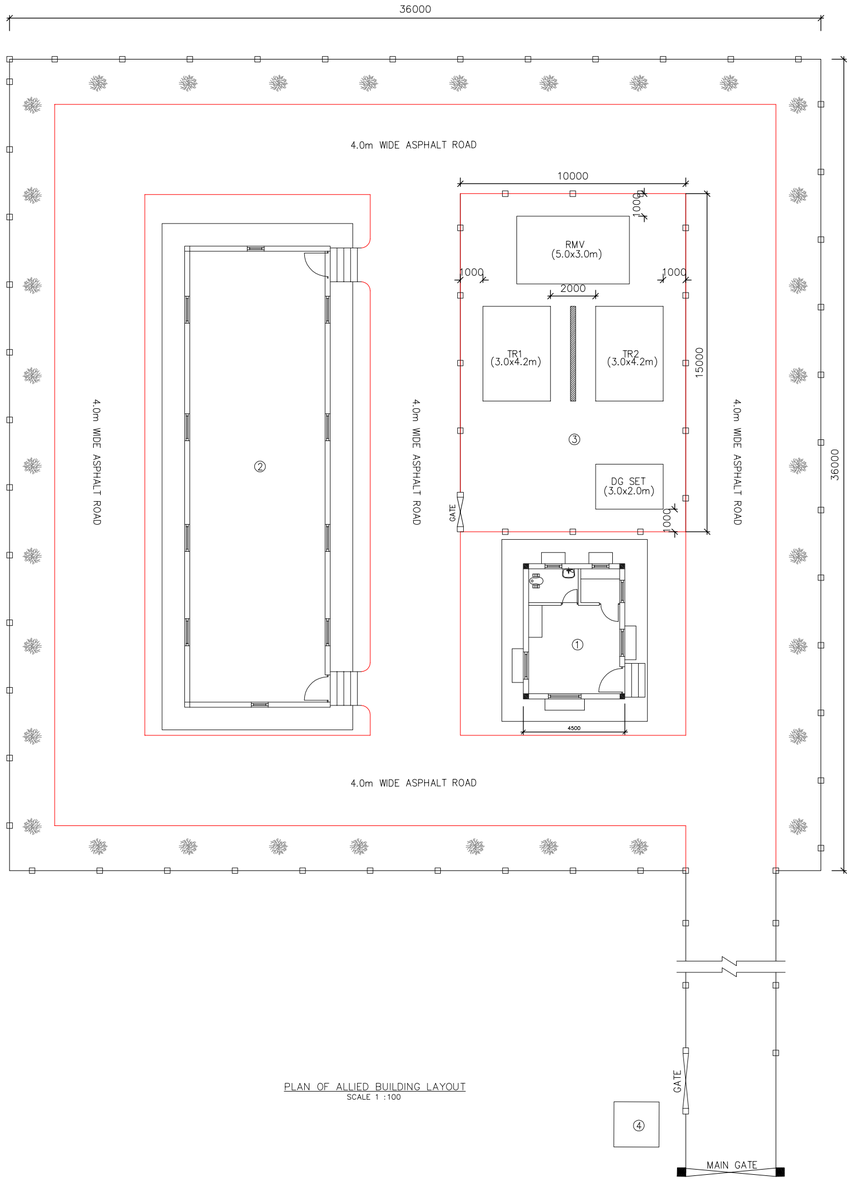
NOTE:

1. All dimensions are in metres, unless otherwise specified
2. Prior to the execution sbc needs to be confirmed by the contractor and to be executed as directed by the engineer in charge.
3. The oreientation of the allied building shall be confirmed by the contractor during execution and vetted by the engineer.
4. The arrangement of pipes such as inlet, delivery pipes are to be laid as per the site condition at the time of execution and as directed by the engineer incharge.

NOTE: The drawing is only for reference and not for construction

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	PONTOON PUMP HOUSE–CONCEPT PLAN
SURVEY CONSULTANTS	SECON BANGALORE - 66

SCALE	DWG. No.	REV.
1:100	SECON/OIL/WS/CP-01	0



PLAN OF ALLIED BUILDING LAYOUT
SCALE 1 :100

NOTE:

1. All dimensions are in metres, unless otherwise specified
2. Prior to the execution sbc needs to be confirmed by the contractor and to be executed as directed by the engineer in charge.
3. The oreientation of the allied building for reference only and shall be confirmed by the contractor during execution and vetted by the engineer.
4. The arrangement of pipes should be laid as per the site condition at the time of execution and as directed by the engineer incharge.
5. The pile socket should be below the rocky strata else where as directed by the engineer incharge during the execution.

NOTE: The drawing is only for reference and not for construction

COMPONENTS DETAILS

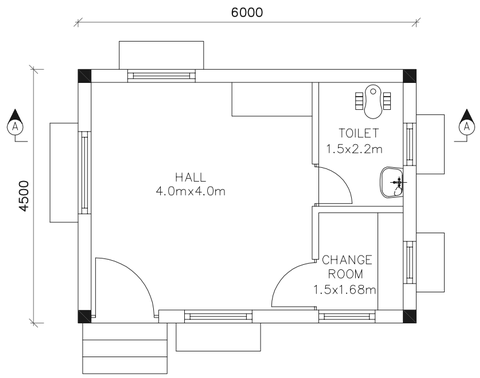
SL NO	DESCRIPTION	SIZE (m)
1	OPERATOR CUM SECURITY ROOM	6.00 X 4.50
2	PANEL ROOM	20.00 X 6.00
3	SPACE FOR GENERATOR CUM TRANSFORMER YARD	15.00 X 10.00
4	SECURITY ROOM	2.00 X 2.00

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	INTAKE AND ALLIED BUILDING LAYOUT PLAN GENERAL ARRANGMENT
SURVEY CONSULTANTS	SECON BANGALORE - 66
SCALE	1:100
DWG. No.	SECON/OIL/WS/LP-02
REV.	0

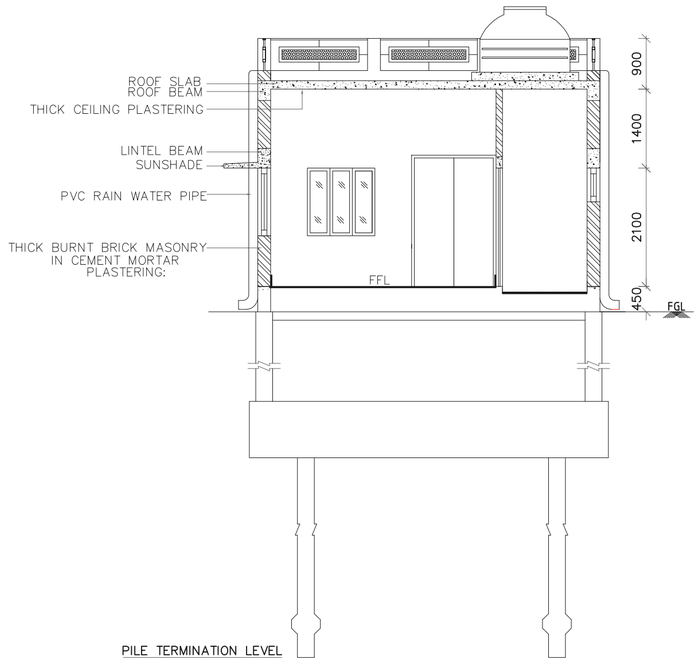
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ELEVATION
SCALE 1:50



PLAN
SCALE 1:50



SECTION-AA
SCALE 1:50

NOTE:

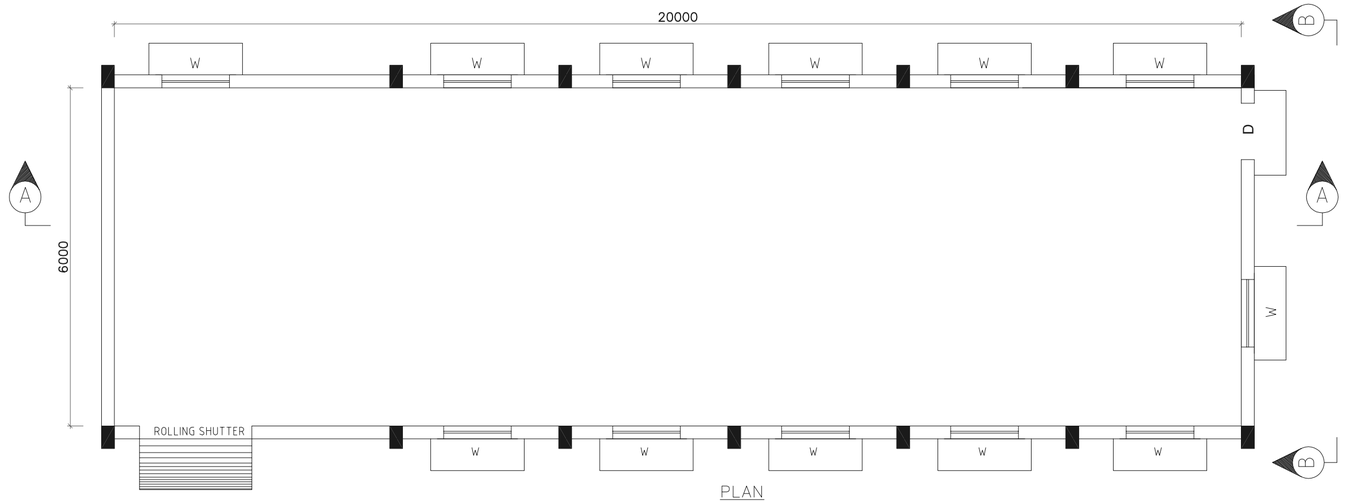
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5. The pile socket should be below the rocky strata else where as directed by the engineer incharge during the execution.

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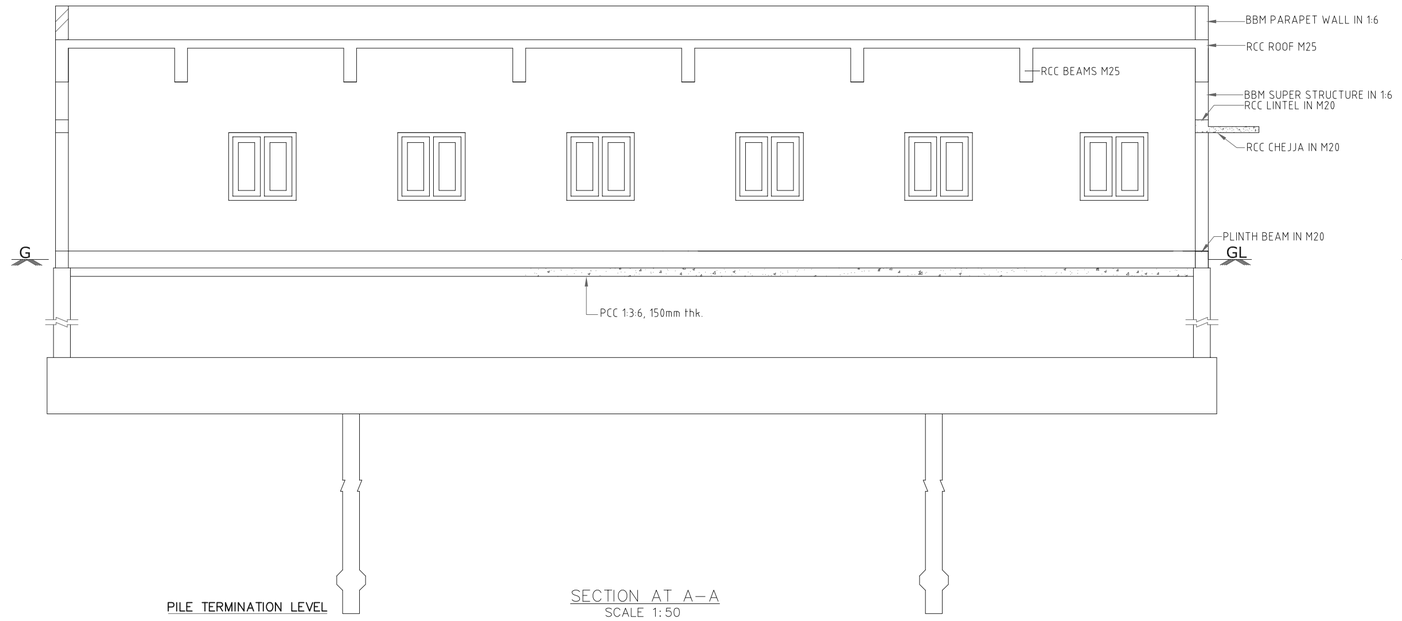
CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	INTAKE AND ALLIED BUILDINGS OPERATOR CUM SECURITY ROOM ARCHITECTURAL DRAWING
SURVEY CONSULTANTS	SECON BANGALORE - 66

SCALE	DWG. No.	REV.
1:50	SECON/OIL/WS/OS-03	0

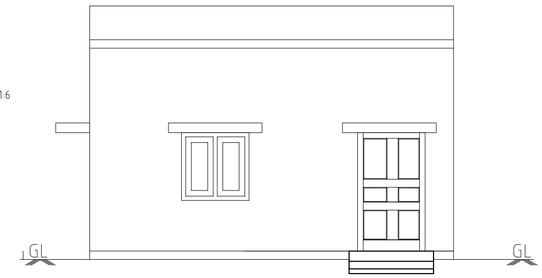
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PLAN
SCALE 1:50



SECTION AT A–A
SCALE 1:50



ELEVATION AT B-B
SCALE 1:50

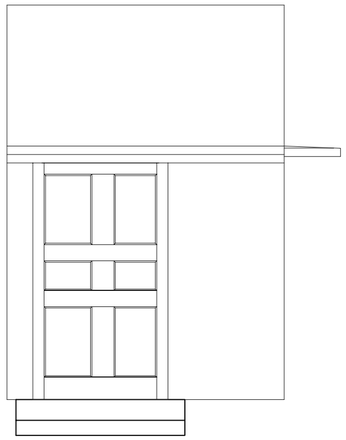
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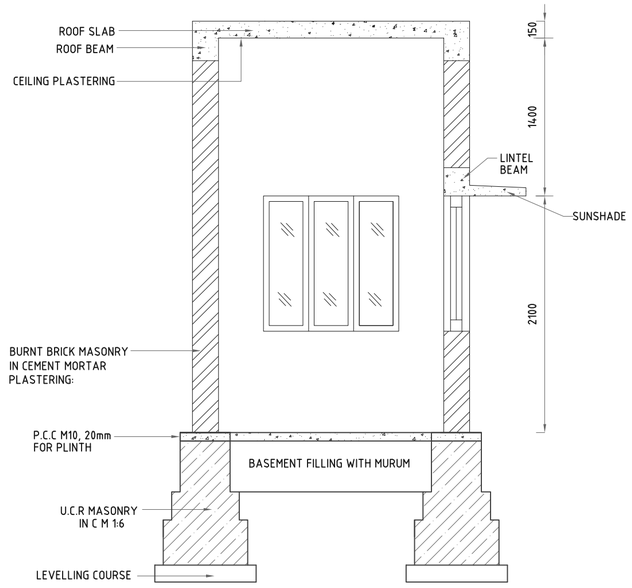
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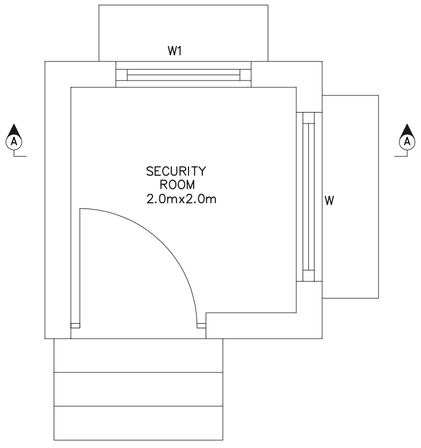
CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	INTAKE AND ALLIED BUILDINGS PANEL ROOM ARCHITECTURAL DRAWING
SURVEY CONSULTANTS	SECON BANGALORE - 66
SCALE	1:50
DWG. No.	SECON/OIL/WS/PR-04
REV.	0

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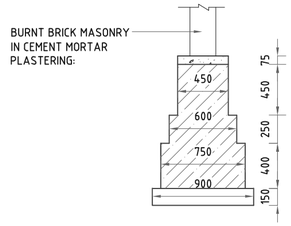


ELEVATION
SCALE 1:25





PLAN
SCALE 1:25



FOOTING DETAILS
SCALE 1:25

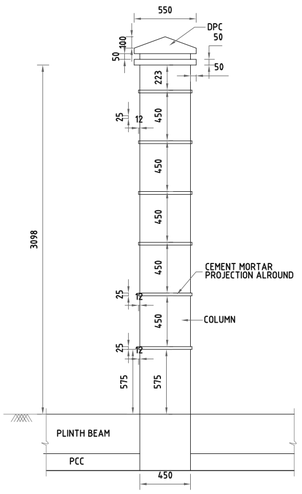
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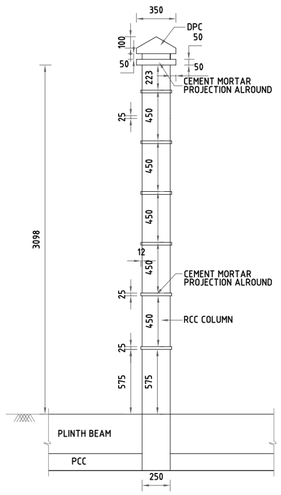
NOTE: The drawing is only for reference and not for construction

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	INTAKE AND ALLIED BUILDINGS SECURITY ROOM NEAR MAIN GATE ARCHITECTURAL DRAWING
SURVEY CONSULTANTS	SECON BANGALORE - 66
SCALE	1:25
DWG. No.	SECON/OIL/WS/SR-05
REV.	0

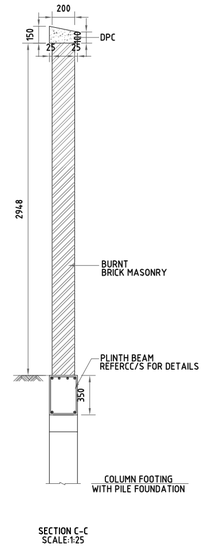
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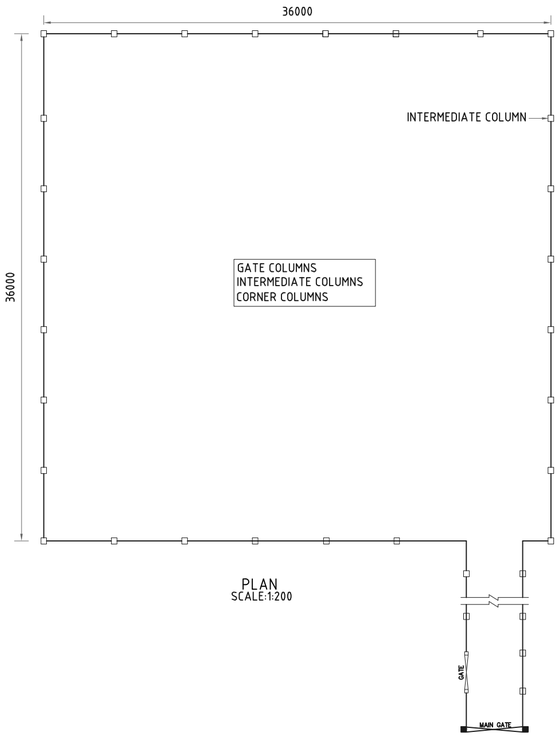
GATE COLUMN
SCALE:1:25



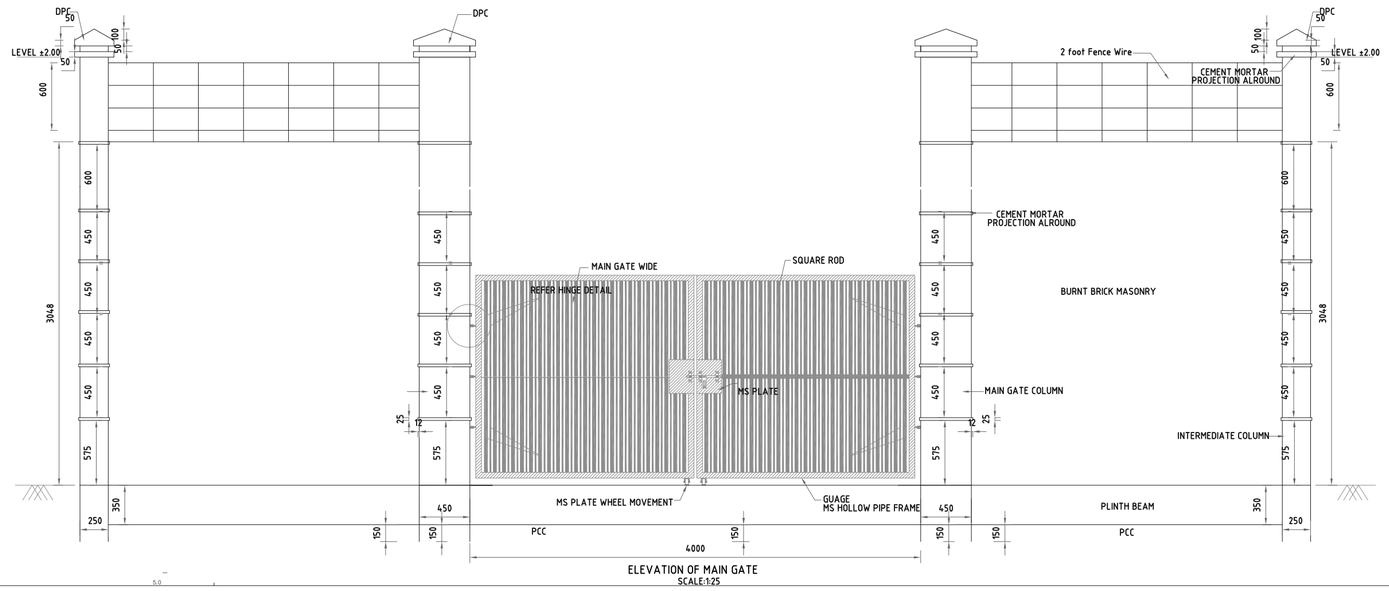
INTERMEDIATE COLUMN
SCALE:1:25



SECTION C-C
SCALE:1:25



PLAN
SCALE:1:200



ELEVATION OF MAIN GATE
SCALE:1:25

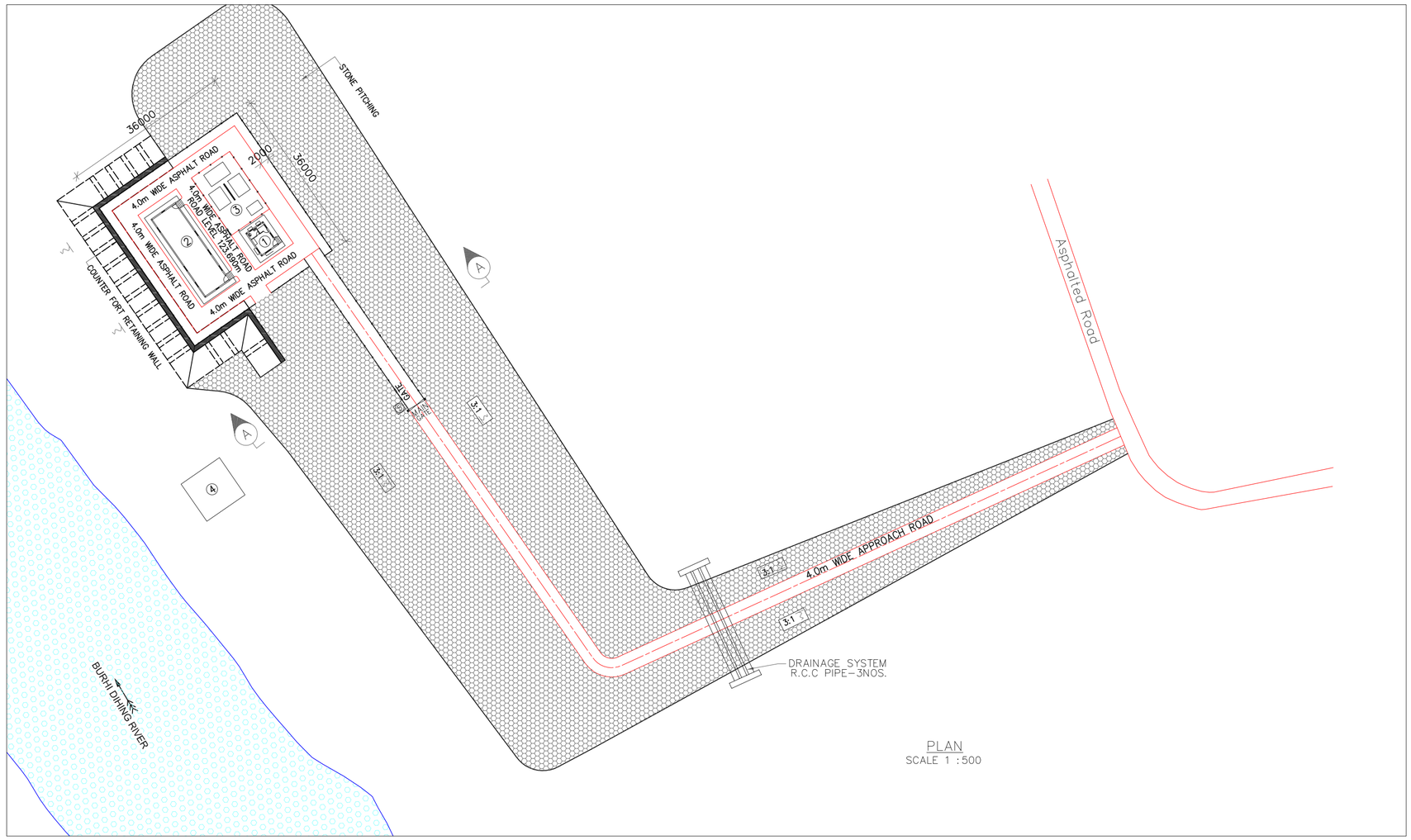
NOTE:

1. All dimensions are in metres, unless otherwise specified
2. Prior to the execution sbc needs to be confirmed by the contractor and to be executed as directed by the engineer in charge.
3. The oreientation of the gate shall be confirmed by the contractor during execution and vetted by the engineer.

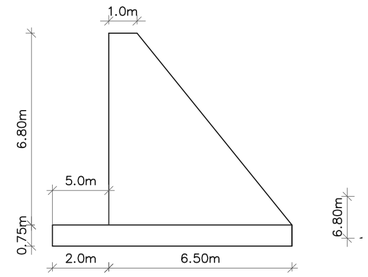
NOTE: The drawing is only for reference and not for construction

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	INTAKE AND ALLIED BUILDINGS COMPOUND WALL/BOUNDARY WALL GENERAL ARRANGEMENT
SURVEY CONSULTANTS	SECON BANGALORE - 66
SCALE	AS SHOWN
DWG. No.	SECON/OIL/WS/CW-06
REV.	0

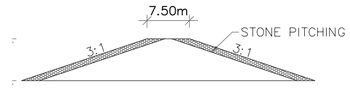
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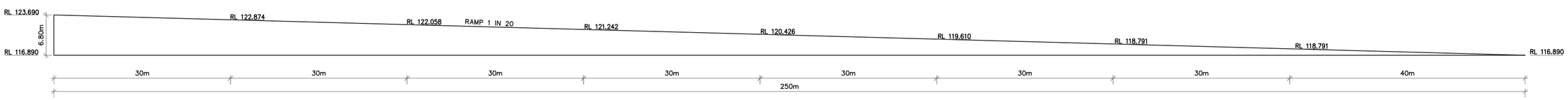
PLAN
SCALE 1 :500



SECTION OF RETAINING WALL
(SCALE 1:50)



SECTION AT A-A
SCALE 1 :50



LONGTITUDINAL SECTION OF APPROACH ROAD
SCALE 1 :500

NOTE:

1. All dimensions are in metres, unless otherwise specified
2. Prior to the execution sbc needs to be confirmed by the contractor and to be executed as directed by the engineer in charge.
3. The oreientation of the allied building for reference only and shall be confirmed by the contractor during execution and vetted by the engineer.

NOTE: The drawing is only for reference and not for construction

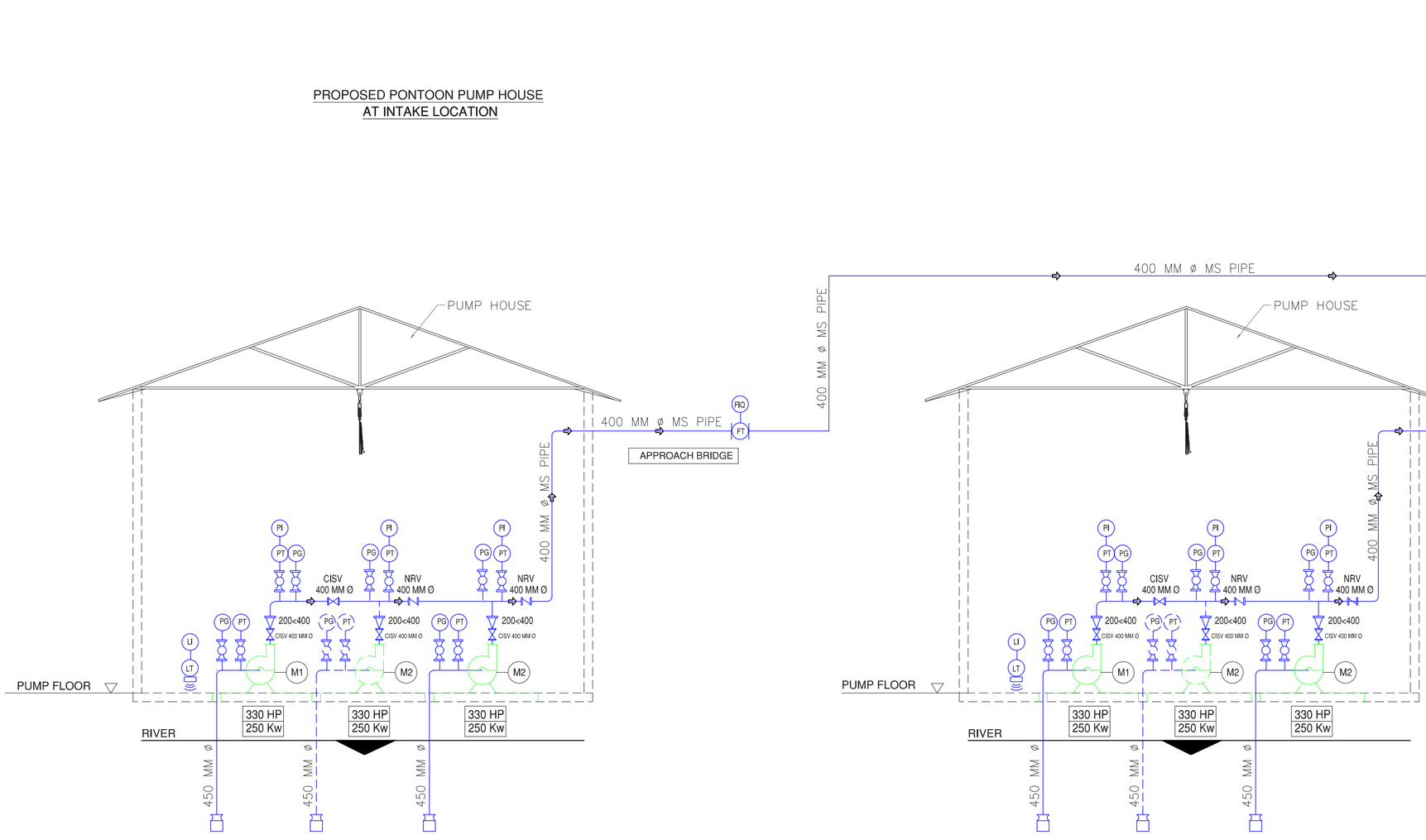
COMPONENTS DETAILS

SL NO	DESCRIPTION	SIZE (m)
1	OPERATOR CUM SECURITY ROOM	6.00 X 4.50
2	PANEL ROOM	20.00 X 6.00
3	SPACE FOR GENERATOR CUM TRANSFORMER YARD	15.00 X 10.00
4	DIESEL UNIT	10.00 X 10.00
4	SECURITY ROOM	2.00 X 2.00

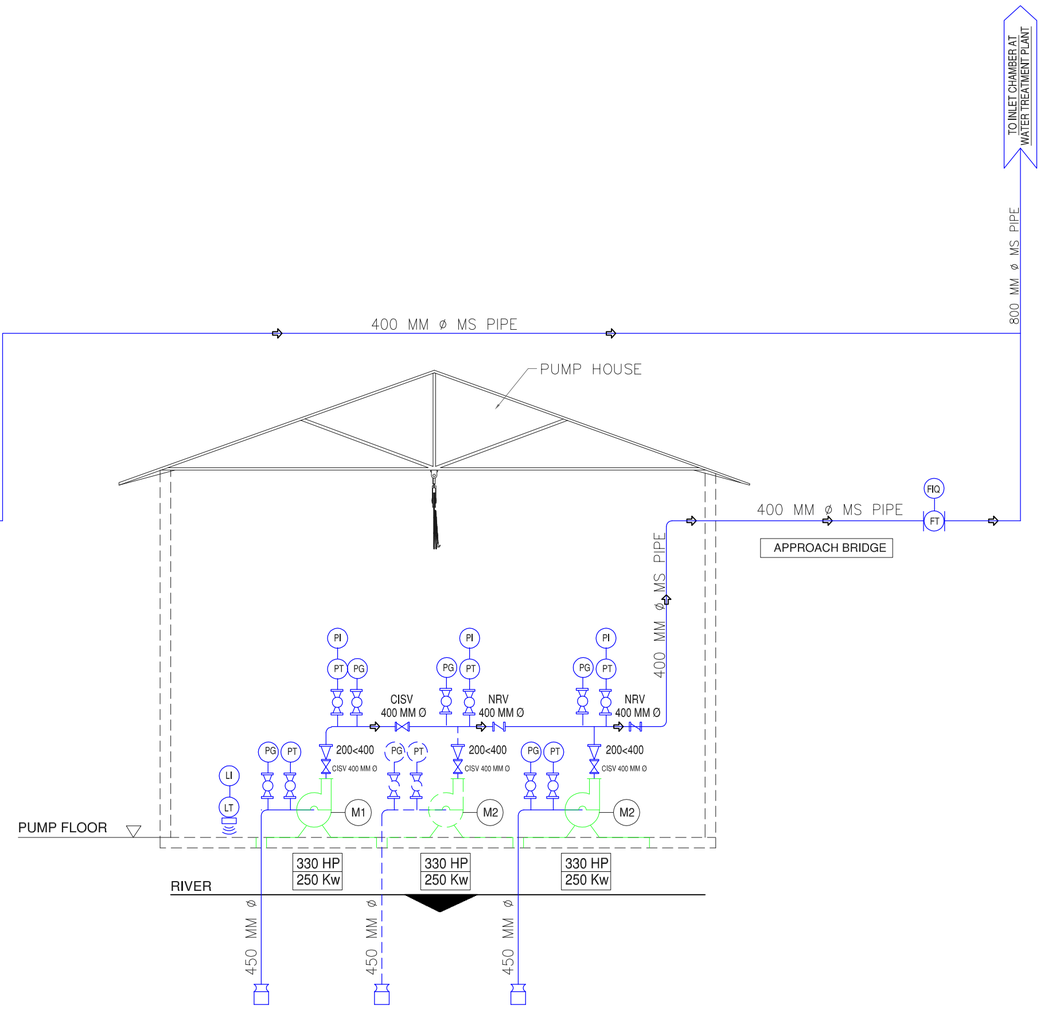
CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	INTAKE AND ALLIED BUILDINGS PLAN AND SECTION OF EMBANKMENT BUND
SURVEY CONSULTANTS	SECON BANGALORE - 66
SCALE	AS SHOWN
DWG. No.	SECON/OIL/WS/AB-07
REV.	0

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PROPOSED PONTOON PUMP HOUSE
AT INTAKE LOCATION



PONTOON PUMP HOUSE-1



PONTOON PUMP HOUSE-2

NOTE:

1. Additional pump arrangment is indicated by dotted lines.

NOTE: The drawing is only for reference and not for construction

LEGEND

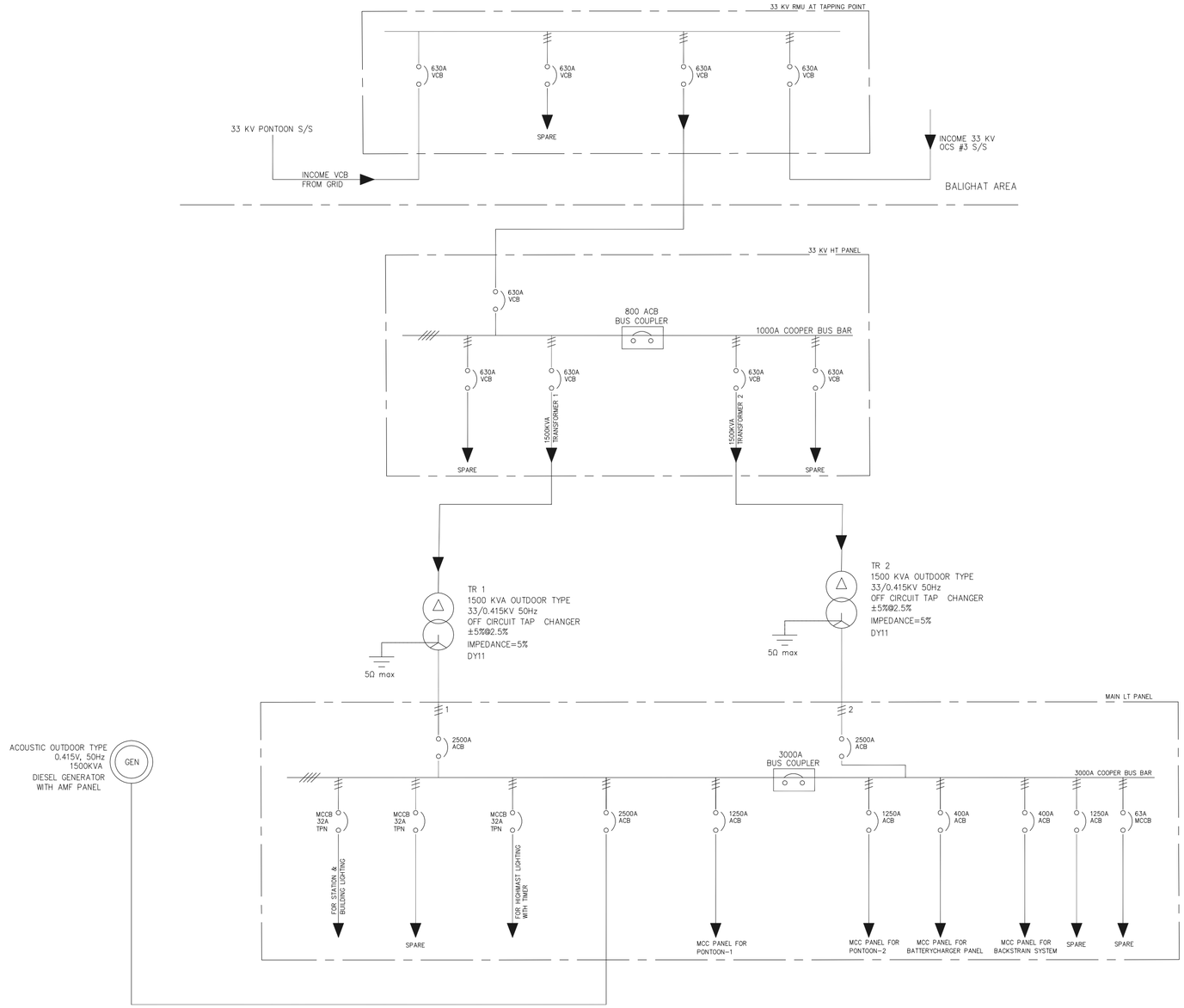
- SLUICE VALVE
- NON RETURN VALVE
- NEEDLE VALVE
- CENTRIFUGAL PUMP
- FOOT VALVE

INSTRUMENTS

ABB	DESCRIPTION
PG	PRESSURE GAUGE(BOURDEN) / SENSOR
PT	PRESSURE TRANSMITTER
PI	DIGITAL PRESSURE INDICATOR(LOCAL)
LT	LEVEL TRANSMITTER(ULTRASONIC)
LI	DIGITAL LEVL INDICATOR(LOCAL)
FT	FLOW TRANSMITTER(ELECTROMAGNETIC)
FIQ	DIGITAL FLOW INDICATOR/TOTALISER(LOCAL)

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	PROPOSED PONTOON PUMP HOUSE AT INTAKE LOCATION (P & I DIAGRAM)
SURVEY CONSULTANTS	SECON BANGALORE - 66
SCALE: N.T.S	DWG. No.: SECON/OIL/WS/P&I-08
REV.	0

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NOTE:

1. SINGLE LINE DIAGRAM IS BASED ON PRELIMINARY DESIGN AND NOT FOR CONSTRUCTION. ONLY FOR GUIDANCE
2. THE CONTRACTOR BASED ON THE FIELD VISIT AND DESIGN OF HIS OWN SHOULD PREPARESINGLE LINE DIAGRAM, CONSIDERING FIELD CONDITIONS, LOCATION AND STATUTORY REQUIREMENTS
3. A PROPER CIVIL FOUNDATION WITH FEW STEPS ARE TO BE PROVIDED TO INSTALL RING MAIN UNIT (AT BOTH TAPPING POINT) AND TRANSFORMER WITH SWITCHING YARD.A PROPER SHED OVER THE TAPPING POINT.
4. A PROPER SHED OVER THE RMU SHOULD BE PROVIDED AT THE RMU SHOULD BE PROVIDED.

LEGEND:

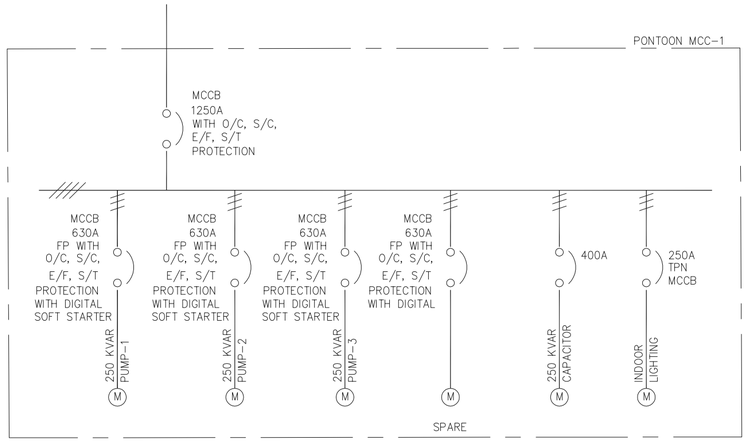
- DISTRIBUTION TRANSFORMER
- GENERATOR
- MINIATURE CIRCUIT BREAKER

ABBREVIATIONS :

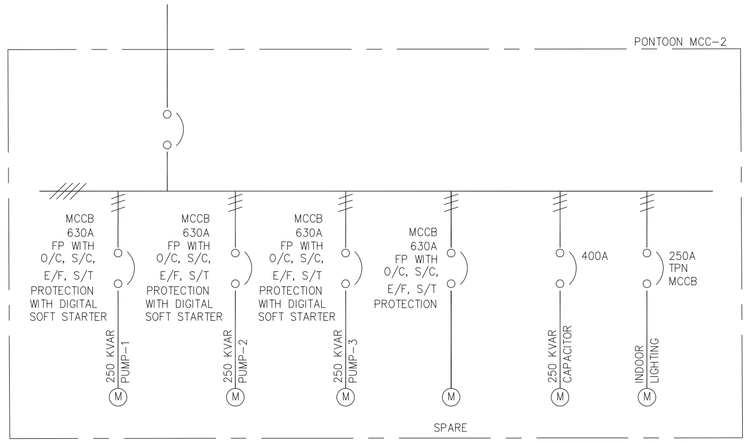
A	–	AMPERE	C.T	–	CURRENT TRANSFORMER
AL	–	ALUMINIUM	ISC	–	SHORT CIRCUIT CURRENT
CU	–	COPPER	IP	–	INGRESS PROTECTION
KW	–	KILO WATTS	COS	–	CHANGE OVER SWITCH
KA	–	KILO AMPS	AMF	–	AUTOMATIC MAINS FAILURE
XLPE	–	CROSS LINKED POLY ETHYLENE	RMU	–	RING MAIN UNIT
DV	–	DIGITAL VOLTMETER	TR	–	TRANSFORMER
DA	–	DIGITAL AMMETER	GEN	–	DIESEL GENERATOR
MFEM	–	MULTI FUNTIONAL ENERGY METER	ACB	–	AIR CIRCUIT BREAKER
KVA	–	KILO VOLT AMPERE	MFEM	–	MULTI FUNTIONAL ENERGY METER
KVAR	–	KILO VOLT AMPERE REACTIVE	O.C.	–	OVER CURRENT
MCCB	–	MOULDED CASE CIRCUIT BREAKER	S.C.	–	SHORT CIRCUIT CURRENT
MCB	–	MINIATURE CIRCUIT BREAKER	E.F.	–	EARTH FAULT
SPN	–	SINGLE POLE NEUTRAL	A.R.	–	ARMOVRED
TPN	–	TRIPLE POLE NEUTRAL	B.C.	–	BUS COUPLER
FP	–	FOUR POLE	S.P.	–	SPARE
P.F	–	POWER FACTOR	VFD	–	Variable Frequncy Drive

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	GUIDE DRAWING SINGLE LINE DIAGRAM FOR PONTOON PUMP HOUSE
SURVEY CONSULTANTS	SECON BANGALORE - 66
SCALE: N.T.S	DWG. No.: SECON/OIL/WS/EE/SLD-01
REV.	0

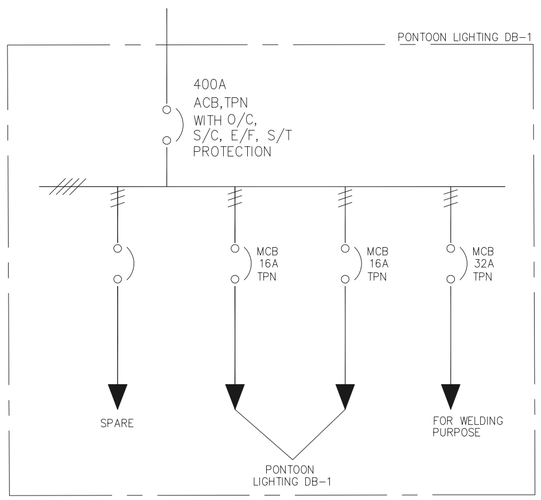
INCOMING FROM MAIN LT PANEL



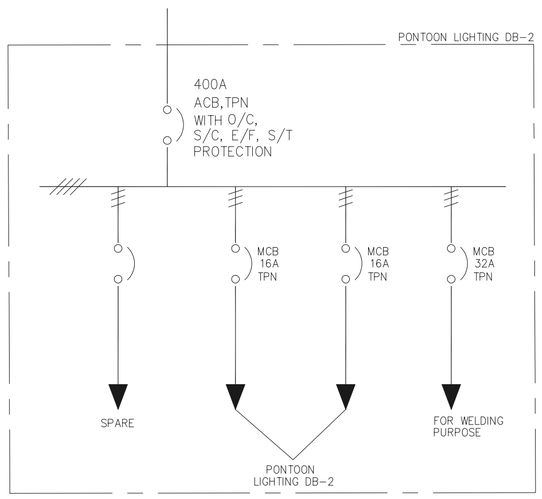
INCOMING FROM MAIN LT PANEL



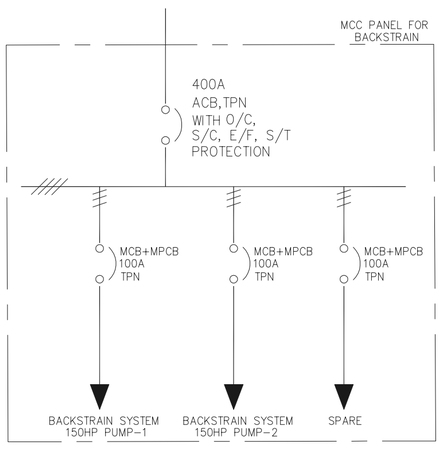
INCOMING FROM MAIN LT PANEL



INCOMING FROM MAIN LT PANEL



INCOMING FROM MAIN LT PANEL



NOTE:

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4. A PROPER SHED OVER THE RMU SHOULD BE PROVIDED AT THE RMU SHOULD BE PROVIDED.

LEGEND:

- DISTRIBUTION TRANSFORMER
- GENERATOR
- MINIATURE CIRCUIT BREAKER
- MOTOR PUMP
- VFD - VARIABLE FREQUENCY DRIVE

ABBREVIATIONS :

A	–	AMPERE	C.T	–	CURRENT TRANSFORMER
AL	–	ALUMINIUM	ISC	–	SHORT CIRCUIT CURRENT
CU	–	COPPER	IP	–	INGRESS PROTECTION
KW	–	KILO WATTS	COS	–	CHANGE OVER SWITCH
KA	–	KILO AMPS	AMF	–	AUTOMATIC MAINS FAILURE
XLPE	–	CROSS LINKED POLY ETHYLENE	RMU	–	RING MAIN UNIT
DV	–	DIGITAL VOLTMETER	TR	–	TRANSFORMER
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KVAR	–	KILO VOLT AMPERE REACTIVE	O.C.	–	OVER CURRENT
MCCB	–	MOULDED CASE CIRCUIT BREAKER	S.C.	–	SHORT CIRCUIT CURRENT
MCB	–	MINIATURE CIRCUIT BREAKER	E.F.	–	EARTH FAULT
SPN	–	SINGLE POLE NEUTRAL	A.R.	–	ARMOVRED
TPN	–	TRIPLE POLE NEUTRAL	B.C.	–	BUS COUPLER
FP	–	FOUR POLE	S.P.	–	SPARE
P.F	–	POWER FACTOR	VFD	–	Variable Frequncy Drive

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	GUIDE DRAWING SINGLE LINE DIAGRAM FOR PONTOON PUMP HOUSE
SURVEY CONSULTANTS	SECON BANGALORE - 66
SCALE	N.T.S
DWG. No.	SECON/OIL/WS/EE/SLD-02
REV.	0

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OIL INDIA LIMITED
FIELD ENGINEERING DEPARTMENT
Duliajan, Assam- 786 602

HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES
FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED,
DULIAJAN, ASSAM

RAW WATER PIPELINE AND ALLIED WORKS ENGINEERING DRAWINGS

DOC. No. SECON/OIL/WS / Vol-III / September -19

PACKAGE-II: VOLUME-III

SEPTEMBER 2019

SECON
Plot No.147, 7B Road, EPIP, White Field,
Bangalore - 560 066
Website: http://www.secon.in

OIL INDIA LIMITED, ASSAM

RAW WATER PIPELINE AND ALLIED WORKS

LIST OF DRAWINGS

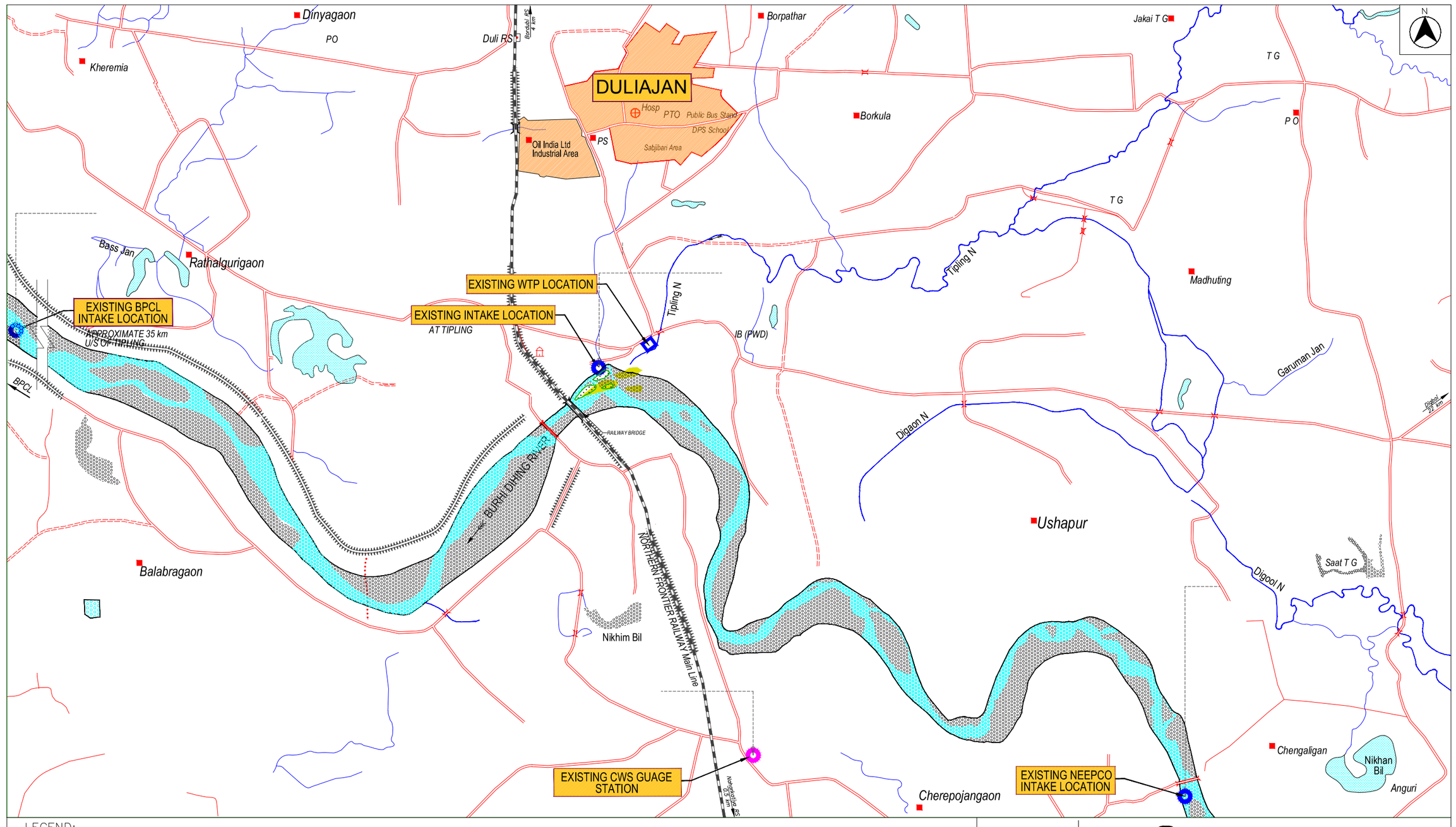
SL No.	TITLE	DRAWING Nos.
01	LOCATION MAP	SECON/OIL/WS/LM–01
02	TOPOGRAPHICAL SURVEY FOR PROPOSED INTAKE AND PROPOSED WTP	SECON/OIL/WS/BS–02
03	ALIGNMENT SHEET SECTION: INTAKE LOCATION TO PROPOSED WTP RAW WATER PIPE & ALLIED WORKS CHAINAGE : FROM 0/000 KM TO 2/004.58 KM	SECON/OIL/WS/LS–03
04	RAW WATER PIPE LINE HYDRAULIC GRADIENT LINE FOR PROPOSED RAW WATER PIPELINE	SECON/OIL/WS/HGL–04
05	RAW WATER PIPE LINE ASPHALTED ROAD CROSSING BETWEEN TP3 & TP4 (CH. 0+263.903m)	SECON/OIL/WS/CS–05
06	RAW WATER PIPE LINE ASPHALTED ROAD CROSSING BETWEEN TP7 & TP8 (CH. 1+598.844m)	SECON/OIL/WS/CS–06
07	RAW WATER PIPELINE NALA CROSSING BETWEEN TP10 & TP11 (CH. 1+783.354m)	SECON/OIL/WS/CS–07
08	RAW WATER PIPELINE TIPLING RIVER CROSSING BETWEEN TP11 & TP12 (CH. 1+870.044m)	SECON/OIL/WS/CS–08
09	STANDARD DRAWING AIR VALVE CHAMBER ARCHITECTURAL DRAWING	SECON/OIL/WS/AV–09
10	STANDARD DRAWING BUTTERFLY VALVE CHAMBER WITH BYPASS ARRANGEMENTS ARCHITECTURAL DRAWING	SECON/OIL/WS/BF–10
11	STANDARD DRAWING SCOUR VALVE CHAMBER ARCHITECTURAL DRAWING	SECON/OIL/WS/SV–11
12	STANDARD DRAWING PIPE–BENDS & THRUST–BLOCK ARCHITECTURAL DRAWING	SECON/OIL/WS/BT/12
13	STANDARD DRAWING PIPE SADDLE/ANCHOR BLOCK ARCHITECTURAL DRAWING	SECON/OIL/WS/SD/13
14	STANDARD DRAWING TRENCH DETAILS ARCHITECTURAL DRAWING	SECON/OIL/WS/TD/14
15	STANDARD DRAWING MS TRUSS BRIDGE FOR TIPLING RIVER CROSSING GENERAL ARRANGEMENT	SECON/OIL/WS/MSB/15

ABBREVIATIONS:

- LM – LOCATION MAP
- LS – L–SECTION
- HGL – HYDRAULIC GRADIENT LINE
- CS – CROSS–SECTION
- AV – AIR VALVE CHAMBER
- BF – BUTTERFLY VALVE CHAMBER
- SV – SCOUR VALVE CHAMBER
- BT – BENDS & THRUST
- SD – SADDLE
- TD – TRENCH DETAILS
- MSB – MS TRUSS BRIDGE
- WS – WATER SUPPLY

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	RAW WATER PIPELINE AND ALLIED WORKS ENGINEERING DRAWINGS LIST OF DRAWINGS
CONSULTANTS	SECON BANGALORE - 66
SCALE: N.T.S	DWG. No.: SECON/OIL/WS/LD-01
REV.	0

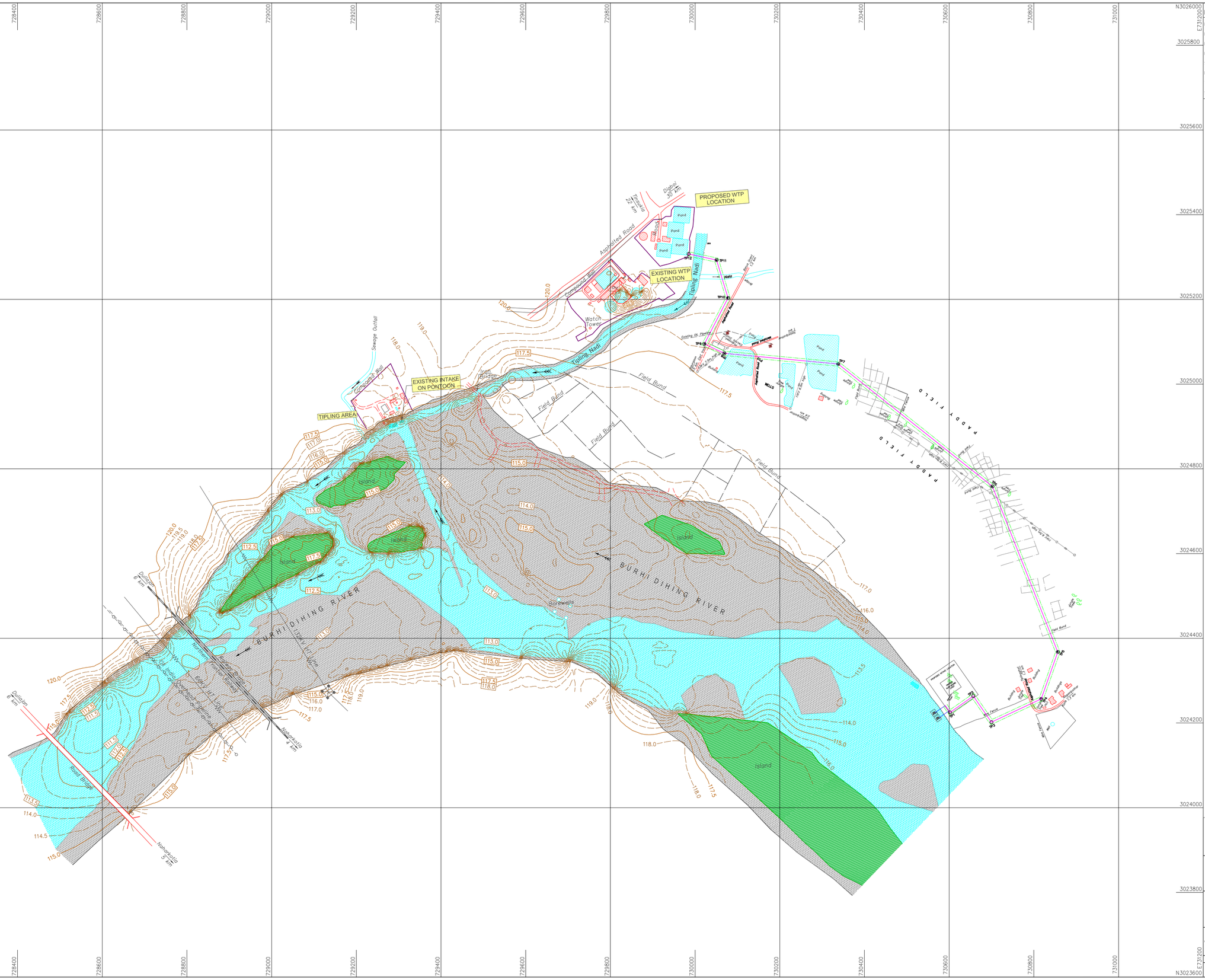
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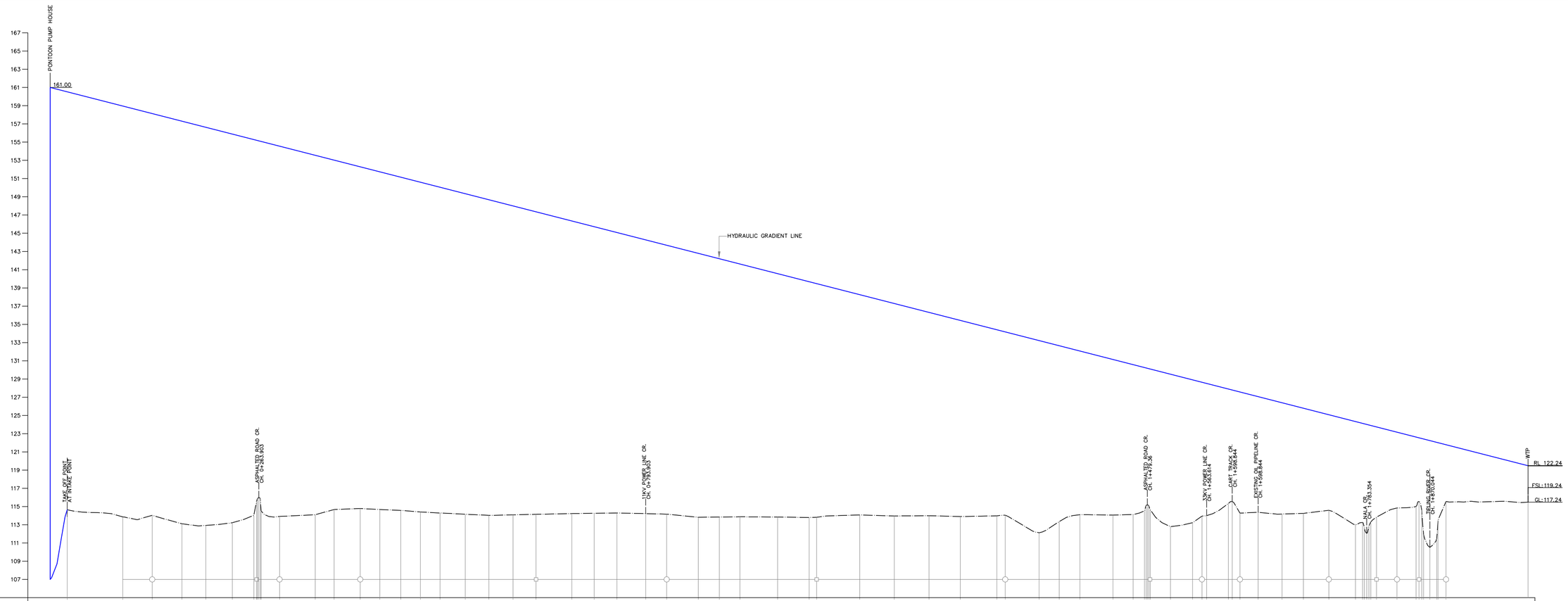
LEGEND:

- EXISTING INTAKE LOCATION
- EXISTING WTP LOCATION
- OTHER ROAD
- UNMETALLED ROAD
- CWS GUAGE STATION
- RAILWAY LINE
- RIVER
- CITY/TOWN/VILLAGE
- STREAM
- HOSPITAL

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	CONSULTANCY SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SYSTEM TO OIL INDIA LIMITED, DULIAJAN, DISTRICT DIBRUGARH, ASSAM
CONSULTANT	SECON PRIVATE LIMITED BANGALORE – 66
TITLE	LOCATION MAP
DWG. No.	SECON/OIL/WS/LM–01 — SCALE: 1:50000

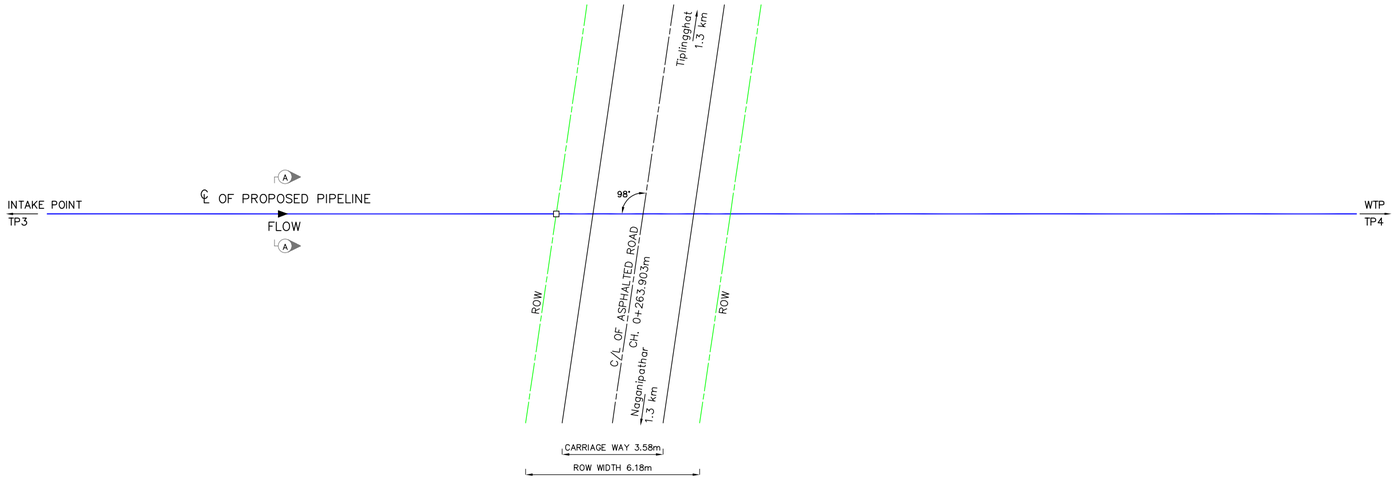

PROPOSED WTP LOCATION
EXISTING WTP LOCATION
EXISTING INTAKE ON PONTOON
TIPLING AREA
Tipling Nadi
Tipling Nadi
Asphalted Road
Compound Wall
Watch Tower
Sewage Outfall
Concrete Wall
Foot Bridge
Field Bund
Field Bund
Field Bund
Field Bund
Island
Island
Island
Island
Island
BURHI DIHING RIVER
BURHI DIHING RIVER
Boreholes
Duliajan 6 km
Duliajan 6 km
Road Bridge
Northern Assam Thrust
Naharkatia 4 km
Naharkatia 5 km
Tinsukia 22 km
Digboi 40 km
PADDY FIELD
PADDY FIELD
Existing Oil Pipeline
Proposed Road 2
Proposed Road 1
Existing Road
Existing Road
Existing Road

| | | |

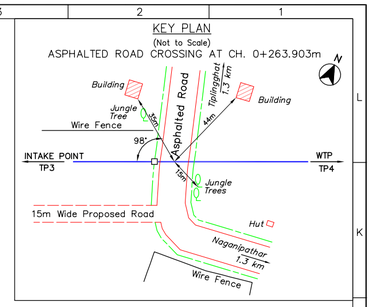

PONTOON PUMP HOUSE
161.00
HYDRAULIC GRADIENT LINE
WTP
RL 122.24
FSL-119.24
GL-117.24
TAKE OFF POINT AT INTAKE POINT
ASPHALTED ROAD CR. CH. 0+283.603
CMV PIPELINE CR. CH. 0+793.903
ASPHALTED ROAD CR. CH. 1+479.36
CMV PIPELINE CR. CH. 1+557.214
CART TRACK CR. CH. 1+598.844
EXISTING RCC PIPELINE CR. CH. 1+598.844
NALA CR. CH. 1+783.354
TIPLANG RIVER CR. CH. 1+870.044
PROFILE
SCALE :
HORIZONTAL 1:2500
VERTICAL 1:200
DATUM w.r.t MSL 105m
167 165 163 161 159 157 155 153 151 149 147 145 143 141 139 137 135 133 131 129 127 125 123 121 119 117 115 113 111 109 107

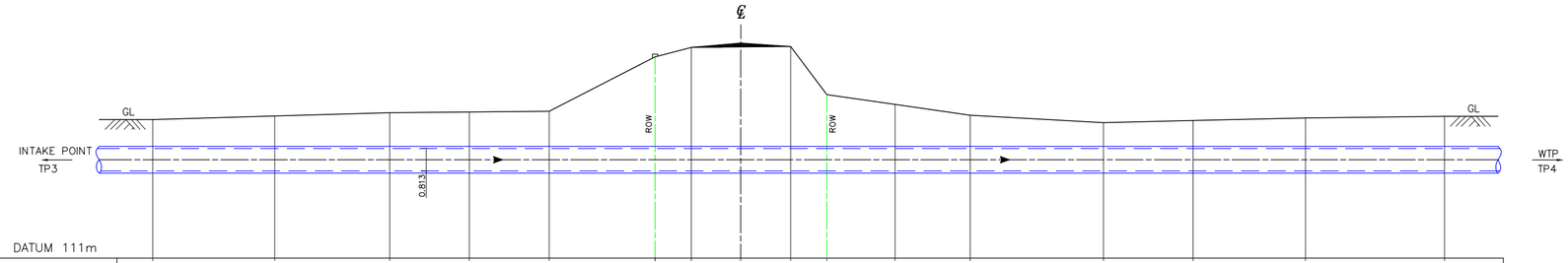
| | | |

PLAN



KEY PLAN
(Not to Scale)
ASPHALTED ROAD CROSSING AT CH. 0+263.903m





LEVEL IN METRES ABOVE MSL	115.99	116.12	116.24	116.26	116.29	118.25	118.59	118.75	118.62	116.89	116.54	116.15	115.88	115.96	116.05	116.11
DISTANCE BETWEEN LEVEL POINTS		4.39	4.14	2.86	2.88	3.81	1.30	1.78	1.80	1.30	2.46	2.70	4.80	3.22	4.05	5.00

NOTE: The drawing is only for reference and not for construction

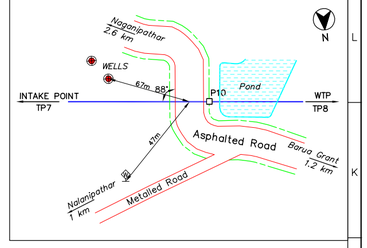
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CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	RAW WATER PIPE LINE ASPHALTED ROAD CROSSING BETWEEN TP3 & TP4 (CH. 0+263.903m)
CONSULTANTS	SECON BANGALORE - 66
SCALE	1:100
DWG. No.	SECON/OIL/WS/CS-05
REV.	0

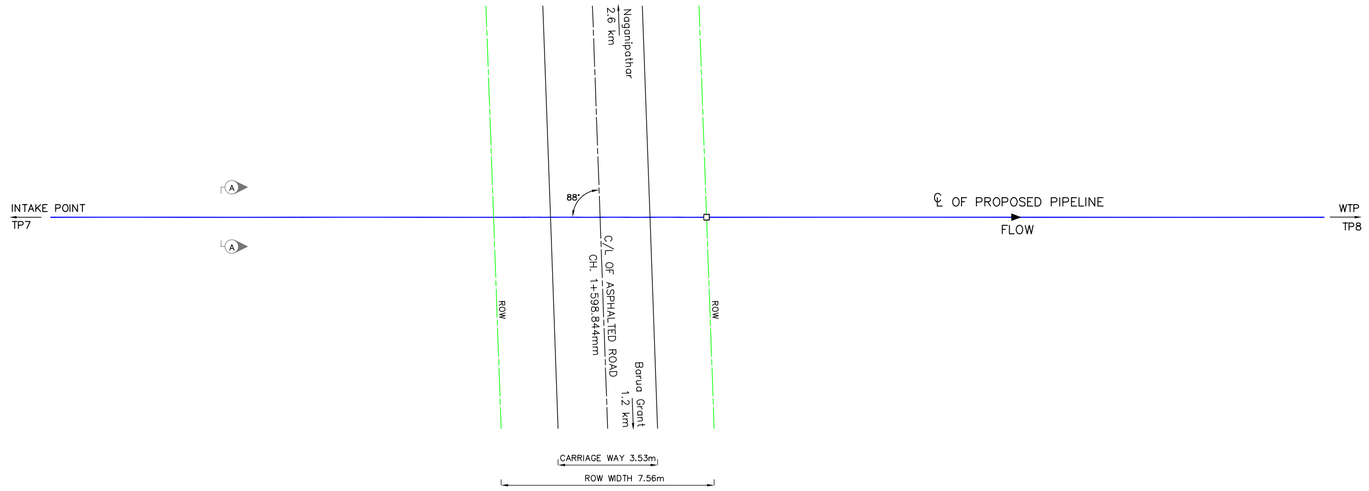
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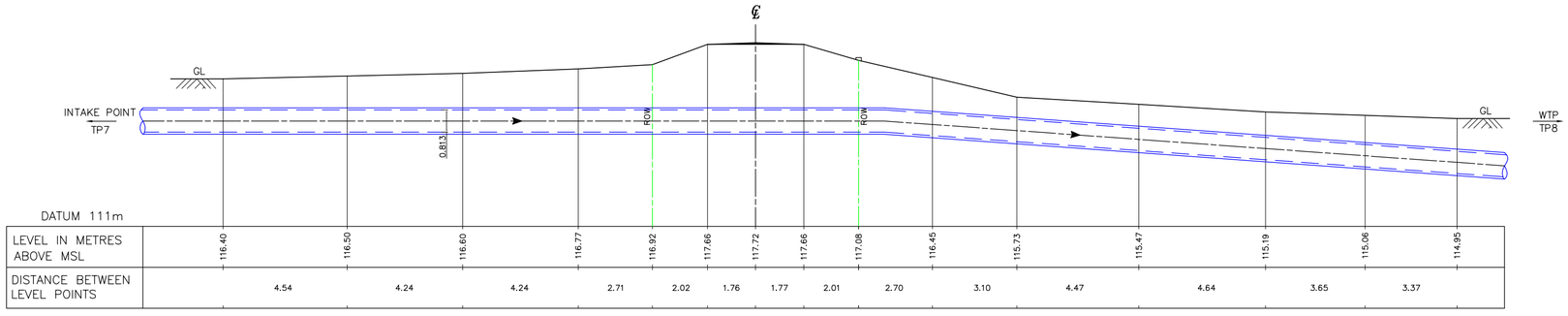
N

KEY PLAN
(Not to Scale)
ASPHALTED ROAD CROSSING AT CH. 1+598.844m



PLAN





DATUM 111m

LEVEL IN METRES ABOVE MSL	116.40	116.50	116.60	116.77	116.92	117.66	117.72	117.66	117.08	116.45	115.73	115.47	115.19	115.06	114.95
DISTANCE BETWEEN LEVEL POINTS		4.54	4.24	4.24	2.71	2.02	1.76	1.77	2.01	2.70	3.10	4.47	4.64	3.65	3.37

GROUND PROFILE

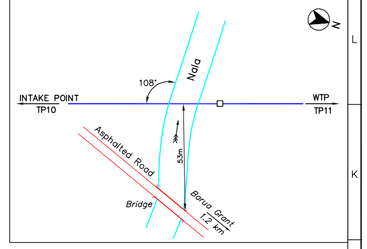
NAME OF ROAD : ASPHALTED ROAD (NAGANI PATHAR TO BARUA GRANT)
CLASSIFICATION : VILLAGE ROAD
JURISDICTION :

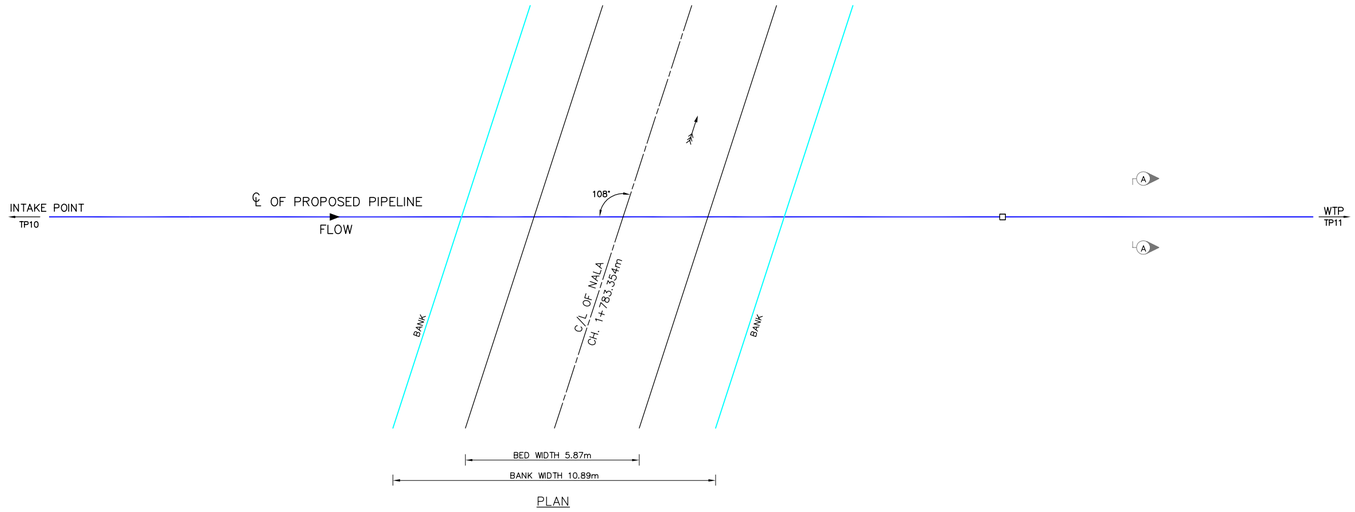
NOTE: The drawing is only for reference and not for construction

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	RAW WATER PIPE LINE ASPHALTED ROAD CROSSING BETWEEN TP7 & TP8 (CH. 1+598.844m)
CONSULTANTS	SECON BANGALORE - 66
SCALE	1:100
DWG. No.	SECON/OIL/WS/CS-06
REV.	0

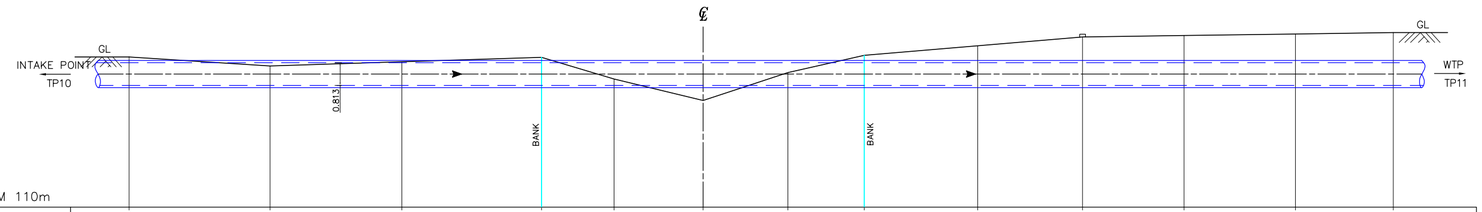


KEY PLAN
(Not to Scale)
NALA CROSSING AT CH. 1+783.354m





PLAN



DATUM 110m

LEVEL IN METRES ABOVE MSL	115.33	115.01	115.16	115.32	114.55	113.79	114.78	115.39	115.73	116.04	116.09	116.15	116.20
DISTANCE BETWEEN LEVEL POINTS		5.00	4.68	4.96	2.57	3.16	3.01	2.71	4.02	3.73	3.60	3.95	3.48

GROUND PROFILE

CLASSIFICATION : NALA
JURISDICTION : PERENNIAL

NOTE: The drawing is only for reference and not for construction

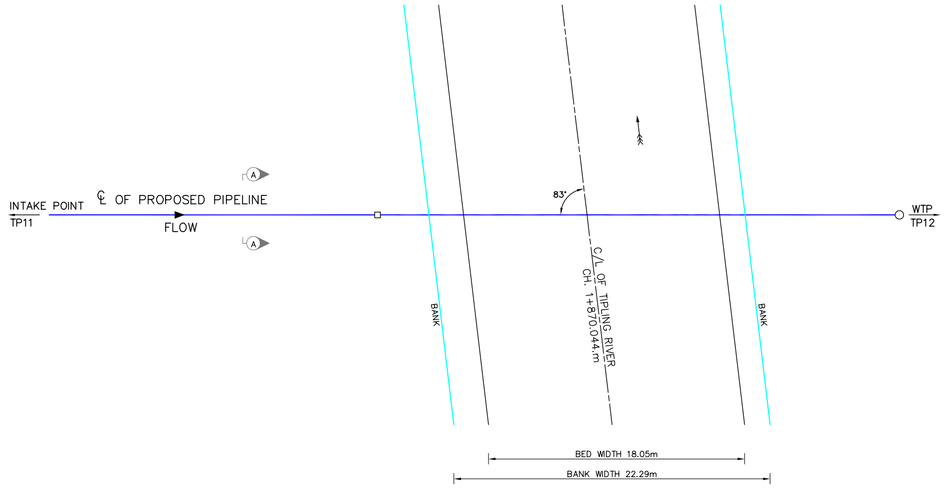
CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	RAW WATER PIPELINE NALA CROSSING BETWEEN TP10 & TP11 (CH. 1+783.354m)
CONSULTANTS	SECON BANGALORE - 66

SCALE	DWG. No.	REV.
1:100	SECON/OIL/WS/CS-03	0

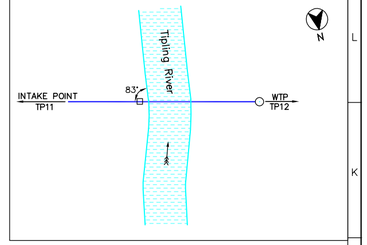
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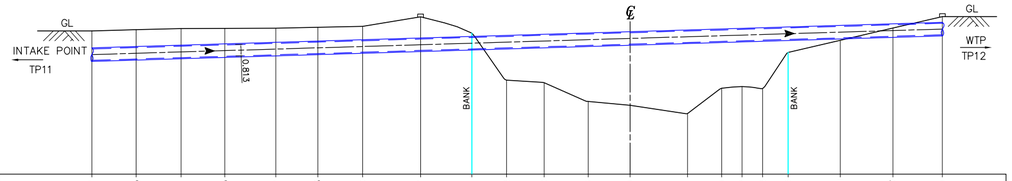
N

PLAN



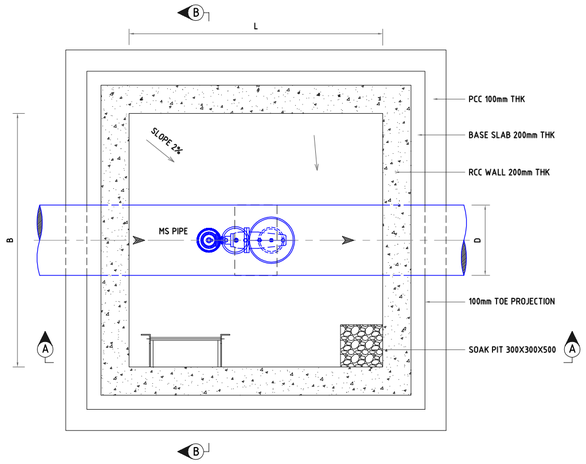
KEY PLAN
(Not to Scale)
TIPLING RIVER CROSSING AT CH. 1+870.044m



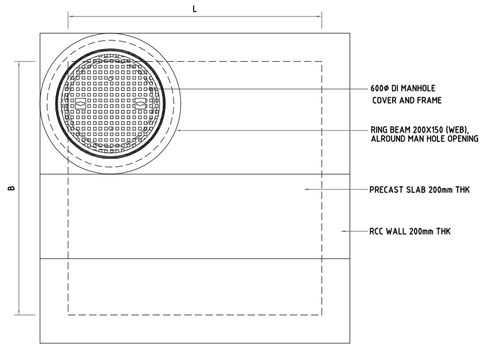


DATUM 107m

| | | |



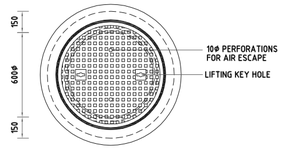
PLAN C-C

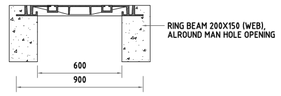


PLAN D-D

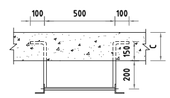
DIMENSIONS OF VALVE & SPECIALS

SL.NO	AIR VALVE SIZE	D	L	B	d	d1
1	100	800	2000	2000	2000	650

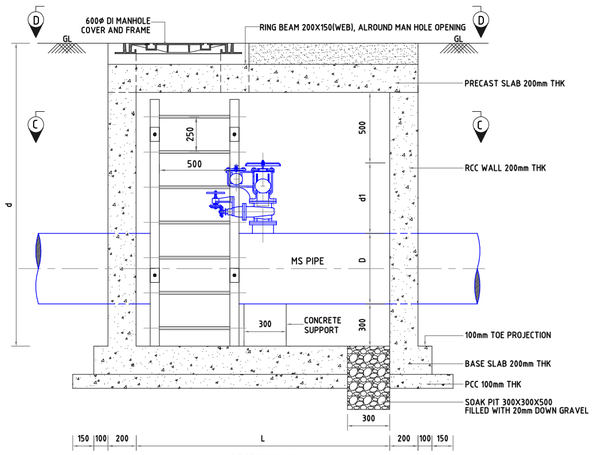




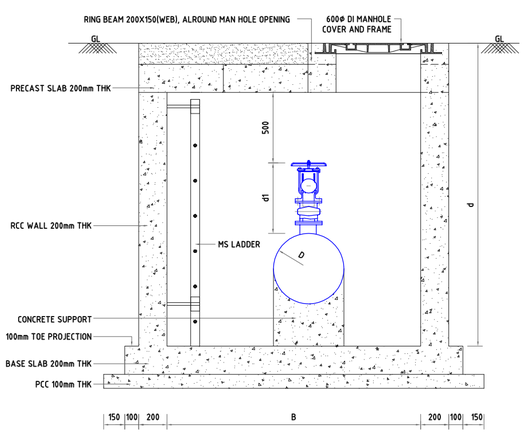
DI MANHOLE COVER & FRAME



MS LADDER



SECTION A-A



SECTION B-B

NOTE :-

1. ALL DIMENSIONS SHOWN ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
2. CO-ORDINATES ARE AS PER SITE CONDITIONS.
3. FOR LOCATION AND DEPTHS OF AIR VALVE CHAMBER REFER TO DRAWINGS OF PIPELINE PLANS AND PROFILES.
4. THE SPECIALS AND PIPE FITTINGS SHALL COMPLY WITH IS:7322 AND IS:1538 LATEST AMENDMENTS.
5. AIR VALVE SHALL COMPLY WITH IS:14845 WITH LATEST AMENDMENTS.
6. ISOLATION SLUICE VALVE SHALL COMPLY WITH IS:14846 WITH LATEST AMENDMENTS.
7. CEMENT :
   - CEMENT USED SHALL BE SULPHATE RESISTANT PORTLAND CEMENT, CONFORMING TO IS:12330.
   - RAPID HARDENING CEMENT, CONFORMING TO IS:8041 SHAL BE USED FOR PRECAST CONCRETE WITH PRIOR APPROVAL FROM THE ENGINEER INCHARGE.
   - TOTAL CHLORIDE CONTENT IN CEMENT SHALL IN NO CASE EXCEED 0.05% BY MASS OF CEMENT.
8. AGGREGATES :
   - ALL COARSE/FINE AGGREGATES SHALL CONFORM TO IS:383 WITH LATEST AMENDMENTS AND TEST FOR CONFORMITY SHALL BE CARRIED OUT AS PER IS:2386 PART I TO VIII.
   - THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER THE ENTIER INFORMATION INDICATED IN APPENDIX A OF IS:383
9. REINFORCE STEEL :
   - FOR REINFORCED CONCRETE, REINFORCEMENT STEEL SHALL COMPLY WITH IS:1786 (HIGH YEILD STRENGTH DEFORMEND BARS) OF GRADE 415.
10. WATER :
    - WATER USED FOR CONCRETING AND CURING SHALL BE CLEAN AND FREE FROM OILS, ACIDS, ALKALIES, SALTS, SUGAR, ORGANIC MATERIALS OR OTHER SUBSTANCES THAT MAY BE DELETERIOUS TO CONCRETE OR STEEL.
    - THE QUALITY OF WATER USED FOR CONCRETING AND CURING SHALL COMPLY WITH IS:3025 (PART 22-23).
11. CONCRETE :
    - ALL CONCRETING WORKS SHALL BE DONE IN ACCORDANCE WITH IS:456-2000 WITH LATEST AMENDMENTS.
12. MANHOLE COVER :
    - DI MANHOLE COVER SHALL COMPLY WITH EN-124 WITH LATEST AMENDMENTS SUBJECT TO PRIOR APPORAL FROM ENGINEER INCHARGE.
13. NECESSARY GEO-TECHNICAL INVESTIGATION HAS TO BE CARRIED OUT PRIOR TO CONSTRUCTION

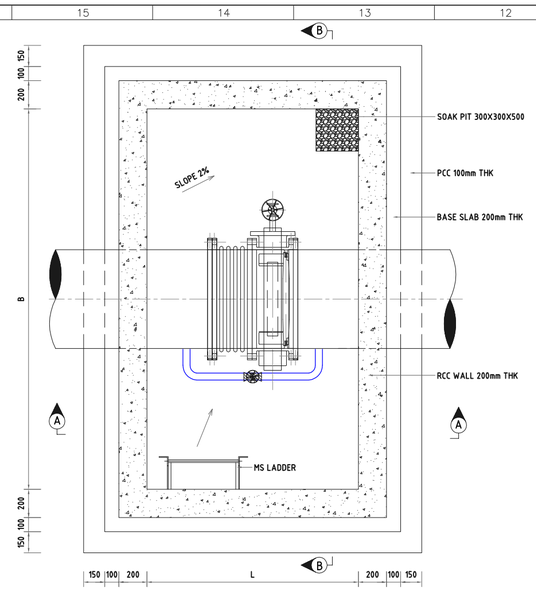
NOTE: THE DRAWING IS ONLY FOR REFERENCE AND NOT FOR CONSTRUCTION

ABBREVIATION :-

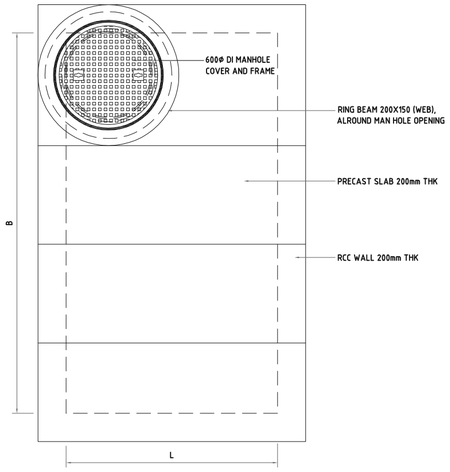
MS : MILD STEEL
PCC : PLAIN CEMENT CONCRETE
THK : THICKNESS

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	STANDARD DRAWING AIR VALVE CHAMBER ARCHITECTURAL DRAWING
CONSULTANTS	SECON BANGALORE - 66
SCALE	1:20
DWG. No.	SECON/OIL/WS/AV-09
REV.	0

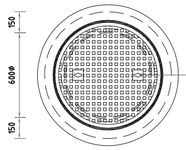
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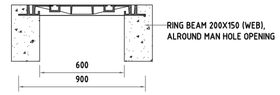


PLAN C-C

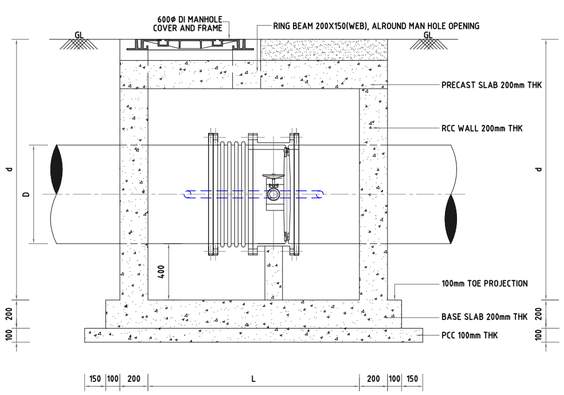


PLAN D-D

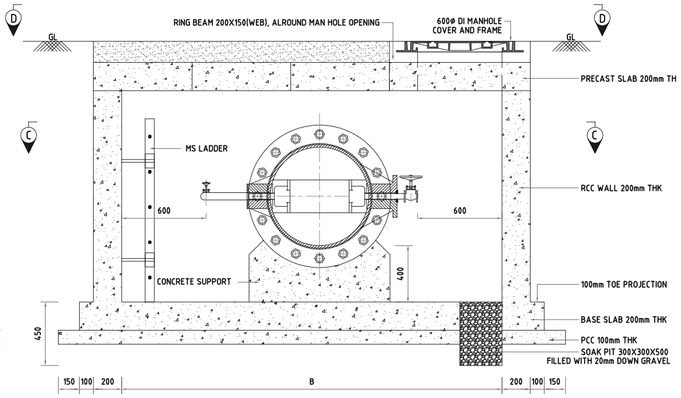




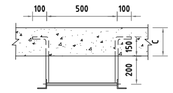
DI MANHOLE COVER & FRAME



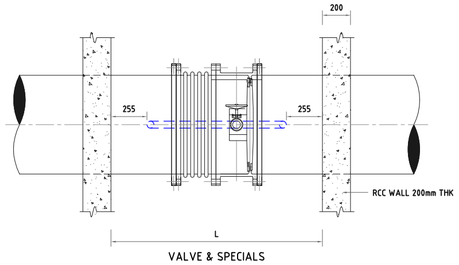
SECTION A-A



SECTION B-B



MS LADDER



VALVE & SPECIALS

DIMENSIONS OF VALVE & SPECIALS

SL.NO	D	L	B	d
1	800	1800	2700	1500

NOTE :-

1. ALL DIMENSIONS SHOWN ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
2. CO-ORDINATES ARE AS PER SITE CONDITIONS.
3. FOR LOCATION AND DEPTHS OF BUTTERFLY VALVE CHAMBER REFER TO DRAWINGS OF PIPELINE PLANS AND PROFILES.
4. THE SPECIALS AND PIPE FITTINGS SHALL COMPLY WITH IS:7322 AND IS:1538 LATEST AMENDMENTS.
5. BUTTERFLY VALVE SHALL COMPLY WITH IS:14845 WITH LATEST AMENDMENTS.
6. CEMENT :
   - CEMENT USED SHALL BE SULPHATE RESISTANT PORTLAND CEMENT, CONFORMING TO IS:12330.
   - RAPID HARDENING CEMENT, CONFORMING TO IS:8041 SHAL BE USED FOR PRECAST CONCRETE WITH PRIOR APPROVAL FROM THE ENGINEER INCHARGE.
   - TOTAL CHLORIDE CONTENT IN CEMENT SHALL IN NO CASE EXCEED 0.05% BY MASS OF CEMENT.
7. AGGREGATES :
   - ALL COARSE/FINE AGGREGATES SHALL CONFORM TO IS:383 WITH LATEST AMENDMENTS AND TEST FOR CONFORMITY SHALL BE CARRIED OUT AS PER IS:2386 PART I TO VIII.
   - THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER THE ENTIER INFORMATION INDICATED IN APPENDIX A OF IS:383
8. REINFORCE STEEL :
   - FOR REINFORCED CONCRETE, REINFORCEMENT STEEL SHALL COMPLY WITH IS:1786 (HIGH YEILD STRENGTH DEFORMEND BARS) OF GRADE 415.
9. WATER :
   - WATER USED FOR CONCRETING AND CURING SHALL BE CLEAN AND FREE FROM OILS, ACIDS, ALKALIES, SALTS, SUGAR, ORGANIC MATERIALS OR OTHER SUBSTANCES THAT MAY BE DELETERIOUS TO CONCRETE OR STEEL.
   - THE QUALITY OF WATER USED FOR CONCRETING AND CURING SHALL COMPLY WITH IS:3025 (PART 22-23).
10. CONCRETE :
    - ALL CONCRETING WORKS SHALL BE DONE IN ACCORDANCE WITH IS:456-2000 WITH LATEST AMENDMENTS.
11. MANHOLE COVER :
    - DI MANHOLE COVER SHALL COMPLY WITH EN-124 WITH LATEST AMENDMENTS SUBJECT TO PRIOR APPORAL FROM ENGINEER INCHARGE.
12. NECESSARY GEO-TECHNICAL INVESTIGATION HAS TO BE CARRIED OUT PRIOR TO CONSTRUCTION

NOTE: THE DRAWING IS ONLY FOR REFERENCE AND NOT FOR CONSTRUCTION

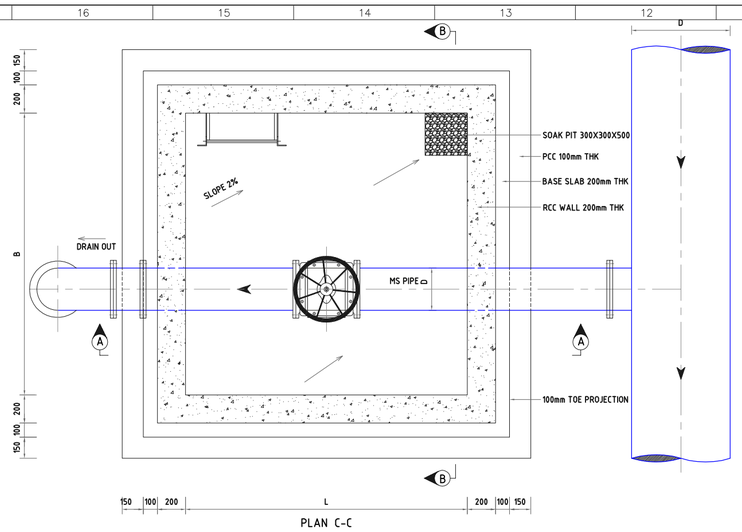
ABBREVIATION :-

MS : MILD STEEL
PCC : PLAIN CEMENT CONCRETE
THK : THICKNESS

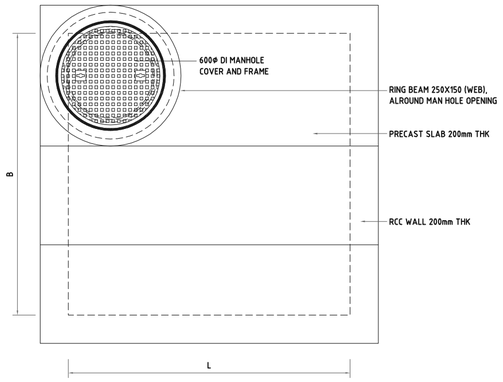
CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	STANDARD DRAWING BUTTERFLY VALVE CHAMBER WITH BYPASS ARRANGEMENTS ARCHITECTURAL DRAWING
CONSULTANTS	SECON BANGALORE - 66

SCALE	DWG. No.	REV.
1:20	SECON/OIL/WS/BF-10	0

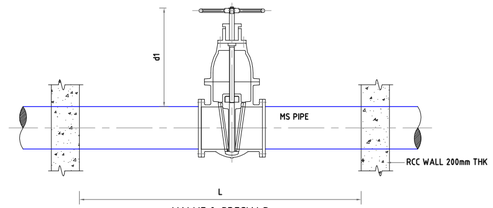
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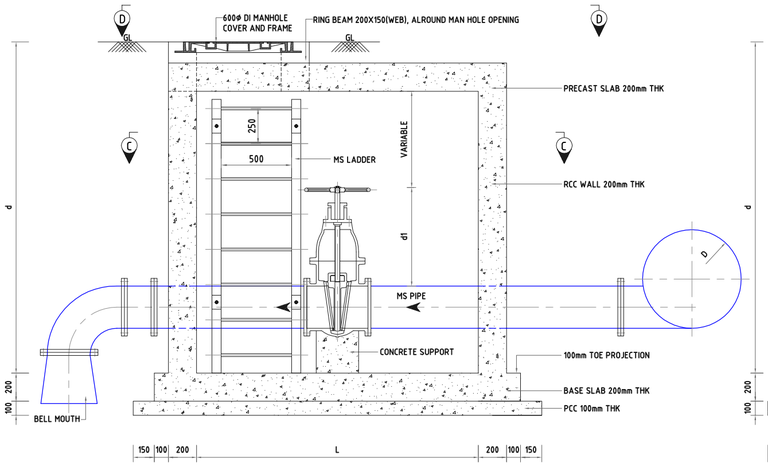
PLAN C-C



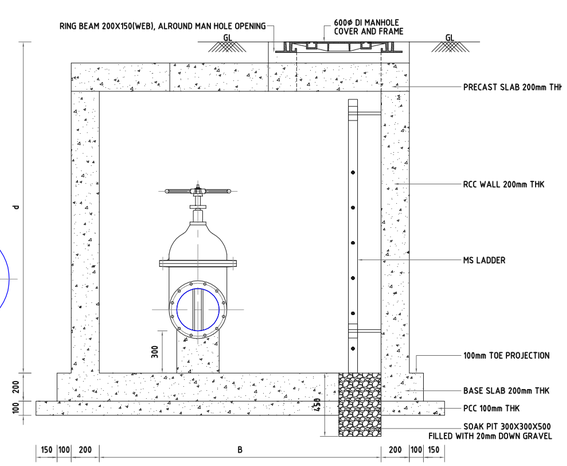
PLAN D-D



VALVE & SPECIALS



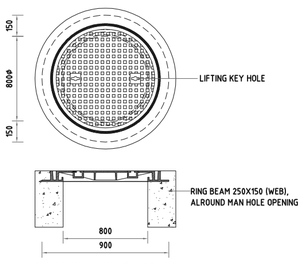
SECTION A-A



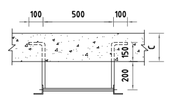
SECTION B-B

DIMENSIONS OF VALVE & SPECIALS

SL.NO	D	L	B	d	d1
1	800	2000	2000	2000	300



DI MANHOLE COVER & FRAME



MS LADDER

NOTE :-

1. ALL DIMENSIONS SHOWN ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
2. CO-ORDINATES ARE AS PER SITE CONDITIONS.
3. FOR LOCATION AND DEPTHS OF SCOUR VALVE REFER TO DRAWINGS OF PIPELINE PLANS AND PROFILES. LOCATION MAY VARY ACCORDING TO THE TOPOGRAPHY AND SITE CONDITIONS.
4. THE SPECIALS AND PIPE FITTINGS SHALL COMPLY WITH IS:7322 AND IS:1538 LATEST AMENDMENTS.
5. SCOUR VALVE SHALL COMPLY WITH IS:14845 WITH LATEST AMENDMENTS.
6. CEMENT :
   - CEMENT USED SHALL BE SULPHATE RESISTANT PORTLAND CEMENT, CONFORMING TO IS:12330.
   - RAPID HARDENING CEMENT, CONFORMING TO IS:8041 SHAL BE USED FOR PRECAST CONCRETE WITH PRIOR APPROVAL FROM THE ENGINEER INCHARGE.
   - TOTAL CHLORIDE CONTENT IN CEMENT SHALL IN NO CASE EXCEED 0.05% BY MASS OF CEMENT.
7. AGGREGATES :
   - ALL COARSE/FINE AGGREGATES SHALL CONFORM TO IS:383 WITH LATEST AMENDMENTS AND TEST FOR CONFORMITY SHALL BE CARRIED OUT AS PER IS:2386 PART I TO VIII.
   - THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER THE ENTIER INFORMATION INDICATED IN APPENDIX A OF IS:383
8. REINFORCE STEEL :
   - FOR REINFORCED CONCRETE, REINFORCEMENT STEEL SHALL COMPLY WITH IS:1786 (HIGH YEILD STRENGTH DEFORMEND BARS) OF GRADE 415.
9. WATER :
   - WATER USED FOR CONCRETING AND CURING SHALL BE CLEAN AND FREE FROM OILS, ACIDS, ALKALIES, SALTS, SUGAR, ORGANIC MATERIALS OR OTHER SUBSTANCES THAT MAY BE DELETERIOUS TO CONCRETE OR STEEL.
   - THE QUALITY OF WATER USED FOR CONCRETING AND CURING SHALL COMPLY WITH IS:3025 (PART 22-23).
10. CONCRETE :
    - ALL CONCRETING WORKS SHALL BE DONE IN ACCORDANCE WITH IS:456-2000 WITH LATEST AMENDMENTS.
11. MANHOLE COVER :
    - DI MANHOLE COVER SHALL COMPLY WITH EN-124 WITH LATEST AMENDMENTS SUBJECT TO PRIOR APPORAL FROM ENGINEER INCHARGE.
12. NECESSARY GEO-TECHNICAL INVESTIGATION HAS TO BE CARRIED OUT PRIOR TO CONSTRUCTION

NOTE: THE DRAWING IS ONLY FOR REFERENCE AND NOT FOR CONSTRUCTION

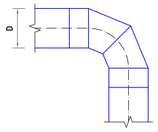
ABBREVIATION :-

MS : MILD STEEL
PCC : PLAIN CEMENT CONCRETE
THK : THICKNESS

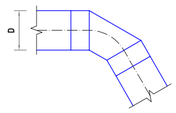
CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	STANDARD DRAWING SCOUR VALVE CHAMBER ARCHITECTURAL DRAWING
CONSULTANTS	SECON BANGALORE - 66
SCALE	1:20
DWG. No.	SECON/OIL/WS/SV-11
REV.	0

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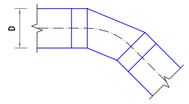
1) 61° - 90°



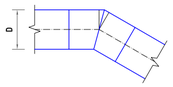
2) 46° - 60°



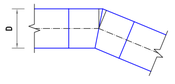
3) 31° - 45°



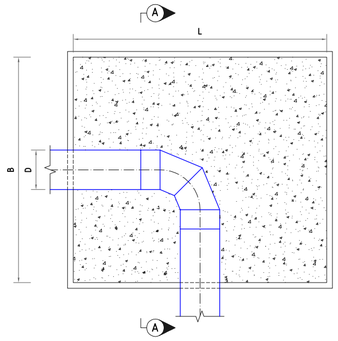
4) 16° 30°



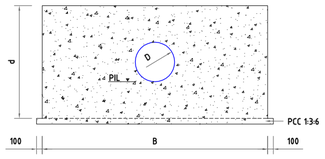
5) UP tO 15°



1) 90°

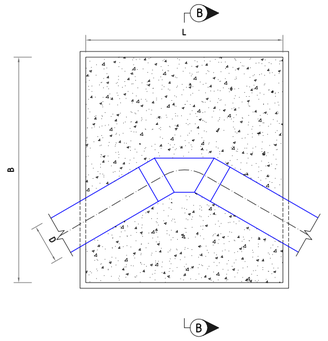


PLAN

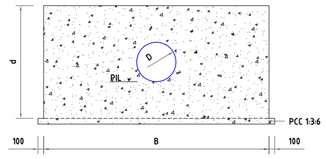


SECTION A-A

2) 60°

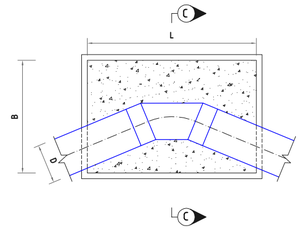


PLAN

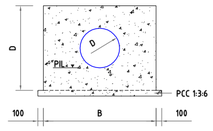


SECTION B-B

3) 45°

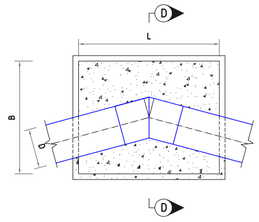


PLAN

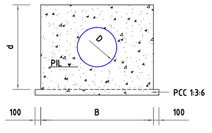


SECTION C-C

4) 30°

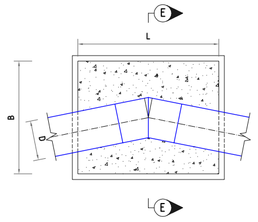


PLAN

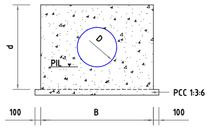


SECTION D-D

5) 15°



PLAN



SECTION E-E

DETAILS OF THRUST BLOCK

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE MENTIONED.
2. FOR LOCATION OF THRUST BLOCK, REF DRAWINGS OF PLAN AND PROFILE OF PIPE LINE.
3. THRUST BLOCK SHALL BE IN CLOSE CONTACT WITH UNDISTURBED GROUND. FOUNDATION SHALL MADE UP TO THE CORRECT LEVEL WITH PLAIN CEMENT CONCRETE.
4. THRUST BLOCK SHALL BE PROVIDED WITH MINIMUM SURFACE REINFORCEMENT OF 5kg/m². SPACING OF THE STEEL BARS SHALL NOT EXCEED 200mm.
5. CEMENT :
   - CEMENT USED SHALL BE SULPHATE RESISTANT PORTLAND CEMENT, CONFORMING TO IS:12330 IN CASE OF HIGHLY CORROSIVE SOIL.
   - TOTAL CHLORIDE CONTENT IN CEMENT SHALL IN NO CASE EXCEED 0.05% BY MASS OF CEMENT.
6. AGGREGATES :
   - ALL COARSE/FINE AGGREGATES SHALL CONFORM TO IS:383 AND TEST FOR CONFORMITY SHALL BE CARRIED OUT AS PER IS:2386 PART I TO VIII.
   - THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER THE ENTIRE INFORMATION INDICATED IN APPENDIX A OF IS:383
7. REINFORCE STEEL :
   - FOR REINFORCED CONCRETE, REINFORCEMENT STEEL SHALL CONFIRM TO IS:1786 (HIGH YEILD STRENGTH DEFORMEND BARS) OF GRADE 415.
8. WATER :
   - WATER USED FOR MIXING AND CURING SHALL BE CLEANED AND FREE FROM OILS, ACIDS, ALKALIES, SALTS, SUGAR, ORGANIC MATERIALS OR OTHER SUBSTANCES THAT MAY BE DELETERIOUS TO CONCRETE OR STEEL.
   - THE WATER USED FOR MIXING AND CURING SHALL BE TESTED IN ACCORDANCE WITH IS:3025 (PART 22-23).
9. CONCRETE :
   - ALL CONCRETE IN WORKS SHALL BE DONE IN ACCORDANCE WITH IS:456-2000 WITH LATEST AMENDMENTS.
   - DESIGN MIX SHALL BE CHECKED AND APPROVED BY THE ENGINEER INCHARGE PRIOR TO THE CONCRETING.
10. NECESSARY GEO-TECHNICAL INVESTIGATION HAS TO BE CARRIED OUT PRIOR TO CONSTRUCTION

ABBREVIATIONS

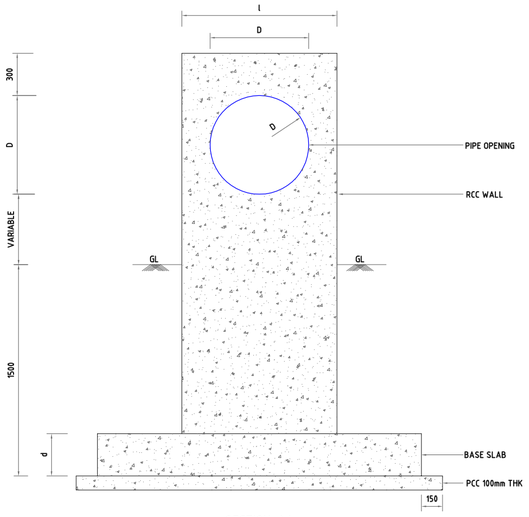
- PIL : PIPE INVERT LEVEL
- PCC : PLAIN CEMENT CONCRETE

NOTE: THE DRAWING IS ONLY FOR REFERENCE AND NOT FOR CONSTRUCTION

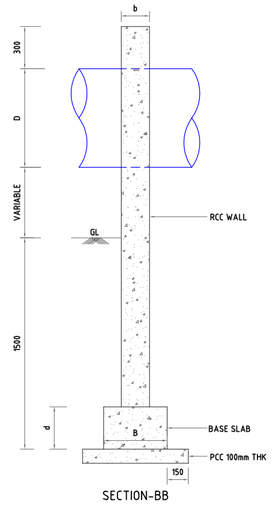
SL. No.	ANGLE OF DEFLECTION (DEGREES)	PIPE DIA-800mm(D)		
		SIZE OF THRUST BLOCK		
		LENGTH(L)	BREADTH(B)	DEPTH(d)
1	15	900	1500	1000
2	30	1000	1250	1250
3	45	1250	1500	1250
4	60	1500	1250	1500
5	90	2000	2000	1500

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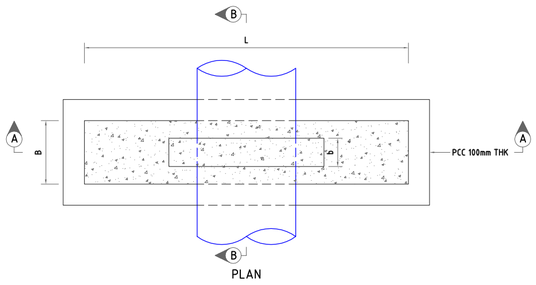
CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	STANDARD DRAWING PIPE-BENDS & THRUST-BLOCK ARCHITECTURAL DRAWING
CONSULTANTS	SECON BANGALORE - 66
SCALE	1:20
DWG. No.	SECON/OIL/WS/BT/12
REV.	0



SECTION-AA



SECTION-BB



PLAN

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED
2. ALL LEVELS ARE IN METERS
3. 40mm DOWN SIZE METAL FOR PCC WORK
4. THE BOTTOM LEVEL OF OPENING MAY BE VERIABLE ACCORDING TO GROUND PROFILE
5. NECESSARY GEO-TECHNICAL INVESTIGATION HAS TO BE CARRIED OUT PRIOR TO CONSTRUCTION

NOTE: THE DRAWING IS ONLY FOR REFERENCE AND NOT FOR CONSTRUCTION

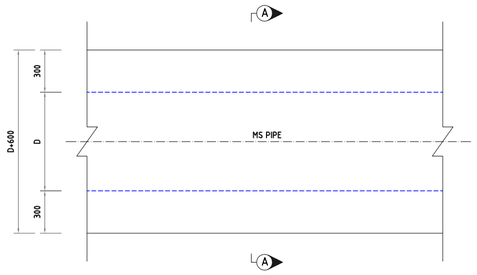
ABBREVIATIONS

GA : GENERAL ARRANGEMENT DRAWING
GL : GROUND LEVEL
PCC : PLAIN CEMENT CONCRETE
SA : SADDLE

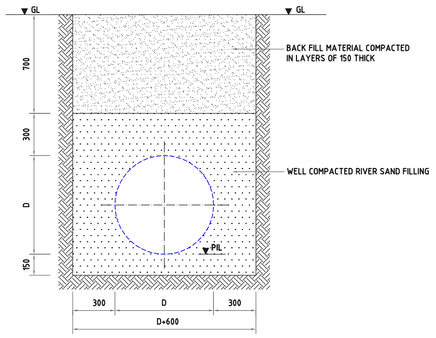
SL. No.	PIPE DIA (D)	SIZE OF FOOTINGS			SIZE OF SADDLE	
		LENGTH (L)	BREADTH (B)	DEPTH (D)	LENGTH (l)	BREADTH(b)
1.	800mm	2300	450	300	1100	200

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	STANDARD DRAWING PIPE SADDLE/ANCHOR BLOCK ARCHITECTURAL DRAWING
CONSULTANTS	SECON BANGALORE - 66
SCALE	1:20
DWG. No.	SECON/OIL/WS/SD/13
REV.	0

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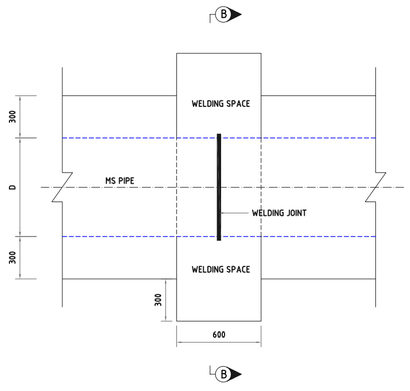


PLAN

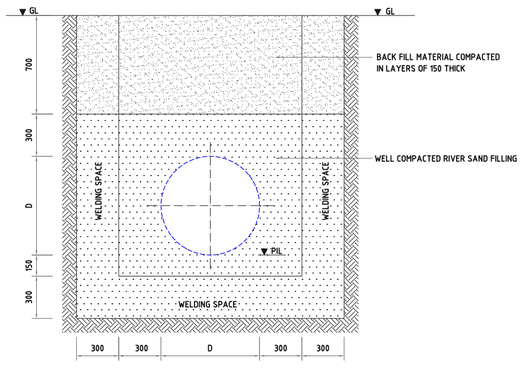


SECTION A-A

PIPING TRENCH



PLAN



SECTION B-B

TYPICAL WELD PIT DETAIL AT WELDING JOINT IN PIPE TRENCH

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE MENTIONED.
2. EARTHWORK EXCAVATION :

   EARTHWORK EXCAVATION FOR THE PIPE LINE TRENCHES IN DIFFERENT SOIL STRATA AND DEPTHS NECESSARY FOR LAYING OF THE PIPE SHALL BE CARRIED AS PER THE FOLLOWING CODE REQUIREMENTS.

   - IS:3764 – SAFETY CODE FOR EXCAVATION WORK.
   - IS:2720 – METHOD OF TEST OF SOILS (ALL PARTS).
   - IS:1498 – CLASSIFICATION AND IDENTIFICATION OF SOILS FOR GENERAL ENGINEERING PURPOSES.
   - IS:2809 – GLOSSARY OF TERMS AND SYMBOLS RELATING TO SOIL ENGINEERING.
   - IS:4081 – SAFETY CODE FOR BLASTING AND RELATED DRILLING OPERATIONS.
   - IS:4988 – GLOSSARY OF TERMS AND CLASSIFICATIONS OF EARTH MOVING MACHINERY (ALL PARTS).
   - IS:5822 – CODE OF PRACTICE FOR LAYING OF ELECTRICALLY WELDED STEEL PIPES FOR WATER SUPPLY.
3. SHORING AND STRUTTING :

   SHORING AND STRUTTING SHALL BE PROVIDED IN LOOSE AND SOFT SOIL WITH PROPER BARRICADING ARRANGEMENTS, WITH WARNING LAMPS AND SIGN BOARDS FOR ENSURING SAFETY.
4. DISPOSAL OF EXCAVATED MATERIALS :

   THE EXCAVATED SOILS SHALL BE DISPOSED OFF FROM THE SITE AFTER THE BACKFILLING OF THE PIPE LINE TRENCHES TO THE AREA IDENTIFIED AND AS DIRECTED BY THE ENGINEER.
5. BACKFILLING :

   BACKFILLING SHALL BE DONE WITH APPROVED MATERIAL FROM THE SELECTED AVAILABLE EXCAVATED EARTH AND SHALL BE REFILLED TO THE ORIGINAL SURFACE MAKING DUE ALLOWANCE FOR SETTLEMENT, IN LAYERS NOT EXCEEDING 150 MM COMPACTED USING THE RAMMING EQUIPMENTS OR VIBRATOR WITH WATERING AND CONSOLIDATION TO ACHEIVE 95% PROCTOR DENSITY.
6. PRESERVATION OF PROPERTY :

   THE CONTRACTOR SHALL UNDERTAKE ALL REASONABLE PRECAUTIONS FOR THE PROTECTION AND PRESERVATION OF ANY OR ALL EXISTING ROADSIDE TREES, SEWERS OR OTHER SUB-SURFACE DRAINS, PIPES, CONDUITS AND ANY OTHER STRUCTURES UNDER OR ABOVE GROUND, WHICH MAY BE AFFECTED BY CONSTRUCTION.
7. D=DEPTH OF BEDDING+150mm
8. MINIMUM EARTH COVER=1000mm FROM THE CROWN OF THE PIPE
9. PIPE MATERIAL MS PIPE
10. WELDING PIT SHALL BE PROVIDED AT PIPE JOINT AS DESCRIBEL IN THE DRAWING,300mmX600mmX300mm FROM THE BOTTOM OF THE PIPE

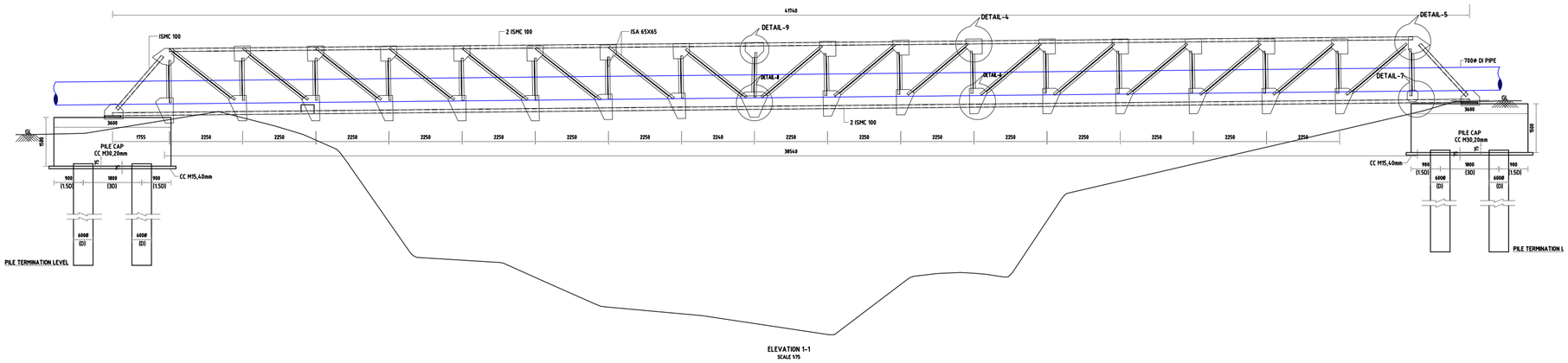
NOTE: THE DRAWING IS ONLY FOR REFERENCE AND NOT FOR CONSTRUCTION

ABBREVIATIONS

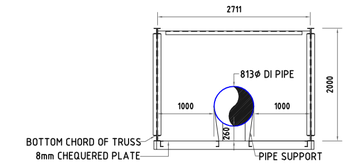
- D : DIAMETER OF THE PIPE
- GL : GROUND LEVEL
- MS : MILD STEEL
- PIL : PIPE INVERT LEVEL

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	STANDARD DRAWING TRENCH DETAILS ARCHITECTURAL DRAWING
CONSULTANTS	SECON BANGALORE - 66
SCALE	1:20
DWG. No.	SECON/OIL/WS/TD/14
REV.	0

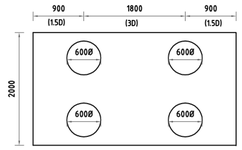
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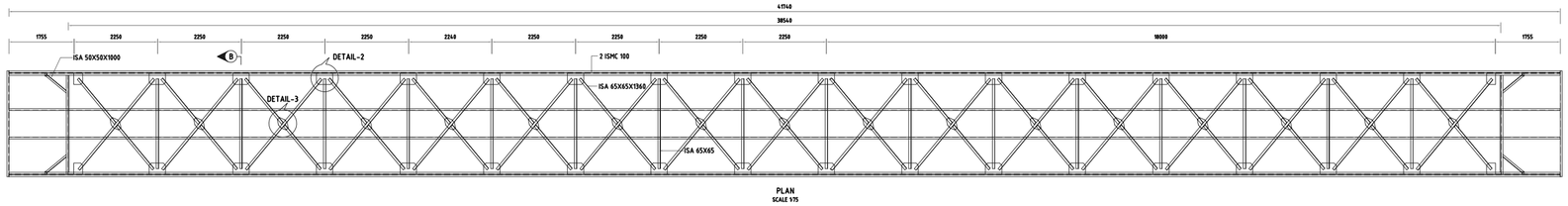
ELEVATION 1-1
SCALE 1:75



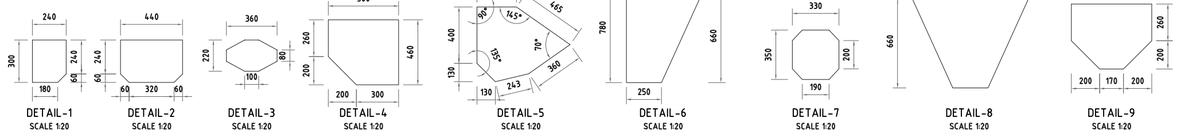
SECTION B-B
SCALE 1:50



PLAN OF PILE FOUNDATION
SCALE 1:50



PLAN
SCALE 1:75

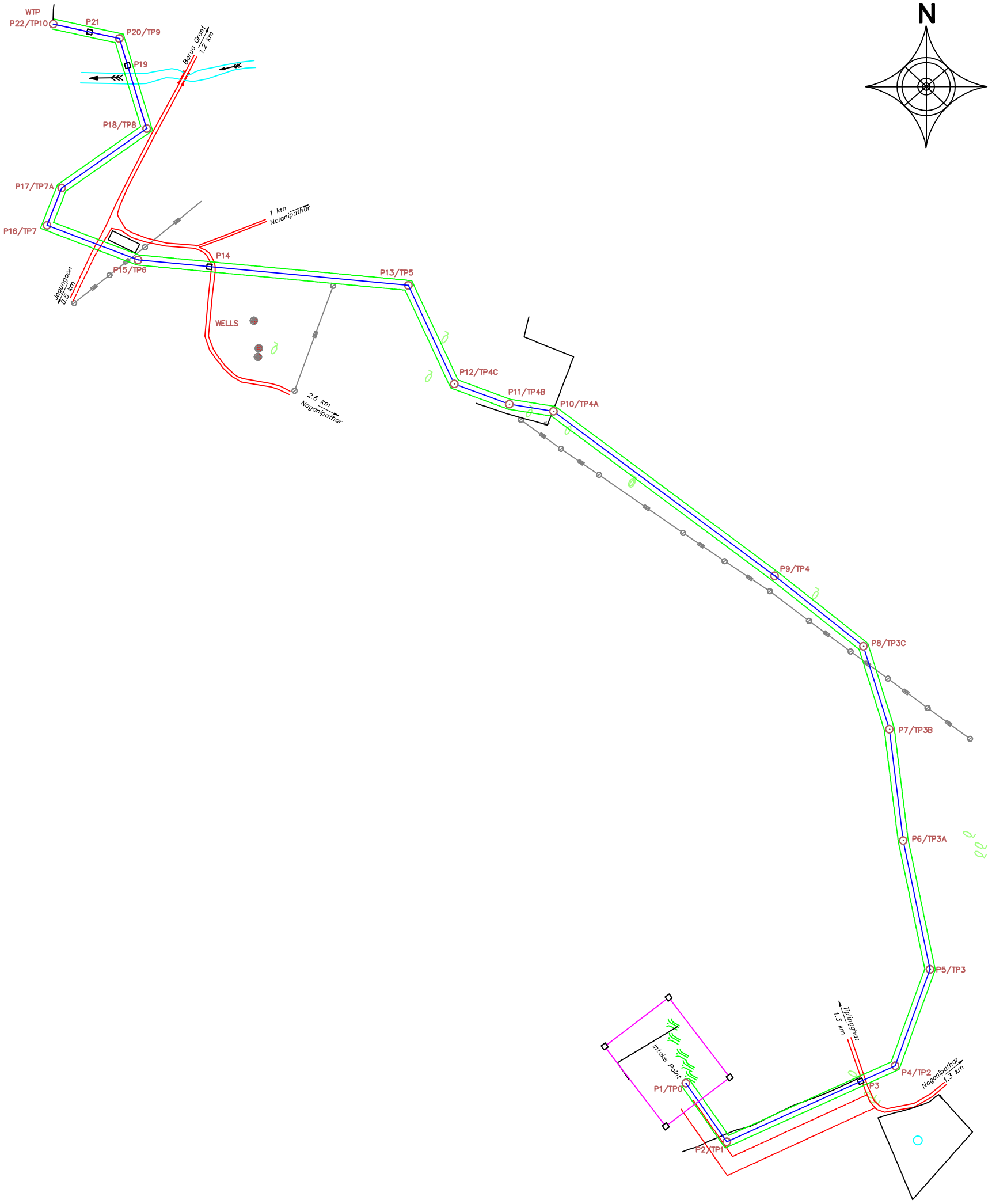


NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE MENTIONED
2. THE GRADE OF CONCRETE IS M30.
3. THE DRAWING IS ONLY FOR REFERENCE AND NOT FOR CONSTRUCTION.
4. THE OREINTATION OF THE BRIDGE SHALL BE AS PER THE PIPELINE AND SITE CONDITION.
5. THE DESIGN SHALL BE CARRIED OUT AS PER IS800:2007
6. ALL STRUCTURAL STEEL SECTIONS SHALL BE AS PER IS SP6:2004
7. THE DESIGN SHALL BE CARRIED OUT FOR THE EARTH QUAKE ZONE-5
8. THE BRIDGE SHALL BE DESIGNED/CONSTRUCTED ONLY FOR PIPE LINE CARRYING AND NOT FOR OTHER PURPOSE.
9. THE LOADING SHALL BE AS PER IS875:1987
10. THE FABRICATION OF THE STEEL STRUCTURE AS PER IS STANDRDS IS:802 PART2:1978
11. ELASTOMERIC BEARING SHALL BE PROVIDED AS PER IRC 083-2.
12. THE GUSSET PLATES SHOWN IN THE DRAWING ONLY FOR REFERENCE.
13. THE JOINT CONNECTION SHALL BE CARRIED OUT USING BOLTS/WELD AS PER IS CODE IS:4000

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM
TITLE	STANDARD DRAWING MS TRUSS BRIDGE FOR TIPLING RIVER CROSSING GENERAL ARRANGEMENT
CONSULTANTS	SECON BANGALORE - 66
SCALE	AS SHOWN
DWG. No.	SECON/OIL/WS/MSB/15
REV.	0

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LEGENDS

- PROPOSED WATER PIPELINE
- TP — TURNING POINT
- P — INTERMEDIATE POINT
- PROPOSED ROW LIMIT

CLIENT: OIL INDIA LIMITED
DULIAJAN, ASSAM

SURVEY CONSULTANTS: SECON
BANGALORE - 66

SECTION : INTAKE POINT to WTP
LENGTH : – 1953.45 METER
ROW WIDTH = 10 m
SCALE : 16 "=1 MILE

SURVEY SHEET NO : 1

PLOTTED BY : K.P NACHAIAH
CHECKED BY : VISHAL BANDELWAR CAMP OFFICER : SUNIL PRADHAN

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SURVEY DETAILS

| | | |

PART-V

SAFETY MEASURE (SM)

To,

GM-CONTRACTS(HoD)
OIL INDIA LIMITED
DULIAJAN-786602

SUB: SAFETY MEASURES

Description of work/service: Hiring Services for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning of Pontoon Type Raw Water in-take Plant including cross country Raw Water Pipeline, Plant Piping and all Electrical and Instrumentation jobs on EPC-LSTK Basis at Oil India Limited, Duliajan, Assam.

Sir,

We hereby confirm that we have fully understood the safety measures to be adopted during execution of the above contract and that the same have been explained to us by the concerned authorities. We also give the following assurances.

a) Only experienced and competent persons shall be engaged by us for carrying out work under the said contract.

b) The names of the authorized persons who would be supervising the jobs on day to day basis from our end are the following:

i) _____

ii) _____

iii) _____

The above personnel are fully familiar with the nature of jobs assigned and safety precautions required.

c) Due notice would be given for any change of personnel under item(b) above.

d) We hereby accept the responsibility for the safety of all the personnel engaged by us and for the safety of the Company's personnel and property involved during the course of our working under this contract. We would ensure that all the provisions under the Oil Mines Regulations, 1984 and other safety rules related to execution of our work would be strictly followed by our personnel. Any violation pointed out by the Company's Engineers would be rectified forthwith or the work suspended till such time the rectification is completed by us and all expenditure towards this would be on our account.

e) We confirm that all persons engaged by us would be provided with the necessary Safety Gears at our cost.

f) All losses caused due to inadequate safety measures or lack of supervision on our part would be fully compensated by us and the Company will not be responsible for any lapses on our part in this regard.

g) We shall abide by the following HSE (Health, Safety & Environmental) POINTS:

GENERAL HEALTH, SAFETY & ENVIRONMENT (HSE) POINTS:

A. Condition of Works: Standard conditions of work as below:

(1) The contractor should arrange all the requisite Manpower and Tools & Machinery for materials transportation, handling and execution of the jobs as detailed in the scope of work.

(2) The contractor must work on Sundays and Holidays whenever required with prior permission from representative of OIL/PMC.

(3) The contractor/authorized representative of contractor shall be informed for job execution by representative of OIL/PMC.

(4) No accommodation, transportation, portable water, electricity, etc will be provided by OIL against this contract.

(5) Water for hydraulic testing will be sourced by the Contractor. All other necessary arrangement including pump, etc. is also to be made by the contractor for hydro test.

(6) Any material found defective due to poor workmanship will have to be replaced by the contractor at his own cost.

(7) Security and responsibility of all company's materials will have to be borne by the contractor once these are handed over to the contractor till the same are returned to the company after completion of work(s).

(8) The contractor shall not engage minor laborer below eighteen (18) years of age under any circumstances.

(9) Any non-technical/local problem causing disruption of work arising in the work site shall have to be settled by the contractor at his own cost.

(10) Building Materials, Equipment, Pipes and pipe fittings etc. are to be transported by the Contractor at his own cost from Field Engineering Yard/Any other yard to the site including loading/unloading causing without any damage to the materials. In case of any damage of materials, the same have to be rectified or replaced by the contractor at own cost as per instruction of OIL's representative.

(11) Any defect during Construction/installation/testing/commissioning/ Welding shall have to be rectified or replaced at contractors cost.

(12) All materials for cutting and beveling of pipes and digging of trench/pit for hooking up job are to be provided by the Contractor. All safety precautions are to be observed.

(13) All necessary equipment/materials such as pumps, valves, fittings, pipes etc. required for hydraulic testing will be arranged by the Contractor.

(14) While cutting across asphalted/graveled road the pipe should pass the road crossing at the same level through a suitable casing pipe in it. The Contractor has to place the casing pipe properly through which the carrier pipe shall be inserted. The casing pipe of suitable size will be supplied by the Company. The trench should be restored back to the original condition by the Contractor. The Contractor shall have to arrange for emergency traffic diversion, road

closer sign, skid etc. The weld joints on the casing as well as pipes and two ties at the end shall be considered as a part of road crossing.

(15) If painting is required for any equipment/pipeline, then prior to painting all such surfaces are to be cleaned. Exterior surfaces are to be scrapped thoroughly by means of emery tapes, wire brush to the entire satisfaction of OIL's representative. After thorough cleaning, Primer (Red-Oxide) as a 1st coat is to be applied on the surface of the pipeline, vales, etc along with trestles and allow the primer to dry completely. Thereafter, the contractor shall be required to apply enamel paint on the above pipeline surfaces. The shades of the enamel paint shall be designated by the representatives of OIL/PMC. All the materials i.e. brushes, emery paper, primer, paint, safety gadgets like safety shoe, hand gloves, goggles etc., including efficient supervisor/manpower will have to be provided by the Contractor.

(16) For any clarification with regard to the above, the contractor may contact the representative of OIL/PMC.

B. Safety Guidelines

(a) The following General Health, Safety & Environment (HSE) points will have to be followed by the contractor strictly.

i. It will be solely the Contractor's responsibility to fulfill all the legal formalities with respect to the Health, Safety and Environmental aspects of the entire job (namely; the person employed by him, the equipment, the environment, etc.) under the jurisdiction of the district of that state where it is operating. Ensure that all sub-contractors hired by him comply with the same requirement as the contractor himself and shall be liable for ensuring compliance of all HSE laws by the sub or sub-sub contractors.

ii. Every person deployed by the contractor must use appropriate PPEs (Personal Protective Equipment) to be provided by the contractor. The Contractor shall provide Personnel Protective Equipment as per the hazard identified and risk assessed for the job and conforming to statutory requirement and company's PPE schedule. Safety appliances like protective footwear, Safety Helmet and Full Body harness shall conform to relevant IS codes. Necessary supportive document shall have to be submitted as proof. If the Contractor fails to provide the safety items as mentioned above to the working personnel, the Contractor may apply to the Company (OIL) for providing the same. OIL will provide the safety items, if available. But in turn, OIL will recover the actual cost of the items by deducting from Contractor's Bill. However, it will be the Contractor's sole responsibility to ensure that the persons engaged by him in the mines use the proper PPE while at work. Contractor employees should be trained in the proper use and maintenance of PPE. In absence of appropriate PPEs, the representative of OIL/PMC has the right to stop the work which will be binding for the Contractor. Moreover, the accountability towards any delay in work/ penalty due non-adherence to PPE shall be binding to the Contractor.

iii. Soft copy of SOP related to scope of work will be handed over to the OIL Engineer in charge by contractor including an assessment of risk, wherever possible and safe methods to deal with it/them. Printout of copy (spiral binding) of the SOP mentioned above is to be kept with all working teams at all times. The SOP clearly stating the risk arising to men, machineries & material from the mining operation / other operations to be done by the contractor and how it is to be managed. However; in case of any doubts, the Contractor shall reconfirm the same from the Engineer In Charge.

iv. Contractor has to ensure that all work is carried out in accordance with the Statute and SOP and for the purpose he may deploy adequate qualified and competent personnel for the purpose of carrying out the job in a safe manner. For work of a specified scope/nature, he should develop and provide to both the representatives of OIL and PMC, who shall be supervising the contractor's work, a site specific code of practice in line.

v. In case of deviation of SOP or non-availability of SOP, job Safety Analysis (JSA) shall be carried out before commencement of the work.

vi. All persons deployed by the contractor for working in a mine must undergo Mines Vocational Training, initial medical examination and Periodic Medical Examination (if required). They should be issued cards stating the name of the contractor and the work and its validity period, indicating status of MVT, IME & PME.

vii. Necessary facilities for monitoring the levels of parameters in respect of Methane, Oxygen, Hydrogen Sulphide and Carbon Monoxide should be provided at mines. Portable multi-gas detector (LEL/O2/CO/H2S) and FLP tool, torch light etc.to be made available at site

viii. The contractor shall be solely responsible to comply all the statutory norms as applicable while executing the job.

ix. It will be entirely the responsibility of the Contractor/his Supervisor/representative to ensure strict adherence to all HSE measures and statutory rules during operation in OIL's installations and safety of workers engaged by him. The crew members will not refuse to follow any instruction given by OIL/PMC's Safety Officer / Engineer / Official / Supervisor/Junior Engineer for safe operation.

x. Any compensation arising out of the job carried out by the Contractor whether related to pollution, Safety or Health will be paid by the contractor only. Contractor shall keep a reasonable degree of order by disposing of accumulated rubbish and excess material. Disposal of solid wastes generated by the Contractor shall be in accordance with the company's Procedure for Solid Waste Management.

xi. Any compensation arising due to accident of the Contractor's personnel while carrying out the job, will be payable by the contractor and their medical treatment/ facilities in case of accidents should be provided by the same Contractor. The contractor's personnel should be aware about the existing as well as probable hazards and ensured their training to tackle such untoward events by the Contractor.

xii. The contractor shall have to report all incidents including near miss to both the representatives of OIL and PMC who shall be supervising the contractor's work.

xiii. The contractor has to keep a register of the persons employed by him/her. The contractor's supervisor shall take and maintain attendance of his men every day for the work, punctually.

xiv. If the company arranges any safety class / training for the working personnel at site (company employee, contractor worker, etc.) the contractor will not have any objection to any such training.

xv. The health check up of contractor's personnel is to be done by the contractor in OIL empanelled Hospital and the reports and statutory forms as applicable to be vetted from the OIL authorised Medical Officer. The frequency of periodic medical examinations should be every five years for the employees up to 45 years of age and every three years for employees of 45 years of age and above.

xvi. The contactor personnel shall arrange daily tool box meeting and monthly pit level meeting headed by the OIL Engineer and maintain records accordingly.

xvii. a) It may be noted that as per DGMS circular & Gazatte Notification for maintenance of register as required by the Mines Act 1952 and Mines Rules, 1955, the forms A, B, D and E have been updated and modified. The above mentioned forms needs to be maintained as per the new format.

b) All other statutory forms to be maintained in respect to Mines Act, 1952, Mines Rules 1955, Oil Mines Regulations 2017 and other applicable laws.

xviii. The Contractor shall submit to DGMS returns indicating –Name of his firm, Registration number, Name and address of person heading the firm, Nature of work, type of deployment work persons, Number of work persons deployed, how many work persons hold VT Certificate, how many work persons undergone IME and type of medical coverage given to the work persons.

xix. The return shall be submitted quarterly (by 10th of April, July ,October & January) for contracts of more than one year . However, for contracts of less than one year, returns shall be submitted monthly.

xx. The Contractor shall report all near misses, minor and, reportable accident to the Engineer in Charge and maintain the record of near misses as per OIL's practice, and accidents in the Form- J for Reportable accident and Form – K for Minor Accidents as per The Mines Rules 1955 in consultation with the Engineer in Charge.

xxi. A contractor employee must, while at work, take reasonable care for the health and safety of people who are at the employee's place of work and who may be affected by the employee's act or omissions at work.

xxii. A contractor employee must, while at work, cooperate with his or her employer or other persons so far as is necessary to enable compliance with any requirement under the act or the regulations that is imposed in the interest of health, safety and welfare of the employee or any other person.

xxiii. Contractor's arrangements for health and safety management shall be consistent with those for the company.

xxiv. In case Contractor is found non-compliant of HSE laws as required, company will have the right for directing the contractor to take action to comply with the requirements, and for further non-compliance, the contractor will be penalized as per prevailing relevant Acts/Rules/Regulations.

xxv. When there is a significant risk to health, environment or safety of a person or place arising because of a non-compliance of HSE Measures Company will have the right to direct the contractor to cease work until the non-compliance is corrected.

xxvi. The contractor should prevent the frequent change of his employees deployed as far as practicable. The contractor shall not employ or terminate his worker without the knowledge of the OIL engineer in charge.

xxvii. The contractor should frame a mutually agreed bridging document between OIL & the contractor with roles and responsibilities clearly defined.

xxviii. For issues not envisaged under the terms and conditions of the contract, the contractor should give consent for formulating a mutually agreed bridging document between OIL and the contractor with the roles and responsibilities clearly defined.

xxix. The First-Aid box should be provided by the Contractor and the same has to be kept ready to use at the site throughout the working hours.

xxx. The availability of First-Aid Fire Fighting equipment should be ensured by the Contractor at all working hours.

xxxi. Contractors/ Supervisor/ Contractor's personnel needs to be aware about the site specific emergency response plan (which includes display of emergency contact nos., establish telephone communication, layout of working area, use of fire extinguisher, emergency exit, assembly point).

xxxii. Smoking is prohibited in all COMPANY Restricted Areas except in authorized smoking areas/ shelters. Carrying of matches and lighters into the Hazardous Area is prohibited. Cellular phones shall not be used in operating areas / hazardous areas unless they have been classified as 'intrinsically safe' for use in that atmosphere. Consumption of alcohol and possession of non- prescribed drug in COMPANY work site is strictly prohibited.

xxxiii. Considering the ongoing Covid-19 pandemic, those who are engaged in the above operations should be followed the Covid-19 Protocol.

(b) Specific Safety measures for the job: The bidder will have to strictly follow the following norms / guidelines.

1. Necessary cold and hot work permits including excavation clearance and permission for working at height as applicable are to be obtained by the competent person of the Contractor from the site representative of OIL/PMC before start of the job(s).

2. While carrying out the welding and cutting work, the contractor should strictly enforce the guidelines as stated in OMR-2017 and OIL's SOP VOL-II (Safe Maintenance Procedure for Floating roof crude oil tanks)

3. The gas cutting sets will have to be fitted with flash back arrestors in the regulator side as well as nozzle side.

4. The jobs of pipe line laying will have to be executed as per strict compliance of regulations enforced by State Pollution Control Board.

5. All Lifting equipment of the Contractor like Crane etc. shall have to be duly calibrated. Calibration Certificate of these equipment shall have to be shown to the representatives of PMC/OIL, IF deemed required.

6. All personnel of the Contractor working near Water Bodies like river, stream, pond etc shall have to mandatorily wear Life Jacket apart from the requisite PPE. While working near water bodies, appropriate safety and precautionary measures are to be adopted.

7. While working at Height all personnel of the Contractor must mandatorily use appropriate safety harness conforming to the relevant Indian standard.

8. During transportation of line pipes by road, they should be tied up securely with rope/ chain on trailers, to prevent toppling over of pipes on bumpy roads alongwith necessary signage. The pipes should be unloaded carefully to prevent damage at the ends/ body of the pipes.

9. The trenching operation should be just ahead of welding operation. This will avoid deep trenches remaining open for many days, creating safety hazards. In any case all the open tranches dug are to be suitably barricaded and marked.

10. Before lowering the pipeline in the trench, it should be ensured that no person is present inside the trench. In case the sides cave in, the pipeline should be kept adequately supported before removing loose soil from underneath.

11. Utmost care is to be observed in deciding the number of the tripods with chain pulley blocks for handling any job. Also the capacity of the chain pulley blocks must be minimum 1.5 times the weight of the material it is going to lift / lower. Two point anchoring may be used wherever required as additional safety measure.

12. After receipt of the workorder the contractor shall have to submit authorized list of contract personnel, who will be engaged for the jobs including name of the Contractor's competent persons and every contact details.

13. Necessary sign board / warning signals like caution, "hot work" in progress, emergency telephone numbers, no entry without permission etc. should be used while working on tanks. The said signals / sign boards shall have to be arranged by the contractor. Barricading of area to be done with reflecting tapes as applicable during work.

14. The contractor shall clear all the rubbish and surplus materials from the site on completion of the work and shall have to leave the site clean and tidy.

15. The contractor have to ensure complete safety of the personnel engaged by him, and of all the equipment they will handle and must take full responsibility for their safety.

16. The contractor have to ensure the quality and reliability of all the tools, equipment and instruments they use. The documents relevant to prove the above should be submitted. Defective tools shall be immediately removed.

17. The daily attendance register of contractor's personnel shall have to be signed by the contractor or his authorized representative.

18. The contractor has to provide suitable facility such as Drinking Water, and sanitation.

19. The contractor personnel have to take every possible care to keep the environment clean and free from pollution.

20. The contractor personnel should understand the implication of the known hazards related to the work undertaken by them and the necessity of having an emergency plan approved by OIL to counter them, if anything goes wrong.

21. Safety Briefing, Evacuation plan in case of emergency and how to inform (in case of emergency) to be discussed during the tool box meeting.

(c) Electrical Safety Points:

1. Every person deployed by the contractor must wear safety gadgets. The Contractor shall provide proper Personnel Protective Equipment as per the hazard identified and risk assessed for the job and conforming to statutory requirement and company PPE schedule. Safety appliances like protective footwear, safety helmet and full body harness shall conform to relevant IS codes

2. Contractor has to ensure that all work is carried out in accordance with the Statute and SOP and for the purpose he may deploy adequate qualified and competent personnel for

the purpose of carrying out the job in a safe manner. For work of a specified scope / nature, he should develop and provide a site specific code of practice (site specific SOP or job specific SOP) in line.

3. Contractor personnel must confirm that, necessary Electrical isolation / energization permit etc. are obtained by OIL's Engineer/ Junior Engineer (Elect.) before starting the jobs.

4. The contractor should have valid Electrical Contractor License issued or recognized/endorsed by State Licensing Board, Govt. of Assam. In case license expires during contract period the same shall be renewed by the contractor. The contract may be terminated if the license is not renewed. In case the contractor/firm does not possess Electrical Contractor License, he/the firm may form a consortium with another person/firm who/which possesses valid Electrical Contractor License issued or recognized/endorsed by State Licensing Board, Govt. of Assam. In such a case, the partner having the valid Electrical contractor license shall be responsible for executing the electrical portion of the contract as per stipulations detailed in the tender.

5. Contractor shall employ work persons with valid wireman permit (covering relevant portions), issued/recognised by State Licensing Board, Govt. of Assam to carry out all electrical jobs and shall deploy supervisor holding valid Electrical supervisor's competency certificate (covering relevant portions), issued/recognized/endorsed by State Licensing Board, Govt. of Assam for supervision of electrical jobs.

6. Quality of jobs carried out by the Contractor shall be of high standard and should be as per the norms of BIS, NEC, CEA Regulations and other electrical standards recognized by the company.

(Seal) Yours Faithfully,

Date_____ M/s._____

FOR & ON BEHALF OF CONTRACTOR

PART-VI
INTEGRITY PACT(IP)

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 **Hiring Services for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning of Pontoon Type Raw Water in-take Plant including cross country Raw Water Pipeline, Plant Piping and all Electrical and Instrumentation jobs on EPC-LSTK Basis at Oil India Limited, Duliajan, Assam.** 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 cooperates with the renowned international Non-Governmental Organization "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 Page 2 of 6 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 h e/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 cartelization in the bidding process.

3. The Bidder/Contractor will not commit any offence under the relevant Anticorruption 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. Any issue relating to execution of contract, if specifically raised before the IEMs shall be looked into by IEMs.

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 undertake(s) to procure 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/ Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor, which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the 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 Subcontractors. 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. However, the Independent External Monitor shall give an opportunity to the bidder / contractor to present its case before making its recommendations to the Principal.

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 clause 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 intensions.

.....	**.....**
For the Principal	**For the Bidder/Contractor**
	Witness 1: .....
	Witness 2: .....

Place.
Date .

BID FORM

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

Sub: IFB No. CDI2352P23

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 work/services in conformity with the said conditions of Contract and Terms of Reference for the sum quoted in the Price Bid Format 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 as per the terms & conditions set out in the subject tender.

If our Bid is accepted, we will submit the Performance Security Deposit as specified in the tender document for the due performance of the Contract.

We agree to abide by this Bid for a period of **120 days** from the date of 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 _____ 20__.

Authorised Person's Signature: _____

Name: _____

Designation: _____
Seal of the Bidder:

STATEMENT OF NON-COMPLIANCE (IF ANY)

(Only exceptions/deviations to be rendered)

1.0 The Bidder shall furnish detailed statement of **exceptions/deviations**, if any, to the IFB 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

Signature of Bidder: _____

Name: _____

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 Non-Compliance**" in the above Proforma is left blank (or not submitted along with the Bid), then it would be construed that the bidder has not taken any exception/deviation to the IFB requirements.

PROFORMA LETTER OF AUTHORISATION FOR ATTENDING BID OPENING

TO
GM- CONTRACTS (HoD)
OIL INDIA LIMITED
P.O. DULIAJAN-786602
Assam, India

SUB: OIL's IFB No. CDI2352P23

Sir,

I/We _____ confirm that Mr. _____ (Name and address) as authorised to represent us during bid opening on our behalf with you against IFB No. CDI2352P23 for **Hiring Services for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning of Pontoon Type Raw Water in-take Plant including cross country Raw Water Pipeline, Plant Piping and all Electrical and Instrumentation jobs on EPC-LSTK Basis at Oil India Limited, Duliajan, Assam.**

Yours Faithfully,

Authorised Person's Signature: _____

Name: _____

Signature of Bidder: _____

Name: _____

Date: _____

PROFORMA FOR LETTER OF AUTHORITY

TO
GM- CONTRACTS (HoD)
Contracts Department
P.O. DULIAJAN PIN-786602
Dist. Dibrugarh, Assam, India

SUB: OIL's IFB No. CDI2352P23

Dear Sir,

We, _____ of _____ confirm that Mr. _____ _____ (Name and Address) is authorised to represent us to Bid, negotiate and conclude the agreement on our behalf with you against IFB No. CDI2352P23 for **'Hiring Services for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning of Pontoon Type Raw Water in-take Plant including cross country Raw Water Pipeline, Plant Piping and all Electrical and Instrumentation jobs on EPC-LSTK Basis at Oil India Limited, Duliajan, Assam'** for any commercial / Legal purpose etc.

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

Authorised Person's Signature: _____

Name: _____

Yours faithfully,

Signature: _____

Name & Designation _____

For & on behalf of _____

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.

FORM OF BID SECURITY (BANK GUARANTEE FORMAT)

To

M/s. OIL INDIA LIMITED,
CONTRACTS DEPARTMENT,
DULIAJAN, ASSAM, INDIA, PIN - 786602.

WHEREAS, _____(Name of Bidder) (hereinafter called "the Bidder") has submitted their offer Dated_____ for the provision of certain services (hereinafter called "the Bid") against OIL INDIA LIMITED, Duliajan, Assam, India (hereinafter called the Company)'s Tender 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 said Bank this _____day of _____20__.

THE CONDITIONS of these obligations are:

1. If the Bidder withdraws their Bid within its original/extended validity; or
2. The Bidder modifies/revises their bid suo moto; or
3. The Bidder does not accept the contract; or
4. The Bidder does not furnish Performance Security Deposit within the stipulated time as per tender/contract; or
5. If it is established that the Bidder has submitted fraudulent documents or has indulged into corrupt and fraudulent practice.

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 any of the 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.

The details of the Issuing Bank and Controlling Bank are as under:

A. Issuing Bank:

BANK FAX NO:
BANK EMAIL ID:
BANK TELEPHONE NO.:
IFSC CODE OF THE BANK:

Contd.....P/2

B. Controlling Office:

Address of the Controlling Office of the BG issuing Bank:

Name of the Contract Person at the Controlling Office with Mobile No. and e-mail address:

Notwithstanding anything contained herein:

a) Our liability under this Bank Guarantee shall is restricted up to Rs.……
b) This guarantee shall be valid till ……
c) We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only and only if you serve upon us a written claim or demand on or before …… (Date of Expiry of BG PLUS one year claim period).
d) At the end of the claim period that is on or after ……. (Date of expiry of the Bank Guarantee Plus Minimum of 1 year claim period shall be stipulated) all your rights under this Guarantee shall stand extinguished and we shall be discharged from all our liabilities under this Guarantee irrespective of receipt of original Bank Guarantee duly discharged, by Bank.

Name of the Contact Person at the Controlling Office with Mobile No. and e-mail address:

a) SIGNATURE AND SEAL OF THE GUARANTORS_____
b) Designation_____
c) Name of the Bank_____
d) Address _____

Note:

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

** Date of expiry of Bank Guarantee should be minimum 30 days after the end of the validity period of the Bid / as specified in the Tender.

*** The Bank Guarantee issuing bank branch shall ensure the following:

a. 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 (indicating the Contract Number) by the BG issuing bank branch to ICICI BANK LTD., Duliajan Branch; IFS Code – ICIC0000213; SWIFT Code – ICICINBBXXX; Branch Address: Kunja Bhavan, Daily Bazaar, Duliajan, Dibrugarh, Assam – 786602.

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

c. Further correspondence against BG towards Bid Security must contain the Tender Number.

[TO BE FILLED-UP / SUBMITTED BY THE VENDOR ON ITS LETTER HEAD FOR E-REMITTANCE]

Name:

FULL Address:

Phone Number:
Mobile Number:
E-mail address:
Fax Number:
Bank Account Number (in which the Bidder wants remittance against invoices):
Bank Name:
Branch:
Address of the Bank:
Bank Code:
IFSC/RTGS Code of the Bank:
NEFT Code of the Bank:
PAN Number:
GST Registration Number:

_____

Signature of Bidder with Official Seal

FORMAT OF PERFORMANCE BANK GUARANTEE

(TO BE FURNISHED BY THE CONTRACTOR IN CASE OF SUBMITTING PERFORMANCE SECURITY IN THE FORM OF BANK GUARANTEE AFTER ISSUE OF LOA)

To,
M/s. OIL INDIA LIMITED,
CONTRACTS DEPARTMENT
DULIAJAN, ASSAM, INDIA, PIN - 786602.

WHEREAS _____ (Name and address of Contractor) (hereinafter called "Contractor") had undertaken, in pursuance of Contact 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 (May incorporate the Bank Name) 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 arguments, 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 _____day of _____

The details of the Issuing Bank and Controlling Bank are as under:

A. Issuing Bank:
BANK FAX NO:
BANK EMAIL ID:
BANK TELEPHNE NO:
IFSC CODE OF THE BANK:

Contd.....P/2

Page No.2

B. Controlling Office:

Address of the Controlling Office of the BG issuing Bank:

Name of the Contract Person at the Controlling Office with Mobile No. and e-mail address:

Notwithstanding anything contained herein:

e) Our liability under this Bank Guarantee shall is restricted up to Rs…….
f) This guarantee shall be valid till ……
g) We are liable to pay the guarantee amount or any part thereof under this Bank Guarantee only and only if you serve upon us a written claim or demand on or before ……(Date of Expiry of BG PLUS one year claim period).
h) At the end of the claim period that is on or after ……. (Date of expiry of the Bank Guarantee Plus Minimum of 1 year claim period shall be stipulated) all your rights under this Guarantee shall stand extinguished and we shall be discharged from all our liabilities under this Guarantee irrespective of receipt of original Bank Guarantee duly discharged, by Bank.

Name of the Contact Person at the Controlling Office with Mobile No. and e-mail address:

SIGNATURE AND SEAL OF THE GUARANTORS_____
Designation_____
Name of the Bank_____
Address _____

Note:

The Bank Guarantee issuing bank branch shall ensure the following:

a. 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 (indicating the Contract Number) by the BG issuing bank branch to HDFC Bank, Duliajan Branch; IFS Code – HDFC0002118; SWIFT Code – HDFCINBBCAL; Branch Address: HDFC Bank Limited, Duliajan Branch, Utopia Complex, BOC Gate, Jayanagar, Duliajan, Dibrugarh, PIN – 786602.

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

c. Further correspondence against BG towards Performance Security must contain the Contract Number.

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 Services _____ (brief description of services) should be provided by the Contractor as detailed hereinafter or as Company may requires;

WHEREAS, Contractor engaged themselves in the business of offering such services 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 services for the Company as per Section-II attached herewith for this purpose and

WHEREAS, Company had issued a firm Letter of Award No. _____ dated _____ based on Offer No. _____ dated _____ submitted by the Contractor against Company's IFB No. _____ and the Contractor accepted the same vide Letter No. _____ dated _____.

WHEREAS, the Contractor has furnished to Company the performance security in the form of _____ for Rs. _____ (being **3% of Contract value).**

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.:

Contd.....P/2

(a) PART-I indicating the General Conditions of this Contract;
(b) PART-II indicating the Schedule of rates;
(c) PART-III indicating the Special Conditions of Contract;
(d) PART-V indicating the Safety Measures.
(e) PART-VI indicating Integrity Pact (IP)

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.

Format of undertaking by Bidders towards submission of authentic information/documents (To be typed on the letter head of the bidder)

Ref. No. _____ Date _____

To,
GM- CONTRACTS (HoD)
Contracts Department,
OIL, Duliajan

Sub: Undertaking of authenticity of information/documents submitted

Ref: Your Tender No. CDI2352P23

Dear Sir,

With reference to our quotation against your above-referred tender, we hereby undertake that no fraudulent information/documents have been submitted by us.

We take full responsibility for the submission of authentic information/documents against the above cited bid.

We also agree that, during any stage of the tender/contract agreement, in case any of the information/documents submitted by us are found to be false/forged/ fraudulent, OIL has right to reject our bid at any stage including forfeiture of our PBG and/or cancel the award of contract and/or carry out any other penal action on us, as deemed fit.

Yours faithfully,

For (type name of the firm here)

Signature of Authorized Signatory

Name :

Designation :

Phone No.

Place :

Date :

(Affix Seal of the Organization here, if applicable)

(TO BE EXECUTED BY THE AUTHORIZED SIGNATORY OF THE BIDDER ON THE OFFICIAL LETTER HEAD OF THE BIDDER)

CERTIFICATE OF COMPLIANCE TO FINANCIAL CRITERIA

Ref.: Point No. '2' of Note under BEC Clause No 5.0 of Tender No. CDI2352P23

I _____ the authorized signatory(s) of _____ (Company or Firm name with address) do hereby solemnly affirm and declare/ undertake as under:

The balance sheet/Financial Statements for the financial year _____ have actually not been audited as on the Original Bid Closing Date.

Yours faithfully,

For (type name of the firm here)

Signature of Authorized Signatory

Name:

Designation:

Phone No.

Place:

Date:

(Affix Seal of the Organization here, if applicable)

Note: This certificate is to be issued only considering the time required for preparation of Financial Statements i.e. if the last date of preceding financial / accounting year falls within the preceding six months reckoned from the Original Bid Closing Date.

CERTIFICATE OF ANNUAL TURNOVER & NET WORTH

TO BE ISSUED BY PRACTISING **CHARTERED ACCOUNTANTS' FIRM** ON THEIR LETTER HEAD

TO WHOM IT MAY CONCERN

This is to certify that the following financial positions extracted from the audited financial statements of M/s..... (Name of the Bidder) for the last three (3) completed accounting years up to ..... **(as the case may be)** are correct.

YEAR	**TURN OVER** In INR (Rs.) Crores	**NET WORTH** In INR (Rs.) Crores

Place:
Date:
UDIN:
Seal:

Membership Code & Registration No.:
Signature

UNDERTAKING BY VENDOR ON SUBMISSION OF BANK GUARANTEE

To,

Oil India Limited
Contracts Department
Duliajan, Assam - 786602

We M/s. ..... are submitting the Performance Security in favour of Oil India Limited, Duliajan in the form of bank guarantee bearing Reference No. .....for an amount of INR..... valid up to ..... as per terms and conditions of Tender / Contract No. .....

BG issuing bank details:

Bank Branch IFS Code	
Contact Details E-mail Addresses	Mobile Telephone Fax
Correspondence Address H No/Street/City	State Country Pin Code

Declaration:

We have arranged to send the confirmation of issuance of the bank guarantee via SFMS portal through our bank using the details mentioned in the tender and hereby confirming the correctness of the details mentioned.

Authorized Signature _____
Name _____
Vendor Code _____
Email ID _____
Mobile No._____

Encl. Original Bank Guarantee

Proforma of Bank Guarantee towards PPP-MII

Ref. No. _____ Bank Guarantee No. _____

Dated _____

To,

Oil India Limited

_____

_____

India

Dear Sirs,

1. In consideration of _____ _____ (hereinafter referred to as OIL, which expression shall, unless repugnant to the context or meaning thereof, include all its successors, administrators, executors and assignees) having entered into a CONTRACT No._____ dated _____ (hereinafter called 'the CONTRACT' which expression shall include all the amendments thereto) with M/s _____ having its registered/head office at _____(hereinafter referred to as the 'CONTRACTOR') which expression shall, unless repugnant to the context or meaning thereof include all its successors, administrators, executors and assignees) and OIL having agreed that the CONTRACTOR shall furnish to OIL a Bank guarantee for India Rupees/US$ _____ for the faithful fulfillment of conditions pertaining to Local Content in accordance with the value mentioned in the certificate of Local Content submitted by the contractor for claiming purchase preference under the Purchase Preference Policy (linked with Local Content).

2. We (name of the bank) _____ registered under the laws of _____ having head/registered office at _____ (hereinafter referred to as "the Bank", which expression shall, unless repugnant to the context or meaning thereof, include all its successors, administrators, executors and permitted assignees) do hereby guarantee and undertake to pay to OIL immediately on first demand in writing any/all money to the extent of Indian Rs./US$ (in figures) _____ (Indian Rupees/US Dollars (in words) _____) without any demur, reservation, contest or protest and/or without any reference to the CONTRACTOR. Any such demand made by OIL on the Bank by serving a written notice shall be conclusive and binding, without any proof, on the bank as regards the amount due and payable, notwithstanding any dispute(s) pending before any Court, Tribunal, Arbitrator or any other authority and/or any other matter or thin whatsoever, as liability under these presents being absolute and unequivocal. We agree that the guarantee

herein contained shall be irrevocable and shall continue to be enforceable until it is discharged by OIL in writing. This guarantee shall not be determined, discharged or affected by the liquidation, winding up, dissolution or insolvency of the CONTRACTOR and shall remain valid, binding and operating against the bank.

3. The Bank also agrees that OIL at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance, without proceeding against the CONTRACTOR and notwithstanding any security or other guarantee that OIL may have in relation to the CONTRACTOR's liabilities.

4. The Bank further agrees the OIL shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said CONTRACT or to extend time of performance by the said CONTRACTOR(s) from time to time or to postpone for any time or from time to time exercise of any of the powers vested in OIL against the said CONTRACTOR(s) and to forbear or enforce any of the terms and conditions relating to the said agreement and we shall not be relived from our liability by reason of any such variation, or extension being granted to the said CONTRACTOR(s) or for any forbearance, act or omission on the part of OIL or any indulgence by OIL to the said CONTRACTOR(s) or any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

5. The Bank further agrees that the Guarantee herein contained shall remain in full force during the period that is taken for the performance of the CONTRACT and all dues of OIL under or by virtue of this CONTRACT have been fully paid and its claim satisfied or discharged or till OIL discharges this guarantee in writing, whichever is earlier.

6. This Guarantee shall not be discharged by any change in our constitution, in the constitution of OIL or that of the CONTRACTOR.

7. The Bank confirms that this guarantee has been issued with observance of appropriate laws of the country of issue.

8. The Bank also agrees that this guarantee shall be governed and construed in accordance with Indian Laws and subject to the exclusive jurisdiction of Indian Courts of the place from where the purchase CONTRACT has been placed.

9. Notwithstanding anything contained herein above, out liability under this Guarantee is limited to Indian Rs./US$(in figures) _____ (Indian Rupees/US Dollars (in words) _____) and our guarantee shall remain in force until _____(indicate the date of expiry of bank guarantee).

Any claim under this Guarantee must be received by us before the expiry of this Bank Guarantee. If no such claim has been received by us by the said date, the rights of OIL under this Guarantee will cease. However, if such a claim has

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

In witness whereof, the Bank through its authorized officer has set its hand and stamp on this _____ date of _____ 20___ at _____

WITNESS NO.1

_____
(Signature)
Full name and official address
(in legible letters)
Stamp

_____
(Signature)
Full name, designation and address
(in legible letters)
With Bank

Attorney as per power of
Attorney No._____
Dated _____

WITNESS NO.2

_____
(Signature)
Full name and official address
(in legible letters)
Stamp

UNDERTAKING FOR LOCAL CONTENT
(To be submitted in the letter head of the bidder)

Ref. No. _____ Date _____

To,
GM- CONTRACTS (HoD)
Contracts Department,
OIL, Duliajan

SUB: UNDERTAKING FOR LOCAL CONTENT

Dear Sir,

We, _____ (Name of the bidder) have submitted Bid No. _____ against Tender No. _____ dated _____ **'Hiring Services for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning of Pontoon Type Raw Water in-take Plant including cross country Raw Water Pipeline, Plant Piping and all Electrical and Instrumentation jobs on EPC-LSTK Basis at Oil India Limited, Duliajan, Assam.**

We hereby undertake that we meet the mandatory minimum local content requirement as mandated as per provision of Purchase preference under Public Procurement (Preference to Make in India) Order, 2017 of Department for Promotion of Industry and Internal Trade (DPIIT), Govt. of India and as amended time to time with modifications as notified vide MoPNG Order No. FP-20013/2/2017-FP-PNG-Part (4) (E-41432) dated 26th April 2022 (including subsequent amendments thereof, if any). The percentage of Local Content is _____ % .

For and on behalf of _____

Authorized signatory _____

Name _____

Designation _____

Contact No. _____

FORMAT FOR HINDRANCE REGISTER

Description of Project:..... **Contract No. & Date:**.....

Contractor's Name:..... **Scheduled Completion Date:**.....

Sl No.	Nature of Hindrance	Items of work that could not be executed because of this hindrance	Date of start of Hindrance	Date of Removal of Hindrance	Period of Hindrance	Overlapping period, if any	Net Hindrance days	Remarks
Signature of Contractor's Representative			**Signature of Engineer-in-charge**			**Signature of HoD**		

PROFORMA FOR UNDERTAKING FROM THIRD PARTY INSPECTION AGENCY
(To be submitted on official letter head)

TO
M/s OIL INDIA LIMITED
P.O. DULIAJAN-786602
Assam, India

Sir,

SUB: OIL's IFB No.

M/s _____ having registered office at _____ intend to participate in the above referred tender of OIL INDIA LIMITED.

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

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

Note: In the event of any requirement, OIL reserves the right to ask the inspection agencies to verify the documents with source, if required at no extra cost to OIL.

Thanking you,

Authorised Person's Signature: _____

Name: _____

EXHIBIT–I

UNDERTAKING FOR WORKS INVOLVING POSSIBILITY OF SUB-CONTRACTIONG

(REF. CLAUSE NO. 18.6 OF THE FORWARDING LETTER)

We, M/s _____, have read the clause regarding restrictions on procurement from a country which shares a land border with India and on sub-contracting to contractors from such-countries, we certify that we are not from such a country/or if from such a country, has been registered with the Competent Authority and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority. We hereby certify that we fulfil all requirements in this regard and are eligible to be considered.

Yours faithfully,
For (type name of the firm here)

Signature of Authorized Signatory
Name:
Designation:
Phone No.
Place:
Date:
(Affix Seal of the Organization here, if applicable)

EXHIBIT–II

UNDERTAKING TOWARDS COMPLIANCE OF CLAUSE NO. 18.1 OF THE FORWARDING LETTER

We, M/s _____, have read the clause regarding restrictions on procurement from a country which shares a land border with India, we certify that we are not from such a country/or if from such a country, has been registered with the Competent Authority. We hereby certify that we fulfil all requirements in this regard and is eligible to be considered.

Yours faithfully,
For (type name of the firm here)

Signature of Authorised Signatory
Name:
Designation:
Phone No.
Place:
Date:

(Affix Seal of the Organization here, if applicable)

OIL INDIA LIMITED
(A Government of India Enterprise)
Duliajan, Assam

SUMMARY PRICE SCHEDULE/ SUMMARY SCHEDULE OF RATES - (SOR-SUMMARY)

DESCRIPTION OF SERVICE: Hiring Services for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning of Pontoon Type Raw Water in-take Plant including cross country Raw Water Pipeline, Plant Piping and all Electrical and Instrumentation jobs on EPC-LSTK Basis at Oil India Limited, Duliajan, Assam.

NAME OF BIDDER	
Bidder's GSTIN No.	

Item No.	SOR-REF	Description of Services	Total as per SOR'S (Exclusive GST) (₹)	GST Amount (₹)	Total as per SOR'S (Inclusive GST) (₹)
10	SOR-1	Design And Detailed Engineering, A	-	-	-
20	SOR-2	Procurement and Supply Portion, B	-	-	-
30	SOR-3	Construction / Installation Portion, C	-	-	-
40	SOR-4	Pre-Commissioning, Mechanical Completion, Commissioning & Reliability Run/ Site Acceptance Test Portion, D	-	-	-
TOTAL EST. CONTRACT VALUE = A+B+C+D			**-**	**-**	**-**
			Total Contract Value (Exclusive GST) (₹)	**Total GST Amount (₹)**	**Total Contract Value (Inclusive of GST) (₹)**

Notes:

1. Price Bids will be evaluated on overall lowest cost basis (L-1 offer) i.e. considering total quoted price for all SOR's inclusive of all liabilities and GST as per SOR-Summary.

2. Bidder needs to mandatorily quote for all the items in Price Bid Format as called for vide SOR i.e. Schedule of Rates (SOR) – 1, 2, 3 and 4 else the bid will be rejected. The bid will not be evaluated if bidder fails to quote against all the items mentioned in the SOR– 1, 2, 3, 4. The SOR-Summary shall reflect the total of SOR's – 1, 2, 3, 4.

3. OIL will prefer to deal with registered bidder 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.

4. Price Bid uploaded without giving any of the details of the taxes (Including rates and amounts) will be considered as inclusive of all taxes including GST. When a bidder mentions taxes as extra without specifying the rates & amount, the offer will be loaded with maximum value towards taxes received against the tender for comparison purposes. If the bidder emerges as lowest bidder after such loading, in the event of order on that bidder, taxes mentioned by OIL on the Purchase Order/ Contracts will be binding on the bidder.

5. Input Tax Credit on GST (Goods & Service Tax) for this service is NOT available to OIL & The bids will be evaluated based on total price including GST.

6. Refer to GCC & SCC or detail of GST.

7. Refer to SCC for detailed description of the service.

FORM	**SOR-1**				
NAME OF WORK	**Design and Detailed Engineering**				
Sl No.	**Description of Items**	**UOM**	**Qty**	**Unit Rate (₹) (Ex GST)**	**Total (₹) (Ex GST)**
1	Residual Process Design	Lumpsum	1		-
2	Detailed Design & Engineering	Lumpsum	1		-
3	Vendors final documents for supply items duly certified	Lumpsum	1		-
4	As-Built Documentation	Lumpsum	1		-
				TOTAL - Exclusive GST (₹)	**-**
				Applicable GST Rate (in %)	
				GST Amount (₹)	**-**
				TOTAL - Inclusive of GST (₹)	**-**

FORM	**SOR-2**				
NAME OF WORK	**Procurement and Supply**				
Sl No.	**Description of Items**	**UOM**	**Qty**	**Unit Rate (₹) (Ex GST)**	**Total (₹) (Ex GST)**
1	Procurement and Supply for Civil Engineering Portion.	Lumpsum	1		-
2	Procurement and Supply for Mechanical & Plant Piping Portion.	Lumpsum	1		-
3	Procurement and Supply of Raw Water Pipeline.	Lumpsum	1		-
4	Procurement and Supply for for Electrical Engineering Portion.	Lumpsum	1		-
5	Procurement and Supply for Instrumentation Engineering Portion.	Lumpsum	1		-
				TOTAL - Exclusive GST (₹)	**-**
				Applicable GST Rate (in %)	
				GST Amount (₹)	**-**
				TOTAL - Inclusive of GST (₹)	**-**

FORM	**SOR-3**				
NAME OF WORK	**Construction / Installation**				
Sl No.	**Description of Items**	**UOM**	**Qty**	**Unit Rate (₹) (Ex GST)**	**Total (₹) (Ex GST)**
1	Construction of Civil Engineering Portion.	Lumpsum	1		-
2	Installation of Mechanical & Plant Piping Portion.	Lumpsum	1		-
3	Construction/ Installation of Raw Water Pipeline.	Lumpsum	1		-
4	Installation of Electrical Engineering Portion.	Lumpsum	1		-
5	Installation of Instrumentation Engineering Portion.	Lumpsum	1		-
				TOTAL - Exclusive GST (₹)	**-**
				Applicable GST Rate (in %)	
				GST Amount (₹)	**-**
				TOTAL - Inclusive of GST (₹)	**-**

FORM	**SOR-4**				
NAME OF WORK	**Pre-Commissioning, Mechanical Completion, Commissioning & Reliability Run/ Site Acceptance Test Portion**				
Sl No.	**Description of Items**	**UOM**	**Qty**	**Unit Rate (₹) (Ex GST)**	**Total (₹) (Ex GST)**
1	Completion of Pre-Commissioning activities.	Lumpsum	1		-
2	Mechanical Completion.	Lumpsum	1		-
3	Completion of Commissioning.	Lumpsum	1		-
4	Completion of Reliability Run/ Site Acceptance Test for 03 months.	Lumpsum	1		-
				TOTAL - Exclusive GST (₹)	**-**
				Applicable GST Rate (in %)	
				GST Amount (₹)	**-**
				TOTAL - Inclusive of GST (₹)	**-**

Sl. No.	Clause No of BEC/BRC	Description	Bidders Remarks (Complied / Not Complied / Deviation)	Bidder to indicate the following to support the remarks/ compliance	
				Name of File as uploaded in E-Tender portal	Relevant Page No. of the file
1	**BEC-BRC Clause No. 1.0**	The bidder must be incorporated/constituted in India and must maintain equal to or more than 20% local content (LC) for the offered services to be eligible to bid against this tender. Regarding calculation of local content and submission of documents during bidding & execution of contracts, provision of Purchase preference under Public Procurement (Preference to Make in India) Order, 2017 of Department for Promotion of Industry and Internal Trade (DPIIT), Govt. of India and as amended time to time with modifications as notified vide MoPNG Order No. FP-20013/2/2017-FP-PNG-Part (4) (E-41432) dated 26th April 2022 (including subsequent amendments thereof, if any) shall be applicable. If such local content is not maintained during execution of contract, OIL reserves the right to invoke the Performance Securities submitted by the bidding and supporting companies, in addition to resorting to other options as may be deemed appropriate. Whether or not the bidders want to avail PPP-MII benefit against this tender, it is mandatory for them to meet the following at the bidding stage: (a) Without specifying the unit rates and bid amount in the technical bid, the bidder must specify the **percentage (%) of local content** in their bid as per format prescribed in **PROFORMA-XIV (duly signed & sealed by the Power of Attorney holder),** without which the bid may be rejected being non-compliant. Such undertaking shall become a part of the contract, if awarded. (b) The aforesaid undertaking of the bidder shall also be supported			

		by a certificate from the statutory auditor or cost auditor of the company (in case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of other than companies) giving the percentage of local content as mandated under Public Procurement (Preference to Make in India) Order, 2017 (as amended time to time). (c) Alongwith the technical bid, bidder must submit a copy of their Certificate of Incorporation/Registration or any other valid document(s) which substantially establishes its constitution in India.			
2	**BEC-BRC Clause No. 2.1**	Experience: The bidder should have experience of successful completion of at least One (01) '**SIMILAR WORK'** of minimum capacity 2.5 MGD (Million Gallons per Day) for Potable Water/ Water Distribution/ Irrigation /Water Management Projects in India in previous 10 (Ten) years to be reckoned from the original bid closing date. The Unit of Measurement is Imperial Gallons, i.e.: 1 Gallon = 4.54 Liters.			
3	**Notes to BEC-BRC Clause No. 2.1**	(a) **'SIMILAR WORK'** mentioned above means "Construction, Installation, Commissioning of Water Sourcing/Intake Plant executed in EPC/LSTK Mode. The job experience should involve execution of all the requisite jobs for Construction, Installation, Commissioning of the Water Sourcing /Intake Plant." (b) If the experience of the Bidder involves Multiple Sources contributing to a single Water Sourcing /Intake Plant and the same conforms to the definition of the '**SIMILAR WORK**' as defined above, the same shall also be considered.			
4	**BEC-BRC CLAUSE NO. 2.2**	**Engineering And Design Capability:** The bidder should have their in-house Engineering and Design Team, or they may hire/outsource the Engineering and Design part of the Project. Note: (i) If the bidder has in-house Engineering and Design Team, then			

		the Key Personnel/ Domain Experts of the team should have minimum 02 Years of Experience or should have associated with minimum 03 Projects involving Engineering and Design. The CVs of Key Personnel/ Domain Experts of the in-house Engineering and Design Team, endorsed by the authorized signatory, must be submitted along with the bid. (ii) If the bidder proposes to hire/outsource the Engineering and Design part of the Project, then an agreement in this regard between the bidder and proposed Design Agency/Firm/Party must be submitted alongwith the bid. Furthermore, the proposed Design Agency/Firm/Party should have executed projects involving Engineering and Design. Documentary evidence in this regard must be submitted alongwith the bid.			
5	**BEC-BRC CLAUSE NO. 2.3**	Bidders must provide an undertaking **(as per Annexure-1 to BEC-BRC)** along with their bid confirming that they shall comply to the requirement 'EPC Contractor's Personnel and Office' as detailed under Clause No: 12 of Section -I: Preamble Document. The CVs of key personnel, endorsed by authorized signatory, as mentioned in the said clause should also be submitted alongwith the bid.			
6	**BEC-BRC CLAUSE NO. 2.4**	Contractor will have to provide an undertaking **(as per Annexure-2 to BEC-BRC)** that the list of manpower earmarked for the project will be associated with the project till project completion and in case of inevitable situation the replacement shall be made by personnel of equivalent experience or more, with approval of client (OIL).			
7	**BEC-BRC CLAUSE NO. 2.5**	Completion period for the Main LSTK-EPC work is 18 months from completion of mobilization period. Offers without confirmation of Completion period for the Main LSTK-EPC work of 18 Months or with Completion period for the Main LSTK-EPC work more than 18 Months shall NOT be accepted. An undertaking in this regard **(as per Annexure-3 to BEC-BRC)** to be submitted by the Bidder along with the Bid.			

8	**BEC-BRC CLAUSE NO. 2.6**	During the tenure of main LSTK-EPC work of 18 Months from completion of mobilization period, OIL will be engaging a PMC contractor for assisting OIL in project execution and monitoring the project. Since PMC Contractor will be engaged by OIL for the entire duration of main LSTK-EPC work, therefore in the event of failure on the part of EPC contractor to complete the main LSTK-EPC work on time i.e., 18 months from completion of mobilization period, the extra expenditure on PMC Contractor towards the extended period [attributable to EPC Contractor] will be recovered from the EPC Contractor. Bidders must provide an undertaking **(as per Annexure-4 to BEC-BRC)** along with their bid confirming the same.			
9	**BEC-BRC CLAUSE NO. 3.1**	In case the bidder is a Joint Venture Company, must be registered in India and incorporated under the Companies Act 1956 and any amendment there under and complying to **Clause No. 1.0,** can participate in the tender and should meet the technical qualification requirements as under: (i) The JV on its own shall meet the experience criteria as per Clause No. 2.1 or (ii) Any member of the JV having a stake of at least 26% in the JV on its own shall meet experience requirement as per Clause No. 2.1. Note: a. In case of (ii) above, an undertaking from the Joint Venture partner, based on whose experience the JV seek qualification, shall be submitted with the techno commercial bid stating that they shall maintain minimum 26% shareholding in the JV till the execution of the contract. b. The JV or its member (as the case may be) shall not rely on the experience of its supporting company/ subsidiary/ co-subsidiary/ sister subsidiary/parent/ holding/ affiliating/ associate company or through any other arrangement like technical collaborator for meeting the technical criteria.			

10	**BEC-BRC CLAUSE NO. 3.2**	**Constitution of Joint Venture**: The members of the JV should not be more than three. If during evaluation of bid, a JV leader proposes any alterations/changes in the constitution or replacement or inclusion or expulsion of any partner(s)/member(s) of the Joint Venture which had originally submitted the bid, to drive some advantages/benefits based on any development(s) having come to his knowledge at any time, the bid of such a JV shall be liable for rejection.			
11	**BEC-BRC CLAUSE NO. 3.3**	**Indian companies/ Joint Venture companies (Incorporated JV): -** Indian bidders whose proposal for Joint Venture involves foreign equity participation or payment of royalty and/ or lumpsum for technical know-how and wherever Govt. approval is necessary, are required to submit copy of Govt. approval, on their application submitted to Secretariat for Industrial Assistance (SIA) (Government of India, Ministry of Industry, prior to the date price bid opening. Confirm to this effect and declaration on the same to be provided as part of their technical offer.			
12	**BEC-BRC CLAUSE No. 3.4**	Members of the JV are not allowed to quote separately/independently against this tender. All the bids received in such case shall be summarily rejected. Further, all bids from parties with technical support from the same Principal shall be rejected.			
13	**BEC-BRC Clause No. 4.0**	1. For proof of requisite Experience (refer Clause No. 2.1), the following documents must be submitted along with the bid: A. Contract document or LoA or Workorder showing details of work. B. Completion certificate(s) or Final Payment certificate(s) or any other document(s) for the above contract, which substantiate the successful execution of work. The submitted document(s) must contain the following: (i) Nature of job done (ii) Contract No. / Workorder No. (iii) Gross Value/quantity of Work Done.			

		(iv) Contract period and date of completion. C. The Bidder must furnish the Complete Communication details of the End User (Owner of the Plant) (w.r.t. Clause No. 2.1.) comprising of the followings: (i) Postal Address. (ii) Contact e-mail ID (iii) Mobile Phone No **General Notes:** (i) OIL reserves the right to ask the bidder to furnish exact Geographical Co-Ordinates (Longitude & Latitude) and Site Photographs of the location of the job submitted as requisite Experience (w.r.t. Clause No. 2.1) duly endorsed by the End User (Owner of the Plant) for further evaluation. (ii) OIL might depute representative (either OIL's own personnel or any other party authorized by OIL) for site visit of the location of the job submitted as requisite Experience (w.r.t. Clause No. 2.1).			
		2. Only Letter of Intent (LOI)/Letter of Award (LOA) or Work Order(s) shall not be accepted as evidence i.e., mere award of contract(s) will not be counted towards experience. Successful completion of the awarded contract(s) to the extent of value/volume, as stipulated respectively under Clause Nos. 2.1 will only be treated as acceptable experience.			
		3. In case requisite experience is against OIL's Contract, bidder shall only be required to categorically specify OIL's Contract Number and date to consider the experience.			
		4. If the prospective bidder has executed a contract in which similar work is a component of the contract, then such work experience will also be taken into consideration. • In case the document submitted as per Point No. 1 above, are			

<table>
<tr><td></td><td></td><td>not sufficient to establish the value and/or quantity and period of the similar work against Point No. 5, above the bidder shall also have to submit the breakup of the works executed under such contract(s) clearly indicating the value and/or quantity and period of SIMILAR work which should be certified by the end user or a certificate issued by a practicing Chartered/ Cost Accountant Firm (with Membership Number & Firm Registration Number).</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>5. SIMILAR work executed by a bidder for its own organization/subsidiary cannot be considered as experience for the purpose of meeting BEC.</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>6. The documents establishing experience of the JV or its member (as the case may be) shall be submitted as per Point No. 1/4 above.</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>NB: Any Documents submitted in languages other than English must have to be accompanied by a Notarized translation of the Same to English.</td><td></td><td></td><td></td></tr>
<tr><td>14</td><td>BEC-BRC Clause No. 5.0</td><td>FINANCIAL EVALUATION CRITERIA: The following financial parameters shall have to be met by the bidder
<table>
<tr><th>Sl. No</th><th>Parameter</th><th>Financial Criteria</th></tr>
<tr><td>1</td><td>Annual Financial Turnover</td><td>Annual Financial Turnover of the bidder from operations during any of preceding 03 (Three) financial/accounting years from the original bid closing date should be minimum ₹ 9,96,10,300.00 (Rupees Nine Crore Ninety-Six Lakh Ten Thousand and Three Hundred) only as per the Audited Annual Reports.

Note: Annual Financial Turnover of the bidder from operations shall mean: “Aggregate value of the realisation of amount made from the sale,</td></tr>
</table></td><td></td><td></td><td></td></tr>
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					supply or distribution of goods or on account of services rendered, or both, by the company (i.e., bidding entity, as the case may be) during a financial year" as per the Companies Act, 2013 Section 2 (91).			
			2	Net worth	Net Worth of the bidder should be minimum **₹ 2,98,83,100.00** (Rupees Two Crore Ninety-Eight Lakh Eighty-Three Thousand and One Hundred) only as per immediate preceding audited financial year result. Net worth shall mean: " the aggregate value of the paid-up share capital and all reserves created out of the profits and securities premium account, after deducting the aggregate value of the accumulated losses, deferred expenditure and miscellaneous expenditure not written off, as per the audited balance sheet, but does not include reserves created out of revaluation of assets, write-back of depreciation and amalgamation."			
			3	Working Capital	The Bidder should have minimum working capital equal to **₹ 2,98,83,100.00** (Rupees Two Crore Ninety-Eight Lakh Eighty-Three Thousand and One Hundred) only as per immediate preceding audited financial year result. Note: Working Capital shall mean "Current Assets minus Current liabilities" as per latest year's audited consolidated annual Financial Statements.			
			4	Bid	The bidding capacity of the contractor should be equal to or more than **₹ 19,92,20,600.00**			

				Capacity	(Rupees Nineteen Crore Ninety-Two Lakh Twenty Thousand and Six Hundred) only. The bidding capacity shall be worked out by the following formula: Bidding Capacity = [A x 1.5] - B Where, A = Maximum annual turnover in any one of the preceding three financial years B = Commitments in next twelve months from the date of expiry of the bid validity as per enclosed format for **ANNEXURE-7.**		
			5	Debt equity Ratio	Debt equity ratio of the bidder should not be more than 2:1. Debt equity ratio shall mean long term borrowings/ Net-worth.		
15	**Notes to BEC-BRC Clause No. 5.0**	1) For proof of Annual Turnover & Net worth any one of the following documents must be submitted along with the bid: (i) A certificate* issued by a practicing Chartered / Cost Accountant (with Membership Number and Firm Registration Number), certifying the Annual turnover & Net worth as per format prescribed in **PROFORMA-XI** Or (ii) Audited Balance Sheet along with Profit & Loss account. *Note: • Mention of UDIN (Unique Document Identification Number) is mandatory for all Certificates issued w.e.f. February 1, 2019 by Chartered Accountant in Practice. • 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 of India and the Central Government, their certificates may be accepted even though FRN is not available. However, bidder to provide documentary evidences for the same.			
		2) Considering the time required for preparation of Financial Statements, if the last date of preceding financial / accounting year falls within the preceding six months/ within the due date for furnishing of audit report as per Section 139(1) of IT Act, 1961 (read along with latest circulars/notifications issued by CBDT from time to time) 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 must submit an affidavit / undertaking certifying that the balance sheet / Financial Statements for the financial year _____ have actually not been audited so far, as per format prescribed in **PROFORMA-X**			
		3) In case the bidder is a Government Department, they are exempted from submission of documents mentioned under Para **1** and **2** above.			
		4) For proof of Working capital and Debt equity ratio bidder must submit Audited Balance Sheet along with Profit & Loss account of immediate preceding audited financial year result alongwith the bid.			
		5) In case the working capital is short the bidder can supplement the same through line of credit from a scheduled commercial bank having net worth more than 100 Crores as per enclosed format. **[ANNEXURE-6.]**			

		6) **In case of Incorporated Joint Venture:** In case the bidder is an Incorporated Joint Venture company**,** who does not meet financial criteria by itself, in that case they can submit bid based on the financial strength of its member having more than 50% stake (supporting company) in the JV. In such case the bidder shall have to submit the following documents along with the technical bid: (i) **Corporate Guarantee (as per Annexure-5)** on the letter head of the member having more than 50% stake in the JV signed by an authorized official undertaking that they would financially support the Joint Venture for executing the project / job in case the same is awarded to them, and (ii) Documents to substantiate that the member has more than 50% stake in the JV company. a) A certificate from the statutory Auditor of the bidding company as well as of the supporting company to establish the relationship and equity percentage holding between bidding company and the supporting company. The certificates should be duly certified by the Company Secretary or one of the Directors of the company concerned. b) The above certificate should not be more than 30 days old as on the original bid closing date.			
		7) OIL reserves the right to ask for any Original or other relevant document to verify the certification.			
16	BEC-BRC CLAUSE NO. 6.1	Bids are to be submitted under Single-Stage Two-Bid System i.e., Un-priced Techno-Commercial Bid and Price Bid in their respective fields in e-tender portal. Only the Price Bid should contain the quoted price.			
17	BEC-BRC CLAUSE NO. 6.2	The price quoted by the successful bidder must be firm during the performance of the contract and not subject to variation on any account except as mentioned in the bid document. Any bid submitted with adjustable price quotation other than the above will be treated as non- responsive and rejected.			

18	BEC-BRC CLAUSE NO. 6.3	**Bid security** shall be furnished as a part of the Techno Commercial Un-priced Bid. The amount of bid security should be as specified in the forwarding letter. Any bid not accompanied by a proper bid security will be rejected			
19	BEC-BRC CLAUSE No. 6.4	Bid Documents / User Id & Password for OIL's E-Tender portal are not transferable.			
20	BEC-BRC CLAUSE NO. 6.5	Any bid received in the form of Physical document/ Telex/ Cable/ Fax/ E-mail will not be accepted.			
21	BEC-BRC CLAUSE NO. 6.6	Bids shall be typed or written in indelible ink. The bidder or his authorized representative shall sign the bid digitally, failing which the bid will be rejected.			
22	BEC-BRC CLAUSE NO. 6.7	Bids shall contain no interlineations, erasures or overwriting except as necessary to correct errors made by bidder, in which case such corrections shall be initiated by the persons(s) signing (digitally) the bid. However, white fluid should not be used for making corrections. Any bid not meeting this requirement shall be rejected.			
23	BEC-BRC CLAUSE NO. 6.8	Any bid containing false statement will be rejected and action will be taken by Company as per Bid Document.			
24	BEC-BRC CLAUSE NO. 6.9	Bids are invited under Single-Stage Two-Bid System. Bidders must submit both "Technical" and "Price" Bids in electronic form through online OIL's e-Tender portal accordingly within the Bid Closing Date and time stipulated in the e-Tender. The Technical Bid is to be submitted as per Scope of Work & Technical Specifications of the tender under "Technical Attachment" Tab and the Priced Bid as per the PRICE BID FORMAT attached under "Notes and Attachments".			
25	BEC-BRC CLAUSE NO. 6.10	Bidder must accept and comply with the following provisions as given in the Tender Document in toto, failing which offer will be rejected: (i) Firm price (ii) Bid Securing Declaration			

		(iii) Period of validity of Bid (iv) Price Schedule (v) Performance Bank Guarantee / Security deposit (vi) Delivery / Completion Schedule (vii) Scope of work (viii) Guarantee of material / work (ix) Liquidated Damages clause (x) Tax liabilities (xi) Arbitration / Resolution of Dispute Clause (xii) Force Majeure (xiii) Applicable Laws (xiv) Specifications (xv) Integrity Pact			
26	BEC-BRC CLAUSE NO. 6.11	There should not be any indication of price in the Un-priced Techno-Commercial Bid. A bid will be straightway rejected if this is given in the Un-priced Techno-Commercial Bid.			
27	BEC-BRC CLAUSE No. 6.12	Bid received with validity of offer less than 120 (One Hundred Twenty) days from Bid Closing Date.			
28	BEC-BRC CLAUSE No. 6.13	The Integrity Pact is applicable against this tender. OIL shall be entering into an Integrity Pact with the bidders as per format enclosed vide PART-VI of the tender document. This Integrity Pact Proforma has been duly signed digitally by OIL's competent signatory. The Proforma has to be returned by the bidder (along with the Un-priced Techno-Commercial 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 sign the Bid.			
29	BEC-BRC CLAUSE NO. 7.1	Price bids shall be opened in respect of only the techno-commercially acceptable bidders whose bids have been found to be substantially responsive. A substantially responsive bid is one that meets the terms and conditions of the Tender and / or the acceptance of which bid will			

		not result in indeterminate liability on OIL.			
30	BEC-BRC CLAUSE NO. 7.2	The bidders must quote their prices in the manner as called for vide Part-II, Schedule of Rates (SOR) i.e. SOR-1 for Design and Detailed Engineering SOR-2 for Procurement and Supply SOR-3 for Construction / Installation SOR-4 for Pre-Commissioning, Mechanical Completion, Commissioning & Reliability Run/ Site Acceptance Test. SOR-Summary - Total of SOR-1, SOR-2, SOR-3 and SOR-4			
31	BEC-BRC CLAUSE NO. 7.3	Bidder needs to mandatorily quote for all the items in Price Bid Format as called for vide SOR i.e., Schedule of Rates (SOR) – 1, 2, 3 & 4, else the bid will be rejected. The bid will not be evaluated if bidder fails to quote against all the items mentioned in the SOR– 1, 2, 3 & 4. The SOR-Summary should reflect the total of SOR's – 1, 2, 3 & 4.			
32	BEC-BRC CLAUSE NO. 7.4	Bidder must include all liabilities and taxes including statutory liabilities but excluding GST. **Applicable GST must be quoted separately in all SOR's– 1, 2, 3 & 4, which will be considered for evaluation of the bid.**			
33	BEC-BRC CLAUSE NO. 7.5	**Price Bids will be evaluated on overall lowest cost basis (L-1 offer) i.e., considering total quoted prices for all SOR's inclusive of all liabilities and GST as per SOR-Summary.**			
34	BEC-BRC CLAUSE NO. 7.6	Based on the evaluation of techno-commercially qualified bidders, the job will be awarded to the L-1 bidder.			
35	BEC-BRC CLAUSE NO. 7.7	The bidders are advised not to offer any discount / rebate separately and to offer their prices in the Price Bid Format after considering discount / rebate, if any.			
36	BEC-BRC CLAUSE NO. 7.8	Conditional and unsolicited discount will not be considered in evaluation. However, if such bidder happens to be the lowest recommended bidder, unsolicited discount without any condition will			

		be considered for computing the contract price.			
37	BEC-BRC CLAUSE NO. 7.9	In case of identical overall lowest offered rate by more than 1 (one) bidder, the selection will be made by draw of lot between the parties offering the same overall lowest price.			
38	BEC-BRC CLAUSE NO. 7.10	OIL will prefer to deal with registered bidder 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.			
39	BEC-BRC CLAUSE NO. 7.11	Input Tax Credit on GST (Goods & Service Tax) for this service is NOT available to OIL & the bids will be evaluated based on total price including GST.			
40	BEC-BRC CLAUSE NO. 8.1	In case bidder takes exception to any clause of bidding document not covered under BEC/BRC, then the Company 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 company. The loading so done by the company will be final and binding on the bidders. No deviation will however be accepted in the clauses covered under BEC/BRC.			
41	BEC-BRC CLAUSE NO. 8.2	To ascertain the substantial responsiveness of the bid the Company reserves the right to ask the bidder for clarification in respect of clauses covered under BEC/BRC also and such clarifications fulfilling the BEC/BRC clauses in toto must be received on or before the deadline given by the company, failing which the offer will be will be evaluated based on the submission. However, mere submission of such clarification shall not make the offer responsive, unless company is			

		satisfied with the substantial responsiveness of the offer.			
42	BEC-BRC CLAUSE NO. 8.3	If any of the clauses in the BEC/BRC contradict with other clauses of bidding document elsewhere, the clauses in the BEC/BRC shall prevail.			
43	BEC-BRC CLAUSE NO. 8.4	Bidder(s) must note that requisite information(s)/financial values etc. as required in the BEC/BRC & Tender are clearly understandable from the supporting documents submitted by the Bidder(s); otherwise Bids shall be rejected.			
44	BEC-BRC CLAUSE NO. 8.5	OIL will not be responsible for delay, loss or non-receipt of applications for participating in the bid sent by mail and will not entertain any correspondence in this regard.			
45	BEC-BRC CLAUSE NO. 8.6	The originals of such documents [furnished by bidder(s)] shall have to be produced by bidder(s) to OIL as and when asked for.			
46	BEC-BRC CLAUSE NO. 9.1	**PURCHASE PREFERENCE POLICY (PPP-MII):** Purchase preference under Public Procurement (Preference to Make in India) Order, 2017 of Department for Promotion of Industry and Internal Trade (DPIIT), Govt. of India and as amended time to time with modifications as notified vide MoPNG Order No. FP-20013/2/2017-FP-PNG-Part (4) (E-41432) dated 26th April 2022 (including subsequent amendments thereof, if any) shall be applicable for this Tender. Bidders to check the provisions of the Notifications for their eligibility to bid and seek benefits for Purchase preference, accordingly.			
47	BEC-BRC CLAUSE NO. 11.2	Upon award of Contract based on PP-LC policy, the bidder shall have to submit additional Bank Guarantee (format enclosed as **PROFORMA-XIII)** equivalent to 10% of the Contract Value towards fulfilment of conditions pertaining to Local Contents in accordance with the value mentioned in the certificate of LC.			

<table>
<tr>
<td>48</td>
<td>BEC-BRC CLAUSE NO. 12.1</td>
<td>Oil India Limited (OIL) has engaged the following 09 (Nine) Independent Inspection Agencies to verify and certify various documents required against BEC/BRC of the tender:
<table>
<tr><th>Sl. No.</th><th>Name of Independent Inspection Agency</th><th>Contact E-mail ID</th></tr>
<tr><td>i.</td><td>M/s. RINA India Pvt. Ltd.</td><td>a. ssd@rina.org
b. Andrea.Vattuone@rina.org</td></tr>
<tr><td>ii.</td><td>M/s. Dr. Amin Controllers Pvt. Ltd.</td><td>a. rkjain@rcaindia.net
b. info@rcaindia.net</td></tr>
<tr><td>iii.</td><td>M/s. Germanischer Llyod Industrial Services GmbH (DNV- Oil & Gas)</td><td>a. mangesh.gaonkar@dnv.com</td></tr>
<tr><td>iv.</td><td>M/s. TÜV SÜD South Asia Pvt. Ltd.</td><td>a. Jaimin.Bhatt@tuv-sud.in
b. sanjaykumar.singh@tuv-sud.in
c. Pankaj.Narkhede@tuv-sud.in
d. Ajit.Yadav@tuv-sud.in</td></tr>
<tr><td>v.</td><td>M/s. IRCLASS Systems and Solutions Private Limited</td><td>a. abhishek.singh@irclass.org
b. pradeep.bansal@irclass.org
c. Asim.Hajwani@irclass.org
d. Amit.Ketkar@irclass.org
e. industrial_services@irclass.org</td></tr>
<tr><td>vi.</td><td>M/s. Gulf Llyods Industrial Services (India) Pvt. Ltd.</td><td>a. contact@gulflloyds.com
b. bbhavsar@gulfllyods.com
c. inspection@gulflloyds.com
d. gulflloyds.india@gmail.com</td></tr>
<tr><td>vii.</td><td>M/s. TUV India Private Limited</td><td>a. salim@tuv-nord.com
b. delhi@tuv_nord.com</td></tr>
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		viii.	M/s. TÜV Rheinland (India) Pvt. Ltd.	a. Shailesh.Deotale@ind.tuv.com b. ravi.kumar@ind.tuv.com c. rupeshkumar.singh@ind.tuv.com d. Neeraj.Chaturvedi@ind.tuv.com			
		ix.	M/s. Bureau Veritas (India) Private Limited	a. udit.chopra@bureauveritas.com b. vishal.sapale@bureauveritas.com c. dinesh.sukhramani@bureauveritas.com d. p.sridhar@bureauveritas.com e. hariprasad.jhawar@bureauveritas.com f. amit.shaw@bureauveritas.com g. business.support@bureauveritas.com h. labhanshu.sharma@bureauveritas.com i. pramodkumar.yadav@bureauveritas.com j. sonal.lad@bureauveritas.com k. bvindia.corporate@in.bureauveritas.com			
49	BEC-BRC CLAUSE NO. 10.2	The Bidders have to get verified and certified the various documents required against BEC/BRC of the tender by any one of the above Independent Inspection Agencies and submit the duly certified Inspection Certificate **(as per Proforma XVI)** issued by the Inspection Agencies along with the Technical Bid of the Tender. All Charges of the					

		Third-Party Independent Inspection Agencies towards verification of bidder's documents and certification thereof shall be borne by the respective bidders and payments on account of above inspection, verification and certification shall be made directly by the Bidder to the Inspection Agency(s). OIL will not be responsible for any payment dispute between Bidders and Third Party Inspection Agencies.			
50	BEC-BRC CLAUSE NO. 10.3	As mentioned above, Bidder(s) have to submit the verified documents and the duly certified Inspection Certificate by the Inspection Agencies along with the Technical Bids. Bid submitted with un-verified supporting documents shall not be normally considered. **However, in case a bidder submits its bid along with all relevant supporting documents against BEC / BRC without getting all / some of them verified by the designated Independent Inspection agency, such bid can be provisionally considered provided it is accompanied by an Undertaking by the Bidder on their official letterhead to submit the duly verified copies/ verification certificate within 07 (seven) days of actual bid opening. Company will neither send any reminder nor seek any clarification in this regard from such bidders, and the bid will be rejected outright if the bidder fails to submit the verified copies / verification certificate within 07 (seven) days of actual bid opening at its own risk and responsibility. If a bidder does not submit the undertaking towards submission of third party certification within 07 (seven) days from date of Bid Closing date, but certified document reaches us within the cut-off date of above 07 (seven) days, then such bids shall be considered.**			

51	BEC-BRC CLAUSE NO. 10.4	The methodology of inspection/verification of documents is broadly as under but not limited to: (a) It is obligatory on the part of the interested Bidders, who choose to participate against the tender, to understand the tender requirements in entirety and the requisite documents sought for in support of the Bid Evaluation Criteria/Bid Rejection Criteria (BEC/BRC) mentioned in the tender in particular. The Bidder must produce all the appropriate documents before any of the OIL's empaneled third party certifying agencies for verification/certification. Neither OIL nor the third party certifying agency shall be held accountable in any manner regarding the choice of documents by the bidder for verification. Therefore, getting the appropriate documents inspected/verified by the agency in support of BEC/BRC clauses is the sole responsibility of the Bidder. (b) The prospective bidder shall contact any of the empaneled inspection agencies. The agency shall go through the Tender Document, especially the requirements of BEC/BRC and list the documents to be verified. They shall depute their qualified/competent inspector to the Bidder's premises to check the original documents and certify the copies which the bidder shall submit along with their bids. OIL will reserve the right to ask the inspection agencies to verify the documents with source, if required at no extra cost to OIL. Verification of documents by OIL's empaneled third party agency shall not automatically make the bidder eligible for award of contract. (c) Verification of documents (but not limited to) are normally categorized as under: ➢ **General Requirement:** • Bidder's PAN Card • Bidder's GST Certificate • ITR of company • Bidder's Certificate of Incorporation – Domestic Bidder. ➢ **Additional Documents: (If applicable against the**			

		tender) • Joint Ventures Agreements with Share Holding pattern ➢ **Technical Criteria** • Experience documentation - Completion Certificates, Reference contact verification, Original Work Order/Contract Copy • Any other document(s), if called for vide BEC/BRC of the Tender. ➢ **Financial Criteria** • Audited Balance Sheet/CA certificate • Line of Credit, Concurrent Commitment etc., if incorporated in the tender.			
52	Note Under BEC-BRC Clause No. 12	**Note: If any documents submitted towards compliance of BEC/BRC experience criteria is issued by Oil India Limited, then such documents need not be verified by TPI agency.**			
53	BEC-BRC Clause No. 13	**COMPLIANCE OF THE COMPETITION ACT, 2002**: The bidder shall strictly comply with the provisions of the Competition Act, 2002, more particularly, Section-3 of the Act. Any violation the provisions of the Act shall attract penal action under the Act.			

COMMERCIAL CHECK LIST

Bidder's Name:_____

TENDER NO. CDI2352P23

This Questionnaire duly filled in should be returned along with each copy of Un-priced Bid. Clauses confirmed hereunder should not be repeated in the Bid.

Sl. No.	Description	Bidder's Confirmation
1.	Bidding structure	
2	Bidder's name and address:	
3.	It is noted that deviations to Terms & Conditions shall lead to rejection of offer, as specified in the Tender.	
4.	Ensure and confirm that prices quoted in 'Schedule of Rates', are for complete scope of work as defined in the tender	
5.	Indicate SAC Code Indicate rate of GST applicable.	SAC Code: GST ..... %
6.	Whether Bid Security submitted?	
7.	Confirm to Submit Performance Security as per Tender requirement	
8.	Confirm that the offer shall remain valid for acceptance up to **120 (One Hundred Twenty) days** from Bid Due Date / Date of opening of bids.	
9.	Whether Mobilization and Completion period of contract is complied?	
10.	Whether Integrity Pact Submitted (if applicable)?	
11.	Confirm that quoted prices shall remain firm and fixed until completion of the contract, except as otherwise mentioned in the bid document.	

12.	Confirm that you have submitted all documents as mentioned in the Tender/Annexures	
13.	Confirm acceptance to all terms & conditions of the Tender.	
14.	Confirm that all correspondence must be in English Language only.	
15.	Indicate Name & Contact No. (Telephone/Fax/E-mail) of person signing the bid.	Name: Contact No.: Fax: Email:
16.	Confirm that all Bank charges associated with Bidder's Bank shall be borne by Bidder.	
17.	Please indicate the following: (i) PAN No. (ii) GST Regn. No.	
18	Whether applying for Purchase Preference Policy (PPP-MII)? (Yes/No)	

Bidder confirms that in case of conflicting version of various terms & conditions at different places, the confirmation furnished as above shall be considered over-riding and final and any other deviation indicated elsewhere shall be treated as redundant.

Signature _____

Name _____

Designation _____

Office Stamp _____