



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
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FORWARDING LETTER

Sub: WORKS CONTRACTS IFB No. CDI0442P23 – Hiring Services for Design, Engineering, Procurement, Fabrication, Inspection, Supply, Construction and Commissioning of 8 MGD [Million Gallons Per Day] Capacity Water Treatment Plant on 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, Inspection, Supply, Construction and Commissioning of 8 MGD [Million Gallons Per Day] Capacity Water Treatment Plant on 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.	:	CDI0442P23
(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	:	15 (fifteen) 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	:	NIL. Refer Clause No. 9.0 of Instruction to Bidder (ITB)
(xi)	Bid Security/EMD Validity	:	NOT APPLICABLE
(xii)	Original Bid Security to be submitted	:	NOT APPLICABLE
(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 period/duration.
(xv)	Location of job	:	Duliajan, Assam

(xvi)	Duration of the Contract	:	The total duration of the contract will be for a period of 26 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: Twenty (20) Months for Demolition of Old Plant and Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning on LSTK Basis of New Water Treatment Plant. • Reliability Run/Site Acceptance Test: EPC Contractor shall be responsible for Initial Operation of the Plant for a period of 06 (Six) 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).
(xviii)	Bids to be addressed to	:	GM-Contracts(HoD), Contracts Department, Oil India Limited, Duliajan-786602, Assam, India.
(xix)	Pre-Bid conference	:	Tentatively on 10.06.2022 & 11.06.2022 at Duliajan. Exact dates and venue will be intimated later on. Note: Second day of the pre-bid is reserved for site visit. The bidders are advised to visit the site to get themselves acquainted with the site conditions and job requirements.
(xx)	Last Date of receipt of Queries	:	07.06.2022

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 bidding company.

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's E-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

Go to this Tab **“Notes and Attachments”** for Uploading **“Price Bid”**

Go to this Tab **“Technical Attachment”** for Uploading **“Technical Bid”**.

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 screenshot shows the 'Create RFX Response' interface. At the top, there are tabs: 'Submit', 'Read Only', 'Print Preview', 'Check', 'Technical RFX Response', and 'Close'. Below these, the form displays 'RFX Response Number 60038748', 'RFX Number 1396', 'RFX Owner BHARALI', and 'Total Value 0.00 INR'. The main section has tabs for 'RFX Information', 'Items', and 'Notes and Attachments'. Under 'RFX Information', there are sub-tabs: 'Basic Data', 'Questions', and 'Technical Attachments'. The 'Event Parameters' section includes a 'Currency' dropdown set to 'Indian Rupee', a 'Detailed Price Information' dropdown set to 'No Price', and a 'Terms of Payment' field. A 'Total Bid Value' field is highlighted with a red box. Callouts provide instructions: 'Bidder to select the currency of the Response' points to the Currency dropdown; '“Total Bid Value” is mandatory in “No Price” RFX' points to the Detailed Price Information dropdown; and '“Total Bid Value” considering all the taxes & duties.' points to the Total Bid Value field.

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 Bidder shall be suspended for a period of two (02) years. This suspension of two years shall be automatic without conducting any enquiry.

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 PRE-BID CONFERENCE

18.1 A Pre-Bid Conference is tentatively scheduled to be held on 10th and 11th June, 2022 to explain the requirements of Company in details to the interested prospective bidders and to understand bidders' perspective including exchange of views/ clarifications, if any, on the Scope of Work, Bid Rejection - Bid Evaluation Criteria and other terms & conditions of the Tender. The parties who want to participate in the pre-bid meeting must confirm their participation and forward their pre-bid queries, if any latest by 07th June 2022. For details, bidders may contact Contracts Department, Oil India Ltd., P.O. Duliajan-786602, Phone: +91374-2808656/2808653, Fax# (91)374-2803549, E-mail: contracts@oilindia.in.

Note: Second day of the pre-bid is reserved for site visit. The bidders are advised to visit the site to get themselves acquainted with the site conditions and job requirements.

18.2 Maximum 02 (two) representatives from each prospective bidder shall be allowed to participate in the pre-bid conference and the bidder must confirm their participation through E-mail.

18.3 The prospective bidders shall submit their queries / clarifications against the tender through E-mail / Fax / Courier addressed to GM-Contracts (HoD), Oil India Ltd., Duliajan-786602, Assam and such queries must reach OIL's office at Duliajan latest by 26.01.2022. OIL shall provide clarifications to only those queries received within this date. Queries / Clarifications against the tender received beyond 26.01.2022 will not be

entertained and replied. OIL will not be responsible for non-receipt or late receipt of any bidder's query in OIL's office.

18.4 However, clarifications / exceptions / deviations, if required any, should be brought out by the bidder prior to or during the Pre-Bid Conference only. After processing these suggestions, as a sequel to the pre-bid conference, Company may communicate the changes in this regard, if agreed any, through an addendum to tender document. Company will not accept any exception / deviation to tender conditions / specifications once the same are frozen after the pre-bid conference and the non-compliant bid(s) shall be rejected outright against this tender.

18.5 The exact date and venue of pre-bid conference will be intimated later on.

19.0 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:

19.1 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)].

19.2 "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.

19.3 "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

19.4 The beneficial owner for the purpose of para 20.3 above will be as under:

19.4.1 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;
- 19.4.2 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;
- 19.4.3 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;
- 19.4.4 Where no natural person is identified under (20.4.1) or (20.4.2) or (20.4.3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;
- 19.4.5 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.
- 19.5 An Agent is a person employed to do any act for another, or to represent another in dealings with third person.
- 19.6 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.
- 19.7 **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.
- 19.8 The bidders to provide an undertaking as per **Exhibit-II** along with their bid complying with Clause No. 20.1 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.

20.0 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: 01.06.2022

INSTRUCTIONS TO BIDDERS**1.0 ELIGIBILITY OF THE BIDDER:**

- 1.1 The eligibility 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. Project Document
 - viii. Annexure – I to Project Document (Layout Drawing)
 - ix. Annexure – II to Project Document (Detail of Electrical Engineering Jobs)
 - x. Annexure – III to Project Document (Detail of Civil and Structural Engineering Jobs)
 - xi. Annexure – IV to Project Document (Detail of Instrumentation Engineering Jobs)
 - xii. Schedule of Company's Plants, Materials and Equipment (SCPME): PART-IV **[Not applicable for this Tender]**
 - xiii. Safety Measures (SM): PART-V
 - xiv. Integrity Pact (IP): PART-VI
 - xv. Bid Form: PROFORMA-I
 - xvi. Statement of Non-Compliance: PROFORMA-II
 - xvii. Authorisation for Attending Bid Opening: PROFORMA-III
 - xviii. PROFORMA of Letter of Authority: PROFORMA-IV
 - xix. Bid Security Declaration-PROFORMA-V
 - xx. PROFORMA for E-Remittance: PROFORMA-VI
 - xxi. Format of Performance Security: PROFORMA-VII
 - xxii. Agreement Form: PROFORMA-VIII
 - xxiii. Format of undertaking by Bidders towards submission of authentic information / documents: PROFORMA-IX
 - xxiv. Certificate of Compliance of Financial Criteria: PROFORMA-X
 - xxv. Certificate of Annual Turnover & Net Worth: PROFORMA-XI
 - xxvi. Undertaking by vendor on submission of bank guarantee: PROFORMA-XII
 - xxvii. Format of BG towards Purchase Preference-Local Content: PROFORMA-XIII
 - xxviii. Undertaking For Local Content- PROFORMA-XIV
 - xxix. FORMAT FOR HINDRANCE REGISTER: PROFORMA-XV
 - xxx. Exhibit-I
 - xxxi. Exhibit-II
 - xxxii. Price Bidding Format (Attached under “**Notes and Attachments**” tab in the main bidding engine of OIL’s E-Tender portal)
 - xxxiii. Technical Evaluation Sheet for BEC-BRC & others
 - xxxiv. 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 **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):
- Complete technical details of the services offered.
 - Documentary evidence established in accordance with Clause No. 8.0.

- c) Bid Security Declaration as **PROFORMA-V** in accordance with Clause No. 9.0 hereunder.
- 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

The Bid Security is required to protect the Company against the risk of Bidder's conduct. In this regard, the bidders shall submit along with their bid a signed "Bid Security Declaration" (**PROFORMA-V**). Any bid not secured in accordance with **PROFORMA-V** above shall be rejected by the Company as non-responsive.

10.0 EXEMPTION FROM SUBMISSION OF BID SECURITY: NOT APPLICABLE.

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 **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 CGM-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 dead line is reached. The system time displayed on the e-procurement web page shall decide the submission dead line.
- 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 Security Declarations 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 Declaration 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 02 Weeks 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 HDFC Bank, Duliajan Branch, IFS Code – HDFC0002118; SWIFT Code - HDFCINBBAL. Branch Address: HDFC Bank Limited, Duliajan Branch, Utopia Complex, BOC Gate, Jayanagar, Duliajan, Dibrugarh, PIN – 786602. The Bank details are as under:

Bank Details of Beneficiary		
A	Bank Name	HDFC BANK LTD
B	Branch Name	DULIAJAN
C	Branch Address	Utopia Complex, BOC Gate, Jayanagar, Duliajan, Dibrugarh, PIN – 786602
D	Banker Account No.	21182320000016
E	Type of Account	Current Account
F	IFSC Code	HDFC0002118
G	MICR Code	786240302
H	SWIFT Code	HDFCINBBAL

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 Rudhra Gangadharan, IAS (Retd.) and Shri Om Prakash Singh, IPS (Retd.) 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@gmail.com
 - b. Shri Rudhra Gangadharan, IAS (Retd.), Ex-Secretary, Ministry of Agriculture
E-mail ID: rudhra.gangadharan@gmail.com
 - c. Shri Om Prakash Singh, IPS (Retd.), Former DGP, Uttar Pradesh,
E-Mail ID: Ops2020@rediffmail.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.

*****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 policy linked with Local Content (PP-LC) notified vide Letter No. FP-20013/2/2017-FP-PNG dated 17.11.2020 by - MoPNG (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 PP-LC 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 in the Government Notification No. FP20013/2/2017-FP-PNG dated 17th November, 2020 for PP-LC.

(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: Bidder must have experience of executing at least one 'SIMILAR WORK' of minimum value **₹ 39,00,00,000.00** (Rupees Thirty-Nine Crore) only in previous 10 (ten) years reckoned from the original bid closing date in PSU/Govt. Organization/ Public Limited Company/Municipalities.

Note to BEC-BRC Clause No. 2.1

‘**SIMILAR WORK**’ mentioned above means experience in successful completion of “Water Treatment Plant for Producing Potable Water of Minimum Capacity 4 MGD (Million Gallons per Day, the Unit of Measurement is Imperial Gallons, i.e. 1 Gallon = 4.54 Liters) with turbidity value of less than 1 NTU in the final treated /output water inclusive of Detailed Engineering Design, inspection, supply, construction, installation, commissioning of all Civil, Mechanical, Electrical, Instrumentation Engineering components”.

- 2.2 The Bidder must provide an undertaking (as per Annexure-1 to BEC-BRC) in writing confirming to the Clause No: 16.0 (EPC Contractor’s Personnel and Office) of the Project Document.
- 2.3 The bidder must provide the list of projects where they have successfully accomplished ‘Similar Work’ (as defined above under Note to BEC-BRC Clause No. 2.1) clearly indicating the Project Name, Client's name & Industry, Brief Scope of Work, Contract value, Contractual & Actual completion date with completion certificates, Client Representative & Contact details, Reasons for delay in completion (if any).
- 2.4 **Engineering and Design Capability:** The bidder should have in-house design and engineering capability for such EPC job. The bidder should provide their in-house set up for design and engineering with the details of their personnel who are on regular pay roll of the bidder. The CV of all such personnel should also be submitted with the bid.
- 2.5 **Project Management:** The bidder should provide along with the bid the details of the project management, inspection & expediting & quality management team of the bidder who will be involved in managing the planning, execution of the project activities and supervising the construction work progress at site meeting all the quality requirements. The bidder should provide their in-house set up for project management, inspection & expediting & quality management team with the details of their personnel who are on regular pay roll of the bidder. The CV of such personnel should also be submitted with the bid.
- 2.6 Bidder 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 should be made with approval of client (OIL) by personnel of equivalent experience or more.
- 2.7 Bidder should submit the list of software available with them for carrying in-house engineering & Project planning and reporting. However, the following minimum engineering software's required for carrying out detail engineering has to be owned by bidder and license copy details of the same in name of bidder must be submitted to OIL along with bid. List is as enclosed.
- a) Piping network analysis - PIPENET, AFT or equivalent
 - b) 3D modeling (piping, electrical, instrumentation & Structural) - PDMS V12.1 SP4 or equivalent
 - c) All 2D drawings - AUTOCAD or equivalent
 - d) Structural analysis and design - STAAD PRO or SAACS or equivalent
 - e) Pipe stress analysis - CAESAR V7.3 or equivalent
 - f) Project management tool - MS PROJECTS or Primavera or equivalent

3.0 BID FROM CONSORTIUM OF COMPANIES

In case the bidder is a Consortium of Companies, the following requirement should be satisfied by the bidder:

- a) One of the member should be leader of the consortium as per MOU of the consortium.
- b) Leader of the consortium member individually should meet the Technical Criteria as per Clause No: 2.1 above.
- c) The other members of the consortium should have commensurating work experience for the division of work.
- d) The leader of the consortium must submit bid on behalf of consortium of bidders. Consortium bids shall be submitted with a Memorandum of Understanding among the consortium members duly executed by the Authorized Executives of the consortium members and notarized. Such MOU/Agreement should be addressed to the Company, clearly stating that the MOU/ Agreement is applicable to this Tender and shall be binding on them for the entire contract period, including extension, if any. This MOU must accompany the technical bid which should clearly define the role/scope of work of each partner/member and should clearly define the leader of consortium. Memorandum of Understanding (MOU) must also state that all the members of consortium shall be jointly and severally responsible for discharging all obligations under the contract. However, the leader of the consortium must submit an undertaking along with the technical bid towards unconditional acceptance of full responsibility for executing the 'scope of work' of this bid document. The following provisions should also be incorporated in the MOU executed by the members of the Consortium:
 - i. Only the leader of the consortium shall register in the E-portal and submit bid on behalf of the consortium. The other members of the consortium shall ratify all the acts and decisions of the leader of consortium, which are taken in connection with and/or during the evaluation of the tender and execution of the contract.
 - ii. The bid security declaration shall be furnished by the leader of the consortium on behalf of consortium with specific reference to consortium bid and name & address of consortium members. The performance security shall be in the name of the leader on behalf of the consortium.
 - iii. The leader of the consortium on behalf of the consortium shall coordinate with OIL during the period the bid is under evaluation as well as during the execution of works in the event contract is awarded and he shall also be responsible for resolving dispute/misunderstanding/undefined activities, if any, amongst all the consortium members.
 - iv. The Leader of the Consortium shall be authorized to incur liabilities and receive instructions for and on behalf of the Consortium.
 - v. The leader of consortium shall take full responsibility for performance of the contract.
 - vi. Each member in a consortium shall be a legal entity and not an individual person.
 - vii. The division in scope of work among Consortium Members shall commensurate with their past experience. The overall Project Management shall be performed by the Leader. All Members of the Consortium shall assume responsibility jointly and severally and shall submit Agreement/MOU along with the Bid clearly defining the scope and responsibility of each member along with nomination of the Leader. This Agreement/MOU must remain in force at least till the end of Defects Liability Period and shall be extended if required as per the Company's advice.

- viii. The Consortium Leader and the distribution of work will be identified and set forth in the bid and will not be permitted to change thereafter without the consent of the Company.
- ix. No change in project plans, time tables or pricing will be permitted as a consequence of any withdrawal or failure to perform by a Consortium Member.
- x. Any correspondence exchanged with the leader of consortium shall be binding on all the consortium/joint venture members.
- xi. Payment shall be made by OIL only to the leader of the consortium towards fulfilment of contract obligations.
- xii. In case of consortium bids, the bid shall be digitally signed by the leader of consortium. The power of attorney from each member authorizing the leader for signing and submission of Bid on behalf of individual member must accompany the Bid.
- xiii. Documents/details submitted with the bidding document pertaining to qualification of the BIDDER must be furnished by each partner/member of consortium and should be complete in all respects clearly bringing up their experience especially in the form of work in their scope.
- xiv. **Constitution of Consortium:** The members of the consortium should not be more than three. If during evaluation of bid, a consortium leader proposes any alterations/changes in the constitution or replacement or inclusion or expulsion of any partner(s)/member(s) of the consortium 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 consortium shall be liable for rejection.
- xv. **Signing of Contract:** In the event of award of contract to the consortium, the contract is to be signed by the members of the consortium and the liability of each one of them shall be jointly and severally.
- xvi. Members of the consortium are not allowed to quote separately/independently against this tender. All the bids received in such case will be summarily rejected. Further, all bids from parties with technical support from the same principal/Subsidiary/Co-Subsidiary/Sister subsidiary will be rejected.
- xvii. Certified copies (attested by Director/Company Secretary) of Board resolutions passed by respective Board of Directors of the companies (Consortium leader and members) agreeing to entering into such consortium with each other for submission of bid for the NIT and authorizing designated executives of each company to sign in the MOU to be provided along with the technical bid.
- xviii. The MOU/Agreement should be legally valid i.e. it should be on a non-judicial stamp paper and notarized. In case of involvement of overseas bidder/consortium partner, the MOU/Agreement should be notarized/endorsed by Indian Embassy.

4.0 BID FROM JOINT VENTURE COMPANY

- 4.1 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-subsiidiary/ sister subsidiary/parent/ holding/ affiliating/ associate company or through any other arrangement like technical collaborator for meeting the technical criteria.

- 4.2 **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.
- 4.3 **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.
- 4.4 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.

5.0 DOCUMENTS TO BE SUBMITTED BIDDER FOR PROOF EXPERIENCE

1. For proof of requisite Experience (refer Clause No. 2.1), the following documents/ photocopy (self-attested/attested) must be submitted along with the bid:
 - A. Contract document showing details of work,
 - AND
 - B. Completion certificate(s) or Payment certificate(s) issued by the client(s) for the above contract or any other document(s), which can substantiate the successful execution of work. The submitted document(s) must contain the following:
 - (i) Nature of job done and Work Order No. / Contract No.
 - (ii) Gross Value of Work Done.
 - (iii) Contract period and date of completion.
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. Following work experience will also be taken into consideration:
 - (i) If the prospective bidder has executed a contract in which similar work is a component of the contract.
 - In case the document submitted as per Point No. 1 above, are not sufficient to establish the value/quantity/period of the similar work against Para 3 (i), above the bidder shall also have to submit the breakup of the works executed under such contract(s) clearly indicating the value/quantity/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).
4. SIMILAR work executed by a bidder for its own organization/subsidiary cannot be considered as experience for the purpose of meeting BEC.
5. The documents establishing experience of the JV or its member (as the case may be) shall be submitted as per Point 1/3 above.

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

6.0 OTHER REQUISITE

- 6.1 Time is the essence of this project. Completion period for the Main LSTK-EPC work is 20 Months from completion of mobilization period. Offers without confirmation of Completion period for the Main LSTK-EPC work of 20 Months or with Completion period for the Main LSTK-EPC work more than 20 Months will be summarily rejected.
- 6.2 During the tenure of the Project timeline of 26 Months and 15 days (15 days of Mobilization, 20 months of Main LSTK-EPC Contract and 06 Months of Reliability Run/Sit Acceptance test), OIL will be engaging a PMC contractor for assisting OIL in project execution and monitoring the project. Since, PMC Contract will be engaged by OIL for the entire project duration, in the event of failure on the part of EPC contractor to complete the project on time i.e. within the project completion period of 26 months and 15 days from the date of issue of LOA, the extra expenditure on PMC Contractor towards the extended period [attributable to EPC Contractor] will be recovered from the EPC Contractor.

7.0 **FINANCIAL EVALUATION CRITERIA**

- 7.1 The following Annual 'Financial Turnover' and 'Net Worth' 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 ₹ 18,00,00,000.00 (Rupees Eighteen Crore) 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 ₹ 5,40,00,000.00 (Rupees Five Crore and Forty Lakh) 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."

Notes to BEC-BRC Clause No. 7.1

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

- (i) A certificate* issued by a practicing Chartered / Cost Accountant (with Membership Number and Firm Registration Number), 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 has to 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) **In case of Consortium of companies:**

- (i) The Annual Financial Turnover from operations of at least one member of the consortium in any of preceding 03 (three) financial / accounting years, reckoned from the original bid closing date should be minimum **₹ 18,00,00,000.00** (Rupees Eighteen Crore) only and the other members of consortium should have Annual Financial Turnover of minimum **₹ 9,00,00,000.00** (Rupees Nine Crore) only in any of preceding 03 (three) financial / accounting years, reckoned from the original bid closing date.
- (ii) Similarly, in case of consortium bidding the Net Worth of all the consortium partners individually should be positive and cumulative Net worth should be minimum **₹ 5,40,00,000.00** (Rupees Five Crore and Forty Lakh) only for the accounting year preceding the original bid closing date.

5) **In case of Incorporated Joint Venture:** In case the bidder is an Incorporated Joint Venture company, who does not meet financial criteria by itself and submits bid based on the financial strength of its member having more than 50% stake in the JV, then documents need to be submitted along with the technical bid in support of the following:

- (i) Annual Financial Turnover from operations of the member having more than 50% stake in the JV during any of preceding 03 (Three) financial/accounting years from the original bid closing date should be minimum **₹ 18,00,00,000.00** (Rupees Eighteen Crore) only.
- (ii) Net worth of the member having more than 50% stake in the JV (supporting company) should be minimum **₹ 5,40,00,000.00** (Rupees Five Crore and Forty Lakh) only for the accounting year preceding the original bid closing date.
- (iii) 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
- (iv) 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.

7.2 **Working Capital:**

- a) The Bidder should have minimum working capital equal to **₹ 5,40,00,000.00** (Rupees Five Crore and Forty Lakh) only as per immediate preceding audited financial year result.

- b) Similarly, in case of consortium bidding the minimum cumulative working capital should be equal to **₹ 5,40,00,000.00** (Rupees Five Crore and Forty Lakh) only for the accounting year preceding the original bid closing date.
- c) Similarly, in case the bidder is an Incorporated Joint Venture company, who does not meet financial criteria by itself and submits bid based on the financial strength of its member having more than 50% stake in the JV, then the member having more than 50% stake in the JV should have minimum working capital equal to **₹ 5,40,00,000.00** (Rupees Five Crore and Forty Lakh) only as per immediate preceding audited financial year result.
- d) 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-3.]
- e) In the event of award, the contractor shall open a project specific account in a nationalized bank located in the vicinity where the project is executed. The contractor shall deposit an amount equal to 10% of the annualized contract value within 15 days from the date of issue of LOA. All payment against the contract shall be remitted to the project specific account. Any withdrawal from this account shall be only after the first payment against the contract is made by OIL. [An undertaking is to be submitted by the bidder as part of the offer conforming to comply on opening of bank account, 10% deposit and minimum balance]
- f) At any point of time the minimum balance after first remittance by OIL against invoice from the contractor shall remain 5% of the annualized contract value.

Note: Working Capital shall mean “Current Assets minus Current liabilities” as per latest year’s audited consolidated annual Financial Statements.

- 7.3 **Bid Capacity:** The bidding capacity of the contractor or cumulative bidding capacity of the consortium should be equal to or more than **₹ 36,00,00,000.00** (Rupees Thirty-Six Crore) only. The bidding capacity shall be worked out by the following formula:

$$\text{Bidding Capacity} = [A \times 1.5] - B$$

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-4.

Note: In case the bidder is an Incorporated Joint Venture company, who does not meet financial criteria by itself and submits bid based on the financial strength of its member having more than 50% stake in the JV, then the bidding capacity of the member having more than 50% stake in the JV should be equal to or more than **₹ 36,00,00,000.00** (Rupees Thirty-Six Crore) only.

- 7.4 **Debt equity ratio:** Debt equity ratio of the bidder or all consortium partners should not be more than 2:1. In case the bidder is an Incorporated Joint Venture company, who does not meet financial criteria by itself and submits bid based on the financial strength of its member having more than 50% stake in the JV, then the debt equity ratio of the member having more than 50% stake in the JV should not be more than 2:1. Debt equity ratio shall mean long term borrowings/ Net-worth.

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

8.0 COMMERCIAL EVALUATION CRITERIA

- 8.1 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.
- 8.2 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.
- 8.3 Bid Security is not applicable against this tender. However, bidders shall submit along with their bid a signed **“Bid Securing Declaration” (Proforma V)** accepting that, if they withdraw or modify their bids during the period of validity; or if they are awarded the contract and they fail to sign the contract; or if they fail to submit performance security before the deadline defined in the NIT; they will be suspended for the period of two years. This suspension of two years shall be automatic without conducting any enquiry.
- 8.4 Bid Documents / User Id & Password for OIL’s E-Tender portal are not transferable.
- 8.5 Any bid received in the form of Physical document/ Telex/ Cable/ Fax/ E-mail will not be accepted.
- 8.6 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.
- 8.7 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.
- 8.8 Any bid containing false statement will be rejected and action will be taken by Company as per Bid Document.
- 8.9 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”**.
- 8.10 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

8.11 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.

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

8.13 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.

9.0 PRICE EVALUATION CRITERIA:

9.1 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.

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

SOR-1 for Clearance/Development of Site Portion.

SOR-2 for Design and Detailed Engineering.

SOR-3 for Procurement and Supply Portion.

SOR-4 for Construction / Installation Portion.

SOR-5 for Pre-Commissioning, Mechanical Completion & Commissioning Portion.

SOR-6 for Reliability Run/ Site Acceptance Test Portion.

SOR-Summary - Total of SOR-1, SOR-2, SOR-3, SOR-4, SOR-5 and SOR-6.

9.3 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, 5 and 6 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, 5 and 6. The SOR-Summary shall reflect the total of SOR's – 1, 2, 3, 4, 5 and 6.

- 9.4 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, 5 and 6 which will be considered for evaluation of the bid.**
- 9.5 **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.**
- 9.6 Based on the evaluation of techno-commercially qualified bidders, the job will be awarded to the L-1 bidder.
- 9.7 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.
- 9.8 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.
- 9.9 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.
- 9.10 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.
- 9.11 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.

10.0 GENERAL:

- 10.1 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.
- 10.2 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.
- 10.3 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.
- 10.4 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.
- 10.5 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.

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

11.0 PURCHASE PREFERENCE CLAUSE:

PURCHASE PREFERENCE POLICY (LINKED WITH LOCAL CONTENT) (PP-LC):

Purchase preference policy-linked with Local Content (PP-LC) notified vide letter No. FP20013/2/2017-FP-PNG dated 17th November, 2020 of MoPNG shall be applicable in this tender. Bidders to check the provisions of the Notification for their eligibility to bid and seek benefits for Purchase preference, accordingly. Purchase preference will be applicable as per the Notification(s) and any amendment thereof. Bidders seeking benefits, under Purchase Preference Policy (linked with Local Content) (PP-LC) shall have to comply with all the provisions of the notification No. FP20013/2/2017-FP-PNG dated 17th November, 2020 or subsequent amendments, if any.

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 the amount of Performance Security towards fulfilment of conditions pertaining to Local Contents in accordance with the value mentioned in the certificate of LC.

12.0 THIRD PARTY INSPECTION:

12.1 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:

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 Lloyd Industrial Services GmbH (DNV GL- Oil & Gas)	a. mangesh.gaonkar@dnvgl.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@gulflloyds.com c. inspection@gulflloyds.com d. gulflloyds.india@gmail.com

Sl. No.	Name of Independent Inspection Agency	Contact E-mail ID
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

12.2 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 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.

12.3 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.**

12.4 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:**
 - Check Bidder's PAN Card
 - Check Bidder's GST Certificate
 - Check ITR of company
 - Check Bidder's Certificate of Incorporation – Domestic Bidder.
- **Additional Documents: (If applicable against the tender)**
 - Joint Ventures Agreements – To cross-check with JV Partners
 - Consortium Agreements – To cross-check with Consortium Partners
 - Holding/Parent/Subsidiary/Sister Subsidiary/Co-Subsidiary Company – To check the Share Holding pattern
- **Technical Criteria**
 - To check Experience Proof
 - To Check the Completion Certificates – Letter of Appreciations of proper Execution
 - Reference contact verification and true copy verification
 - To check Original Work Order/Contract Copy
 - To check any other document(s), if called for vide BEC/BRC of the Tender.
- **Financial Criteria**
 - Check and verify Audited Balance Sheet/CA certificate – Turnover & Net Worth.
 - Check Notarization validity, if any
 - To check the Line of Credit, if incorporated in the tender.

Note: If any documents LOI/LOA/Contracts etc. are submitted towards BEC/BRC experience criteria issued by Oil India Limited, such documents need not be verified by TPI agency.

13.0 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. 2.2 of BEC-BRC of 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, Inspection, Supply, Construction and Commissioning of 8 MGD [Million Gallons Per Day] Capacity Water Treatment Plant on LSTK Basis at Oil India Limited, Duliajan, Assam.**

2.0 I/We, the aforementioned bidder against the subject tender, hereby declare to comply with all the provisions of Clause No: 12 (EPC Contractor's Personnel and Office) of Project Document in toto.

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. 2.6 of BEC-BRC of 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, Inspection, Supply, Construction and Commissioning of 8 MGD [Million Gallons Per Day] Capacity Water Treatment Plant on LSTK Basis at Oil India Limited, Duliajan, Assam.**

2.0 I/We, the aforementioned 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 should be made with approval of client (OIL) by personnel of equivalent experience or more.

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**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-4 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%

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)
<u>Witness:</u> 1. 2.	<u>Witness:</u> 1. 2.

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 Bidding 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 COMPANY 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 CONTRACTORS 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 3 rd 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.

PART-II**PREAMBLE TO SCHEDULE OF PRICES**

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 including Clearance/Development of Site by demolishing an old 1.5 MGD WTP and Design, Engineering, Procurement, Fabrication, Supply, Construction & Commissioning and Initial Operation (reliability run/ site acceptance test) of the Plant for a period of 06 (Six) 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, 4, 5 and 6. The bid will not be evaluated if bidder fails to quote against all the items mentioned in the SOR– 1, 2, 3, 4, 5 and 6. The SOR-Summary is the total of SOR's – 1, 2, 3, 4, 5 and 6.
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	Clearance/Development of Site Portion, A			
20	SOR-2	Design And Detailed Engineering, B			
30	SOR-3	Procurement and Supply Portion, C			
40	SOR-4	Construction / Installation Portion, D			
50	SOR-5	Pre-Commissioning, Mechanical Completion & Commissioning Portion, E			
60	SOR-6	Reliability Run/ Site Acceptance Test Portion, F			
TOTAL EST. CONTRACT VALUE = A+B+C+D+E+F					
			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, 4, 5 & 6.

FORM		SOR-1			
NAME OF WORK		Clearance/Development of site by demolishing an old 1.5 MGD WTP located at the site of 8 MGD WTP to be constructed as per details of bid document.			
Name of Bidder					
Sl. No.	Description of Items	UOM	Qty.	Unit Rate (₹)	Total (₹) (Ex GST)
1	Decommissioning, Removal, Lifting and Transportation of Mechanical Equipment & Piping.	Lumpsum	1.00		
2	Decommissioning, Removal, Lifting and Transportation of Electrical Equipment & Cabling.	Lumpsum	1.00		
3	Demolition Removal, Lifting and Transportation of Civil Structures.	Lumpsum	1.00		
4	Site Clearance/ Site Development for construction of 8 MGD WTP	Lumpsum	1.00		
TOTAL - Exclusive GST (₹)					
Applicable GST Rate (in %)					
GST Amount (₹)					
TOTAL - Inclusive of GST (₹)					

FORM		SOR-2			
NAME OF WORK		Design and Detailed Engineering of 8 MGD capacity Water Treatment Plant (WTP) as per details of bid document.			
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-3			
NAME OF WORK		Procurement and Supply Portion of 8 MGD capacity Water Treatment Plant (WTP) as per details of bid document.			
Name of Bidder					
Sl. No.	Description of Items	UOM	Qty.	Unit Rate (₹)	Total (₹) (Ex GST)
1	Procurement for Civil Engineering Portion.	Lumpsum	1.00		
2	Procurement for Mechanical & Plant Piping Portion.	Lumpsum	1.00		
3	Procurement for Electrical Engineering Portion .	Lumpsum	1.00		
4	Procurement for 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		Construction/Installation Portion of 8 MGD capacity Water Treatment Plant (WTP) as per details of bid document.			
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	Installation of Electrical Engineering Portion.	Lumpsum	1.00		
4	Installation of Instrumentation Engineering Portion.	Lumpsum	1.00		
TOTAL - Exclusive GST (₹)					
Applicable GST Rate (in %)					
GST Amount (₹)					
TOTAL - Inclusive of GST (₹)					

FORM		SOR-5			
NAME OF WORK		Pre-Commissioning, Mechanical Completion & Commissioning Portion of 8 MGD capacity Water Treatment Plant (WTP) as per details of bid document.			
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		
TOTAL - Exclusive GST (₹)					
Applicable GST Rate (in %)					
GST Amount (₹)					
TOTAL - Inclusive of GST (₹)					

FORM		SOR-6			
NAME OF WORK		Six (06) months of reliability run/site acceptance test portion of 8 MGD capacity Water Treatment Plant (WTP) as per details of bid document.			
Name of Bidder					
Sl. No.	Description of Items	UOM	Qty.	Unit Rate (₹)	Total (₹) (Ex GST)
1	Reliability Run/Site Acceptance Test [O&M, HSE Compliance Expenses, Spares & Consumables Elements etc. for six (06) 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, Inspection, Supply, Construction and Commissioning of 8 MGD [Million Gallons Per Day] Capacity Water Treatment Plant on LSTK Basis at Oil India Limited, Duliajan, Assam.

The Project also includes Clearance/Development of Site by demolishing an old 1.5 MGD WTP located at the site of 8 MGD WTP to be constructed.

NB: The Unit of Measurement is Imperial Gallons, ie: 1 Gallon = 4.54 Liters.

All materials like fuel, water, consumables, 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. Power if available at site may be provided by OIL on chargeable basis.

The detailed Scope of Work is defined in attached Project Document.

2.0 MOBILIZATION

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

2.2 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.

3.0 DURATION OF THE CONTRACT

The total duration of the contract will be for a period of **26 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: Twenty (20) Months for Demolition of Old Plant and Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning on LSTK Basis of New Water Treatment Plant.
- Reliability Run/Site Acceptance Test: EPC Contractor shall be responsible for Initial Operation of the Plant for a period of 06 (Six) Months from the Date of Commissioning of the Plant is all aspects.

4.0 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.

5.0 PERFORMANCE SECURITY: 3.00 % of Contract Value.

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

7.0 REMUNERATION & TERMS OF PAYMENT

7.1 Payment will be made, as per following payment terms, up to **100%** of the value of work done. Final payment will be made only after satisfactory completion of the work. Such 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.

7.2 Terms of Payment

- (i) 1% of the project cost payable for completion Clearance/Development of Site by demolishing an old 1.5 MGD WTP located at the site of 8 MGD WTP to be constructed.
- (ii) 6% of the project cost payable for completion of Fieldwork, Residual Concept Plan, Residual Design, Engineering, Design Report, Working Drawings for 8 MGD Capacity Water Treatment Plant including allied buildings and approval of the project deliverables by the OIL.
- (iii) 30% of project cost payable for Procurement supply, Installation and testing of the equipment 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
- (iv) 23% of project cost payable after completion of construction the Civil works and Allied buildings.
- (v) 30 % of the payments shall be made after the completion of the pre- commissioning, mechanical completion, successful commissioning.
- (vi) 10% of the payments shall be made after the completion Reliability test run /Site Acceptance test.

7.3 All Invoices are to be sent to the following address:

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

8.0 DE-MOBILIZATION:

- a) After successful Commissioning and completion of subsequent 06 (Six) 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.
- b) The contractor shall be required to submit the following documents but not limited to the same on completion of Commissioning of the Plant:
 - 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, if any.
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.
15. Warranty / Guarantee Certificates of all the items.

- 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

9.0 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.

10.0 WARRANTY AND REMEDY OF DEFECTS: A period of 12 (Twelve) Months from completion of Initial Operation (reliability run/ site acceptance test) 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.

11.0 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	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	Site In-Charge (Instrumentation)		Experience: A Graduate in Instrumentation Engineering with minimum of 3 years or Diploma in Instrumentation Engineering with minimum of 5 years of experience in electrical engineering jobs of project nature.
6	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.
7	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.

12.0 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) Clearance/Development of Site by demolishing an old 1.5 MGD WTP located at the site of 8 MGD WTP to be constructed.
- b) Construction of Plant Piping
- c) Civil construction jobs
- d) Painting
- e) Electrical Jobs
- f) Instrumentation Jobs
- g) Logistics
- h) NDT
- i) TPI

13.0 AREA OF OPERATION: Duliajan, Assam

14.0 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.

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

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

17.0 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
PO 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*****

PROJECT DOCUMENT	OWNER
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PROJECT DOCUMENT

PROJECT TITLE:

**DESIGN, ENGINEERING,
 PROCUREMENT, FABRICATION,
 INSPECTION, SUPPLY,
 CONSTRUCTION AND
 COMMISSIONING OF 8 MGD
 CAPACITY WATER
 TREATMENT PLANT ON LSTK
 BASIS AT DULIAJAN, ASSAM,
 INDIA**

PROJECT DOCUMENT	OWNER
DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, INSPECTION , SUPPLY, CONSTRUCTION AND COMMISSIONING OF 8 MGD CAPACITY WATER TREATMENT PLANT ON LSTK BASIS AT DULIAJAN, ASSAM, INDIA	 Oil India Limited Comparing Newer Horizons

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

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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.** A pontoon Based Raw Water In-take Plant (situated approximately 2 KM away) shall supply 10 MGD Raw River water to the 8 MGD WTP to be constructed. ***(THE RAW WATER IN-TAKE PLANT AND RELATED PIPE LINE IS BEING CONSTRUCTED THROUGH A SEPARATE CONTRACT)***

THE PROJECT OBJECTIVE CAN BE DEFINED AS: *To Construct a water treatment plant on EPC/LSTK basis, of capacity 8 MGD treated water, to treat raw river water and achieve latest IS-10500 standards for drinking water with specific reference to the turbidity value of < 1 NTU at the outlet of treatment plant, by incorporating clariflocculation followed by submerged ultra filtration process at Tipling, Duliajan, Assam. The Project also includes demolition of the old 1.5 MGD WTP located at the site of 8 MGD WTP (to be constructed) for Clearance/Development of Site for construction of the 8 MGD WTP.*

OIL now intends to hire EPC services for Construction of 8 MGD Capacity Water Treatment Plant at Tipling, Duliajan, Assam as per the Project Definition above. This volume details the scope of work, conditions of work and relevant details required for the EPC/LSTK vendor to participate in the Tendering Process.

NOTE: The construction of Pontoon Type Raw Water Intake Plant (required for the 8 MGD WTP) , related piping and associated facilities are NOT part of this EPC Project. This has been catered to by a SEPARATE CONTRACT.

2.0 BRIEF DESCRIPTION OF WORK

I.Introduction:

This volume defines the jobs and responsibilities of the EPC Contractor for Design, Engineering, Procurement, Fabrication, Supply, Construction, Installation and Commissioning on EPC Basis of 8 MGD Capacity Water Treatment Plant at Tipling, Duliajan complete in all aspects at Duliajan, Assam, India.

The scope of work includes (but not limited to) Residual Process Design, Residual Engineering, Basic Engineering and Design (based on FEED of the PMC), Detail Engineering (based on FEED of the PMC), Obtaining all necessary

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approvals from statutory bodies as applicable , Health, Safety and Environmental (HSE) compliance, Soil Investigation, Tendering, Inspection, 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, Final Commissioning, Performance Guarantee Test Runs including Total Project Management on EPC Basis for Commissioning, Completion and handing over the 8 MGD Capacity Water Treatment Plant complete in all aspects at Duliajan, Assam, India. The scope of work for the EPC Contractor also Clearance/Development of Site by demolishing an old 1.5 MGD WTP located at the site of 8 MGD WTP to be constructed.

II. Basic Details:

The 8 MGD Capacity Water Treatment Plant shall have to be constructed (After clearance/Development of Site by demolishing a 1.5 MGD WTP located at the site of 8 MGD WTP)at the Tipling, Duliajan in Dibrugarh District of Assam. The site of the construction of the 8 MGD WTP to be cleared/developed by demolishing an existing old 1.5 capacity water treatment plant. The indicative map for the site is as bellow:



Fig: Indicative Map of the site of 8 MGD WTP

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III. Demolition of old 1.5 MGD WTP:

The Job involves demolition , decommissioning of all existing Structures/equipment of an old 1.5 MGD WTP located at the site of 8 MGD WTP to be constructed under the scope of this EPC Contract. The scope of work also includes removal, dismantling of Civil Structures, Mechanical Items, all piping, electrical items to make the site ready for construction of the 8 MGD WTP. All the dismantled Mechanical Items, all piping, electrical items and civil items to be lifted , transferred and dumped as per the direction of OIL's representative at a designated site for subsequent disposal by OIL. A few photographs of the old 1.5 MGD WTP is appended below for reference purpose only. All leveling, Earth Moving, Excavation etc required for making the site ready for construction of the 8 MGD WTP shall also be under scope of work of the EPC Contractor.

Please note that the photographs are indicative only and are not exhaustive of the equipment installed at the 1.5 MGD WTP to demolished to make the site ready for construction of the 8 MGD WTP.



Fig: Indicative Photographs of old 1.5 MGD WTP

IV. Brief Process Description of 8 MGD WTP:

A Pontoon Type Raw Water Intake plant (situated approximately 2 KM away from the site of 8 MGD WTP) 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 (32 Inch OD) 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 Basic Design Operational philosophy of Pontoon Pump Houses are as below:

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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.

Primary Screening of physical matter in the raw river water shall take place in the Raw Water Intake plant as described below:

- In the discharge of the pumps, the first level of solids interception will be provided through Basket Strainer. The basket strainer will have the capability to filter out big size solids and particles viz.. big silt, debris etc., and prevent this from being conveyed to the treatment plant.
- The basket strainer will be placed in the main discharge header. Redundancy will be provided so that, at any point of time, 100% of the capacity is treated through the basket strainer system.
- An in-situ backwashing system will be provided for the cleaning and flushing of the strainer system.

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.

The Scope of Work of the EPC Contractor shall be to Design, Develop, Procure, Fabricate, Construct and Commission a water treatment plant of capacity 8 MGD treated water, to treat the river water being supplied from the Ponton Based Raw Water Intake Plant (as described above) and to achieve latest IS:10500 standards for drinking water with specific reference to the turbidity value of < 1 NTU at the outlet of treatment plant, by incorporating clariflocculation followed by submerged ultra filtration process.

NOTE: The construction of Pontoon Type Raw Water Intake Plant (required for the 8 MGD WTP) , related piping and associated facilities are NOT part of this EPC Project. This has been catered to by a SEPARATE CONTRACT.

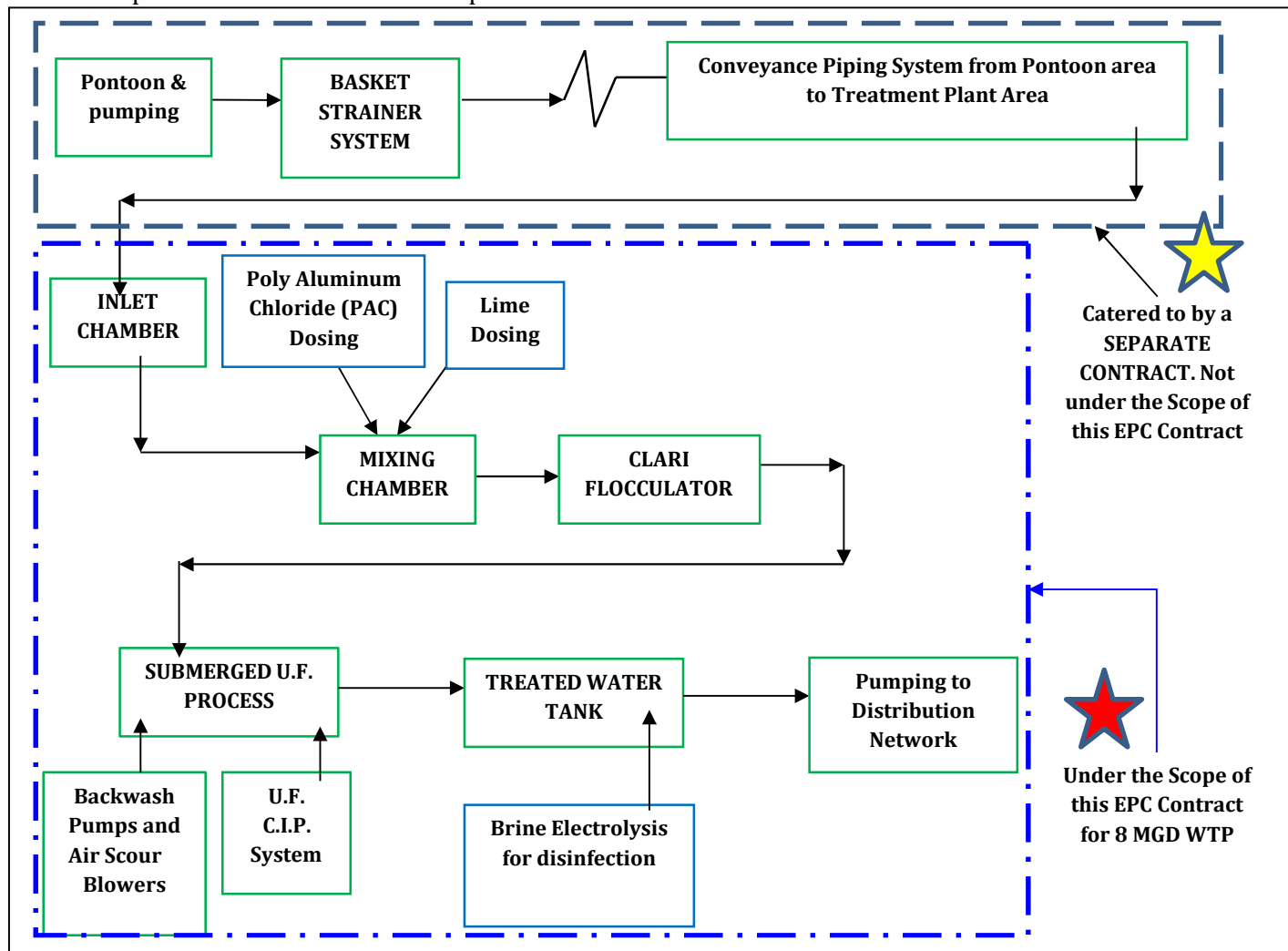
3.0 Core process selection philosophy:

- (i) The Submerged UF process is capable of taking inlet Turbidity loads of 100 NTU continuous and even 300 – 500 NTU on shock load basis and still yield a consistent < 1 NTU as the product, in addition to Log 5 reduction in bacteria.
- (ii) However, the river water is known to carry massive Turbidity values during winter and expected to spike at very highly irregular and non- controlled time slot , even within a day.
- (iii) In such a dynamic inlet raw water quality input, it has been decided to integrate the strengths of both the conventional process as well as the advanced technologies to evolve a HYBRID SYSTEM as the ADVANCED TECHNOLOGICAL OPTION.

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- (iv) Right at the beginning, in the pontoon intake itself, an interference filtration using basket strainer is provided to ensure that maximum capture of TSS is done even before the raw water is pumped into the treatment plant. This will also prevent settling of TSS in the pipe line system.
- (v) The raw water will go through primary physico-chemical settling system which is the conventional process involving flash mixing and clariflocculation
- (vi) Then, it will be processed through Submerged Ultra Filtration which is a technologically more advanced than conventional pressurized ultra filtration. S-UF is more suited to this application than P-UF
- (vii) Disinfection is also being done with Brine Electrolysis involving insitu generation of hypo chlorite from salt solution, which is also technologically advanced as compared with conventional gas chlorination which comes with its safety and other related drawbacks.

The whole process is summarized in the process schematic as below:



4.0 Process description:

- A. Step 1: Mixing with dosing chemicals followed by Clariflocculator
- B. Step 2 : Submerged Ultra Filtration with pre-screening
- C. Step 3 : Disinfection with In-situ hypo chlorite generation through Brine Electrolysis
- D. Step 4: Treated Water Storage and Distribution

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A. Mixing with dosing chemicals followed by Clariflocculator:

Brief Description:

- (i) Inlet chamber is provided to still the flow
- (ii) The raw water then goes through a Flash Mixer wherein Alum and Lime are added
- (iii) The coagulated solids in the raw water are allowed to settle down in the Clariflocculator
- (iv) The outlet of the Clariflocculator goes to the downstream Submerged UF system
- (v) The solids from the bottom of the Clariflocculator are taken for direct disposal.

Unit Operations:

- (i) Inlet chamber – civil tank
- (ii) Flash Mixer – civil tank with flash mixer agitator
- (iii) Alum dosing tanks with agitators and alum dosing pumps
- (iv) Lime dosing tanks with agitators and lime dosing pumps
- (v) Clariflocculators – 2 nos in parallel – civil tank with clariflocculator mechanism

B. Submerged Ultra Filtration with pre-screening:

Brief Description:

- (i) Submerged UF system is provided to bring down the Turbidity to < 1 NTU
- (ii) The treated water from the upstream clariflocculator goes by GRAVITY to the submerged UF tanks.
- (iii) The Submerged UF membranes are kept inside the tank
- (iv) Five working and One standby i.e total of SIX tanks are provided
- (v) The permeate is taken through Filtrate Pumps and reach the treated water tank
- (vi) The UF modules are backwashed and air scoured on a set time interval
- (vii) Based on design and operating guidelines, Chemically Enhanced Backwashing (CEB) system is provided to inject suitable chemicals during the backwashing sequence
- (viii) A dedicated CIP system consisting of CIP tank, CIP pump is provided for periodic cleaning of the UF membranes
- (ix) The entire UF operation is controlled through PLC
- (x) The acidic / alkaline cleaning wastes are led to a NEUTRALIZATION PIT.
- (xi) In the neutralization pit, either acid or alkali, depending on the pH of the effluent, is added through dosing systems
- (xii) The neutralized water is taken out for disposal
- (xiii) The backwash waste from the UF modules are taken back into the pre-treatment for reuse

Unit Operations:

- (i) Submerged UF tanks and submerged UF membranes
- (ii) UF backwash pumps
- (iii) UF backwash air blower
- (iv) UF air compressor – for primary backwash as well as for pneumatic control
- (v) UF CEB dosing tanks
- (vi) UF CEB dosing pumps
- (vii) UF CIP tank
- (viii) UF CIP pumps

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C. Disinfection with In-situ hypo chlorite generation through Brine Electrolysis:

Brief Description:

- (i) For disinfection, it is proposed to use Brine Electrolyser to generate in-situ hypochlorite
- (ii) The system consists of suitable electrolyser and hypo storage tanks
- (iii) Hypo is dosed using dosing pumps in the treated water tank to maintain the FRC

Unit Operations:

- (i) Brine Electrolyser – 1 w + 1 sb

D. Treated Water Storage and Distribution:

Brief Description:

- (i) The treated water from the treatment plant is stored in a treated water tank
- (ii) From the treated water tank, high quantity pumps are provided for distribution
- (iii) The treated water is distributed through FIVE MANIFOLDS as per the proposed distribution plan

Unit Operations:

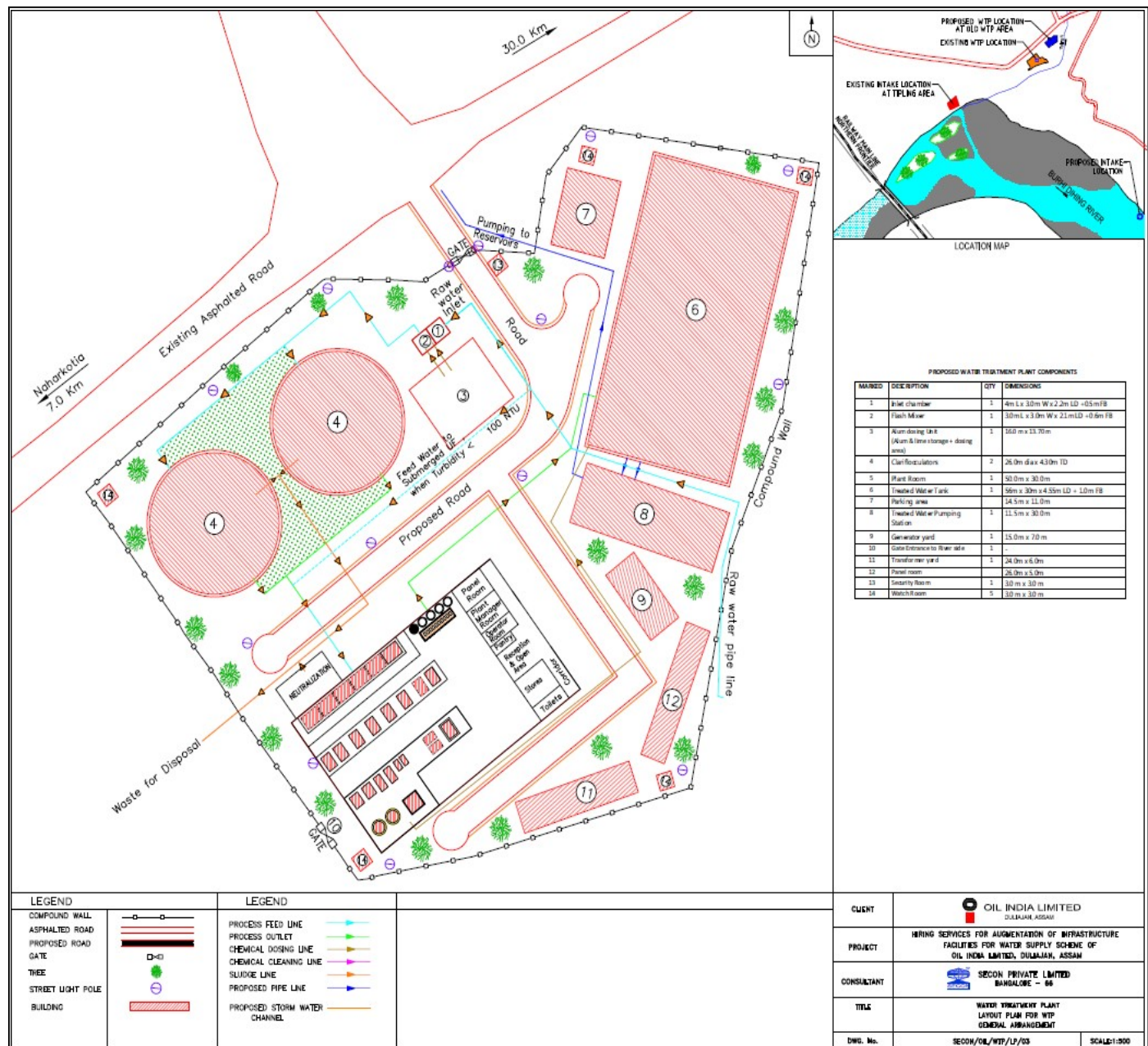
- (i) Treated water tank
- (ii) Treated water transfer pumps
- (iii) Connection to the existing manifold

Summary of Process Selection:

Step 1:	Primary Solids removal through - Flash Mixing of the raw water with alum and lime - Settling of the coagulated solids through Clariflocculator
Step 2:	Submerged Ultra Filtration to bring down the Turbidity to < 1 NTU consisting of - Submerged UF tanks and membranes - UF backwash pumps and air blowers - UF CEB dosing systems - UF Effluent Neutralization Systems - UF CIP system with CIP tank and CIP pump
Step 3:	Disinfection of treated water through in-situ Electrochlorinator through - Brine Electrolyser - Hypo storage and dosing systems
Step 4:	Treatment and distribution system - Treated Water Storage tank - Treated water transfer pumps - Connection to existing manifold for distribution

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Equipment Layout: The proposed Equipment layout for the 8 MGD WTP is as below:



Drawing No: SECON/OIL/WTP/LP/03 is attached, **Annexure - I**.

5.0 Design Basis

(a) The design basis for 8 MGD WTP is summarized as below:

CAPACITY OF THE TREATMENT PLANT	MGD	8
DESIRED PRODUCT FLOW RATE	m ³ /day	30280
	m ³ /hr	1317
OUTLET OF UF SYSTEM:	m ³ /hr	1317

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RECOVERY OF UF SYSTEM, INCLUDING BACKWASH LOSSES (AS PER MANUFACTURER'S RECOMMENDATION, TAKEN AT 45 LMH FLUX)	%	90.9
HENCE, INLET TO UF SYSTEM	m3/hr	1448
THIS IS THE OUTLET OF THE PRIMARY CLARIFLOCCULATION PRODUCT OF CLARIFLOCCULATOR	m3/hr	1448
LOSS IN CLARIFLOCCULATOR UNDERFLOW	%	2.25
RECOVERY OF CLARIFLOCCULATOR SYSTEM	%	97.75
SO, INLET FLOW RATE TO CLARIFLOCCULATION SYSTEM	m3/hr	1482
MAKEUP FOR CHEMICAL PREPARATION AND OTHER REQUIREMENTS (APPROXIMATED AT AROUND 100 KLD)	%	0.5
SO, DESIGN INLET FEED FLOW TO THE PLANT	m3/hr	1489
PLANT WILL BE DESIGNED FOR	m3/hr	1500
	m3/day	34500
	MLD	34.5
NOTE:		

Provision for re-use of backwash loss may be taken up at a later date. Hence, pretreatment design has been taken by considering this 10 % loss in UF system to be included in the input design.

The Design Basis of Parameters for the 8 MGD WTP are as below:

Parameter	Unit	Design Inlet (raw water)	After Primary Clariflocculation	After Ultra Filtration	Final Treated Water
pH	Index	5.5 – 7.5	6.5 – 8.0	6.5 – 7.5	7 – 7.5
Turbidity	NTU	100 (normal) and 600 (once in a shift for 2 hours)	< 100	< 1	< 1
Total Suspended Solids	Ppm	100 (normal) and > 300 ppm continuously for more than 2 hours	< 50	< 1	< 1
Total Dissolved Solids	Ppm	< 2100	< 2100	< 2100	< 2100
Free Residual Chlorine	Ppm	NA	NA	NA	0.2 – 0.5

(b) The main electrical power requirement of the 8 MGD WTP shall be catered to by OIL's captive power. The electrical power is to be tapped from the 11 KV overhead lines. Suitably rated separate Diesel Generating (DG) Set 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. (750 Minimum)

6.0 Summary of major Machinery / Equipment/Structures at the 8 MGD WPT

The 8 MGD WTP shall have to be commissioned at the site made ready subsequent to the demolition of the old 1.5 MGD WTP and making site ready for construction, as detailed under 2.0-III above (demolition job is also under the scope of this Project).

The following is a summary of major Machinery / Equipment/Structures that are to Designed, Procured/ Fabricated/Constructed, Supplied, Installed, Tested, Inspected and Commissioned for Final Commissioning of the 8 MGD WTP:

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(NB: The list of items mentioned are indicative only. The Design, Supply, Construction, Installation, Inspection, Testing and Commissioning of all other items as mentioned in the SCC /drawing/ contract document for completion of the plant as per Project Definition shall be in the scope of the contractor. Contractor shall supply and execute the same without any additional cost. Also, if any other items/ tools/jobs not mentioned in contract document(SOQ/SCC/drawing etc.) but required for completion of the plant shall be in the scope of the contractor. The same shall be supplied and execute by the contractor without any additional cost.)

Sl No	Description	Quantity	Details
A. Primary Treatment System			
1.	Inlet Chamber	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Inlet Chamber (4.0m x 3.0 m x 2.2m LD +0.5m FB) for Flow equalization and normalization of Raw Water.
2.	Flash Mixer	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Flash Mixer (3.0m x 3.0m x 1.80m LD +0.7m FB) to provide rapid mixing of the pre-treatment chemicals with the raw water
3.	Flash mixer agitator	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD Flash mixer agitator (with direct driven agitator mechanism) for bringing about flash mixing with high speed agitator.
4.	Clariflocculators	02 (02 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Clariflocculators (26.0m dia x 5.9m TD with flocculator compartment of 11.0m dia x 2.5m SWD) for Primary treatment for removal of TSS and Turbidity in the raw water
5.	Clariflocculator mechanism	02 (02 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD Clariflocculator mechanism suitable for above civil tanks, 5 hp clarifier mechanism with flocculator paddles.
6.	Poly Aluminum Chloride (PAC) /Alum dosing tank	02 (01 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Poly Aluminum Chloride (PAC) /Alum dosing tanks (2.0m x 2.0m x 1.8m LD+0.5m FB)to prepare Poly Aluminum Chloride (PAC) /alum solution
7.	Poly Aluminum Chloride (PAC) /Alum dosing pump	03 (02 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD Poly Aluminum Chloride (PAC) /Alum dosing pumps (400 lph @ 2 bar) to pump alum solution to the Flash Mixer.
8.	Poly Aluminum Chloride (PAC) /Alum dosing tank agitator	02 (01 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD Poly Aluminum Chloride (PAC) /Alum dosing tank agitator (1.0 hp, 180 rpm, SS shaft, impeller) to ensure proper mixing.
9.	Lime dosing tank	02 (02 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Lime dosing tank (2.2m x 2.2m x 1.8m LD+0.5m FB) to prepare lime solution.
10.	Lime dosing pump	03 (02 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD Lime dosing pump (500 lph @ 2 bar) to pump lime solution to the Flash Mixer.

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Sl No	Description	Quantity	Details
11.	Lime dosing tank agitator	02 (02 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD Lime dosing tank agitator (1.0 hp, 180 rpm, SS shaft, impeller) to ensure proper mixing.
12.	Chemical House	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Safe Storage of Chemicals (as per MSDS) along with suitable chemical handling facility. Sizing to be finalized during Design considering all the chemicals to be used and the storage amount required for safe/efficient operation of the plant.

B. Submerged Ultra Filtration System

The system shall consist of the followings:

- (i) UF modules, UF tank, UF filtrate pumps
- (ii) Backwash system consisting of backwash pumps, air scour blowers
- (iii) CEB system consisting of dosing tank and dosing pumps for chemicals used periodically in the CEB, neutralization pit and neutralized water transfer pumps.
- (iv) CIP system consisting of CIP tank and CIP pump, process air compressor and air receiver system for providing process and control air + PLC + Valves
- (v) Process air compressor and air receiver system for providing process and control air + PLC + Valves

1.	Submerged UF modules	06 (05 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of 224 Nos of L20N Submerged UF Model along with Rack to reduce turbidity to < 1 NTU
2.	Submerged UF Tanks	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Tank for the submerged UF, 20.0m x 5.0m x 5.0m LD + 1.0m FB total dimension to house the submerged UF membranes.
3.	S-UF Filtrate Pumps	08 (05 Working+ 03 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD S-UF Filtrate Pumps (Centrifugal Pump, 390 m3/hr @ 15 mwc) for pumping S-UF Filtrate.
4.	S-UF backwash pumps	02 (01 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD S-UF backwash pumps (Centrifugal Pump, 680 m3/hr @ 12 mwc)
5.	Air Blower for backwash	02 (01 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD Air Blower for backwash (Roots type, 3200 m3/hr @ 36 Kpa) to be used for backwashing.
6.	Air compressor	02 (01 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD Air compressor (22 m3/hr, 101 mwc) for process and control air compressor.
7.	Process air receiver	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Process air receiver (vertical pressure vessel, 1200 liters for 10 bar).

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Sl No	Description	Quantity	Details
8.	CIP Tank	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of CIP Tank (3.0m L x 4.0m W x 4.0m LD + 0.5m FB) for cleaning of UF membranes.
9.	CIP pump	02 (01 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD CIP pumps (250 m3/hr @ 12 mwc) for pumping cleaning solution to UF membranes.
10.	CEB hypo tank	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of CEB hypo tank (2 m3 tank in FRP; 1.5m dia x 1.2m LD +0,3m FB) storing hypo chlorite for dosing.
11.	CEB hypo dosing pump	02 (01 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD CEB hypo dosing pump (1200 lph @ 2 bar) for hypo dosing.
12.	CEB Citric acid tank	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of CEB Citric acid tank (2 m3 tank in FRP; 1.5m dia x 1.2m LD +0,3m FB) for storing citric acid solution for dosing.
13.	CEB citric acid dosing pump	02 (01 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD CEB citric acid dosing pump (800 lph @ 2 bar) for citric acid dosing.
14.	CEB sulphuric acid tank	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of CEB sulphuric acid tank (2 m3 tank in PP / MS ; 1.5m dia x 1.2m LD +0,3m FB) for storing sulphuric acid for dosing
15.	CEB sulphuric dosing pump	02 (01 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD CEB sulphuric dosing pump (400 lph @ 2 bar) for sulphuric dosing
16.	CEB SMBS tank	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of CEB SMBS tank (2 m3 tank in FRP ; 1.5m dia x 1.2m LD +0,3m FB) for storing SMBS for dosing.
17.	CEB SMBS dosing pump	02 (01 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD CEB SMBS dosing pump (400 lph @ 2 bar) for SMBS dosing.
18.	CEB caustic tank	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of CEB caustic tank (2 m3 tank in FRP ; 1.5m dia x 1.2m LD +0,3m FB) for storing caustic for dosing.
19.	CEB caustic dosing pump	02 (01 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD CEB caustic dosing pump (800 lph @ 2 bar) for caustic dosing.

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Sl No	Description	Quantity	Details
20.	Neutralization pit	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Neutralization pit (165 m3 liquid holdup; 11.0m x 6.0m x 2.5m LD+0.5m FB) for neutralizing cleaning solution.
21.	Pit transfer pumps	02 (01 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD Pit transfer pumps (180 m3/hr @ 10 mwc) to transfer neutralized water.
22.	Submerged UF House	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Submerged UF House. Sizing to be finalized during Design to accommodate all the equipment inclusive of all Electrical and Instrumentation Items.

C. Disinfection and Treated Water Storage:

1.	Brine Tank	02 (01 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Brine Tank (3.0m dia x 2.5m LD+0.5mFB) for preparation of brine solution for electrolysis
2.	Brine Electrolyser	02 (01 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Brine Electrolyser (Titanium and MMO coated electrodes in PP/FRP housing for brine electrolysis to give 2.50 ppm as hypo solution) for in-situ generation of hypochlorite solution for disinfection
3.	Hypo dosing tank	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Hypo dosing tank (10 m3 tank in FRP ; 2.5 m dia x 2.5 m LD +0.3m FB) to dose hypo for disinfection
4.	Hypo dosing pump	03 (02 Working+ 01 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD Hypo dosing pump (500 lph @ 2 bar) to dose hypo.
5.	Treated Water tank	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Treated water tank (60.0m x 30.0m x 4.5m LD + 0.5m FB) to store final treated water for subsequent pumping to distribution system.
6.	Disinfection Shed	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Disinfection Shed. Sizing to be finalized during Design.

D. Treated Water Distribution Pumps:

1.	EMD Treated Water Distribution Pumps	05 (03 Working + 02 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of EMD Treated Water Distribution Pumps (140 lps @ 200 mwcc)
2.	DED Treated Water Distribution Pumps	02 (00 Working + 02 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of DED Treated Water Distribution Pumps (140 lps @ 200 mwcc)
3.	EOT Cranes	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of

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Sl No	Description	Quantity	Details
			EOT Cranes for movement/transfer of Treated Water Distribution Pumps. Rating to be finalized during Design.
4.	Treated Water Distribution Pump House	01 (01 Working+ 0 Standby)	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Treated Water Distribution Pump House. Sizing to be finalized during Design. The Finished GL of the Pump House should preferably be able to provide Positive Suction for the Treated Water Distribution Pumps.

E. Plant Piping

1.	Plant Piping	Lumpsum	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Plant Piping starting from 32 Inch OD Raw Water Inlet Pipe Line for the entire plant for complete treatment till discharge manifold to be indicated by OIL.

F. Electrical Engineering Jobs

1.	Electrical Engineering Jobs	Lumpsum	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of All Electrical Engineering Items inclusive of all necessary transformers, panel boards cabling work and DG Set etc. The details of the same are as per Annexure – II.

G. Civil Engineering Jobs

1.	Civil Engineering Jobs	Lumpsum	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of All Civil Engineering Jobs for the complete plant for the facilities as detailed above along with Foundations for machinery/ equipment, Plant Room, Operator's Room, Control Room, Security Hut, Asphalt Roads for the complete plant, Generator area, Treated Water Pump House, Boundary / Compound Wall Assembly Point, Emergency Gate, Landscaping etc. The details of the same are as per Annexure – III.

H. Instrumentation Jobs:

1.	Instrumentation Jobs	Lumpsum	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of All Instrumentation Jobs inclusive of all necessary panel boards, display/ alarms unit, cabling work etc. The Indicative Instrumentation List is as per Annexure – IV.

Note: In case of any discrepancy among the Project Document and the Annexures, decision of OIL in this regard shall be final and binding.

7.0 Pre-Bid Conference

- (i) A Pre-Bid Conference shall be organized prior to Bid Closing Date, via One to One Interaction at Duliajan, Assam, India or through Video Conferencing mode to explain the requirements of Company in details to the interested prospective bidders and to understand bidders' perspective including exchange of views / clarifications, if any, on the Scope of Work, Bid Rejection - Bid Evaluation Criteria and other terms & conditions of the Tender. The parties who want to participate in the pre-bid meeting must confirm their participation and forward their pre-bid queries, if any latest by the date indicated in the RFQ. For details, bidders may contact Contracts Department, Oil India Ltd., P.O. Duliajan-786602, Phone: +91374-2808656/2808653, Fax# (91)374-2803549, E-mail: contracts@oilindia.in.

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- (ii) Maximum 02 (two) representatives from each prospective bidder shall be allowed to participate in the pre-bid conference.
- (iii) The prospective bidders shall submit their queries / clarifications against the tender through E-mail / Fax / Courier addressed to GM-Contracts (HoD), Oil India Ltd., Duliajan-786602, Assam and such queries must reach OIL's office at Duliajan latest by the date indicated in the RFQ. OIL shall provide clarifications to only those queries received within this date. OIL will not be responsible for non-receipt or late receipt of any bidder's query in OIL's office.
- (iv) However, clarifications / exceptions / deviations, if required any, should be brought out by the bidder prior to or during the Pre-Bid Conference only. After processing these suggestions, as a sequel to the pre-bid conference, Company may communicate the changes in this regard, if agreed any, through an addendum to tender document. Company will not accept any exception / deviation to tender conditions / specifications once the same are frozen after the pre-bid conference and the non-compliant bid(s) shall be rejected outright against this tender.
- (v) The exact date and venue of pre-bid conference will be intimated later on.
- (vi) The Prospective Bidder shall have to attend the Pre Bid Conference on their own. OIL shall not provide any transport or accommodation for the same.

Note: The bidders are advised to visit the site to get themselves acquainted with the site conditions and job requirements. Site Visit shall be arranged for all interested bidders on the next day of Pre-Bid meeting.

8.0 Mobilization and Period of Contract

The total duration of the contract will be for a period of 26 Months and 15 Days from date of issue of LoA.

Break-up of Contract Duration is as under:

- (i) Mobilization – 15 Days. (A “Kick Off Meeting” shall be arranged within 15 (Fifteen) Days from the Date of Issue of LoA. The Date of “Kick Off Meeting” shall be treated as completion of Mobilization.)
- (ii) Main LSTK/EPC work: Twenty (20) Months for execution and Final Commissioning of actual LSTK job.
- (iii) Reliability Run/Site Acceptance Test: EPC Contractor shall be responsible for Initial Operation of the Plant for a period of 06 (Six) Months from the Date of Commissioning of the Plant is all aspects.

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.

9.0 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

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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.

10.0 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 8 MGD WTP complete in all aspects at Duliajan, Assam, India.
The scope of work also includes 06 (Six) Months of Initial Operation (reliability run/ site acceptance test) and 18 (Eighteen) Months of Maintenance Service during Warranty, including all manpower, materials and consumables for the 8 MGD WTP from the date of final commissioning.
- b) 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.
- c) 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.
- d) 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
- e) EPC Contractor arrange for the visit of vendor specialists for minimum two occasions during engineering stage without any cost implication to OIL.
- f) 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.
- g) **The BIDDER may visit the site at their cost prior to submission of bid and apprise himself of the existing site conditions.**
- h) 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.
- i) 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.
- j) 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 appropriate Authorities and necessary coordination and liaison work in this respect shall be the responsibility of the EPC CONTRACTOR.

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- 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 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) The EPC Contractor shall ensure finalization of the orders within 90 (Ninety) days from the date of award of the LoA for the items identified as process critical items during Design/ Engineering Phase of the Project.
- 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.

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- 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.
- i) Bidders are required to include the TPI charges within their lump sum prices.
- j) 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.
- k) 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.

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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.

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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.

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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 than 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 06 (Six) Months of Reliability Run, inclusive of day to day operation and maintenance. The on job training to OIL's personnel shall continue during this 06 (Six) 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 06 (Six) Months of Performance Guarantee Test with 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

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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.

II. 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.

11.0 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:
- Code-1- Approved
 - Code-2- Approved & Retained for information
 - Code-3- Approved with comments, document to be re-submitted for final Approval
 - Code-4- Not approved, to be re-submitted
 - 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:
- g) Soft copies of all the "AS BUILT" drawings.
- h) Three complete set of all "AS BUILT" drawings inclusive of P&IDs, PFDs for all the facilities.
- i) Three complete set of all "AS BUILT" drawings pertaining to civil (including structural and architectural), mechanical, piping layout, electrical, and instrumentation job.
- j) 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/Warranty Certificates complete in all respects.
- k) Six sets of Operating and Maintenance manuals for all the bought out items.
- l) Results of All Test Reports.
- m) 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.

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12.0 Implementation Schedule

- a) A master network schedule conforming to the overall schedule shall be prepared by the EPC Contractor and submitted for review within 25 days of award of LOA. with the bid. The Master Network will identify milestones of Key events 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) Based on the approved Master Network, the EPC Contractor will prepare further detailed network and schedules indicating the schedule for data availability/drawing release/documentation.
- 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.
- 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.

13.0 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.

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- 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:
- Planning, scheduling, monitoring & reporting.
 - Construction supervision, discipline wise.
 - Quality assurance and quality control, discipline wise.
 - Shipping, custom clearances, inland transportation
 - Warehouse management and material control.
 - Field engineering/Purchase.
 - Health, Safety and Environment (HSE) Management
 - Statutory clearances and enforcement of statutory rules / regulations and Labour Laws
 - Personnel/administration/Industrial Relations
 - Billing and Invoicing
 - Finance and Accounts
 - Security

14.0 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/ OIL shall 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.

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- 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.

15.0 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 for a period of 06 (Six) Months from the Date of Final Commissioning of the Plant in all aspects. All requisite manpower, fast moving spares, chemicals and consumables for the same shall have to be arranged by the EPC Contractor. The details of required manpower shall be finalized during detailed engineering phase of the Project. The EPC/ LSTK contract should also train OIL's personnel for day to day operation and trouble shooting of the plant during this period of 06 (Six) Months.

16.0 EPC Contractor's Personnel and Office

- 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 8 MGD WTP 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) Contractor will have to provide an undertaking 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 should be made with approval of client (OIL) by personnel of equivalent experience or more.
- e) 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:

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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.	Site In-Charge (Instrumentation)	01	Experience: A Graduate in Instrumentation Engineering with minimum of 3 years or Diploma in Instrumentation Engineering with minimum of 5 years of experience in Instrumentation engineering jobs of project nature.
6.	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.
7.	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.

Note: 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.

17.0 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

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- 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/installation, 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.

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- 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
- 11.0 a) It may be noted that as per DGMS circular & Gazette 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.
- 12.0 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.
- 13.0 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.
- 14.0 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.
- 15.0 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.
- 16.0 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.
- 17.0 Contractor's arrangements for health and safety management shall be consistent with those for the company.
- 18.0 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.
- 19.0 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.

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- 20.0 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.
- 21.0 The contractor should frame a mutually agreed bridging document between OIL & the contractor with roles and responsibilities clearly defined.
- 22.0 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.
- 23.0 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.
- 24.0 The availability of First-Aid Fire Fighting equipment should be ensured by the Contractor at all working hours.
- 25.0 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).
- 26.0 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.
- 27.0 Considering the ongoing Covid-19 pandemic, those who are engaged in the above operations should be followed the Covid-19 Protocol.
- 28.0 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.
- 29.0 Necessary cold and hot work permits including excavation clearance and permission for working at height, Confined Space Entry as applicable are to be obtained by the competent person of the Contractor before start of the job(s). Work Permit System should be inline as per guidelines issued by HSE Department.
- 30.0 The Contractor's personnel should be aware about the existing as well as probable hazards and ensure their training to tackle such untoward events by the Contractor. If the Company (OIL) arranges any safety awareness program / training for the working personnel at site (company employee, Contractor worker, etc.) the Contractor will not have any objection to any such training.
- 31.0 Any requirement arise by the Statutory Authorities during the period of contract shall be applicable and binding for the Contractor.

(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 the torch 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, Hydra, slings, D-Shackles 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.

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- 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 trenches dug are to be suitably barricaded and marked. Excavation clearance and permit should be taken wherever required.
- 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. Emergency escape route should be demarcated at work site.

(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. Lockout and Tagout procedure should be followed strictly.
- 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

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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.

18.0 Payment Terms

- (i) 1% of the project cost payable for completion Clearance/Development of Site by demolishing an old 1.5 MGD WTP located at the site of 8 MGD WTP to be constructed.
- (ii) 6% of the project cost payable for completion of Fieldwork , Residual Concept Plan, Residual Design, Engineering, Design Report, Working Drawings for 8 MGD Capacity Water Treatment Plant including allied buildings and approval of the project deliverables by the OIL.
- (iii) 30% of project cost payable for Procurement 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.
- (iv) 23% of project cost payable after completion of construction the Civil works and Allied buildings.
- (v) 30 % of the payments shall be made after the completion of the pre- commissioning, mechanical completion, successful commissioning.
- (vi) 10% of the payments shall be made after the completion Reliability test run /Site Acceptance test.

19.0 Contract Completion and Closure

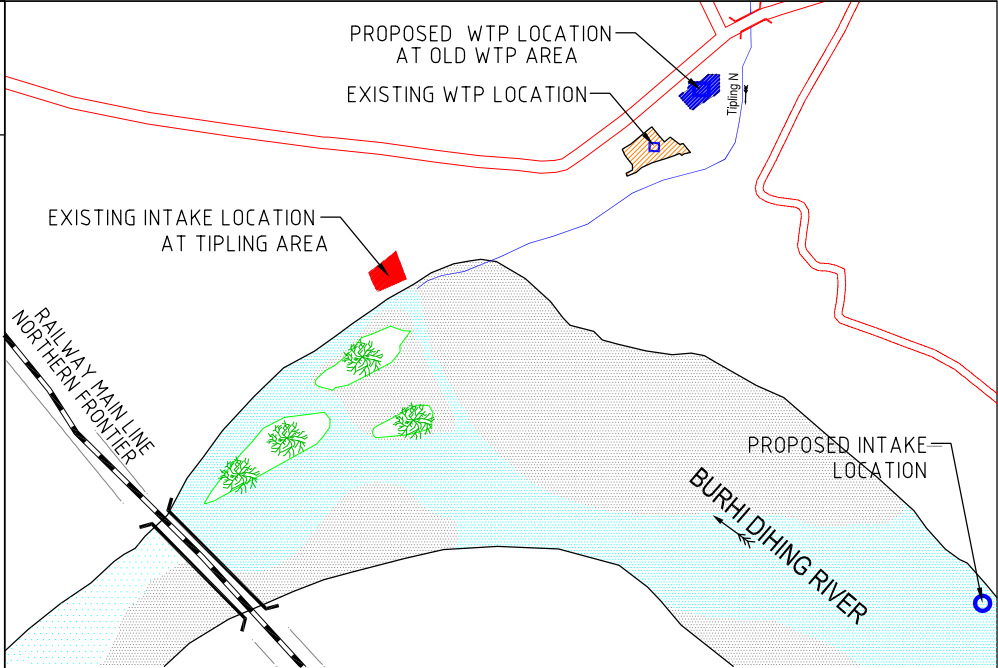
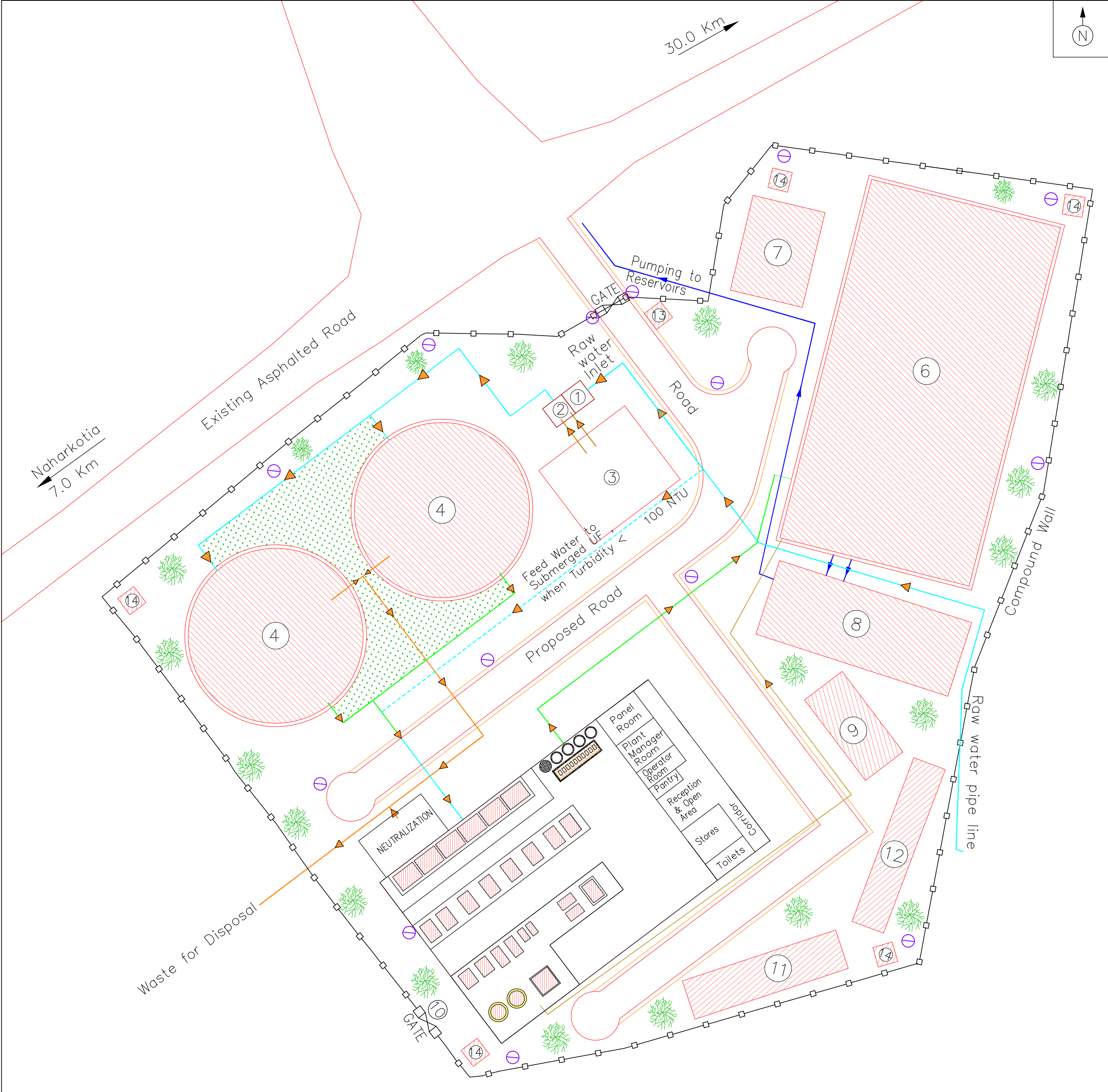
- a) On successful Commissioning, completion of 06 (Six) Months Reliability Run Test and completion of all other balance works as per scope of work covered under these specifications, including fulfillment of requirements of Documentations, Drawings and Data, the Plant shall be ready for Handover to 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.

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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.



LOCATION MAP

PROPOSED WATER TREATMENT PLANT COMPONENTS

MARKED	DESCRIPTION	QTY	DIMENSIONS
1	Inlet chamber	1	4m L x 3.0m W x 2.2m LD +0.5m FB
2	Flash Mixer	1	3.0m L x 3.0m W x 2.1m LD +0.6m FB
3	Alum dosing Unit (Alum & lime storage + dosing area)	1	16.0 m x 13.70 m
4	Clariflocculators	2	26.0m dia x 4.30m TD
5	Plant Room	1	50.0 m x 30.0 m
6	Treated Water Tank	1	56m x 30m x 4.55m LD + 1.0m FB
7	Parking area		14.5 m x 11.0 m
8	Treated Water Pumping Station	1	11.5 m x 30.0 m
9	Generator yard	1	15.0 m x 7.0 m
10	Gate Entrance to River side	1	-
11	Transformer yard	1	24.0m x 6.0m
12	Panel room		26.0m x 5.0m
13	Security Room	1	3.0 m x 3.0 m
14	Watch Room	5	3.0 m x 3.0 m

LEGEND		LEGEND	
COMPOUND WALL		PROCESS FEED LINE	
ASPHALTED ROAD		PROCESS OUTLET	
PROPOSED ROAD		CHEMICAL DOSING LINE	
GATE		CHEMICAL CLEANING LINE	
TREE		SLUDGE LINE	
STREET LIGHT POLE		PROPOSED PIPE LINE	
BUILDING		PROPOSED STORM WATER CHANNEL	

CLIENT	OIL INDIA LIMITED DULIAJAN, ASSAM	
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SCHEME OF OIL INDIA LIMITED, DULIAJAN, ASSAM	
CONSULTANT	SECON PRIVATE LIMITED BANGALORE - 66	
TITLE	WATER TREATMENT PLANT LAYOUT PLAN FOR WTP GENERAL ARRANGEMENT	
DWG. No.	SECON/OIL/WTP/LP/03	SCALE:1:500

PROJECT DOCUMENT	OWNER
DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, INSPECTION, SUPPLY, CONSTRUCTION AND COMMISSIONING OF 8 MGD CAPACITY WATER TREATMENT PLANT ON LSTK BASIS AT DULIAJAN, ASSAM, INDIA	 Oil India Limited Oil India Limited Comparing Newer Horizons

ANNEXURE-II

Details of Electrical Engineering Jobs

wrt

DESIGN, ENGINEERING, PROCUREMENT,
FABRICATION, INSPECTION, SUPPLY,
CONSTRUCTION AND COMMISSIONING OF
**8 MGD CAPACITY WATER TREATMENT
PLANT ON LSTK BASIS AT DULIAJAN,
ASSAM, INDIA**

PROJECT DOCUMENT	OWNER
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PARTICULAR REQUIREMENTS - ELECTRICAL EQUIPMENT

“The list of items mentioned in the SOQ/BOQ are indicative only. The Design, Supply, Installation, Testing and Commissioning of all other items as mentioned in the SCC /drawing/ contract document for completion of the plant shall be in the scope of the contractor. Contractor shall supply and execute the same without any additional cost. Also, if any other items/ tools/jobs not mentioned in contract document(SOQ/SCC/drawing etc.) but required for completion of the plant shall be in the scope of the contractor. The same shall be supplied and execute by the contractor without any additional cost.”

1.1 INTRODUCTION

The specific design and performance requirement for all electrical equipment are given in this Annexure-II. The requirement specified shall be fully met with by the Contractor. In case of any deviations, the Contractor shall bring out the same in “Schedule of Deviations from Particular Requirement” failing which it will be considered that the Contractor fully complies with these requirements. Drawing No: SECON/OIL/WS/EE/SLD-02 (Single Line Diagram for Water Treatment Plant and Allied Works) is attached (ANNEXURE-II: A) for reference purpose.

1.2 PRIMARY POWER SOURCE

Oil India Scope of works

- a) Providing two nos. of 11 KV power source (Overhead feeders)

Contractor scope

- a) The Contractor’s scope starts with the proposed substation and shall cover all equipment/items as given in the Scope of works.
- b) Supply and laying of cables/ providing overhead line from the outgoing side of metering unit.
- c) Supply and laying of cables from existing overhead 11kV feeders to incomer of 11kV panel with all terminations.
- d) Construction of substation which includes transformers, LT Room, HT Room, DG Room and further downstream works as per the scope of works.
- e) Connection of 2 nos. cables of 11kV feeder of Pontoon water intake plant in the HT panel with all required termination.
- f) Any temporary power supply required by the Contractor during the execution of work shall avail temporary supply from the Electricity Board on EPC contractors’ own cost. However, electricity may be provided by OIL at its discretion on chargeable basis if available at nearest point. The Contractor shall have to arrange for required switch board with proper safety device like RCBO/ELCB/RCCB to draw power and use safely from the

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existing source. However, for welding machine power supply shall not be provided by the company, contractor may use Diesel Welding Generators for the same.

- g) The contractor shall have to execute the works as desired by the Electrical Inspector or Engineer Incharge in order to make installation conforming to latest CEA regulations 2010 (measures related to safety & electric supply).

1.3 POWER SUPPLY ARRANGEMENT

The power supply scheme and distribution described below is **for reference only**. The EPC Contractor shall prepare his own design calculations, conduct detailed engineering and prepare drawings to make his own estimate of quantities for entire electrical system.

Power Requirement

The indicative working load is mentioned below

Working Load = 1800 kVA (during peak flow)

Working Load = 2900 kVA (during Average flow)

Main Power Supply Scheme

The provision has to made for the changeover facility for two different source at tapping point and HT metering panel provided at the incoming side and Connected to 11KV main panel through Underground cables, which feeds the power to 2Nos, 11KV/6.6KV Transformer through 11KV underground cables, 2 Nos. 11kV/415V Transformers. The 11KV main panel shall have 4 no's of outgoing for transformers, 2no's for pontoon intake panel and 2nos. are required for spare.

LT Distribution

- The LT side of the 11/0.433 kV Transformers, which will feed the proposed ISPS loads through 415V Main PCC (Loc: HT cum PCC panel room).
- 415V PCC shall have provision for 2 Nos. of Transformer incoming & 1 No. of DG incoming with required ATS. The panel shall have 2 nos. Bus couplers
- All main motors shall have independent VFD starter panels and shall be located in the 415V switchgear room near the pump room.

6.6 kV Panel

1.4 GENERAL DESIGN CRITERIA

- The design standards described herein are generally in compliance with the latest Indian Standards, and code of practices already established in the country.
- All electrical installations shall conform to the latest IE rules or CEA.
- All electrical equipment shall be rated for 450C design ambient temperature.
- 11kV System**

a) Nominal voltage	:	11kV

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b) Number of phases	:	3
c) Frequency	:	50 Hz
d) Connection	:	3 Wire
e) Maximum Fault Level	:	500 MVA
f) Fault Current	:	26.2 kA

(e) **LV System**

a) Voltage:	:	415 V nominal
b) Frequency:	:	50 Hz
c) Connection	:	4 wire
d) No load transformer voltage	:	433 V
e) System earthing	:	Solidly earthed
f) Maximum fault level	:	36 MVA
g) Fault Current	:	50 kA

Plant shall, unless otherwise specified, be capable of continuous operation at a voltage level in the range of 90% to 110% of the relevant nominal voltage and a frequency variation of $\pm 5\%$ with a maximum combined tolerance of 10%.

(f) **AC Control, Lighting and Space Heating**

a) Voltage:	:	240 V
b) Phases:	:	1
c) Frequency	:	50 Hz
d) Connection	:	2 wire (Phase & Neutral)

(g) **DC Control, Protection and Alarm**

a) Voltage:	:	110 V
b) Phases:	:	1
c) Connection	:	2 wire (unearthed)

1.5 11kV INDOOR SWITCH GEAR PANEL

- 11 kV switchgears shall be sheet metal enclosed with draw out type vacuum circuit breakers for incoming and outgoing feeders, control and protection for the HV motors and auxiliary transformers.
- The switchboard shall be rated for a fault current not less than 26.2 kA (rms).
- Wiring shall be done with cable as per CEA guideline. There shall be sufficient nos. of exhaust fan for ventilation and illumination.

1.6 POWER TRANSFORMERS

- The transformers shall be out door type, ONAN, 11/0.433 kV, 3 phase, 50 Hz, two winding, Dyn11 with solidly earthed neutral.

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- (b) The transformers shall be sized considering minimum 10% contingency of total working load while arriving at the final capacity of transformers.
- (c) Two numbers of transformers shall be provided such that under normal condition, each transformer will be loaded up to 50% and in case of failure/maintenance of any one transformer, the healthy transformer shall have capacity to take entire load so as to have 100% standby.
- (d) The transformer shall be designed such that at any point of time maximum loading on any single transformer shall not exceed 85% of full load capacity.

1.7 ENERGY EFFICIENT INDUCTION MOTORS

- (a) Motors shall be suitable for

1	Motors rated upto 355 kW	LT Supply
2	Motors > 355 kW	HT supply

- (b) The motors will be of Reputed and Reliable make and the same will be subject to approval of client's representative.
- (c) The Degree of Protection of Terminal Boxes of all Outdoor Motors shall be IP55.
- (d) All the stator winding terminals of the induction motors shall be brought out up to the terminal box.
- (e) All LT motors are required to be TEFC type with class 'F' insulation. Outdoor type Motor shall be with IP55 degree of protection and indoor shall be IP54. LT energy efficient motors shall be as per IS 12615 & IEEMA 19-2000 and shall have Efficiency Class equal to IE-2 as per IS 12615: 2011.
- (f) All motors shall be compatible for soft starter operation.

1.8 SYSTEM PROTECTION

Numerical relay based protection system for various parts of the power supply system are proposed. The following minimum protection systems shall be used:

(a) 11 kV System

The 11kV system shall have check synchronizing relay in between 2 incomers, outgoing feeders to Pontoon water intake plant and Bus coupler. (sync check provision required)

11 kV Incomer Feeder

- Inverse definite minimum time phase over current protection;
- Inverse definite minimum time earth fault protection.

11 kV Outgoing Feeder

- Inverse definite minimum time phase over current protection
- Inverse definite minimum time earth fault protection.

(b) 415V System

415 V Incomer Feeders

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- Over current & Earth fault protection;

LV Motors

Motors less than 15 KW

- Single phasing preventor.
- Motor Protection Circuit Breaker
- Earth Leakage protection

..

Motors above 15kW up to 100kW

- MCCB with separate bimetallic overload relay and single phase preventor.
- Earth leakage protection

Motors 100kW and above

- 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
- Earth Leakage Protection

(c) 6.6 kV system

(d) 6.6kV motors

(e) 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)

(f) Blowers

Blowers shall be provided with the following additional protection:

- Over pressure

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(g) Rotating Arm Drives

Rotating arm drives shall be provided with the following additional protection:

Motion detectors;

- Over torque detectors.

(h) Valve Actuator Drives

Valve actuator drives shall be provided with the following additional protection:

- Over torque detectors.

1.9 SWITCHGEAR EQUIPMENT / INSTRUMENTS

(a) 11 kV Feeders and 6.6kV feeders

- Analog Ammeter for all 3 phases
- Analog Voltmeter selector switch
- Digital Multifunction meter with RS 485 connectivity
- Indication lamps for each phases as R, Y, B, Breaker trip, ON, OFF, Trip circuit healthy, Trip supervision circuit.

(b) 415V Incomer Feeders

- Analog Ammeter with selector switch
- Analog Voltmeter with selector switch
- Digital Multifunction meter with RS 485 connectivity

(c) 415V Motor Starter Feeders

- Analog Ammeter with selector switch
- KW meters for Motor feeders more than 100 kW
- DOL Starters for motor feeders less than or equal to 5.5 kW
- Line/Neutral Soft Starters for motor feeders above 5.5 kW
- Variable Frequency Drive (VFDs) for main motors (6.6kv motors).

1.10 STANDBY DIESEL GENERATOR SETS

(a) The Standby Diesel Generator Sets shall be complete with Acoustic Enclosure.

(b) The contractor shall size the DG considering 50% of the working plant load in the event of power failure without affecting the discharge parameters. The DG Set shall be sized with minimum 10% Contingency Capacity.

(c) In case of mains failure detected by an under-voltage relays mounted on bus of the AMF panel, the standby generator starts and after the generator set reaching the rated speed and rated voltage, the generator circuit breakers will be switched on to feed Diesel Generator power to the panel. On restoring main supply, the reverse sequence of the

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above will be followed for the mains supply to feed power to the loads as in normal condition.

1.11 415 V PCC / MCC

- (a) The feeder list indicated in the SLD is only tentative. The Bidder has to design the feeder configuration on the basis of equipment/load list, equipment/ load locations & minimum 10% spare capacity for future addition. These schematics shall be submitted to employer, along with the bids.
- (b) 415 V PCC/MCC shall be floor standing, sheet steel enclosed with IP 54 Degree of Protection, Form – IV or better enclosure as per IS 8623 complete with Air circuit breakers/MCCB's/MPCBs, Control & Protection. The PCC /MCC shall be rated for a fault current not less than 50 KA (rms) for 1 sec. Outdoor panels if required shall be with minimum IP-55 degree of protection.
- (c) All Motor Feeders in the MCC Panels shall have Contactors, Start Stop Push buttons, OLR Reset button and ON-OFF-Trip indication.
- (d) All Motors the MCC Panels shall be provision to operate from both PLC & MCC inside the Process arear.
- (e) Emergency Stop push button shall be provided near the motors.
- (f) All door locks shall be provided with special keys to ensure opening by authorized personal only.
- (g) Earth bus-bar shall be extended outside the Switchgear panel at the ends.
- (h) Panel height shall not be more than 2300 mm (Including 100mm base ISMC if it is pedestal mounted). The depth of panel shall not exceed 1350mm & any operating handle of switchgear shall not be more than 1800 mm and not lower than 300 mm from base of the panel. Substation/MCC/Switchgear/ Electrical building shall have at least 3 mtrs clear room height.
- (i) The exposed bus live parts in the cable alley shall be totally covered against accidental contact by a shroud (and not by sleeve) to protect the workmen working on the switchgear.
- (j) Soft starters shall be provided for all main motors.

1.12 OPERATION LOGIC OF SWITCHGEARS

Operation Logic of 415V Switchgear:

Under normal condition, the total power required for the ISPS is fed from Grid mains. In case of power failure, the under voltage relay of Grid Mains incomer shall give a start command to DG Set.

1.13 POWER FACTOR

The system shall be designed such that a power factor of not less than 0.95 is maintained using Automatic power factor correction panel.

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1.14 DC POWER SUPPLY

- (a) 110V DC system is envisaged for protection and controls of 11kV control and relay panel.
- (b) DC Power supply shall be provided for Trip / Closing coils, Indications etc. of 11kV Switchgears and if required for 415V Switchgears.
- (c) Local circuit breaker shall be provided for batteries.
- (d) The batteries shall be 110V, maintenance free and shall be complete with battery, battery charger with boost & trickle charging facilities, necessary controls, indications and DC distribution board.
- (e) The battery room shall be provided with acid proof tile flooring, corrosion proof lighting fixtures, exhaust fans and wash basin. Electrical equipment like luminaires, exhaust fan etc. of the battery room shall be FLP type and wiring shall be done with cable suitable for FLP equipment.

1.15 CABLING

a) HV Power Cables

HV cables shall be 3 core, 11kV (UE), XLPE type with stranded aluminum conductors & GI armouring. Minimum size of cable shall be selected based on the short circuit considerations.

b) LV Power Cables

LV power cables shall be 1.1 kV XLPE type with

- Stranded Copper Conductors with GI armouring for sizes below 6 sq.mm.
- Stranded aluminum conductors with GI armouring for sizes 6 sq.mm and above.

No. of cores shall be as per requirement.

c) Control cables

Control cables shall be 650/1100V, PVC with stranded copper conductors and GI armouring. Number of cores shall be as per requirement. Minimum size of core shall be 1.5 Sq.mm.

d) Cable Rating

All power cables shall be sized for continuous current carrying capacity and permissible voltage drop at an ambient temperature of 45 °C. Due consideration shall be taken of cable grouping, method of installation and local variations in ambient conditions.

Further, for cables controlled by circuit breakers, due consideration shall be given to the fault level.

HV and LV cables shall be sized for a minimum fault clearance time of 1 second for incoming feeders, 0.5 seconds for tie feeders & and 0.16 second for equipment feeders.

For all LT Cables, the voltage drop in the cables between the transformer and the switchgear (PCC) or between PCC and MCC for full load current shall be limited to 2%.

Further the voltage drop in cables between PCC/MCC to Motor terminals for full load

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current shall be limited to 3%. The total Voltage drop transformer secondary to motor terminal shall be limited to 5%.

Under motor starting conditions the corresponding voltage drop shall not affect the operation of the motor controls or the ability of the motor to start and run effectively and in any event shall not exceed 15%.

e) Cable Installations

Heavy duty galvanized iron cable tray and ladder racking shall be used for cable support systems installations inside the plant areas. These shall be used to route cables along walls, below beams and within cable trenches. Cables shall be securely fixed to the support systems. Bundling of cables shall be permitted where allowance for this practice has been made while sizing the cables.

Installation of cables outside the plant areas shall be as per IS: 1255.

Cables of different categories shall be installed so as to maintain satisfactory clearances for safety and in order to reduce the possibility of electrical interference. The Table 12.1 details the distances in mm that shall be maintained between the different categories of cable.

Table - Separation Distances between different Categories of Cable

Cable Category	HV Power	LV Power	C&I/Protection	Telecom
HV Power	N/A	300	600	600
LV Power	300	N/A	300	300
C&I/Protection	600	300	N/A	100
Telecomm	600	300	100	N/A

f) Cable Numbering

All cables shall be allocated a unique number which will be fixed to each end of the cable using a corrosion resistant label. Cables of different categories will be tagged with the following subscripts and a three-digit number.

- HV power HV-P_ _ _
- LV power P_ _ _
- Control C_ _ _
- Instrumentation I_ _ _
- Protection PR_ _ _
- Telecommunication T_ _ _

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1.16 BUILDING SERVICES

a) Lighting

The lighting system work shall conform to the requirements of relevant code of practice, and drawings enclosed with specification.

All plant internal and external areas shall be provided with energy efficient light fittings.

The minimum illumination levels to be achieved shall be as follows:

Table - Illumination Levels

Sr. No.		Min. Lux Level
1.		300
2.	Control Room / SCADA Room – General Lighting	300
3.	Laboratory	300
4.	Indoor Electrical substation, DG Room, Blower & Pump rooms	200
5.	Battery Room	150
6.	Machinery service area	200
7.	All other indoor areas	100
8.	Outdoor platforms and walk ways	50
9.	Building entrance	100
10.	Outdoor plant areas	20
11.	Outdoor transformer yards - General - On equipment	20 30
12.	Street lighting	20
13.	Emergency Lighting	

Emergency Lighting shall be provided with self-contained chargeable type emergency luminaries in internal premises as per requirement. These luminaries shall automatically illuminate in the event of a power failure and provide a minimum level of lighting for approximately 3 hours. They shall automatically recharge on the return of mains power.

The outdoor lighting fittings shall be weatherproof, dustproof and corrosion resistant with IP 65 protection class.

The main entrance to the building, structures, all external area/ road/ pathway and site where required, shall be provided with appropriate external lighting.

For area lighting, GI Pole of sufficient height as mentioned shall be installed for installation of fixtures or Building structures may be used with prior approval from OIL.

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Outdoor/ street lighting shall be provided with photocell & timer controls, with manual override facilities.

Wiring:

- i) Wiring for lighting in office & pumping station internal areas shall be done with 1.1kV, PVC insulated, stranded copper conductor wires of adequate size.
- ii) Lighting in external areas shall be installed using multicore armored cable.

b) Ventilation Fans

Variable speed ventilation ceiling fans & exhaust fans shall be provided in offices and switchgear rooms as per requirement. Minimum one Ceiling fan of 48" size shall be provided for each 2.5 Sq.mm or part thereof of the area concerned. The supply to these fitted ceiling fans shall be provided from the local lighting circuit.

c) Small Power Outlets

Switched single phase three pin 6 A and 16A receptacles shall be provided throughout. In offices and control rooms they shall be modular decorative type and industrial type in all other areas for single and three phase sockets. All outlets for domestic pump, dewatering pump, submersible sump pump shall be provided with local starter panel or control cubicle. All metal clad sockets shall be provided with suitable metal clad plug. All socket outlets shall be provided with ELCB/RCCB at the source side.

30 A switched (MCB) three phase and neutral receptacles shall be provided in plant areas where appropriate i.e. adjacent to areas where flooding is likely (to permit the use of portable sump pumps) or where other portable equipment is likely to be used in the operation of the treatment plant. The Contractor shall install ten such outlets at various locations throughout the treatment plant.

The location of outlets shall be approved by the Engineer. The spacing of 6A and 16A outlets shall be arranged to suit the intended location of equipment, desks etc. Receptacles for outside areas shall have a degree of protection of IP 55.

1.17 EARTHING & LIGHTNING PROTECTION

- (a) An earthing system comprising chemical earth electrodes, GI pipe, GI strap, conductors etc. shall be provided for all electrical equipment, metallic structure etc. There shall be separate earthing system for neutral of transformers, Neutral of DG set, Surge Arrester, Lightning Arrester, body earthing of panels, transformers, motors, earthing of metallic structure etc.
- (b) The earthing system shall be designed to give a combined earth resistance value of not greater than 1 ohm. In order to be sure of obtaining suitable final values, soil resistivity shall be measured at the various sites during the detailed design phase of the work.

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- (c) In outdoor substation areas the main earth electrode conductors shall be located, to ensure potential gradients occurring at the surface during fault conditions are kept within allowable limits.
- (d) Materials used for earth electrodes shall be designed to suit the ground conditions.
- (e) The system shall be designed for the following maximum earth fault currents. These values will be confirmed at the detailed design phase.
 - 11 kV system 26.2 kA.
 - 415 V system 50 kA.
- (f) The fault clearing time shall be taken as one second for the 11kV and 415V systems.
- (g) The maximum temperature allowed for steel welded joints will be taken as 500 °C with an ambient of 45°C. Main equipotential bonding conductors shall be galvanised steel.
- (h) Circuit protective conductors will comprise either the armouring of the supply cable or, for major loads such as main switchboards and large drives the supply cabling plus an additional suitably sized single core copper cable.
- (i) The neutral point of the 11/0.433 kV transformer secondary windings shall be solidly earthed.
- (j) Lightning protection system shall be provided on all main structures. Air terminations and down conductors shall be copper.
- (k) The lightning protection system need shall be established by calculating the risk factor value of each building, structure etc as per procedure given in IS/IEC: 62305.
- (l) The lightning protection installation shall comply with Standard Specifications.
- (m) Air termination system comprising of rods/mesh or combination of both shall be provided and the methods used to determine the positioning of Air Termination system shall be as per IS/IEC 62305.
- (n) Air termination system shall be connected to the earthing system by down conductors fixed along the outer surface of building. Number & layout of the down conductors shall be as per IS/IEC 62305.
- (o) Each down comer shall be terminated to a separate treated test earth electrode which in turn will be connected to the station earthing system.
- (p) Test link shall be provided in the run of each down conductor at approximately 1000 mm above ground level.

1.18 Others

Firefighting system shall contain but not to limited to, the items listed below –

- Portable fire extinguishers.
- Nitrogen injection fire prevention method for transformer as per latest NFPA/IEEE /CIGRE standards.
- Sand & Water Bucket.

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1.19 TECHNICAL DATA SHEETS

13 11 KV/ 6.6 kV Power Transformers

Sr. No.	Description	Unit	Technical Particulars	
1	Rated output	KVA	As per the Requirement	
2	Quantity required	Nos.	Min. 2 Nos.	
3	Transformer location		Outdoor	
4	No load transformer ratio	kV	6600	
5	Number of phases		Three	
6	Rated frequency	Hz	50	
7	Impedance at all taps	%	Value as per IS 2026/1180	
8	Number of winding/ material of conductor		Two/Copper	
9 (a)	Method of connection HV winding		Delta	
	LV winding		Star	
(b)				
10	Vector group		Dyn 11	
11	LV Neutral		Solidly earthed	
12	Type of cooling		ONAN	
13	Reference Ambient	°C	45	
14	Oil by thermometer	°C	40	
15	Winding by resistance	°C	45	
13	Tap changer		As per Specification	
14	Tap range	%	As per Specification	
15	Tap step	%	As per Specification	
16 (a)	Terminal connection HV terminals		Cable box with air insulated disconnecting Chamber	
(b)	LV terminals		Suitable for connecting Bus Duct emanating from top side of transformer with neutral 100% rated	
17 (a)	Current Transformer On LV		As per Requirement	
(b)	On LV Neutral			
18	LV Neutral earthing		LV neutral bushing – part of bus duct as well as separate neutral bushing For earthing connection.	
19	Insulation of Windings		H.V.	L.V.

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Sr. No.	Description	Unit	Technical Particulars	
(a)	One minute power frequency withstand voltage (dry and wet)	kV (r.m.s)	28	3.0
(b)	1.2/50 micro second full wave impulse withstand voltage	kV (peak)	75	
20	Insulation of bushings		H.V.	L.V.(Line and Neutral)
(a)	Rated Voltage of bushing	kV	12	1.1
(b)	Power frequency withstand voltage	kV (r.m.s)	28	3.0
(c)	1.2/50 microsecond full wave impulse withstand voltage	kV (peak)	75	-
(d)	Minimum Creepage distance	mm	25mm/kV on 12kV	25mm/kV on 1.1kV
21	Vacuum withstand capability of transformer main tank with bushings, radiations, fitting and accessories.		As per specification	
22	11 kV/Cable Box 11 cable box shall be provided on transformer towards right hand side of transformer with when viewed from H.V side. This will facilitate removal of transformer for maintenance without affecting 11 kV cable terminations.			
23	Radiator Banks Radiator banks shall be provided on transformer on left side when viewed from H.V side.			

12.20.1 11 KV/ 0.433 kV Power Transformers

Sr. No.	Description	Unit	Technical Particulars
1	Rated output	KVA	As per the Requirement
2	Quantity required	Nos.	Min. 2 Nos.
3	Transformer location		Outdoor
4	No load transformer ratio	kV	0.433

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Sr. No.	Description	Unit	Technical Particulars	
5	Number of phases		Three	
6	Rated frequency	Hz	50	
7	Impedance at all taps	%	Value as per IS 2026/1180	
8	Number of winding/ material of conductor		Two/Copper	
9 (a)	Method of connection HV winding		Delta	
	LV winding		Star	
(b)				
10	Vector group		Dyn 11	
11	LV Neutral		Solidly earthed	
12	Type of cooling		ONAN	
13	Reference Ambient	°C	45	
14	Oil by thermometer	°C	40	
15	Winding by resistance	°C	45	
13	Tap changer		As per Specification	
14	Tap range	%	As per Specification	
15	Tap step	%	As per Specification	
16 (a) (b)	Terminal connection HV terminals LV terminals		Cable box with air insulated disconnecting Chamber Suitable for connecting Bus Duct emanating from top side of transformer with neutral 100% rated	
17 (a) (b)	Current Transformer On LV On LV Neutral		As per Requirement	
18	LV Neutral earthing		LV neutral bushing – part of bus duct as well as separate neutral bushing For earthing connection.	
19	Insulation of Windings		H.V.	L.V.
(a)	One minute power frequency withstand voltage (dry and wet)	kV (r.m.s)	28	3.0
(b)	1.2/50 micro second full wave impulse withstand voltage	kV (peak)	75	
20	Insulation of bushings		H.V.	L.V.(Line and Neutral)

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Sr. No.	Description	Unit	Technical Particulars	
(a)	Rated Voltage of bushing	kV	12	1.1
(b)	Power frequency withstand voltage	kV (r.m.s)	28	3.0
(c)	1.2/50 microsecond full wave impulse withstand voltage	kV (peak)	75	-
(d)	Minimum Creepage distance	mm	25mm/kV on 12kV	25mm/kV on 1.1kV
21	Vacuum withstand capability of transformer main tank with bushings, radiations, fitting and accessories.		As per specification	
22	11 kV Cable Box 11 cable box shall be provided on transformer towards right hand side of transformer with when viewed from H.V side. This will facilitate removal of transformer for maintenance without affecting 11 kV cable terminations.			
23	Radiator Banks Radiator banks shall be provided on transformer on left side when viewed from H.V side.			

12.20.2 11 kV Metal Enclosed Switchgears

Sr. No.	Description	Unit	Technical Particulars
1	Quantity	No.	As per Requirement
2	Switchgear cubicles and Busbar ratings		
(a)	Rated voltage, phases and frequency		11 kV, 3 Ph 50 Hz
(b)	System Neutral Earthing Effectively earthed / Non effectively earthed		Non-effectively earthed. Resistance earthed limiting earth fault current to full load current
(c)	Maximum system voltage	kV	12
(d)	One minute Power frequency withstand voltage	kV (rms)	28

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Sr. No.	Description		Unit	Technical Particulars
(e)	12/50 μ sec impulse withstand voltage		kV (peak)	75
(f)	Short circuit withstand			
	(i)	Short time (1 sec) at rated voltage	kA(rms)	26.2
	(ii)	Dynamic rating	kA(peak)	62.5
(g)	Reference ambient temperature			45 °C
(h)	Maximum temperature of bus bars droppers connectors and contacts at continuous current rating under site reference ambient temperature			90°C - FOR BUSBARS HAVING NON-SILVER PLATED JOINTS 105°C - FOR BUSBARS HAVING SILVER PLATED JOINTS
(i)	Continuous current rating of bus bar		A	As per the SLD
(j)	Bus bar material			ALUMINIUM
(k)	Bus bar Insulation			Fully insulated by encapsulation in epoxy resin with mould caps protecting all joints
(l)	Cable entry			Bottom
	Cable type for Incoming and Outgoing feeders			11 kV XLPE unearthed Aluminium conductor
3	Switchgear constructional Requirement			
(a)	Thickness of sheet steel Frame, Frame enclosures, doors, covers and partitions		mm	Frame – 2.5 Doors/Covers – 2.0
(b)	Degree of protection			BUS BARS – IP3X, OTHERS – IP4X
(c)	Colour finish shade			Interior - GLOSSY WHITE Exterior - Light grey semi-glossy shade 631 of IS:S
(d)	Earthing bus	i) Material		Copper
		ii) Size	mm x mm	25 x 6 (*)
(e)	Earthing conductor	i) Material		GS Flat
		ii) Size	mm x mm	50 x 10 (*)

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Sr. No.	Description	Unit	Technical Particulars
4	Breaker Particulars		
(a)	Circuit breaker type		Vacuum (With Surge Suppressor)
(b)	Voltage, phases and frequency		12 kV, 50 Hz, 3 Ph
(c)	Rated operating duty		0-3 MIN-CO-3 MIN-CO
(d)	Rated current at reference ambient temperature		
(i)	Incoming breakers	A	As per the Requirement
(ii)	Outgoing breakers	A	As per the Requirement
(e)	Rated breaking capacity	kA (rms)	26.2
(f)	Rated making current	kA (peak)	62.5
(g)	Short time current withstand for 1 sec duration	kA (rms)	26.2
(h)	Total break time		Less than 5 cycles
(i)	Operating mechanism type (Normal)		Motor Charged Spring.
	Operating mechanism type (Emergency)		Manual Spring Charged for closing and tripping
(j)	Minimum no. of auxiliary contacts		6 NO+ 6 NC
(k)	Withstand test voltage		
(i)	One minute power frequency	kV (rms)	28
(ii)	1.2/50 μ sec impulse	kV (peak)	75
(l)	Auxiliary control voltage		
(i)	For closing / tripping coil		110 V DC
(ii)	For spring charging motor		240 V AC
(iii)	For space heaters and lighting		240 V AC
(m)	Anti pumping feature		To be provided
(n)	Latching requirement		Trip free
	Current Transformers		
(a)	Type		Cast resin Bar Primary
(b)	Class of insulation		Class B or better
(c)	Rated current ratio and burden		
(i)	Incomers and bus couplers		As per the Requirement
(ii)	Outgoing feeders Motor feeders - Protection		As per the Requirement
(iii)	Motor feeders - Metering		As per the Requirement

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Sr. No.	Description	Unit	Technical Particulars
	(iv) Auxiliary Transformer feeder – Metering		Not Applicable
(d)	Accuracy class		
	(i) Metering		MIN. CL 0.5/1.0
	(ii) Protection		MIN. 5P10
(e)	Short time 1 sec current rating	kA (rms)	26.2
(f)	Dynamic rating	kA (peak)	62.5
6	Voltage Transformers		
(a)	Type		Cast resin
(b)	Rated Voltage		
	(i) Primary	V	11000/ $\sqrt{3}$
	(ii) Secondary – S1	V	110/ $\sqrt{3}$
(c)	Method of connection		
	(i) Primary – P		Star, earthed
	(ii) Secondary – S1		Star, earthed
(d)	Application – S1		Metering and protection
(e)	Rated burden	VA	As per the Requirement (should be capable to supply the whole panel if the PT on the other side of bus coupler not working)
(f)	Accuracy class		Class B or better
(g)	Rated voltage factor		
	(i) Continuous		1.1
	(ii) Short time		1.5
7	Meters		Digital/Analogue
(a)	Accuracy Class		
	(i) Indicating Meters		Class 1.0 or better
	(ii) Energy Meter		Class 1.0 or better

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Sr. No.	Description	Unit	Technical Particulars
8	Annunciations		
(a)	Following alarm annunciation shall be provided on the respective 11 kV switchgear modules Incoming feeders (i) Incoming circuit breaker - trip (ii) Lockout relay - trip (iii) Bus section circuit breaker trip		
(b)	Outgoing feeders (motor feeders) – Not Applicable (i) Motor trip on fault (ii) Motor winding temperature high alarm (iii) Motor winding temperature high trip		
(c)	Other Outgoing feeder - trip		
(d)	Spare windows	As per SLDs	
9	Cubicle Components Each 11 kV circuit breaker cubicle shall be provided with the following minimum standard accessories		
(a)	One control switch 'trip-neutral-close' spring return to neutral position		
(b)	One control selector switch 'Local-remote stay-put' type		
(c)	Indicating lamps with series resistors (i) 'Red' for breaker in 'On' indication (this shall also supervise trip coil) (ii) 'Green' for breaker 'Off' position (iii) 'Blue' for breaker in 'Service' position (iv) 'Amber' for breaker in 'Test' position (v) 'White' for breaker closing spring 'Charged' Indicating lamps (iii), (iv) and (v) shall be provided when positive mechanical indicators for these conditions are not available/visible		
(d)	Mechanical trip push button to trip the breaker when control supply is lost. The push button shall be shrouded type		

12.20.3 415 V Metal Enclosed Switchgears/ MCC/PCC

Sr. No	Description	Unit	Technical Particulars
1	Quantity	Nos	As per Requirement
2	415 V Switchgear And Busbar Ratings		
(a)	Rated voltage phase and frequency		415 V, 3 Ph 50 Hz
(b)	System Neutral Earthing		Effectively earthed
(c)	Maximum system voltage	V	476

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Sr. No	Description	Unit	Technical Particulars
(d)	One minute power frequency voltage		
	i) Power circuits	V	2500
	ii) Control circuits	V	1500
	iii) Aux. Circuits connected to Sec of CTs	V	2000
(e)	Continuous current rating of Busbars under site reference Ambient Temperature and type & material	Rating Material	As per the Requirement, AL
(f)	Busbar insulation		Fully insulated encapsulation in epoxy resin with moulded caps protecting all joints
(g)	Reference Ambient Temperature	° C	45
(h)	Maximum Temperature of Busbars, Droppers and Contacts at current rating under site ambient temperature		85° C for bus bars and non silver plated joints 100° C for silver plated joints
(i)	Short Circuit current withstand for Busbars and droppers		As per SLD & specs
	(i) Short time 1 sec	kA (rms)	50kA
	(ii) Dynamic Rating	kA (peak)	125kA
3	Switchgear Constructional Requirement		
(a)	Type of Construction		Single front fixed type
(b)	Thickness of sheet steel		
	(i) Frame, Frame enclosures, doors, covers and partitions	mm	Cold Rolled – 2.0
(c)	Degree of protection		AS PER IS:13947
(d)	Colour finish shade		Interior : Glossy white Exterior: Light grey semi glossy Shade 631 of IS-5
(e)	Earthing bus	Material	Copper
		Size	mm x mm
			25x6 (*)
	Earthing conductor	Material	GS
		Size	mm x mm
			50 x 10 (*)
(g)	Minimum clearances in air of live parts		

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Sr. No	Description	Unit	Technical Particulars
(h)	(i) Phase to Phase	mm	25.4
	(ii) Phase to Earth	mm	19.4
	Cable entry to cubicles		Bottom
4	Starters		
(a)	Contactor rated duty		AS PER IS:13947
(b)	Utilisation category		AS PER IS:13947
(c)	Control transformer :		
(d)	Standard applicable		As per Specifications
(e)	Thermal over load relay reset		
5	Circuit Breakers		
(a)	Circuit breaker type		Air circuit Breaker
(b)	Voltage, frequency & no. Of phases		415V, 3 PHASE, 4W,50Hz
(c)	Rated breaking duty		B-0.3 SEC-MB-3 SEC-MB
(d)	Rated breaking capacity (i)MVA (ii)KA(RMS) at 415V 0.25 p.f.		
(e)	Short circuit withstand current for 1 sec. Duration	kA (RMS)	50
(f)	Rated making current	kA(PEAK)	125
(g)	Type Of Operating Mechanism		Motor wound spring charged
(h)	Minimum No Of Auxiliary Contacts		6 NO + 6 NC
(i)	Standards Applicable		As per specs
6	MCCB's		
(a)	Moulded case circuit breakers to be provided. (a) for motor control circuits (b) for other circuits		
(b)	Voltage, frequency & no of Phases		415V, 50Hz, 3PH
(c)	Rated operating duty		O-3MIN-CO-3MIN-CO
(d)	Rated breaking capacity (at 415v 0.25 p.f.)	kA(RMS)	50
(e)	Rated making current	kA (Peak)	125
(f)	Rated current at site reference ambient temperature		As per Specifications
(g)	On/off operation Manual Remote power operated		Yes Yes

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Sr. No	Description	Unit	Technical Particulars
(h)	Releases required Over load inverse time Under voltage		Yes Yes
(i)	Standards applicable		As per Specifications
7	Instrumentation Transformers		
(a)	Current transformer		
	(i) Ratio		As per the Requirement
	(ii) Burden	VA	As per the Requirement
	(iii) Accuracy Class		1.0
(b)	Voltage transformer		
	(i) Ratio		$(415V/\sqrt{3}) / (110V/\sqrt{3})$
	(ii) Burden	VA	50
	(iii) Accuracy Class		1.0

12.20.4 415 V Power Capacitor and Control Panel

Sr. No	Description	Unit	Technical Particulars
1	General		
(a)	Quantity		
(b)	Rated Capacity	KVAR	As per the Requirement
(c)	Rated voltage	V	433
(d)	Rated frequency and phases		50 Hz, 3 Phase
(e)	Ambient temperature	° C	45
(f)	Cable gland required		Yes
(g)	Type of cable		1.1 kV, XLPE, Al. Conductor
(h)	Size of cable		As per Requirement
(i)	Cable entry		Bottom
2	Constructional Requirement		
(a)	Thickness of sheet steel i) Frame, Frame enclosures, doors covers and partition	Mm	Cold rolled 2.0
(b)	Degree of protection		IP 54
(c)	Colour finish shade		Interior : Glossy white Exterior: Light Grey Semi Glossy Shade 631 of IS 5
(d)	Earthing bus	Material	Copper

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Sr. No	Description	Size	Unit	Technical Particulars
			mm x mm	25x6 (*)
(e)	Earthing conductor	Material		Copper
		Size	mm x mm	40 x 6 mm (*)
3	Design Requirement			
(a)	Insulation level		kV (rms)	2.5
(b)	Capacitor bank connection			Delta
(c)	Short circuit withstand for busbars		kA (rms)	As per SLD & specifications
	i) Short time (1 sec)			
	ii) Dynamic		kA (peak)	87.5
(d)	Type of switching			Automatic switching responsive to power factor through power factor sensing relay
(e)	Switching steps			Minimum 8 steps
(f)	Rating of contactor			To suit KVAR unit
(g)	Incomer switch current rating			To suit rated capacity of KVAR
(h)	Busbars			Copper

12.20.5 Battery

Sr. No.	Description	Unit	Technical Particulars
1	Application		Control, annunciation and emergency lights
2	Type of battery		VRLA
3	Number of battery banks required		As per requirement (*)
4	Ambient conditions		Min. Temp. 25° C
			Max. Temp 45° C
5	D.C. system voltage	V	110
6	Ampere hour capacity of battery at 27 Deg. C at 10 hour rate to give final cell voltage of 1.75 volts/cell	Ah	As per the Requirement
7	Momentary load/duration	A	
8	Emergency load/duration	A	
9	Continuous load/duration	A	
10	Cell voltage - initial/final	V	
11	Mounting arrangement		Multi-tier
12	Charging method proposed		Float cum boost charging

12.20.6 Battery Charger and D.C. Distribution Board

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Sr. No.	Description		Unit	Technical Particulars
1	General			
(a)	Number required			
	(i) Battery charger		Nos.	As per the Requirement (*)
	(ii) D.C. Distribution board		Nos.	As per the Requirement (*)
(b)	DC System Voltage (Nominal)		V	110
(c)	DC System Earthing			Unearthed
(d)	Ambient Design Temperature		Deg. C	45° C
(e)	Busbar material & size		-	Copper , size as per Requirement
2	DC Bus Load			
(a)	Total continuous DC load		A	
(b)	Short time loads (Additional to continuous loads)			
	(i) DC lights/Facia lamps		A	
	(ii) Starting current and duration		A	
	of Largest Connected DC Motor		Secs	
3	Battery Details			
(a)	Float/Trickle charging current of battery		mA	200
(b)	Boost Charging Current of Battery (Maximum)		A	10
(c)	Boost Charging Voltage of Battery (maximum)		V	142
(d)	Maximum Time for Boost charging of Battery		hr	10
(e)	Battery capacity & no. of cells		Ah	As per the Requirement (*)
			Nos.	As per the Requirement (*)
4	AC System Data			
(a)	Supply	Voltage	V	415
		Phase		3
(b)	(i) Variation in supply Voltage		%	± 10
	(ii) Variation in supply frequency		%	± 5
(c)	Short Circuit level		kA	35
(d)	Type of earthing			Solidly Earthed
5	Performance			
(a)	DC voltage setting adjustment for			±10% of nominal voltage

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Sr. No.	Description	Unit	Technical Particulars
	float charger		
(b)	Voltage stabilisation for constant voltage regulator		±1% of set D.C. voltage, with AC input variation and DC load variation from 0 to 100%
(c)	Maximum permissible variation in DC voltage (no load to full load)		± 1%
(d)	D.C. voltage setting adjustment for boost charging		70% to 100% of max. boost charging voltage
(e)	D.C. current adjustment for boost Charging		30% to 100% of max. boost charging current
(f)	Current stabilisation for constant current regulator for boost charger		± 2%
(g)	Minimum permissible power factor to rated continuous load		0.8
(h)	Permissible ripple content at rated continuous load		3% (maximum)
6	Miscellaneous		
(a)	Constructional Features for Battery Charger & D.C. Distribution Board		
	(i) Thickness of sheet steel Frame, Frame enclosures, doors, covers and partition	mm	Cold rolled 2.0
	(ii) Degree of protection		IP 42
	(iii) Colour finish shade		Interior: Glossy white
			Exterior: Light Grey Semi Glossy Shade 631 of IS 5
	(iv) Earthing bus	Material	Copper
		Size	mm x mm
			25 x 6(*)
	(v) Earthing conductor	Material	GS
		Size	mm x mm
			40 x 6(*)
(b)	Cable entry		Bottom
(c)	Cable Sizes		
	(i) Battery	sq.mm	As per the Requirement
	(ii) DC output	sq.mm	As per the Requirement
	(iii) AC input	sq.mm	As per the Requirement
(d)	Relay for auto changeover from Float to boost mode to be provided		Yes

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Sr. No.	Description	Unit	Technical Particulars
	(in case of float-cum-boost charger)		

12.20.7 Cables: HV, LV, Control and Telecommunication

Sr. No.	Description	Unit	Technical Particulars
(a)	11 kV earthed Aluminium Conductor XLPE, armoured power cable		As per IS 7098
(b)	650/1100 V grade PVC insulated Aluminium conductor armoured power cable (AYWY or AYYF)		As per IS 1554
(c)	650/1100 V grade XLPE insulated Aluminium conductor armoured power cable		As per IS 7098
(d)	650/1100 V grade PVC insulated copper conductor armoured control cable		As per IS 1554
(e)	Telecommunication cables		As per IS 10579 IS 5801 IS 9943
(f)	Epoxy Heat Shrinkable Straight through joints and end terminations.		

12.20.8 Lighting Fixtures and Accessories

1	General		
(a)	Normal Supply Voltage, Phase and Frequency	AC DC	230V, 1PH, 50Hz
(b)	Variation in Supply		
	i) Voltage	%	+10%
	ii) Frequency	%	+5%
	iii) Combined voltage & frequency	%	+10%
(c)	Design Ambient Air Temperature	°C	45
(d)	Luminaire Terminal Suitable for		
2	Indoor non hazardous area		
(a)	Conductor material		COPPER
(b)	Wire size	Cores x s	4C x 2.5 Sq.mm
1.4.2	Indoor hazardous / Outdoor area		
(a)	Conductor material		ALUMINIUM
(b)	Cable size	Cores x sq.	4C x 16 Sq.mm
1.5	Luminaire Earthing Terminal Suitable for		

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	a) Conductor material		GI
	b) Conductor size	SWG	12

12.20.9 Lighting System and Equipment

Sr. No.	Description	Unit	Technical particulars
1	System particular		
(a)	Voltage		
(i)	3 phase, 4 wire 50 HZ System		
	Rated	V	415
	Maximum	V	476
	One minute withstand Voltage		2000V
(ii)	D.C. System		
	Rated	V	110
(b)	System short-circuit level		
(i)	at 415 V, A.C.	KA (rms)	10
(ii)	at 110 V.D.C	KA (D.C)	6
(c)	Reference ambient temperature	⁰ C	45
2	Distribution board/panels		
(a)	Main, floor mounted distribution boards		As per the Requirement (*)
(i)	Main lighting distribution board(A.C)		As per Specifications (Part 6: General Requirements – Electrical Equipment)
	Make		
	Type		
	Degree of protection		
	Bus bar material		Copper
	Bus bar current rating	A	
	Short circuit current rating	KA	10
	Details of incoming and outgoing feeders		
	Cable entry		Bottom
	Location		Indoor
(ii)	Emergency lighting panel (DC)		Not applicable
	• Make		
	• Type		
	• Degree of protection		
	• Bus bar material		
	• Bus bar current rating	A	

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Sr. No.	Description	Unit	Technical particulars
	• Short circuit current rating	KA	
	• Details of incoming and outgoing feeders		
	• Cable entry		
	• Location		
(iii)	Single/three phase DBs, wall/structure mounting		As per Specifications (Part 6: General Requirements – Electrical Equipment)
	SLDB/TLDB for indoor area		
	• Make		
	• Type		
	• Details of incoming and outgoing feeders		
	• Degree of protection		
(iv)	Single/three phase DBs for outdoor area		As per Specifications (Part 6: General Requirements – Electrical Equipment)
	• Make		
	• Type		
	• Details of incoming and Outgoing feeders		
	• Degree of protection		
(v)	Paint finish		
	(i) Colour shade:		Interior : Glossy white Exterior: Light gray semi glossy shade 631 of IS:5
3	Street light poles and flood light poles		As per Specifications (Part 6: General Requirements – Electrical Equipment)
(a)	Street light pole		
	Type		
	Total height:	M	9.0
	Quantity:	Nos.	As per the Requirement (*)
(b)	Floodlight light pole		
	Type		
	Total height :	M	30
	Quantity:	Nos.	As per the Requirement (*)

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Sr. No.	Description	Unit	Technical particulars
	No. of floodlights to be fixed per pole	No.	

12.20.10 Lighting system Installation Work

Sr. No.	Description	Unit	Technical Particulars
1	Installation of Earthing Conductor		
(a)	Indoor Areas		
	(i) Size	SWG	12 (*)
	(ii) Material		G.S. wire
(b)	Outdoor Areas		
	(i) Size	SWG	8 (*)
	(ii) Material		GI strap/wire
2	Installation of Conduits		
(a)	Rigid		
	(i) Material		Galvanised steel
	(ii) Sizes	mm ²	20 (*)
3	Installation of Wires/Cables		
(a)	1100 V, 1 Core, PVC Insulated Wires		
	(i) Conductor material		Copper
	(ii) Size	sq.mm	Lighting 1Cx1.5(*) Receptacles 1Cx2.5(*)
	(iii) Colour Coded 'Black'	Metres	
	(iv) Colour Coded 'Red,yellow,Blue and Green' Colour code of wires shall be as follows: Phase wires-Red/yellow/Blue Earth: Green Neutral: Black	Metres	
(b)	1100 V, PVC Insulated PVC Sheathed Armoured Cable		
(c)	Size & cores	Core x mm ²	2C X 4 and 2C X 6
			4C X 6
4	Contractor shall route and supply these items as required.		
5	Supply of earthing conductors, mounting accessories and all fixing hardware are included as part of the installation work.		

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Sr. No.	Description	Unit	Technical Particulars
6	Supply of conduits and wires/cables and all fixing hardware are included as a part of installation work.		

12.20.11 Earthing and Lightning Protection System

Sr. No.	Description	Technical particulars		
		Size	Material	No. of Leads & quantity
1	Main earthing grid	a) Size & Material: As per Specifications (Part 6: General Requirements – Electrical Equipment)		
(a)	Buried in earth			
(b)	Buried in floor slabs in buildings	b) Quantity as per requirement (*)		
2	Conductor leads to equipment (above ground)			
(a)	Transformers	c) Min. No. Of Leads shall be 2 for 3-Ph & 1 for 1-Ph.		
(i)	Transformer neutral to bottom of tank			
(ii)	From bottom of tank to earth grid	d) Min. Requirement & additional earth pits shall be made such as to maintain Grid values 1 Ohm.		
(iii)	Transformer tanks and radiator bank			
(b)	Diesel & Bio Gas generator set	e) For Transformer & DG Neutral – Minimum 2 Nos. each independent.		
(i)	Neutral earthing			
(ii)	Body earthing			
(c)	Fence posts and gates (flex. braid)			
3	11 KV metal enclosed switchboard, 415V switchgear/ MCC.			
4	Motors			
(a)	415V motors above 10 KW			
(b)	415V motors up to 10 KW			
(c)	Fractional Horse Power motors			
5	Other items			
(a)	Capacitor panel, battery charger panel, dc distribution board , Main Lighting DB, control panels and sub-lighting distribution boards etc			
(b)	Hand rails			
(c)	Cable trays			
(d)	Tanks			
(e)	Junction boxes			
(f)	Lighting fixtures, receptacles, lighting conduits			
(g)	Push button stations, limit switches			
6	Crane rail			
7	Street lighting, flood lighting poles and junctions boxes			
8	Metallic noncurrent carrying structures			
9	Lightning conductors			

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Sr. No.	Description	Technical particulars		
		Size	Material	No. of Leads & quantity
(a)	Lightning protection down comers for building			
(b)	Lightning protection horizontal roof conductor for building			
10	Electrodes			
(a)	Chemical Electrode/GI pipe			
(b)	Plate Electrode			

Note:

- (i) Any requirement/ features/ provisions/tools/materials not specifically mentioned in the Specification, but are necessary for trouble free and smooth operation of the Plant System shall be included without any extra cost.
- (ii) (*) – The numbers, ratings, sizes etc. have to be worked out by the contractor and to be approved by the OIL's Engineer prior to execution of work.

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GENERAL REQUIREMENTS - ELECTRICAL EQUIPMENT

13.1 INTRODUCTION

The scope of this specification consists of general requirements of Design, manufacture, inspection and testing at manufacturer's works, supply, packing, forwarding and delivery to site, unloading, handling and storing the equipment at site, assembly, installation, testing and commissioning at site of the equipment/ system listed below as per Specifications, data sheets & Single Line Diagram. Particular requirements of all electrical equipments are covered under 'Electrical' of this Specification. The electrical system comprising of but not limited to the following:

- Oil cooled Transformers
- HT Switchgear Panels (Both 11kV and 6.6kV panels)
- 415V Metal enclosed switchboards (MCCs/PCCs)
- 415 V Power capacitor and control panel
- Bus Duct
- Diesel Generator Set with Acoustic Enclosure
- UPS
- Battery, Battery charger and DC Distribution board
- Cabling System: HV, LV, Control and Telecommunications
- Cable carrier system,
- Lighting
- Lighting System Equipment
- Earthing & Lightning protection system.

The equipment of those manufacturers, who have sufficient proven experience of manufacturing (to be defined by OIL during Engineering & Design) the respective equipment of similar capacity, shall be considered.

Various equipment /items shall conform to latest applicable standards specified. In case of Conflict between standards and this specification, this specification shall govern.

13.2 TRANSFORMERS

Oil immersed naturally cooled continuous duty with Copper winding 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.

Rating

- The capacity of transformer shall be 3MVA and 1MVA.
- The nominal primary voltage shall be 33 KV, 50 Hz and the highest voltage For equipment shall be 36 KV.
- The nominal secondary voltage shall be 415/240 V, 50 Hz.
- The neutral point shall be earthed.

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- e) 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.
- f) Vector group shall be Dyn 11.
- g) The normal voltage ratio of the transformers at principal tapping shall be 11000/6600 Volts and 11000/415 Volts.
- h) Type of insulation shall be Oil.

A. Applicable Standards

The transformers shall conform to the latest applicable standards specified below

Power Transformer	IS:2026/BS:171/IEC:60076 IS11171
Fittings and Accessories	IS:3639
Outdoor type Oil immersed distribution transformers upto 2500kVA, 33kV Transformer	IS:1180-2014
Loading of oil immersed transformer	IS:6600/BS:CP.1010 /IEC:60354
Transformer Oil	IS:335/BS 148/IEC:60296
Bushings for > 1000V, AC	IS:2099/BS:223/IEC:60137
Bushings for $\leq$ 1000V, AC	IS:7421
Degree of Protection	IS:13947 (Part 1) / IEC:60947-1
Double float type Buchholz Relay	IS:3637
Electrical insulation classified by thermal stability	IS1271/BS:2757/IEC:60085
Climate Proofing	BS:CP1014
Code of Practice for selection, installation and	IS - 10028
Maintenance of transformers	
Manual on Transformers	CBIP Publication No.295

B. Features of Construction

- a) The transformer tank shall be made from high-grade sheet steel, suitably reinforced by stiffeners made of structural steel sections.
- b) All seams, flanges, lifting lugs, braces, and other parts attached to the tank shall be welded.
- c) The interior of the tank shall be cleaned by sand blasting and painted with two coats of heat resistant, oil insoluble paint.
- d) Adequately sized manholes shall be provided for ease of inspection and maintenance. Steel bolts and nuts exposed to atmosphere, shall be galvanized.
- e) The tank cover shall be removable and shall be suitably sloped so that it does not retain rainwater.
- f) Lifting lugs and eyebolts shall be so located that a safe clearance is obtained without the use of a spreader, between the sling and transformer bushings.

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- g) Transformers shall be provided with fixed type radiators. Fins of the radiators shall not have sharp edges and shall be rounded in shape.
- h) The transformer core shall be constructed from high grade, non-ageing, cold-rolled, grain oriented, silicon steel laminations. The steel laminations shall be of "core" type. Each lamination shall be coated with insulation which is unaffected by the temperature attained by the transformer during service. Core laminations shall be annealed and burrs removed after cutting. Cut edges shall be insulated. The framework and clamping arrangements of core and coil shall be securely earthed inside the tank by a copper strap connection to the tank.
- i) Windings shall be of insulated copper wire or copper strip. Windings and insulation shall be so arranged that free circulation of oil is possible between coils, between windings, and between winding and core. The windings shall be fully shrunk under vacuum before assembly. High voltage end-windings shall be suitably braced to withstand short circuit stresses and stresses caused up by surges.
- j) The sequence and orientation of HV/LV side phase and neutral bushings shall be as specified in the latest edition of relevant IS.
- k) Transformer shall operate without injurious heating at the rated KVA and at any voltage up to + 10 % of the rated voltage of any tap. Transformer shall be designed for 110 % continuous over-fluxing withstanding capability.
- l) Transformer shall be provided with Zero sequence / earth fault current protection on LV side transformer feeder protection. (Neutral CT to be provided in case of solid grounding)

C. Winding connections

Windings shall be of HV: Delta & LV: Star, vector group Dyn 11.

D. Rating

The rating of transformers shall be as per standard ratings shown in IS 1180:2014 or relevant standard.

E. Type of cooling

The transformers shall be oil immersed with natural oil circulation, type ONAN. With the provision for radiator cooling for air natural, if required will be added in future. The rating of the transformer with ONAN shall be specified.

F. Impedance and losses

The percentage impedance, no load & load losses shall be as per IS 1180: 2014 or relevant standard.

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G. **Performance requirements**

- (a) The transformers shall be suitable for operation without danger on to any particular tapping at the rated kVA provided that the voltage does not vary by more than $\pm 10\%$ of the voltage corresponding to the tapping.
- (b) The transformers shall be suitable for continuous operation with a frequency variation of $\pm 5\%$ of rated frequency, combined voltage and frequency variation should not exceed 10% .
- (c) All transformers shall be capable of withstanding external short circuit without damage as per IS 2026.
- (d) The transformers shall be capable of continuous operation in accordance with relevant IS for loading of oil immersed transformers.
- (e) The neutral terminal of star windings shall be designed for the highest over current that can flow through this terminal.
- (f) The temperature rise of oil & windings over the specified ambient temperature shall not exceed the limits given below with air as cooling medium when tested in accordance with IS 2026 (Part-2).

Top oil (measured by thermometer)	:	40° C
Winding (measured by resistance)	:	45° C
- (g) Noise level of transformers shall be less than 80 dB at a distance of 1 metre.

H. **Tap Changer**

- (a) The standard tapping range shall be $+5\%$ to -15% of HV in terms of 2.5% with taps on HV Side.
- (b) For transformer of rating less than or equal to 500 kVA, tap changing shall be carried out by means of an off circuit externally operated self-positioning switch when the transformer is in de-energized condition. Off circuit tapping arrangement shall be either by means of an externally operated switch with mechanically locking device and a position indicator. Arrangement for pad-locking shall be provided.
- (c) **On Load Tap Changing Gear for Transformer (above 500kVA)**
 The OLTC gear shall be designed to complete successfully tap changes for the maximum current to which transformer can be loaded i.e. 150% of the rated current. Devices shall be incorporated to prevent tap change when the through current is in excess of the safe current that the tap changer can handle. The OLTC gear shall withstand through fault currents without injury.
- (d) When a tap change has been commenced it shall be completed independently of the operation of the control relays and switches. Necessary safeguard shall be provided to allow for failure of auxiliary power supply or any other contingency which may result in the tap changer movement not being completed once it is commenced.

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- (e) Oil in compartments which contain the making and breaking contacts of the OLTC shall not mix with oil in other compartments of the OLTC or with transformer oil. Gases released from these compartments shall be conveyed by a pipe to a separate oil conservator or to a segregated compartment within the main transformer conservator. A Buchholz relay shall be installed in the above pipe. The conservator shall be provided with a prismatic oil level gauge.
- (f) Oil in compartments of OLTC which do not contain the make and break contacts, shall be maintained under conservator head by valve pipe connections. Any gas leaving these compartments shall pass through the Buchholz relay before entering the conservator.
- (h) OLTC driving mechanism and its associated control equipment (Local) shall be mounted in an outdoor, weather-proof cabinet with IP 55 protection which shall include :
 - (i) Driving motor (415V, 3-phase, 50 Hz. AC squirrel cage).
 - (ii) Motor starting contactor with thermal overload relays, isolating switch and HRC fuses.
 - (iii) Duplicate sources of power supply with automatic changeover from the running source to the standby source and vice versa.
 - (iv) Control switch: Raise/off/lower (spring return to normal type).
 - (v) Remote/local selector switch (maintained contact type).
 - (vi) Mechanical tap position indicator showing rated tap voltage against each position and resettable maximum and minimum indicators.
 - (vii) Limit switches to prevent motor over-travel in either direction or final mechanical stops.
 - (viii) Brake or clutch to permit only one taps change at a time on manual operation.
 - (ix) Emergency manual operating device (hand crank or hand wheel).
 - (x) A five digit operation counter.
 - (xi) Electrically interlocked reversing contactors (preferably also mechanically interlocked).
 - (xii) 240V, 50 Hz. AC space heater with switch and HRC fuses.
 - (xiii) Interior lighting fixture with lamp door switch and HRC fuses.
 - (xiv) Gasketed and hinged door with locking arrangement.
 - (xv) Terminal blocks, internal wiring, earthing terminals and cable glands for power and control cables.
 - (xvi) Necessary relays, contactors, current transformers etc.
- (g) Control Requirements for OLTC
The following electrical control features shall be provided:

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- (i) Positive completion of load current transfer, once a tap change has been initiated, without stopping on any intermediate position, even in case of failure of external power supply.
 - (ii) Only one tap change from each tap change impulse even if the control switches or push button is maintained in the operated position.
 - (iii) Cut-off of electrical control when manual control is resorted to. Cut-off of a counter impulse for a reverse tap change until the mechanism comes to rest and resets the circuits for a fresh operation.
 - (iv) Cut-off of electrical control when it tends to operate the tap beyond its extreme position.
- (h) Automatic Control of OLTC: Automatic OLTC control shall include the following items:
- (i) Voltage setting device
 - (ii) Voltage sensing and voltage regulating devices.
 - (iii) Line drop compensator with adjustable R and X elements.
 - (iv) Timer 5-25 seconds for delaying the operation of the tap changer in the first step for every tap change operation
 - (v) Adjustable dead band for voltage variation
- (i) The OLTC remote control equipment shall be housed in an indoor sheet steel cubicle to be located in a remote control room. It shall conform to degree of enclosure protection IP42 or better and shall comprise the following.
 - (j) The OLTC control panel shall comprise of rigid welded structural frames made of structural steel section or of pressed and formed cold rolled steel and frame enclosures, doors and partitions shall be of cold rolled steel of thickness 2 mm. Stiffeners shall be provided wherever necessary.
 - (k) All doors, removable covers and plate shall be gasketed all around with neoprene gaskets. Panel shall be dust, weather and vermin proof providing degree of protection of IP54, colour of finish shade for interior and exterior shall be glassy white and light grey semi glossy shade 631 of IS-5 respectively.
 - (l) Min. Size of earthing bus shall be of 25 x 6 mm copper.
 - (m) The OLTC remote control equipment shall comprise of the following
 - (i) Control switch: Raise/Off/Lower (spring return to normal type)
 - (ii) Auto/manual selector switch (maintained contact type)
 - (iii) Tap position indicator
 - (iv) Facia type alarm Annunciators with “accept” and “lamp test” facilities.
- A.C. supply failure
 - Drive motor auto tripped
 - Tap change delayed

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- (v) Necessary auxiliary relays
- (vi) Lamp indications for :
 - Tap change in progress
 - Lower limit reached
 - Upper limit reached
- (vii) Cable glands for power and control cables.
- (viii) 240 V rated panel space heater with ON-OFF switch.
- (ix) Fluorescent type interior lighting fixture with lamp and door switch.
- (x) HRC fuses.
- (xi) Terminal blocks.
- (xii) Internal wiring.
- (xiii) Earthing terminal.

I. **Fittings and Accessories**

The following fittings and accessories shall be provided for transformer:

- (a) Inspection manhole(s) with cover(s) on the top cover of the transformer.
- (b) Lifting lugs or eyes for lifting of fully assembled transformer by crane.
- (c) Jacking pads, at least four in number, at suitable height, for lifting the complete transformer filled with oil.
- (d) Lifting arrangements for
 - (i) Complete transformer filled with oil
 - (ii) For the assembly of core and coils and
 - (iii) For lifting the tank of large transformers whenever specified.
- (e) Hauling eyes on each face of the transformer (for transformer rated 10000 KVA and above).
- (f) Skids at the base of the transformer.
- (g) A ladder assembly shall be provided to reach the top of the transformer for maintenance work. It shall be possible to padlock the ladder to the transformer tank so that ladder cannot be removed. Usage of transformer structure / marshalling boxes etc as means to climb transformer are not acceptable.
- (h) Earthing pads: Two earthing pads of copper or other non-corrodible material shall be welded at the bottom corners of the transformer tank and supplied with clamp type terminals suitable for the Employer's earthing conductors. Suitable earthing terminals on cable boxes and separately mounted radiator banks shall also be provided.
- (i) Neutral earthing bar of copper of specified section installed from the neutral bushing to ground level suitably supported along its run on porcelain insulators, together with clamping arrangements at neutral bushing and for two Employer's earth conductors. The supporting insulators shall be tank mounted.

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- (j) Terminal marking and rating plates shall be as per the specified standard and shall also give the following additional information:
- (i) Connection diagram showing the internal connections.
 - (ii) Guaranteed Temperature rise of winding and oil.
 - (iii) Insulation levels of the windings, including neutral end of windings with uniform insulation.
 - (iv) Transportation weight.
 - (v) Un-tanking weight.
 - (vi) Core and winding weight.
 - (vii) Table giving the tapping voltage, tapping current and tapping power factor for each tap. Values of short circuit impedance on the extreme tapplings and on the principal tapping and indication of the winding to which the impedance is relates.
- (k) The transformer shall also be provided with the following non-corrodible plates, indelibly marked showing:
- (i) Location and function of all valves and plugs and indication of the maintenance instrument reference for applying vacuum of drying and oil filling.
 - (ii) Valves connection diagram
- (l) The conservator shall be provided with the following accessories:
- (i) Filling plug, sump and drain valve of 15 mm size for conservator of size 650 mm and 25 mm size for conservator above 650 mm diameter.
 - (ii) 150 mm diameter magnetic type oil level gauge with low oil level alarm contacts and a prismatic oil sight gauge, both as specified in Data Sheet and provided with markings for minimum oil level and oil level at rated temperature rise.
 - (iii) A bolted cover at one end for cleaning.
 - (iv) Valve for shutting off oil to the transformers.
 - (v) Weather proof dehydrating breather with silica gel and oil seal to eliminate constant contact with the atmosphere, mounted at a level of about 1400 mm above ground level.
 - (m) Gas and Oil Actuated Relay (Buchholz Relay)
 - (n) Temperature Indicators
 - (o) Dial Type Thermometer
 - (p) Winding Temperature Indicator

1.2 Cable Terminations / Cabling Requirement

11kV air insulated cable box with air insulated disconnecting chamber shall be provided with supporting brackets and structure to facilitate their support from ground level. The disconnecting chamber and terminal box shall be air insulated and complete with seal-off bushings, removable flexible connectors/links and removable

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covers. LT terminal box shall be suitable for connecting LT air insulated bus duct/LT cable.

- 1.3** All transformers shall be provided with lockable emergency Push Button station near the transformer to trip the transformer as per IER. All transformers shall be provided with alarm annunciation on breaker control panel.

1.4 Tolerance on Losses

The permissible tolerances on the guaranteed values of transformer losses shall be as per IS 2026. Cost loading shall be done for capitalization of losses at time of bid evaluation for all transformers as per CBIP Manual on transformers.

1.5 Rejection

- (a) The OIL or OIL's Representative reserves the right to reject the transformer if the same does not meet the specification requirement, subject to tolerances as per IS 2026.
- (b) The impedance values difference and temperature rise values shall not exceed from the guaranteed specified values.
- (c) The rejected transformers shall be replaced by transformers complying with the requirements of this specification at the Contractor's cost. If the commissioning of the project is likely to be delayed by the rejection of a transformer, the Employer's Representative reserves the right to accept the rejected transformer until the replacement transformer is made available.
- (d) Transporting the rejected and replacement transformers as well as installation and commissioning of both the transformers shall be at the Contractor's cost.

1.6 Drawings and Data

All Drawings, data, technical particulars, temperature rise calculations, detailed literature, catalogues, type test certificates of typical transformer etc shall be submitted along with the bid/ after award of contract as specified under " Bid/Contract Drawings" , Part 3, General Requirements, Volume-2 of Bid Documents.

13.3 11/6.6 KV HV METAL ENCLOSED SWITCHBOARDS & SWITCHGEARS

HV/MV metal enclosed Switchboards and Switchgear system shall have provision such that inter-opera ability with instrumentation control system.

A. Applicable Standards

The switchgear and its components shall conform to the latest applicable standards specified below:

Circuit Breakers

IS : 13118 / BS : 5311

/IEC: 60056,60694,IEC 62271-100

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Metal Enclosed switchgear	IS:3427 / BSEN:60298 / IEC:60298, IEC 62271-200
Current Transformers	IS : 2705 / BS : 7626
Voltage Transformers	IS : 3156 / BS : 7625 / IEC : 60186
Arrangement for Switchgear Busbars, Main Connections and Auxiliary wiring	IS : 5578, 11353
Busbar Support insulators	IS : 2544 / BS : 3297 / IEC :60 273
Degree of Protection	IS : 13947 (Part 1) / IEC : 60947-1/ BSEN : 60529
Electrical Relays for Power system protection	IS : 3231, 3842 / BS : 142 / IEC : 60255
Electrical Indicating Instruments	IS : 1248 / BS : 89 / IEC :60051
High Voltage Fuses	IS : 9385 / BS : 2692 / IEC : 60282
AC Electricity Meters	IS : 722, 8530 / BS : 5685 / IEC : 60145,60211
Specification for copper rods and bars for electrical purposes	IS : 613
Code of practice for phosphate iron and steel	IS : 6005 / BS : 3189
Alternating current Switches for voltages above 1000 V	IS : 9920 / IEC : 60129,60265 & 60298
Low voltage fuses	IS : 13703 / BS 1362 / IEC 60269
Toggle switches	IS : 3452 / BS : 3676
Code of practice for selection, installation and maintenance of switchgear and control gear	IS : 10118
Control switches	IS:6875 / BSEN 60947/IEC: 60947
Classification of Hazardous areas having Flammable gases and vapours for Electrical Installation	IS 5572, IS 5571
Electrical apparatus for explosive gas atmospheres-General Requirements	IEC 60079
Fault level calculation	IS: 2026

B. **Constructional Features**

- a) Switchgear design shall be of metal enclosed, single front, free standing, floor mounted and fully compartmental execution having separate sections for each circuit. Each Circuit shall have a separate vertical panel with distinct compartments for main bus bars, circuit breaker, cable termination and auxiliary devices.

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- b) The adjacent panels shall be completely separated by steel sheets except in bus bar sheet compartments where insulated barriers shall be provided to segregate adjacent panels. Compartments with doors for access to operating mechanism shall be so arranged as not to expose high voltage circuits.
- c) Switchgear cubicle shall be provided with hinged door on the front with facility for locking door handle.
- d) Switchboard shall be dust and vermin-proof and shall have a degree of protection of enclosure of IP 4X and the relay and meter compartments shall have a degree of Protection not less than IP 52.
- e) All removable covers shall be gasketed all around with neoprene or superior gaskets.
- f) Instruments, relays and control devices shall be flush-mounted on hinged door of the metering compartment located in the front portion of cubicle. The metering compartment shall be properly shielded to prevent mal-operation of electronic equipment such as numerical / static relays due to electro-magnetic fields.
- g) All transformers shall be provided with alarm annunciation on breaker control panel.
- h) Each switchgear cubicle shall be fitted with a label on the front and rear of the cubicle. Each switchboard shall also be fitted with label indicating the switchboard designation, rating and duty.
- i) Each relay, instrument, switch, fuse and other devices shall be provided with separate label.
- j) The fully draw-out modules shall have all the circuit components mounted on withdraw able type steel chassis.
- k) All power and control connections shall be of the draw out type. It shall be possible to withdraw the chassis mounted circuit components without disconnecting any connections. All draw-out contacts shall be of silver plated copper.
- l) In case of circuit breaker compartments, suitable barriers shall be provided between breaker and all control, protective and indication circuit equipment including instrument transformers such that no live parts are accessible.
- m) External cable connections shall be through separate cable compartments for power and control cables. Safety shutters shall be provided to cover up the fixed high voltage contacts on busbars when the circuit breaker carriage is moved to 'test' and 'isolated' positions.
- n) One metal sheet shall be provided between two adjacent vertical sections running to the full height of the switchboard except for the horizontal busbar compartment. However, each shipping section shall have metal sheets at both ends. After isolation of the power and control connections of a circuit, it shall be

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possible to carry out maintenance in a compartment safely, with the bus bars and adjacent circuits alive.

- o) All sheet steel work shall be phosphate in accordance with the following procedure and in accordance with IS: 6005 "Code of Practice for Phosphate Iron and Steel". Oil, grease, dirt and swarf shall be thoroughly removed by emulsion cleaning. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.
- p) After phosphate, thorough rinsing shall be clean water followed by final rinsing with dilute dichromate solution and even drying. The phosphate coating shall be followed by the application of two coats of ready mixed stoving type zinc chromate primer. The first coat may be "flash dried" while the second coat shall be stoved. After application of the two coats of primer finishing synthetic enamel paint shall be applied, each coat followed by stoving. The second finishing coat shall be applied after completion of tests. The final finished thickness of paint film on steel shall not be less than 100 microns and shall not be more than 150 microns. Finished painted surface of panels shall present an aesthetically pleasing appearance free from dents and uneven surface. A small quantity of finishing paint shall be supplied for minor touching up required at site after the installation of the panels.

C. **Circuit Breaker**

- a) Circuit breakers shall be vacuum type with three separate single pole interrupting units, operated through a common shaft by a sturdy operating mechanism. Surge Arrestors shall be provided for each motor / transformer feeder.
- b) Circuit Breakers shall be re strike free, stored energy operated and trip free type. Circuit breaker along with its operating mechanism shall be mounted on a wheeled carriage moving on guides, designed to align correctly and allow easy movement. Plugs and sockets for power circuits shall be silver faced and shall be insulated with suitable insulating material shrouds. All corresponding components of circuit breaker cubicles of same rating shall be interchangeable with one another.
- c) Anti pumping relay and trip coil suspension relay shall be provided.
- d) There shall be 'Service', 'Test' 'Fully withdrawn' positions for the breakers. In the 'Test' position the circuit breaker shall be capable of being tested for operation without energizing the power circuits, i.e. the control circuits shall remain undisturbed while the power contacts shall remain disconnected.
- e) Separate limit switches, each having a minimum of 2 'NO' + 2 'NC' contacts, shall be provided for both 'Service' and 'Test' positions of the circuit breakers. All these service, test, fully withdrawn, spring charge and also breaker ON / OFF shall be visible mechanically from outside the breaker panel when the front door is closed.

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- f) Electrical closing & tripping shall be performed by shunt trip & close coils both in Local & Remote mode. Selector switch lockable in “Local” position shall be provided on the cubicle door. ‘Red’ and ‘Green’ indicating lamps shall be provided on cubicle door to indicate breaker close and open positions. Breaker “Service”, “Test” and breaker readiness positions shall be indicated by separate indicating lamps on the cubicle door.
- g) Connection of the control / interlocking circuits between the fixed portion of the cubicle and the breaker carriage shall be preferably by means of plug socket arrangement.
- h) 10% spare feeders with at least one for each type of highest rating shall be provided in each switch gear.
- i) Surge arrestors shall be provided for all motors / transformer feeders and shall be metal oxide gapped or gapless type generally in accordance with IEC 60099-1 and suitable for indoor only.
- j) Core balance CTs (CBCT) shall be provided on outgoing motor and transformer feeders having CT Ratio 50 / 1A or more. These CBCTs shall be mounted inside the switch gear panel.

D. Operating Mechanism Control

- a) Circuit breakers shall be operated by a motor spring charging type of mechanism. The mechanism shall be complete with motor, opening spring, closing spring and all accessories to make the mechanism a complete operating unit.
- b) Operating mechanism shall normally be operated from the breaker cubicle itself.
- c) The tripping spring shall be charged by the closing action, to enable quick tripping. Closing of the circuit breaker shall automatically initiate recharging of the springs to enable the mechanism to be ready for the next closing stroke. Charging time for the springs shall not exceed 30 seconds. It shall be possible to manually charge the springs in an emergency. Transfer from motor to manual charging shall automatically disconnect the charging motor. All operating mechanisms shall be provided with "ON" - "OFF" mechanical indication. The charging mechanism shall be provided with mechanical indicators to show "charged" and "discharged" conditions of the spring. Failure of any spring, vibration or mechanical shock shall not cause tripping or closing of the circuit breaker.
- d) Only one closing operation of the circuit breaker shall result from each closing impulse (manual or electrical), even if the breaker trips while the control device (manual or electrical) is being held in the "close" position.
- e) The circuit breaker mechanism shall make one complete closing operation, once the push button (PB) or control switch has been operated and the first device in the control scheme has responded, even though the PB or control switch is

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released before the closing operation is complete, subject to the condition that there is no counter- impulse for tripping.

- f) Means shall be provided to manually open and close the breakers slowly, when the operating power is not available, for maintenance and adjustments. A local manual trip device shall also be provided on the operating mechanism.
- g) Circuit breaker control shall be on 110 V DC. Closing coils and other auxiliary devices shall operate satisfactorily at all voltages between 80-110 % of the control voltage. Trip coils shall operate satisfactorily between 50 -110 % the rated control voltage.

E. **Safety Interlocks and Features**

- a) Withdrawal or engagement of a circuit breaker shall not be possible unless it is in the open position.
- b) All circuit breaker shall have lockable local / remote selector switch, for closing the breaker from local shall be possible only in TEST position. Whereas as closing from remote shall be possible in either SERVICE and TEST position. For opening breaker from local shall be possible only when local remote selector switch shall be in local position. Opening breaker from remote shall be either breaker in service position or selector switch being in remote position.
- c) All Motors and Service Transformers feeder breaker shall have lockable emergency push button (openable only with key) near motor and service transformer, hard wired to circuit breaker panel emergency push button.
- d) Operation of a circuit breaker shall not be possible unless it is in service position, withdrawn to test position or fully drawn out. It shall not be possible to close the circuit breaker electrically in the service position, without completing the auxiliary circuit between the fixed and moving portions.
- e) Circuit breaker cubicles shall be provided with safety shutters operated automatically by the movement of the circuit breaker carriage to cover the stationary isolated contacts when the breaker is withdrawn. Padlocking facilities shall be provided for locking the shutters positively in the closed position. It shall, however, be possible to open the shutters intentionally against spring pressure for testing purposes.
- f) The circuit breaker carriage shall be earthed before the breaker reaches the test position from fully withdrawn position. In case of breakers with automatic disconnecting type of auxiliary disconnects, the carriage shall be earthed before the auxiliary disconnects are made and the carriage earthing shall break only after the auxiliary disconnects break.

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- g) Caution nameplate, "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, i.e. incomer to the switchboard. Suitable interlock shall be wired for the purpose.

F. Earthing

- Copper earthing bus shall be provided and extended throughout the length of the switchboard. It shall be bolted to the framework of each unit and brazed to each breaker earthing contact bar. It shall be located at the bottom of the board.
- The earth bus shall have sufficient cross section to carry the momentary short circuit and short time fault current for at least 1 second or higher without exceeding maximum allowable temperature rise.
- The earth bus shall be properly supported to withstand stresses induced by the momentary short circuit current.
- Suitable clamp type terminals at each end of the earth bus shall be provided to suit the size of the earthing conductors. Bolted joints, slices, tap, etc. to the earth bus shall be made with at least two bolts. Positive earthing of circuit breaker frame shall be maintained when it is in the connected position and in all other positions whilst the auxiliary circuits are not totally disconnected.
- Hinged doors shall be earthed through flexible earthing braid of adequate cross section.
- All non-current carrying metal work of the switchboard shall be effectively bonded to the earth bus.
- Positive connection of the frames of all the equipment mounted in the switchboard to the earth bus bar shall be maintained through insulated conductors of size equal to the earth bus bar or the load current carrying conductor, whichever is smaller.
- All instrument and relay cases shall be connected to earth busbar by means of 1100V grade, green coloured, PVC insulated, stranded, tinned copper, 2.5 sq. mm conductor looped through each of the earth terminals.

G. Circuit / Busbar Earthing Facility

- It shall be possible to connect each circuit or set of 3 phase bus bars of the switchboard to earth through earthing switches.
- Earthing switches / earthing devices shall be mechanically interlocked with the associated breakers to prevent accidental earthing of live circuit or bus bars. In case the earthing facility comprises earthing trucks to be inserted in place of circuit breakers, separate earthing trucks shall be supplied for each type / size of breaker.

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- c) The earthing facilities proposed to be provided by the contractor and shall be subject to Employer's approval. Auxiliary contacts (min. 2 NO + 2 NC) shall be provided on each earth switch / earthing device and shall be wired to the terminal block for interlocking purpose.

H.

Annunciators

- a) Annunciators shall be of fascia type with translucent plastic window for each alarm point.
- b) **Annunciated fascia plates shall be engraved in block lettering with respective alarm inscriptions. The inscriptions shall be clearly readable and visible when the respective fascia LED light is lighted.**
- c) Each annunciation window shall be provided with two LED Lights to provide redundancy against LED light failure. Lamps shall be replaceable from the front. Lamps shall be of clustered LED type.
- d) All fascia annunciated points shall be suitable to accept external contacts of either 'NO' or 'NC' self or hand reset type for initiating the annunciation sequence shall be suitable for accepting fleeting faults of duration as less as 15 milliseconds.
- e) For static Annunciator schemes, special precaution shall be taken by the Contractor to ensure that spurious alarm conditions do not appear due to influence of external magnetic fields on the annunciator wiring and switching disturbances from the neighbouring circuits within the panels / desks.
- f) A "Lamp Test" push button shall be provided for each individual panel's group of Annunciators to limit the sudden drain on the battery. Provision of testing facilities for flasher and audible electronics alarm circuits of annunciators is desirable. The Contractor shall give the details of the offered scheme.
- g) **Annunciator shall have following features:**
 - Suitable for annunciating subsequent faults immediately after the sound cancel of the previous fault.
 - During lamp test, if a fault occurs, the corresponding lamp circuit shall be automatically disconnected from the "lamp test" circuit and shall start flashing.
 - Designed to prevent mal-operation of the scheme or sequence when the push buttons are pressed incorrectly or in the wrong order.
 - "Alarm Supply Failure" Alarm scheme similar to the normal annunciation sequence, but shall operate on a different DC supply or on AC auxiliary supply
 - Alarm annunciates having provision to integrate all alarm / trip signals to PLC.
 - Alarm annunciation shall be provided for transformers, Chlorination system and surge vessel system where ever discrete local automation is envisaged.
 - All Annunciations shall have interfacing facilities for communication for SCADA.

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I. Indicating Instruments & Meters

- a) The instruments shall be electronic / digital type with LCD display. These instruments should have high performance ratio and can be equipped with digital output (for alarms) or with interfacing facilities for communication and remote reading of parameters.

Metering Instruments

- Multi Function Meter (MFM) with the facility to measure A, V, KW, KWh, KVAR, PF, Hz with communication port.
 - Multi-Function Meters shall be of the accuracy class 1.0, suitable for measurement of unbalanced loads in three phase three wire circuits.
- b) MFM shall be suitable for operation from the secondary of CTs and VTs. They shall be provided with a separate 3 phase 4 wire type test blocks for the testing of the meters without disturbing the CT and VT secondary connections.
- c) The instruments can be electronic / digital type with LCD display & RS 485 connectivity for remote reading of parameters in SCADA. These instruments should have high performance ratio and can be equipped with digital output (for alarms).

J. Control and Selector Switches

- a) Control and instrument switches shall be heavy duty rotary type, provided with escutcheon plates clearly marked to show operating position and suitable for semi-flush mounting with only the switch front plate and operating handle projecting out. The connections shall be from the back. The contact assembly at the back of the switch shall be enclosed in dust tight removable covers.
- b) The control switches shall be 3 positions, spring return to neutral type. They shall be provided with contacts to close in 'normal after close' and 'normal after trip' position.
- c) Each switch shall have external red and green indicating lamps, (except when discrepancy type switches are called for). In addition, a semaphore indicator shall be provided for earthing switch. Local / Remote selector switch shall be stay put 2 / 3 position with lockable provision.
- d) Contacts of the switches shall be spring assisted and contact faces shall be of silver / silver alloy. Springs shall not be used as current carrying parts. Contact rating and configurations of the switches shall be adequate for the functions desired. Lockable type switches, which can be locked in a particular position, shall be provided, if required. Emergency stop buttons, if any, shall incorporate 'stay-put' features with independent reset facilities.

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K. Indicating Lights / Pilot Lights

- a) Indicating light shall be rated for operation at either 230 V AC or at the specified DC system voltage as applicable. Lights shall be provided with translucent light covers.
- b) Clustered LED type lamps shall be provided. Lenses shall be glass or plastic in standard colours, red, green, blue, white and amber, in accordance with IEC 60073. Miniature pilot lamps may be provided with plastic marking plate contained inside square (or rectangular) front lens to provide indication of legend or symbols engraved on the marking plate.
- c) **The basis of colours shall be as follows:**

Red	:	Flow of energy.
Green	:	No flow of energy.
White	:	Supervision of power available, relay coil healthy, etc.
Amber	:	For all alarm conditions such as pressure low, overload, Disagreement with original condition, 'abnormal' condition or 'sequence-on' condition also for service and test position.
Blue	:	For all healthy conditions such as control supply, spring charged and lockout relay coil healthy.
Yellow	:	For R, Y, B indication light, yellow as one of the light.

L. Push Buttons

- a) Push buttons shall be of momentary contact type with rear terminal connections. The colour of the push button actuator shall be red for 'OPEN / STOP' and green for 'CLOSE / START'. The push button knob shall be suitably shrouded to prevent inadvertent operation. The push buttons shall be provided with integral inscription plates engraved with their designation.
- b) Normal stop push button shall be mushroom type latchable in red colour, after pressing and it is latched, the latch can be removed by clockwise rotation. (Motor stops automatically after pre determined conditions such as delivery valve close in case of pumps.) This may replace stop push button.
- c) Emergency stop push button red in colour shall be lockable by pressing the push button and can be opening only with key and with shrouding. (Motor stopped immediately irrespective of predetermined conditions required) Emergency Push button with shrouding shall be provided near transformer and motors for remote tripping.
- d) Reset push button shall be either for resetting the flag and OLR or LEDs with push button for resetting.

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- e) All push buttons shall have independent, potential free, 2NO + 2NC contacts. The contact faces shall be of silver / silver alloy. The contacts shall be rated 10A and capable of breaking inductive load of 5A at 110V DC.
- f) All push button shall have additional NO /NC potential free for hard wiring to instrumentation control panel.

M. **Space Heaters**

Adequately rated anti-condensation space heaters shall be provided for each switchboard / cubicle, bus ducts and Motors above 30 kW. Space heater shall be of the industrial strip continuous duty type, rated for operation on a 240 V, 1 phase, 50 Hz, AC system. Space heater shall be provided with a single pole MCB with overload and short circuit release, a neutral link and a RTD thermostat to cut off the heaters at 35 degree C.

N. **Cubicle Lighting / Receptacle**

Each cubicle shall be provided with interior lighting by means of 18 W energy efficient (lumen per watt shall be indicated) fluorescent tube lighting fixture. An MCB shall be provided for the lighting circuit. The lighting fixture shall be suitable for operation from a 240 V, 1 ph, 50 Hz, AC supply. A 240 V, 1 phase, AC receptacle (socket) plug point shall be provided in the interior of each panel with an MCB.

O. **Power and Control Cable Termination**

- a) Terminals for power connections shall be complete with adequate phase segregating insulating barriers, shrouds and suitable aluminium solder less crimping type of lugs for terminating the cables and control cables lugs and ferrules shall be tinned copper conforming to IS 8309. The cable lugs for control cables shall be provided with insulating sleeve and shall suit the type of termination provide on the equipment.
- b) Double compression type glands with armour and bonding clamps for the termination of all solid dielectric multicore cables shall be provided and shall confirm to BS: 6121. They shall be designed to secure the armour wires to provide electrical continuity between the armour and the threaded fixing component of the gland and to provide watertight seals between the cable outer sheath and gland and between the inner sheath and threaded fixing component. The gland shall preferably project above the gland plate to avoid entry of moisture.
- c) Earthing connectors between cable armour and earth shall be routed outside the cable gland in an approved manner. Gland insulation shall be capable of withstanding test for appropriate high voltage for one minute.

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- d) Cable terminations for HV / MV cables shall be heat / cold shrinkable type. Adequately sized shrouds / bolts shall be provided at connections to completely cover the terminations.
- e) Where core-balance type current transformers are provided on the feeder cables for earth fault protection, glands for cables shall be insulated from earth in an approved manner.

P. Wiring For Control and Protective Circuits

- a) All low voltage wiring for control, protection and indication circuits shall be carried out with 1100 V grade, PVC insulated cable with stranded, tinned copper conductor of minimum 1.5 sq. mm size. The size of conductor for CT circuits shall be minimum 2.5 sq. mm.
- b) All wiring shall be run on the sides of panels and shall be neatly bunched and cleated without affecting access to equipment mounted in the panel. The wiring shall be bound and supported by clamping, roughing or lacing. Spiral wrapping will not be accepted. Wire ways shall not be more than 50% full. Adequate slack wire shall be provided to allow for one re-stripping and reconnection at the end of each wire. When screened cables or wires are necessary, an insulating sheath shall be included. Wiring and supports shall be of fire resistant material.
- c) Wiring shall only be jointed or tied at terminals. Terminals of the clamp type shall not have more than two wires connected.

Q. Termination and Ferrules

- a) Engraved core identification ferrules, marked to correspond with the wiring diagram, shall be fitted to each wire and each core of multicore cables terminated on the panels.
- b) Moisture and oil resisting insulating material shall be used. The ferrules shall be of the interlocking type and shall grip the insulation firmly without falling off when the wire is removed.
- c) All wires forming part of a tripping circuit shall be distinctively marked. Spare auxiliary contacts of electrical equipment shall be wired to terminal blocks.

R. Control Wiring Terminal Blocks

- a) Terminal blocks (TBs) shall be of 1000 V grade, 10A and stud type. Brass stud of at least 6 mm dia. with fine threads shall be used and securely locked within the mounting base to prevent turning. Each terminal shall comprise two threaded studs, with a link between them, washers, and matching nuts and locknuts for each stud. Connections to the terminals shall be at the front.

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- b) Terminals shall be numbered for identification, grouped according to function. Engraved 'black on-white' labels shall be provided on the terminal blocks describing the function of the circuit.
- c) Terminals for circuits with voltage exceeding 110 V shall be shrouded. Terminal blocks at different voltages shall be segregated into groups and distinctively labelled. Terminals used for connecting current transformer secondary leads shall be 'disconnecting and shorting' type with a facility for earthing the secondary.
- d) Terminal blocks shall be arranged with 100 mm clearance, between any two sets. Separate terminal stems shall be provided for internal and external wiring respectively. All wiring shall be terminated on terminal blocks, using crimping type lugs or claw type of terminations.
- e) At least 20 % cores shall be kept spare in multicore control cables. At least 10% spare terminals shall be provided and space for adding another 10% spares terminals shall also available in each set of TBs.

S. **Bus Bars**

- a) The Bus bars shall be of electrical grade, high conductivity, copper and shall be provided with minimum clearances as per relevant IS. Bus bar cross section shall be uniform throughout the length of the switchgear.
- b) All bus bars and bus taps shall be insulated with close fitting sleeve of hard, smooth, dust and dirt free, heat shrunk PVC insulation of high dielectric strength, to provide a permanent non-ageing and non-tracking protection, impervious to water, tropical conditions and fungi. The insulation shall be non-inflammable and self-extinguishing type and in fast colours to indicate phases.
- c) The dielectric strength and properties shall hold good for the temperature range of 0 to 95 degree centigrade. If the insulating sleeve is not coloured, bus bars shall be colour coded with colored PVC tape at suitable intervals.
- d) Busbar joints shall be of the bolted type. Spring washers shall be provided to ensure good contact at the joints. Busbars shall be thoroughly cleaned at the joints and suitable contact grease shall be applied just before making a joint.
- e) Direct access to, or accidental contact with busbars and primary connections shall not be possible. All apertures and slots shall be protected by baffles to prevent accidental shorting of busbars due to insertion of maintenance tools.
- f) Sequence of red, yellow and blue phases and neutral for four-pole equipment shall be left to right and top to bottom, for horizontal and vertical layouts respectively.
- g) End terminations at transformer end and MV panel end shall be flexible bus bar such that no load / force / weight of the bus bar act on the terminal studs.

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T. Current & Voltage Transformers

- a) Current transformers shall be of cast resin, bar-primary type unless specified otherwise, suitable for continuous operation at the ambient temperature prevailing inside the switchgear enclosure and shall have polarity markings indelibly marked on each transformer and at the lead terminations at the associated terminal block. The class of insulation shall be Class E or better.
- b) Current transformers shall be able to withstand the thermal and mechanical stresses resulting from the maximum short circuit and momentary duties of the switchgear. For wound-primary type CTs, the short time current rating shall not be less than 0.5 sec. CT core laminations shall be of high grade silicon steel. Where multi-ratio current transformers are specified, a label shall be provided, clearly indicating the connections required for the alternative ratios.
- c) These connections shall also be shown on panel wiring diagrams. Identification labels shall be fitted giving type, ratio, rating, output and serial numbers and duplicate rating labels are to be fitted on the exterior of the mounting chambers suitably located to enable reading without the removal of any cover or metal sheeting forming part of the structure of the switchboard.
- d) Magnetization characteristics, calculated performance and protective settings shall be provided by the Contractor. All Voltage Transformers shall be of Single Phase type. The bus VT's shall be housed in a separate panel in a truck so as to be fully with draw able. All Voltage transformers shall have HRC fuses on Primary and Secondary Side. There shall be provision for changeover on secondary side of Voltage Transformers to have alternate arrangement in case one Voltage Transformer fails.

U. Relays

- (i) All Protective relays shall be numerical type. Numerical relays shall have appropriate setting ranges, accuracy, resetting ratio, transient overreach and other characteristics to provide required sensitivity.
- (ii) All numerical protective relays shall be flush mounted at the front with connections at the rear. Shall have communication port for remote, metering and monitoring facility, suitable for electrical measurement including voltage, current, power (active / reactive) and energy parameters.
- (iii) All numerical relays shall have keypad to allow relay settings from relay front. Resetting knobs shall be accessible from the front on removing the external cover and shall be external to the case.
- (iv) All numerical relays and timers shall be rated for control supply voltage specified and be capable of satisfactory continuous operation between 70 % and 110 % of the rated voltage. Making, Carrying and Breaking Current ratings of the relay Contacts shall be adequate for the circuits in which they are used.

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- (v) The numerical relays shall have communication, Metering and Monitoring Facility. The communication facility shall have two Ports local front port (RJ45/USB) for laptop communication and the second port (Rear RS485) for SCADA.
- (vi) The numerical processor shall be capable of measuring and sharing values of a wide range of quantities, events, faults and disturbance recordings with time stamping using internal real time clock. Battery backup for real time clock in the event of power failure shall be provided.
- (vii) Numerical Relays shall have diagnostic feature with self check for power failure, Programmable routines, memory and main CPU Failures etc.
- (viii) The Protective relays shall have adequate number of potential free contacts (Programmable). The Contacts shall be suitable for directly wiring in the breaker closing and tripping circuits operating from 110 V DC Control Voltage.
- (ix) The current operated relays shall have provision for 4 Sets of CT Inputs and Voltage operated relays shall have provision for 3 PT inputs. Relays shall be suitable for CT secondary current suitable for CT Secondary current of 1 A / 5 A selectable at Site.
- (x) Numerical Relays shall be immune to any kind of electromagnetic interference and capacitance effect due to length of connected control cables.
- (xi) Timer function shall be programmable for ON/OFF delays.
- (xii) Numerical Relays shall be able to provide supervisory function such as trip circuit monitoring, circuit breaker monitoring, PT & CT supervisions and recording facilities with post fault analysis.
- (xiii) All relays shall withstand minimum test voltage of 2 KV AC RMS for one minute.
- (xiv) Numerical relays shall have two level password protections, one for read only and other for authorization for modifying the setting etc.

V. Energy monitoring and power supply management

- a) Necessary Provisions & features shall be incorporated to enable energy monitoring /energy management for the installation. Energy Metering shall meet the requirement of guaranteed specific energy consumption specified by the contractor through instrumentation control system.
- b) In case, Numerical relays having built in features of energy measurement of requisite accuracy and provided in switch gear, separate energy meter is not required.

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- c) Necessary provision & features shall be incorporated to under voltage monitoring/ relay for incomer feeder, bus bar chamber and control supply.

W. I / O signal for Instrumentation, Control & Automation System from Electrical panels.

- a) I/O signals from instruments shall be separately wired to a marshalling box such that instrumentation engineers will not enter in to power panel that are not familiar with them.
- b) Necessary provisions shall be incorporated to meet the requirements indicated in
- I/O Schedules – ACB/VCB, Command Open & Close, Feedback trip, Breaker healthy (Ready to close), Local /Remote, Breaker Opened / Closed.
 - Data Transfer Schedule
 - Alarm Schedule of Particular requirement of Instrumentation, Control & Automation System, Part-13, and Volume 2 of the Bid document.

X. Drawings and Data

1.7 All Drawings, data, technical particulars, temperature rise calculations, detailed literature, catalogues, type test certificates etc. shall be submitted along with the bid/ after award of contract.

13.4 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.

1 Types of starters for motors are

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 : Auto Transformer Starter (Automatic type)
- Above 100 KW : Soft Starters

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2 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.

3 Soft Starter

3.1 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

3.2 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.

3.3 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.

3.4 The soft starter module shall be suitable for floor mounting and free-standing type, or Mounting inside a panel.

3.5 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.

3.6 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.

3.7 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.

3.8 The cable compartment shall house all power cable connections along with associated cable terminations.

3.9 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.

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3.10 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.

3.11 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.

4 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.

5 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 °C around the soft starter, the soft starter should be derated by 1.2 % for each °C over 40°C up to 60°C 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 characteristic

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

6 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 energises 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.

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7 Soft Starter Protection

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.

8 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.

9 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.

13.5 MOTOR

13.1 GENERAL REQUIREMENTS

- 13.1.1. For the purpose of design of equipment/systems, an ambient temperature of 50 deg.Centigrade and relative humidity of 95% (at 40 deg C) shall be considered. The equipment shall operate in a highly polluted Environment.
- 13.1.2. All equipment shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.
- 13.1.3. All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.
- 13.1.4. Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor equipment.

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13.1.5. Degree of Protection

Degree of protection for various enclosures as per IEC60034-05 shall be as follows:-

- i) Motors - IP 55
- ii) Cable box - IP 55

All outside motors shall be provided with canopy of adequate size to ensure no water ingress to motor.

13.1.6. CODES AND STANDARDS

- 1) Three phase induction motors : IS/IEC:60034
- 2) Single phase AC motors : IS/IEC:60034
- 3) Crane duty motors : IS:3177, IS/IEC:60034
- 4) DC motors/generators : IS/IEC:60034
- Energy Efficient motors : IS 12615, IEC: 60034-30

13.2 TYPE

- a) Squirrel cage induction motor suitable for direct-on-line starting.
- b) Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3, conforming to IS 12615, or IEC:60034-30. HT motors shall have minimum design efficiency of 95 %. However, tolerance on this efficiency value shall be applicable as per IEC 60034.
- c) Crane duty motors shall be squirrel cage Induction motor as per the requirement.
- d) Motor operating through variable frequency drives shall be suitable for inverter duty with VPI insulation. Also these motors shall comply the requirements stipulated in IEC: 60034-18-41 and IEC: 60034-18-42 as applicable.
- e) Motors operating through variable frequency drives shall also meet the requirements mentioned in subsection for VFD.

13.3 RATING

13.3.1 Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor.

13.3.2 Whenever the basis for motor or driven equipment ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.

13.4 TEMPERATURE RISE

3.4.1 Air cooled motors

70 deg. C by resistance method for thermal class 155(F) insulation.

3.4.2 Water cooled

80 deg. C over inlet cooling water temperature mentioned elsewhere,

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by resistance method for thermal class 130(B) & 155(F) insulation.

13.5 OPERATIONAL REQUIREMENTS

13.5.1 Starting Time

13.5.2 For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time

13.5.3 For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time.

13.5.4 For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.

13.5.5 Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.

13.6 Torque Requirements

13.6.1 Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% of motor rated torque.

13.6.2 Pull out torque at rated voltage shall not be less than 205% of rated torque. It shall be 275% for crane duty motors.

13.7 Starting voltage requirement

- (a) Up to 85% of rated voltage for ratings below 110 KW
- (b) Up to 80% of rated voltage for ratings from 110 KW to 200 KW
- (c) Up to 85% of rated voltage for ratings from 201 KW to 1000 KW
- (d) Up to 80% of rated voltage for ratings from 1001 KW to 4000 KW
- (e) Up to 75 % of rated voltage for ratings above 4000KW

Except AOP & JOP motors running on D.G emergency supply, starting voltage shall be 80%.

13.8 DESIGN AND CONSTRUCTIONAL FEATURES

Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors, space heater terminals inside the main terminal box may be acceptable.

All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). The method of movement of primary and secondary coolant shall be self-circulated by fan or pump directly mounted on the rotor of the main motor as per IEC 60034-6. However VFD driven motors can be offered with forced cooling type with machine mounted fan or pump driven by separate electric motor.

Winding and Insulation

a) Type : Non-hygroscopic, oil resistant, flame resistant

(b) Starting duty : Two (hot starts in succession, with motor

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initially at normal running temperature.

- (c) 11kV & 6.6 kV AC : Thermal class 155 (F) insulation. motors The winding insulation process shall be Global Vacuum Pressure Impregnated i.e. resin poor method. The lightning Impulse & inter-turn insulation surge withstand level shall be as per IEC-60034 part-15.
- (d) 240VAC, 415V AC : Thermal Class (F) or better
- (e) 220V DC motors : Thermal Class (H) or better

Motors rated above 1000KW shall have insulated bearings/housing to prevent flow of shaft currents.

Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.

Noise level for all the motors shall be limited to 85dB (A). Vibration shall be limited within the limits prescribed in IS/IEC 60034-14. Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.

In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer and 2 numbers duplex platinum resistance type temperature detectors.

Motor body shall have two earthing points on opposite sides.

11 KV motors shall be offered with Separable Insulated Connector (SIC) as per IEEE 386. The offered SIC terminations shall be provided with protective cover and trifurcating sleeves. SIC termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.

6.6 KV motors shall be offered with dust tight phase separated double walled (metallic as well as insulated barrier) Terminal box. Suitable termination kit shall be provided for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non-magnetic material for single core cables) shall be provided.

The spacing between gland plate & center of bottom terminal stud shall be as per Table-I.

All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.

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The motors shall be suitable for bus transfer schemes provided on the 11kV, 6.6 kV /415V systems without any injurious effect on its life.

For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.

The size and number of cables (for HT and LT motors) to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box suitable for the same.

The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance).

(a)	From 50KW & upto 110KW	:	11.0
(b)	From 110 KW & upto 200 KW	:	9.0
(c)	Above 200 KW & upto 1000KW	:	10.0
(d)	From 1001KW & upto 4000KW	:	9.0
(e)	Above 4000KW :		6 to 6.5

13.9 TYPE TEST

13.10 HT MOTORS

13.11 The contractor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately in the relevant schedule of Section - VII- (BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the employer's engineer.

13.12 The type tests shall be carried out in presence of the employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the employer's approval for the type test procedure before conducting the type test. The type 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.

13.13 In case the contractor has conducted such specified type test(s) within last ten years as on the date of bid opening, he may submit during detailed engineering the type test reports to the employer for waiver of conductance of such test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The employer reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.

13.14 Further the Contractor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED" and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. However if

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the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, **the contractor shall conduct all such tests under this** contract at no additional cost to the employer either at third party lab or in presence of client/ employer's representative and submit the reports for approval.

13.15 LIST OF TYPE TESTS TO BE CONDUCTED

The following type tests shall be conducted on each type and rating of HT motor

- No load saturation and loss curves upto approximately 115% of rated voltage
- Measurement of noise at no load.
- Momentary excess torque test (subject to test bed constraint).
- Full load test (subject to test bed constraint)
- Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp., coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose.

13.16 LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED

The following type test reports shall be submitted for each type and rating of HT motor

- Degree of protection test for the enclosure followed by IR, HV and no load run test.
- Terminal box-fault level withstand test for each type of terminal box of HT motors only.
- Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15
- Surge-withstand test on interturn insulation shall be as per clause no. 4.2 of IEC 60034, part-15

13.17 LT Motors

LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for employer's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

- 13.17.1 However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the employer either at third party lab or in presence of client/ employer's representative and submit the reports for approval.

13.17.2 LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED

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The following type test reports shall be submitted for each type and rating of LT motor of above 100 KW only

1. Measurement of resistance of windings of stator and wound rotor.
2. No load test at rated voltage to determine input current power and speed
3. Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors)
4. Full load test to determine efficiency power factor and slip.
5. Temperature rise test.
6. Momentary excess torque test.
7. High voltage test.
8. Test for vibration severity of motor.
9. Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section)
10. Test for degree of protection and
11. Over speed test.
12. Type test reports for motors located in fuel oil area having

flame proof enclosures as per IS 2148 / IEC 60079-1

All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

TABLE

DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS

Motor MCR in KW	Minimum distance between centre of bottom terminal stud and gland plate in mm
UP to 3 KW practice.	As per manufacturer's
Above 3 KW - upto 7 KW	85
Above 7 KW - upto 13 KW	115
Above 13 KW - upto 24 KW	167
Above 24 KW - upto 37 KW	196
Above 37 KW - upto 55 KW	249
Above 55 KW - upto 90 KW	277
Above 90 KW - upto 125 KW	331

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Above 125 KW-upto 200 KW

385/203 (For
Single core
cables only)

For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.

PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:

Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:

Motor MCR in KW	Clearance
UP to 110 KW	10mm
Above 110 KW and up to 150 KW	12.5mm
Above 150 KW	19mm

13.6 415 V METAL ENCLOSED SWITCHGEARS / PCC

A. Applicable Standards

The switchgear and its components shall conform to the latest applicable standards specified below. .

Switchgear General Requirements	IS:13947/BS:5486/IEC:60947
Factory Built Assemblies of SWGR and Controlgear for Voltages upto and including 1000V AC & 1200V DC	IS:8623/BS:5486/IEC:60439
Air Break Switches	IS:13947-P3 /BSEN60947 /IEC:60947-3
Moulded Case Circuit Breaker	IS 2516 / IEC 60947-2/ BS EN 60947-2
Miniature Circuit Breakers	IS:8828/BSEN:60898
Low voltage Fuses	IS:13703/BS:1362/IEC:60269-1
Contactors	IS:13947/BS EN60947-4 /IEC:60947-1
Starters	IS:13947/BS EN60947-4/ IEC:60292-1 TO 4
Control Switches / Push buttons	IS:6875 / BSEN 60947
Current Transformers	IS:2705/BS:7626

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Voltage Transformers	IS:3156/BS:7625/IEC:60044, 60186
Indicating instruments	IS:1248/BS:89/IEC:60051
Marking and Identification of Conductors and Apparatus Terminals	IS:11353/BS:159
A.C. Electricity Meters	IS:722, 8530/BS:5685 / IEC 60145, 60 211
Degree of Protection	IS:13947/IEC:60947-P1
Selection installation and maintenance of switchgear and controlgear	IS:10118
Code of practice for phosphating iron and steel	IS:6005/BS:3189
Specification for copper rods and bars for electrical purposes	IS:613
Control transformers for switchgear and controlgear voltage not exceeding 1000V AC	IS:12021

B. Features of Construction

- (a) The switchgear shall be metal enclosed, dust proof, modular type, suitable for indoor floor mounting and shall have following features.
 - (i) Total height of switchgear shall not exceed 2300 mm. Height of Switches, Pushbuttons shall not exceed 1800 mm and shall not be less than 700 mm.
 - (ii) Shall be single front execution and fixed type
 - (iii) Shall have designation labels both on front and rear sides
 - (iv) Shall be provided with proper gasketing for removable covers, doors, between panels and base frame and all around the perimeter of adjacent panels.
 - (v) Degree of Protection shall be IP54.
 - (vi) Thickness of CRCA Sheet shall be minimum 2mm. However, the structure of the panel and the supporting sheet at the base of Air Circuit breaker shall be made with minimum 3mm thick CRCA/GI/Aluzinc sheet
- (b) Switchgear shall be divided into distinct vertical sections each comprising :
 - (i) A completely enclosed busbar compartment running horizontally
 - (ii) Enclosed vertical busbars serving all modules in vertical section
 - (iii) A separate horizontal enclosure for all auxiliary power and control buses if required
 - (iv) Vertical cable alley of 250mm wide covering entire height
- (c) Operating devices shall be incorporated only in the front of switchgear.
- (d) Each shipping section shall have metal sheets at both ends.
- (e) Cable alley shall be provided with suitable hinged doors.
- (f) GS/GI Earth bus of size 50mm x 10 mm shall be provided at the bottom.
- (g) Rear of Single Front Switchgear shall be provided with removable panels with screws.
- (h) All doors shall be with concealed type hinges and captive screws.

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- (i) Each vertical section shall be equipped with 240 V, 1 Phase, 50 Hz space heater controlled by thermostat.
- (j) A 240 V, 1 phase, AC plug point shall be provided in the interior of each cubicle with on-off switch for correction of head lamps.
- (k) Interchangeability
All identical equipment and corresponding parts be fully interchangeable without any modifications.
- (l) Main and Auxiliary Buses
 - (i) Switchgear busbars shall be of uniform cross section throughout the length and made of high conductivity, electrical grade hard drawn copper conductor.
 - (ii) Busbar shall be fully insulated by encapsulation in epoxy resin with moulded caps protecting all joints and shall be adequately supported to withstand stresses developed due to short circuits. Supports shall be of glass reinforced phenolic material or cast resin.
 - (iii) Busbar joints shall be provided with contact grease at the joints and shall be complete with tensile steel bolts and Belleville washers and nuts.

C. Air Circuit Breaker (ACB)

- (a) Air circuit breaker shall be selected for feeders for load current equal to and more than 630A.
- (b) Circuit breakers shall be operated by a motor spring charging type of mechanism. The motor operated spring charged mechanism shall be complete with motor, opening spring, closing spring and all accessories to make the mechanism a complete operating unit.
- (c) The tripping spring shall be charged by the closing action, to enable quick tripping. Closing of the circuit breaker shall automatically initiate recharging of the springs to enable the mechanism to be ready for the next closing stroke. Charging time for the springs shall not exceed 30 seconds. It shall be possible to manually charge the springs in an emergency. Transfer from motor to manual charging shall automatically disconnect the charging motor. The charging mechanism shall be provided with mechanical indicators to show "charged" and "discharged" conditions of the spring. Failure of any spring, vibration or mechanical shock shall not cause tripping or closing of the circuit breaker.
- (d) Only one closing operation of the circuit breaker shall result from each closing impulse (manual or electrical), even if the breaker trips while the control device (manual or electrical) is being held in the "close" position.
- (e) The circuit breaker mechanism shall make one complete closing operation, once the push button has been operated and the first device in the control scheme has

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responded, even though the PB is released before the closing operation is complete, subject to the condition that there is no counter- impulse for tripping.

- (f) Means shall be provided to manually open and close the breakers slowly, when the operating power is not available, for maintenance and adjustments. A local manual trip device shall be provided on the operating mechanism.
- (g) All operating mechanisms shall be provided with "ON" - "OFF" mechanical indication.
- (h) Closing coils and other auxiliary devices shall operate satisfactorily at all voltages between 85-110 % of the control voltage. Trip coils shall operate satisfactorily between 70 -110 % the rated control voltage.
- (i) The Breaker shall be provided with Microprocessor based releases for Inverse-time delayed overload releases for the phases, Short-time delayed short-circuit releases and earth-fault releases.
- (j) The breaker service Short Circuit breaking capacity (ICS) shall be equal to ultimate Short Circuit capacity (ICU) and shall be equal to short time withstand current of Breaker (ICW)

D. Moulded Case Circuit Breaker (MCCB)

- (i) MCCBs shall be of the air break, quick make, quick break and trip free type and shall be totally enclosed in a heat resistant, moulded, insulating material housing. MCCBs shall have an ultimate short circuit capacity not less than the short circuit current Specified. MCCBs shall have a service short circuit breaking capacity (I_{cs}) equal to the ultimate short-circuit capacity (I_{cu}).
- (ii) Each pole of MCCB shall be fitted with a bi-metallic thermal element for inverse time delay protection and a magnetic element for short circuit protection. Alternatively, they shall be fitted with a solid state protection system. Such a protection system shall be fully self-contained, needing no separate power supply to operate the circuit breaker tripping mechanism. Thermal element shall be adjustable. Adjustments shall be made simultaneously on all poles from a common facility. Thermal elements shall be ambient temperature compensated.
- (iii) The MCCBs shall be provided with the following features.
 - (i) Common trip bar for simultaneous tripping of all poles
 - (ii) Shrouded terminals
 - (iii) Time for clearing short circuit current of 20 msec.
 - (iv) 2 NO + 2 NC auxiliary contacts

E. Switches and Fuses

- (a) 415 V air-break switched shall be of the load break, fault make, group operated type. For use on 3-phase systems, the switches shall be of the triple pole type with a link

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for neutral wire. For use on single phase system and d-c systems, the switches shall be of the two pole type.

- (b) Switches shall be of the heavy duty, quick make and quick break type. Switch contacts shall be silver plated, and contract springs shall be of stainless steel. Switch handles shall have provision for locking in both fully open and fully closed positions. Mechanical ON-OFF indication shall be provided on the switches.
- (c) Switches for controlling motor circuits shall be of the load break, fault make type, and shall be capable of breaking locked rotor current of the associated motor.
- (d) 415 V switches and fuses shall be provided with the following interlocks so that:
- (e) The fuses are not accessible unless the switch is in fully open condition.
- (f) It shall not be possible to close the switch when the fuse cover is open, but an authorised person may override the interlock and operate the switch. After such an operation, the cover shall be prevented from closing if the switch is left in the 'ON' position.
- (g) All fuses shall be of the HRC cartridge type, mounted on plug-in type of fuse bases. Fuses shall be provided with visible indicators to show that they have operated.
- (h) Earthing and neutral lines in main supply circuits shall be of solid silver plated copper and be of the bolted pattern.
- (i) Fuses and links functionally associated with the same circuit shall be mounted side by side.

F. **Miniature Circuit Breaker (MCB)**

- (a) MCB shall be hand operated, air break, quick make, quick break type.
- (b) Operating mechanisms shall be mechanically trip-free from the operating knob to prevent the contacts being held closed under overload or short-circuit conditions.
- (c) Each pole shall be fitted with a bi-metallic element for overload protection and a magnetic element for short-circuit protection. Multiple pole MCBs shall be mechanically linked such that tripping of one pole simultaneously trips all the other poles. The magnetic element tripping current classification shall be of the type suitable for the connected load. Where this is not specified, it shall be Type C. The short circuit rating shall be not less than that of the system to which they are connected.

G. **Contactors**

- (a) The power contactors used in the switchboard shall be of, air break, single throw, triple pole, electromagnetic type. Contactors shall be suitable for uninterrupted duty and rated for Class AC3 duty in accordance with the latest edition of IS 13947.
- (b) Operating coils of all contactors shall be suitable for operation on 240 V, single phase, 50 Hz supply. Contactors shall be provided with at least two pairs of NO and NC auxiliary contacts. Contactors shall not drop out at voltages down to 70 % of coil

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rated voltage. Contactors shall be provided with a three element, positive acting, ambient temperature compensated, time lagged, hand reset type thermal overload relay with adjustable settings. The hand reset button shall be flush with the front door of the control module, and shall be suitable for resetting the overload relay with the module door closed. Relays shall be either direct connected or CT operated. Overload relay and reset button shall be independent of the "Start" and "Stop" push buttons. All contactor shall all be provided with single phasing preventer (SPP).

- (c) Motor starters shall be complete with auxiliary relays, timers and necessary indications.

H. Current Transformers

- Current Transformers shall be Cast Resin type.
- Current transformers shall have polarity markings indelibly marked on each transformer and at the lead terminations at the associated terminal block.
- Current transformers shall be able to withstand the thermal and mechanical stresses resulting from the maximum short circuit and momentary duties of the switchgear, as indicated in the Technical Specification.
- CT core laminations shall be of high grade silicon steel.
- Identification labels shall be fitted giving type, ratio, rating, output and serial numbers.

I. Voltage Transformers

- Voltage Transformers shall be Cast Resin type.
- Secondary and tertiary windings of voltage transformers shall be rated for a three phase line to line voltage of 110 V.
- It shall be possible to replace voltage transformer fuses easily without having to de energiser the main bus-bars.

J. Indicating Instruments & Meters

- Electrical indicating instruments shall be of around 110 mm square with 240° scale. Taut band type of instruments is preferred. Taut band moving coil instruments for use on AC systems shall incorporate built-in transducers. Instrument dials shall be white with black numbers and lettering.
- Normal maximum meter reading shall be of the order of 60 % normal full scale deflection. Ammeters for motor feeders shall have suppressed scale to show current from full load up to six times the full load current. Watt hour meters shall be of the induction type and shall be provided with reverse running stops. Instruments shall have an accuracy of Class 1.0.

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K. Indicating Lamps

Indicating lamps shall be of the cluster LED type, with low watt consumption. Indicating lamp shall be of the double contact, bayonet cap type rated for operation at either 240 V AC or at the specified DC system voltage as applicable. Lamps shall be provided with translucent lamp covers. Bulbs and lenses shall be interchangeable and easily replaceable from the front.

L. Push Buttons

"Start" and "Stop" push buttons shall be coloured green and red respectively. Stop Push Button shall be lockable stay-put type with Mushroom head.

M. Space Heaters

Adequately rated anti-condensation space heaters shall be provided, one for each control panel, for each switchboard and for each marshalling kiosk. Space heater shall be of the industrial strip continuous duty type, rated for operation on a 240 V, 1 phase, 50 Hz, AC system. Each space heater shall be provided with a single pole MCB with overload and short circuit release, a neutral link and a control thermostat to cut off the heaters at 350 °C.

N. Safety Arrangements

All terminals, connections and other components, which may be "live" when front access door is open, shall be adequately screened. It shall not be possible to obtain access to an adjacent cubicle or module when any door is opened. Components within the cubicles shall be labelled to facilitate testing.

O. Earthing of Switchboards / Panels

- Each switchboard, control panel, etc. shall be provided with an earth busbar running along its entire length. The earth bus bar shall be located at the bottom of the board/panel.
- Earth bus bars shall be of copper and shall be rated to carry the rated symmetrical short circuit current of the associated board/panel for one second, unless otherwise specified. Earth bus bars shall be properly supported to withstand stresses induced by the momentary short circuit current of value equal to the momentary short circuit rating of the associated switchboard/panel.
- Positive connection of the frames of all the equipment mounted in the switchboard to the earth bus bar shall be maintained through insulated conductors of size equal to the earth bus bar or the load current carrying conductor, whichever is smaller.

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- (d) All instrument and relay cases shall be connected to earth bus bar by means of 1100 V grade, green coloured, PVC insulated, stranded, tinned copper, 2.5 sq. mm conductor looped through the case earth terminals.

P. Internal Wiring

The internal wiring shall be carried out with 650/1100V grade, PVC insulated, stranded conductor wires. The minimum size of conductor for power circuits shall be 4 Sq.mm copper or equivalent size aluminium conductor. Control circuits shall be wired with copper conductor of atleast 1.5 Sq.mm.

Q. I / O & Other Data for Instrumentation, Control & Automation System

Necessary provisions shall be incorporated to meet the requirements indicated in

- (a) I / O Schedules
- (b) Data Transfer Schedule
- (c) Alarm Schedule

Drawing and Data

All Drawings, data, technical particulars, calculations, detailed literature, catalogues, test certificates etc shall be submitted along with the bid/ after award of contract as specified, "Tender/Contract Drawings", Part 2, General Requirements, Volume-2 of Tender Documents.

13.7 415 V POWER CAPACITOR AND CONTROL PANEL

A. Applicable Standards

The capacitor and control panel conform to the latest applicable standards specified below. In case of conflict between standards and this specification, this specification shall govern

Shunt capacitors for power systems	IS : 13340
Internal fuses and internal overpressure disconnectors for shunt capacitors	IS : 12672
Metal enclosed switchgear	IS : 3427 / BSEN 60298 / IEC : 60298
Code of practice for phosphating iron and steel	IS : 6005/BS : 3189
Specification for copper rods and bars for electrical purpose	IS : 613

B. Design Features

- (a) 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.

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- (b) The capacitor bank shall be complete with the required capacitors along with the supporting post insulators, steel rack assembly, copper bus bars, copper connecting strips, foundation channels, fuses, fuse clips, etc. The steel rack assembly shall be hot dip galvanised.
- (c) 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.
- (d) The complete capacitor banks with its accessories shall be metal enclosed (in sheet steel cubicle), indoor floor mounting and free standing type.
- (e) All sheet steel work shall be thoroughly cleaned of rust, scale, oil, grease, dirt and swarf by pickling, emulsion cleaning etc. The sheet steel shall be phosphate and then painted with two coats of zinc rich primer paint. After application of primer, two coats of finishing synthetic enamel paint oven baked/stoved shall be applied.
- (f) 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.
- (g) 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.
- (h) Capacitors shall be of Mixed Dielectric of polypropylene and paper with internal element fuses. The impregnant shall be non PCB (poly chlorinated biphenyl) oil.
- (i) Each unit shall satisfactorily operate at 135% 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.
- (j) **Unit Protection**
Each capacitor unit shall be individually protected by an HRC fuse suitably rated for load current and interrupting capacity, so that a faulty capacitor unit shall be disconnected by the fuse without causing the bank to be disconnected. Thus, the fuse shall disconnect only the faulty unit and shall leave the rest of the units undisturbed. An operated fuse shall give visual indication so that it may be detected during periodic inspection. The fuse braking time shall co-ordinate with the pressure built up within the unit to avoid explosion. Mounting of the individual fuse may be internal or external to the capacitor case.

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C. Power Capacitor and Control Panel

- 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 and shall consist of:
- Busbars shall be of copper conductor of hard drawn (HD) and high conductivity
- Isolating switch
- Contactor with overload element
- Relays responsive to current/voltage/KVAR/PF as specified for automatic switching
- 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 lamps for capacitors ON/OFF indication.
- Protective relays to protect the healthy capacitor units when one unit fails in a series connection
- Space heater and cubicle lighting as per the requirements.

D. Drawings and Data

All Drawings, data, technical particulars, calculations, detailed literature, catalogues, test certificates etc shall be submitted along with the bid/ after award of contract as specified, "Bid/Contract Drawings", Part 2, General Requirements, Volume-2 of Bid Documents.

13.8 DIESEL STANDBY GENERATOR

A. Applicable Standards

The Diesel Standby Generator and its components shall conform to the latest applicable

Standards specified below:

Diesel Engines for General Purposes	:	BS 5514 / ISO 3046
The Electrical Performance of Rotating Electrical Machinery	:	BS 5000
Rotating Electrical Machines	:	IS 4722
Circuit breakers	:	IS-13118, BS-5311, IEC-56 & 694, BSEN-60942 (P-2)

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Air break switches air break	:	IS-13947 (P-3), BS-EN60947, IEC-
disconnectors, air break switch	:	60947-3
disconnectors and fuse combination units		
for voltage not exceeding		
1000 V AC or 1200 V DC		
Current transformer	:	IS-2705/BS-7626, IEC-60185
Voltage transformer	:	IS-3156/BS-7625/IEC 60186
Electrical Relays	:	IS-3231,3842/BS-142/IEC-60255
Contactors for voltage not	:	IS-13947 Part-IV/ BSEN-60947-4-
exceeding 1000 V ac or 1200 VDC	:	1/ IEC-60947-4-1
Control Switches	:	IS-6875/BSEN-60947 /
		IEC-60947-4-1
High Voltage Fuse		IS-9385/BS-2692/ IEC-60282
Low Voltage Fuse	:	IS-13703/BS-1362 IEC-269-1
Electrical direct acting indicating	:	IS-1248/BS-89/IEC-60051
Instruments		
A.C. electricity metres of induction	:	IS722, 8530/BS-5685 / IEC-
type voltage greater than 1000 volts	:	60145, 60211
Resistance wire, tapes and stripes	:	IS-3725
for heating elements		
Wrought aluminium and aluminium	:	IS-5082
alloy bars, rods, tubes and sections		
for electrical purposes		
Specification for copper rods and	:	IS-613
bars for electrical purposes		
Toggle switches	:	IS-3452/BS-3676
Control switches/push buttons	:	IS-6875/BSEN 60947
Noise and Emission Limit	:	As per latest notification of
		ministry of Environment and
		Forests

B. General Requirements

- (a) The diesel engine shall draw cooling air directly from outside the room through a weatherproof, acoustically treated duct. The exhaust system shall be insulated to minimize the amount of heat entering the room and to prevent injury to personnel. The exhaust system pipe shall be 2 Meters above the nearest building as per CPCB. The exhaust pipe line diameter shall be suitably designed to avoid back pressure

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when discharged at higher elevation. The silencer shall be of the 'residential' type and be located externally.

- (b) The generation voltage shall be 415V for D.G capacity less than 2 MVA and generation voltage shall be 11kV for D.G capacity more than 2 MVA. Even if one D.G set is required for achieving the required capacity they shall be operated in parallel with necessary synchronizing arrangement with LCD.
- (c) At no point D.G sets will be operating parallel with grid. The diesel engine fuel shall be stored in an above ground bulk storage steel tank to be located adjacent to the generator room at a site accessible for filling to local road tankers.
- (d) The storage tank shall be sized to store fuel for 1 day running of the engine at full load. The tank shall be provided with fittings to permit the visual observation of fuel level and filling by local tanker operators. A level sensor shall also be mounted in the tank so that remaining fuel volume can be monitored at the generator / substation PLC and the operator stations in the SCADA room.
- (e) The fuel storage tank shall be located in a bund capable of holding not less than 125% of the maximum storage tank contents. Fuel transfer pumps shall be provided to automatically transfer fuel from the bulk storage tank to a high level 990 litres day tank located in the generator room or generator skid mounted day fuel tank. A semi-rotary hand pump shall be provided to permit transfer of fuel in the event of a failure of the transfer pump.
- (f) Any leakage from the pumps shall be routed to the bund. A system shall be provided within the generator room to detect fire, to raise a local audible alarm (manually silenced locally) and if a high level day tank is used, to automatically dump the day fuel back to the bulk storage tank.
- (g) The Fuel system shall be constructed such that leakage of water, fuel or oil within the generator room shall be routed to a local sump where a detector shall be provided to raise an alarm. Adequate sensors shall be provided to detect the fault and shall be wired to control panel.
- (h) The system shall be constructed such that the leakage of fuel or the accumulation of water within the fuel storage bund shall be detected and shall raise an alarm.
- (i) All alarms shall be conveyed to the central HMI through the PLC.

C. Diesel Generating Set Automatic Control

- (a) AMF of Diesel Generator Set capable of automatic starting and picking the load within 30 seconds shall be provided to cater for emergency loads and lighting during mains power failure.
- (b) Diesel generating set for use in auto mains failure mode shall have a three position automatic /off /manual selection and shall operate as follows:
 - (i) Automatic mode :

On occurrence of mains failure the following sequence shall be followed.

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a) Mains to Generator changeover

- mains failure detected
- delay of 10 seconds
- generator is started and run up to speed
- time delay of 50 seconds
- mains supply is switched off
- generator supply is switched on

b) Generator to Mains changeover

- mains healthy detected
- manual changeover signal received,
- generator supply is switched off
- mains supply is switched on
- generator runs for 2 minutes and stops

All timer settings shall be adjustable.

- (c) If mains power is restored during the initial one minute delay then the power shall be monitored for a further one minute and if it is still healthy, mains power shall be restored. The generator shall be stopped after a further 2 minutes of running on no load. If the generator fails to start after an initial period of cranking, two further attempts shall be made with an appropriate interval between each attempt. If the engine fails to start after three attempts the system shall shut down and a local and remote alarm shall be annunciated.

(ii) Manual mode:

- (d) The generator shall run to the dictates of manual controls on the generator. No automatic changeover of mains to generator supply or vice versa shall take place. The generator shall be loaded by manual switching if required.

D. Alternator for Diesel Generating Set

- (a) The generation voltage shall be 415V for capacity less than 2 MVA and generation voltage shall be 11kV for capacity more than 2 MVA.
- (b) Alternator shall be 4 pole, 3 phase, 50 Hz, 0.8 P.F, salient pole, revolving field, Brush less type, self-regulating continuously rated and manufactured in accordance with IS 4722, BS 5000: Part 99 or IEC 60034-1. They shall be totally enclosed, screen protected, fan ventilated and vertical drip-proof conforming to IP 23.
- (c) The Alternator shall be complete with excitation system, AVR and all necessary auxiliaries. The alternator shall be driven by diesel engine detailed below and shall match the same in all respects.

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- (d) The terminal box shall be dustproof with IP 54 degree of protection. The terminal box shall be suitably sized to terminate the size and number of cables involved.
- (e) Alternators shall be capable of withstanding a 10% overload for 1 hour in any 12 hour Period under the specified conditions of temperature, humidity and atmospheric pressure. Alternator windings shall be of Class H insulation with Class F temperature rise and tropicalised.
- (f) The alternator shall have pre-packed grease lubricated ball or roller bearing sand provided with facilities for degreasing whilst in service. The alternator shall be foot mounted on a common bed frame with the prime mover close coupled to the engine flywheel housing. The direction of alternator rotation when viewed from the driven end shall be clockwise and phase voltage sequence UVW.
- (g) The alternator vibration level shall not exceed the values defined in IS 12075. The alternator shall be capable of maintaining a short circuit current of three times full load current for a period of 10 seconds. The alternator shall be fitted with an anti-condensation Alternator shall have 6 Nos. duplex RTDs inside the stator winding. No individual harmonic shall exceed 1% and the total harmonic shall not exceed 3%.
- (h) The alternator, its neutral and control panel shall be earthed as per relevant standards. Alternator rotor assembly shall comprise exciter rotor, full wave silicon bridge rectifier, surge protection device and salient pole rotating field system. The rotor shall be fitted with interconnected pole face damping windings. Voltage regulation shall be maintained to within $\pm 2.5\%$ for a power factor of 0.8 to unity, including hot to cold variations.
- (i) The steady state frequency droop between no load and full load shall not exceed 5%. Transient voltage deviation following a step load of 60% of rated at a power factor of between 0.4 and zero shall not exceed 15% with a voltage recovery time to 97% rated voltage not exceeding 0.5 second.
- (j) The set shall be capable of continuous operation with a phase current imbalance of 33% of rated current whilst maintaining the output voltage within $\pm 5\%$ of rated. Alternator shall have sensors for alternator protection and shall be wired to control panel.
- (k) The alternator shall be provided with class F insulation with temperature rise limited to that of class B insulation.

E. Diesel Engine for Generating Set

- (a) Engine shall be four-stroke, direct injection, and turbocharged industrial machines. They shall be fitted with renewable wet cylinder liners if water cooled and shall be direct coupled to the alternator and mounted on a common rigid steel bedplate.

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- (b) Engines shall be rated for continuous duty at site ambient conditions with an inherent O/ L Capacity of 10% for 1 hour in any 12 hours.
- (c) The engine shall be capable of running at full load for not less than 180 hours without maintenance adjustments and 10,000 hours between major overhauls. The maximum operating speed shall be 1 500 rpm. The range of manual adjustment shall not be less than $\pm 5\%$ of rated speed. The performance of engine governors under load conditions shall be to Class A2 in accordance with BS 5514: Part 4.
- (d) Engine governors shall be suitable for remote control load sharing between identical engine units. In addition to any electrical over speed trips, there shall be a mechanical over speed device which shall operate at 120% of the rated speed. Re-setting of the over speed trip shall be possible by hand only.
- (e) The steady state output speed drop between no load and full load shall not exceed 5%. The transient output speed deviation shall not exceed 10% for a step of 60%. Engines shall be designed to run on fuel oil complying with IS 1460 or BS 2869, Class A2.
- (f) Engines shall be cooled by means of a water jacket, heavy duty air blast radiator with integral radiator header tank, circulating pump and engine driven pusher type fan. The fan shall draw air in from the vicinity of the engine block and discharge it through the radiator core. The radiator shall be mounted on the same bedplate as the engine and alternator on suitable vibration isolators and be arranged so that it is located directly behind automatic louvers set into the external wall of the engine room. A thermostatically operated by-pass valve shall be fitted in the cooling system to maintain an optimum operating temperature during starting and running conditions. Drain cocks shall be provided so that all the water can be drained from the system. A separate oil cooler shall be used for cooling the engine oil. A thermostatic by-pass valve shall be incorporated.
- (g) Engine lubrication shall be by a closed circuit wet sump, forced feed system supplied by an engine driven pump fitted with pressure regulating and relief valves, sump suction filter and changeover renewable micro-felt full flow line filters. A hand operated semi-rotary oil pump shall be installed to carry out initial priming or to fill or empty the sump as required. The sump shall be fitted with an easily accessible drain point. The oil shall be of the grade recommended by the engine manufacturer.
- (h) The starting system shall comprise 12 or 24 V heavy duty lead acid batteries (positioned on a floor mounted stand adjacent to the engine) connected by heavy duty flexible butyl rubber cables. Batteries shall be sized to give six consecutive starts of the engine at 0°C. An engine driven alternator and charging system shall be provided. An automatic mains energized battery charger shall be provided, with

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sufficient capacity to maintain the battery in a condition to full fill the starting requirements.

- (i) Barring (hand turning) equipment shall be provided so that the engine can be manually rotated for maintenance purposes. It shall be arranged so that normal starting of the engine is inhibited whilst the hand turning equipment is connected.
- (j) Twin heavy duty air intake filters in accordance with IS 3169 or BS 7226 suitable for operating in dust laden atmospheres shall be fitted. The filters shall be of the paper element with pre-cleaner type. Turbo charger filters shall be fitted. Breathers shall be fitted with washable filters which are easily accessible for maintenance.
- (k) Instrumentation shall be provided to monitor speed, oil pressure, oil temperature (sets larger than 250 kVA), and water temperature and battery charge current. The bedplate shall be of heavy gauge steel construction, stress relieved and free from distortion. Engine shall be provided with sensors for engine protection and shall be wired to control panel.
- (l) Machined surfaces shall be incorporated for mountings and for levelling. Anti-vibration mountings shall be fitted between the bedplate and the floor to prevent vibrations being transmitted to the building. The mountings shall be adjustable for levelling purpose and shall be designed to resist horizontal movement of the diesel set.
- (m) The fuel System shall comprise an engine driven feed pump with duplex filters, 990 litres day tank with supporting structure or generator skid mounted day fuel tank, with all inter connecting pipe work , flexible engine connection pipe etc.

F. Diesel Generator Control Panel:

- (a) The control panel shall have provision such that inter-opera ability with instrumentation control system. The control panel with communication facility shall be separately mounted on anti vibration mountings and shall comprise the following:
 - (i) Breaker incorporating short circuit and overload trip
 - (ii) Earth fault protection for the Alternator
 - (iii) Alternator Over & Under Voltage Protection
 - (iv) Voltage Controlled Over Current Relay
 - (v) -Voltmeter with built in selector switch /(digital)
 - ammeter with built in selector switch / (digital)
 - frequency meter
 - Power Factor Meter
 - KWH Meter (Multifunction meter)
 - engine temperature and oil pressure gauge
 - service hours run indicator

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- key switch start and stop control
- operational status indicator
- anti-condensation heater and thermostat
- alternator anti-condensation heater controls
- mains fed battery charger
- Auto start on mains power supply failure facility
- Fails to Start (Alarm)
- Over / Under Voltage (Alarm)
- Battery Charger Fault (Alarm)
- Low fuel Oil Level (Alarm)
- Over Load (Alarm)
- Low Lube Oil Pressure (Trip)
- High Water Temperature(Trip)
- High Lube Oil Temperature (Trip)
- Electrical Protection Relays (Trip).

- (b) A reset button shall be provided to cancel the alarm /shut-down condition prior to re-starting.
- (c) Simple operating instructions shall be detailed on the fascia of the control panel. All alarm and trip status signals from diesel supply system, engine control panel and alternator protection shall be hard wired to a marshalling box for instrumentation control system.

G. Synchronising Panel

- 1.8 Whenever two or more sets are required to operate together, necessary synchronizing panel complete with circuit breaker, synchroscope, numeric relays, digital meters etc shall be provided. The Panel shall be floor standing, CRCA Sheet steel enclosed.

H. Acoustic Enclosure

- (i) The DG Set shall be provided with acoustic enclosure, fully integrated, weather proof with superior finish for long and durable life.
- (ii) The acoustic enclosure shall be CRCA sheet steel enclosed with necessary panels and doors, inside lining of fire retardant foam/glass wool as acoustic material.
- (iii) The sound level shall be restricted to 75dB at a distance of 1 meter, under full load, free field conditions as per relevant standards.
- (iv) The acoustic enclosure shall be certified to meet the emission norms.

I. Bulk Fuel Storage Tanks

- (i) Bulk fuel storage shall be in accordance with the explosives norms and necessary approval shall be obtained by the contractor.(If required)

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- (ii) Tanks and fittings, etc shall conform to IS 803 or BS 799: Part 5The tank shall be constructed in mild steel and the fittings in materials other than:
 - (iii) Yellow brass, including low grade alloys of copper and zinc.
 - (iv) Lead and zinc.
 - (v) Galvanized metals.
 - (vi) Natural rubber.
- (vii) The maximum fuel surface level below the point of entry of the vent shall not be less than 100 mm. The internal surface shall be cleaned and treated with temporary preservative, soluble in fuel oil, before shipment.
- (viii) The following fittings shall be included:
 - (a) 600 mm diameter manhole complete with portable cover situated in the top of the tank complete with ladder to the interior.
 - (b) Dipstick, calibrated in litres with guide tube and striker plate.
 - (c) Local indication of fuel level to be given at a position where it can be easily read during fuel delivery.
 - (d) Filling pipe work and fittings complete with isolation valve and captive end cap. The filling point to be at the top of tank to prevent siphoning.
 - (e) Outlet pipe situated at the raised end of the tank not less than 150 mm above tank bottom, complete with check valve, isolating valve and end cap.
 - (f) Drain pipe situated at lowest point in tank complete with isolating valve and captive end cap.
 - (g) Inlet fittings for overflow pipe from daily service tank or tanks (where specified).
 - (h) Vent pipe situated at high level in the tank. The pipe shall rise continuously from the tank and terminate with an inverted 'U' bend and vermin screen.
 - (i) External ladder for horizontal tanks more than 2 m diameter.
 - (j) Level sensors shall be included which are connected to Low fuel oil level.

J. Drawings

All Drawings, data, technical particulars, temperature rise calculations, detailed literature, catalogues, type test certificates etc. shall be submitted along with the bid/ after award of contract as specified under “ Bid/Contract Drawings” , Part 3, General Requirements, Volume-2 of Bid Documents.

13.9 BATTERY, BATTERY CHARGER & DCDB

- a) Battery, Battery Charger shall be three phase incoming supply with breaker. DC equipment shall comply with IEC 60896 including those standards referred to therein.
- b) General Requirements
Following items shall be covered in the Contract:

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- (i) 110 V Value Regulated Lead Acid Battery (VRLA)
 - (ii) Float-cum-boost charger for 110 V batteries
 - (iii) DC distribution board.
- c) All connections between battery, battery chargers and DC distribution board shall be designed for effective segregation between positive and negative leads.
 - d) Back up time for batteries shall not be less than 30 min.
 - e) The system shall be complete with all mounting stands, insulators, interconnecting accessories etc all as per enclosed specifications and data sheets.

A. **Valve Regulated Lead Acid Battery**

Design Features

Battery offered shall be Value Regulated Lead Acid Battery (VRLA) Type. The battery shall conform to the latest applicable standards specified below:

Stationary Value Regulated Lead Acid Batteries

Specification : IS 15549-2005

- a) The equipment offered shall be complete with all parts that are necessary or usual for the efficient operation of the equipment, whether specifically mentioned or not.
- b) The VRLA batteries shall be starved electrolyte type to allow recombining of generated oxygen internally. The battery shall be completely explosion resistant, shall tolerate freezing and shall not allow gases to escape during normal charging conditions. The battery shall not require any topping and be maintenance free.
- c) All inter cell, inter modules and inter stack connectors shall be covered with heat shrunk FR/FRLS sleeves.
- d) Containers, cell lids, safety vents, separators, connectors, electrolyte, shall conform to the relevant IS/IEC and safety standards. The cell containers shall conform to the safety requirements of UL 94 HB or equivalent safety standard. The safety vent shall be self resealing pressure regulating with flame arrestor. In case the batteries are proposed to be housed in a sheet metal or polymeric enclosure, the same is deemed to be included in the scope of the bidder. The enclosure for battery shall conform to the safety provisions of UL 1778 or equivalent standard.
- e) The battery shall be complete with accessories and devices, including but not limited to the following:
 - i) Battery racks
 - ii) Set of intercell, inter- module and inter stack connectors as required for the complete installation.

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- iii) Accessories for testing and maintenance
- f) Battery racks shall be constructed from steel. Metallic stands shall be painted with acid resistant paint after 2 coats of primer. The racks shall be rigid, mechanically strong, free standing type and free from warp and twist. The completed racks shall be suitable for being bolted end to end to form continuous row. Insulators shall be provided below the legs of the stands
- (h) 1 set of accessories for testing and maintenance shall also be provided suitable for all the three battery banks.
- | | | | |
|------|--------------------|---|---|
| i. | One | - | -3, 0, +3 volts DC voltmeter with built-in discharging resistor and suitable leads for measuring cell voltage. |
| iii. | Two | - | PVC aprons |
| iv | Two | - | Cell lifting straps |
| v | One set
Each of | - | Terminals and cable boxes with glands for connecting cable as required.
Spare connectors
Spare vent plugs
Spare nuts and bolts
Suitable set of spanners |

Drawing

All Drawings, data, technical particulars, calculations, detailed literature, catalogues, test certificates etc shall be submitted along with the bid/ after award of contract as specified under, "Bid/Contract Drawings", Part 3, General Requirements, Volume-2 of Bid Documents.

B. Battery Charger and D.C. Distribution Board

Applicable Standards

The battery charger and D.C. Distribution board shall conform to the latest applicable standards specified below. In case of conflict between the standards and this Specification, this Specification shall govern.

Basic climatic and mechanical durability tests for components for electronic and electrical equipment	:	IS: 9000
Environmental tests for electronic and electrical equipments	:	IS: 9000
Metal clad base material for printed	:	IS: 5921

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circuits for use in electronic and telecommunication equipment

Transformers and inductors (power audio, pulse and switching) for electronic equipment : IS: 6297

Printed wiring boards : IS: 7405

Environmental requirements for semi-conductor devices and integrated circuits : IS: 6553

Terminals for electronic equipment : IS: 4007

Factory built assemblies of switchgear IEC:60439 : *IS:8623/BS:5486* /

and control gear for voltages upto and including 1000 V AC and 1200 V DC

Air break switches : IS: 13947(Part-3) BSEN 60947-3

Miniature circuit breakers : IS 8828/BSEN: 60898

HRC cartridge fuses : IS: 9224/BS: 88

Contactors : IS: 13947 (Part – 3) /BS: 775 / IEC: 60158-1

Control switches/push buttons : IS: 6875

Indicating instruments : IS: 1248/BC: 89/ EC:51

Degree of Protection : IS: 13947-(Part 1) /IEC: 60947-1

Climate-proofing of electrical equipment : BSCP: 1014

Code of practice for phosphating iron and steel : IS: 6005/BS: 3189

Semi-conductor converters : IEC: 60146

Semi-conductor rectifier equipment safety code : IS: 6619

Specification for copper rods and bars for Electrical purposes : IS: 613

Battery Charger

(a) Battery charger shall be combined float-cum-boost type.

(b) The charger shall be static type composed of silicon controlled rectifiers (SCRs) and diodes connected in three phase full wave half controlled bridge circuit.

(c) The rectifier transformers for float and boost chargers shall be indoor dry type, double wound with delta-star connections.

(d) The float charger shall be designed for supplying :

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- (i) The D.C. loads specified under Sr. No. 8.19.2 of Vol II, Part-8 i.e. continuous load and short-time overload.
 - (ii) The trickle charging current of the battery.
- (e) The boost charger shall be designed for supplying the boost charging current of the battery.
- (f) If the battery and charger are to be supplied by separate supplier, the charger supplier shall coordinate with the battery supplier regarding float /trickle boost charging current & voltages required for the battery.
- (g) Battery Charger shall be provided with facility for both automatic and manual control of output voltage and current and necessary selector switch shall be provided.
- (h) Performance
- (i) Float Charger

The D.C. output voltage during float charging shall be stabilised within $\pm 1\%$ of the set DC bus voltage. Manual control shall be used if auto mode fails.
 - (ii) Boost Charger

For boost charging the discharged battery after a mains failure, the rectifier shall charge the battery at high rate limited to the maximum boost charging voltage. After a specified number of hours (adjustable) when the rated cell voltage is reached, the charger shall be returned to float charge status.

 - In case of combined float-cum-boost charger, the switching and control of high rate charge and return to float charge shall be by automatic controller/regulator. Manual control shall be used if auto-mode fails.
 - During boost charging following emergency measures shall be provided:
 - If the AC mains supply fails, an arrangement shall be made to automatically connect the battery directly across the load.
 - If the separate or spare float charger supplying D.C. load fails, the load shall be fed from the point of connection at the tapping of the battery via adequately rated blocking diodes.
- (i) Suitable filter Circuits shall be provided in the chargers to limit the ripple content (peak to peak) in the output voltage to 1% irrespective of D.C Loads.
- (j) The D.C System shall be unearthed.
- Charger Panel and D.C. Distribution Board**
- (a) Battery charger panel and D.C. distribution board shall be sheet metal enclosure free standing type with cable entry from bottom.

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- (b) Indications, controls and output voltage setting adjustments shall be on front panel. The Contractor shall submit a scheme for alarm and trip indication lamps on the cabinet and for fault annunciation contacts paralleled for remote annunciation.
- (c) The components shall be liberally rated and housed in a well ventilated sheet metal cubicle complete with input and output terminals. Louvers shall be provided for ventilation backed up by fine wire mesh so that the degree of protection shall be equal to or better than IP-42.
- (d) Busbars shall be of copper conductor of hard drawn (HD) and high conductivity. Busbars shall be fully insulated by encapsulation in epoxy resin with moulded caps protecting all joints.
- (e) All printed circuit cards shall be plug-in type, interlocked to prevent insertion in a wrong slot. Each card shall have LED indication on its front plate to indicate normal condition and readily and marked test pins.
- (f) All components shall be accessible to the maintenance technician for easy disassembly and replacement. Access to parts of equipment shall be with minimum danger from all hazards.
- (g) All components and modules shall be clearly and unambiguously marked and all wiring colour-coded and tagged.
- (h) All power and control wiring within the cubicle shall be done with stranded copper wires. The power wiring shall be adequately sized for the required rating. The minimum sizes for control wiring will be 1.5 mm² and for power wiring shall be 2.5 mm².
- (i) Ground terminals with isolating links shall be provided.
- (j) Cable glands shall be provided to suit the incoming and outgoing cables.

Components/Accessories

- (a) The main items are listed below. However, additional items required for completeness or to meet the specified performance or operational requirements of the charger, shall be deemed to be included in the Contractor's scope. Instead of incoming ON/OFF switches, stricker fuses and contactors, the Contractor may provide suitably rated 3 pole MCBs with overload and short circuit protection and auxiliary contacts.
 - (i) One (1) set - Three phase full wave half controlled bridge rectifier circuit comprising silicon controlled rectifiers and silicon diodes complete with resistor/ capacitor network for surge protection. The diodes/SCRs shall be individually protected by fuses with fuse fail indication.
 - (ii) One (1) Double wound, dry type, three phase suitably rated mains transformer.
 - (iii) One (1) set of suitably rated control transformers for electronic controller.

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- (iv) One (1) Electronic controller comprising of power supply card, soft start cum current limit card, auto trickle mode card with facility for setting trickle charge current and monitoring battery current, error amplifier cards and pulse generating cards for achieving the DC output voltage stabilisation of $\pm 1\%$ and also for achieving current limiting feature. The electronic controller shall have protection features with indications for under-voltage, over-voltage, set output voltage and phase failure or voltage unbalance. The electronic controller shall be provided with following features.
- Boost current stabilisation of $\pm 2\%$ with AC input variation of voltage and frequency variation of $\pm 10\%$ and $\pm 5\%$ respectively.
 - Boost charge current limiter with potentiometer to adjust the setting.
- (v) Adequately sized necessary built-in accessories shall be provided such that on failure of the controller in auto mode the voltage can be effectively controlled manually.
- (vi) One (1) Filter circuit comprising of smoothing choke and condensers complete with HRC fuse with trip indication for filter condenser circuit.
- (vii) One (1) Auto/Manual selector switch for selecting the mode of operation of the controller.
- (viii) One (1) front panel mounted potentiometer for set point adjustment of output voltage in auto mode.
- (ix) One (1) front panel mounted potentiometer for manual adjustment of voltage in manual mode.
- (x) One (1) TP AC ON/OFF switch for float charger incoming.
- (xi) One (1) set of HRC fuses complete with fuse fittings for AC input with suitable ratings and with trip indication.
- (xii) One (1) set of the pilot lamps with series resistors to indicate float charger AC Mains 'ON' condition.
- (xiii) One (1) AC contactor with suitably rated coil and three main and 2 NO + 2 NC auxiliary contacts, suitably rated thermal overload relay and ON/OFF control switch.
- (xiv) One (1) set of HRC fuses complete with fuse fittings for the DC output, and with trip indication.
- (xv) One (1) moving coil DC ammeter, with shunt, of size 96 x 96 mm and suitable range to read the float charger output current.
- (xvi) One (1) Double pole DC ON/OFF rotary switch for float charger output.
- (xvii) One (1) pilot lamp with series resistor to indicate float charger DC 'ON' condition.
- (xviii) Annunciation System for the following
- (a) AC Supply Failure.
 - (b) Rectifier Fuse Failure.

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- (c) Surge Circuit Fuse Failure.
- (d) Filter Fuse Failure.
- (e) Load Limiter Operated.
- (f) Charger Trip.
- (g) Battery on Float.
- (h) Battery on Boost.

Power Electronic Components

- (a) Diode and thyristors shall be of monocrystalline type silicon, capable of continuous output at specified voltages. It shall have high power efficiency.
- (b) If many diode or thyristor assemblies are connected in parallel, care shall be taken to ensure that each rectifier or thyristor operates within its rating and shares the load uniformly. This may be achieved with the help of chokes. Also, care should be taken to select matched pairs of rectifier heat sink units.
- (c) Each diode or thyristor built in a multi-built assembly shall be provided with a short circuit protection to avoid complete shut-down of the equipment because of a fault on single unit. Suitable fuses shall be provided for such protection.
- (d) Necessary spare capacity shall be built in the equipment to continuously supply full load even with one unit out of circuit.
- (e) The diodes or thyristor banks shall be natural air cooled.
- (f) The diodes or thyristors shall be protected against overvoltage due to chopping surges with the aid of snubbers (i.e. resistor-capacitor combination and Metal oxide varister). It shall be ensured that normal load currents and especially fault currents are shared equally between parallel links, within the specified limits. To achieve this, great care shall be taken to design the layout of the rectifier links to ensure equal lengths of busbars and as near as possible identical contact resistance in each current path.

Drawings and Data

All Drawings, data, technical particulars, calculations, detailed literature, catalogues, test certificates etc shall be submitted along with the bid/ after award of contract as specified "Bid/Contract Drawings", Part 3, General Requirements, Volume-2 of Bid Documents.

13.10 CABLING SYSTEM: HV, LV, CONTROL AND TELECOMMUNICATIONS

A. Applicable Standards

The cables shall conform to the latest applicable standards specified below.

PVC insulated cables	:	IS: 694
(For voltage upto 1100 V)		
HRPVC & PVC insulated cables	:	IS: 1554
heavy duty		
Crosslinked polyethelen insulated	:	IS: 7098

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PVC sheathed cables

Low frequency cables and wires with : IEC: 60189-1 &
PVC insulation and sheath IEC-60189-2

PVC insulation and sheath of electric : IS: 5831
cables

Polyethylene insulation and sheath for : IS: 6474
electric cables

Conductors for insulated electric cables : IS: 8130

Methods of test for cables : IS: 10810

Specification for drums of electric cables : IS: 10418

Specification for PVC insulated cables : BS: 6346

for electricity supply

Specification for PVC insulation and : BS: 6746
sheath of electric cables

B. Features of Construction

(a) XLPE Insulated HV Power Cables :

The Cables shall be 11 KV/ 11 KV (Un earthed) grade, heavy duty, stranded aluminium Conductor, XLPE Insulated, Conductor Screening by extruded Semiconducting Compound, insulation screening through Combination of semi conducting compound and non magnetic tape(Copper tape), inner sheath over laid up cores, galvanised steel wire /strip armoured (Aluminium wire armouring for single core cables), outer sheath of extruded black PVC Compound type ST-2. Core Identification shall be by printed numerals.

(b) LT Power Cables

(i) PVC Insulated Cables:

The Cables shall be 1.1 KV Grade, heavy duty, Stranded Aluminium/ Copper Conductor, PVC Compound type A insulated, inner sheathed, galvanised steel wire /strip armoured, black PVC compound type ST1 outer sheathed.

(ii) XLPE Insulated Cables:

The Cable shall be 1.1 KV Grade, heavy duty, stranded aluminium/ Copper Conductor, XLPE insulated, inner sheathed, galvanised steel wire/ strip armoured ,extruded black PVC Compound type ST2 outer sheathed.

(c) Control Cables:

The Cables shall be 1.1 KV grade, heavy duty, stranded copper conductor, PVC Compound type A Insulated, galvanised steel wire/ strip armoured extruded PVC type ST1 outer sheathed.

(d) Telecommunication Cables:

The cables shall meet the following requirements:

(i) Conductor : Solid, tinned, annealed copper

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- (ii) Insulation : PVC insulation Type-A as per IS:5831
- (iii) Twisting : The insulated conductors shall be twisted together to form twisted pairs or quads, these shall be stranded in concentric layers to form the cable core. The cable thus formed shall be tightly lapped with outer wrapping tapes. The interstices of insulated cable core shall be completely filled with viscose compound
- (iv) Overall screening : With 0.075 mm Aluminium tape or 0.013 mm melinex tape, overlap not less than 30%
- (v) Other details : A suitable non-magnetic rip cord shall be laid longitudinally under the sheath. The armouring shall be of galvanised steel wires or galvanised single steel strip. The inner PVC sheath shall be of Type-A. The outer PVC sheath shall be of Type ST-1.

C. Cable Rating

- a) The Contractor shall ensure that cable and wires associated with the distribution and control systems, plant wiring and all other installations throughout the Works are adequately rated for their use.
- b) In assessing the rating of any cable or wire, the following factors shall be taken into account:
- Supply voltage and frequency
 - Maximum voltage drop permissible
 - Type and magnitude of load
 - Fault level and duration related to circuit protection relays and fuses
 - Circuit over current protection
 - Route length and disposition of cables
 - Ambient temperature
 - Method of installation
- c) All power cables shall be sized for continuous current carrying capacity at the ambient temperature of 45 °C. The design current of any circuit shall exceed the full load current of the supplied device by at least 10%. Power cables shall be sized to limit the maximum voltage drop to no more than 3 %.
- d) Under motor starting conditions the corresponding voltage drop shall not affect the operation of the motor controls or the ability of the motor to start and run effectively and in any event shall not exceed 10%. The Contractor when sizing cables for the remote operation of shunt trip coils shall take due account of the voltage drop caused by the momentary current surge taken at the instant of energisation. HV and LV cables shall be sized for a fault clearance time of 0.5

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seconds for the incoming feeders and 0.16 seconds for switchboard feeders controlled by circuit breaker.

D. Cable Colours

All cable cores shall be colour coded throughout their length and shall be so connected between switchboard, distribution board, plant and accessories, that the correct sequence or phase colours are preserved throughout the system.

The colour coding should be as follows:

3 Phase	Red, Yellow And Blue
Single phase or DC	Red And Black
Earth	Green
Control	Blue (DC), Red (AC)

E. Cable Conductors

Copper conductors shall be used for cables of sizes upto 6 Sq.mm. Aluminium conductors shall be used for cables of size 10 Sq. mm and above. Cores of cross-sectional area greater than 1.5 mm² shall be stranded. Lighting final distribution circuits shall be of a minimum cross-section of 1.5 mm². Power cables shall be of a minimum cross-section of 2.5 mm². Internal wiring of control panels shall be of a minimum cross-section of 1.0 mm² flexible and stranded. Control cables shall be of a minimum cross-section 1.5 mm² for external use and 1.0 mm² for internal use.

F. Cable Numbering

All cables shall be allocated a unique number which shall be fixed to each end of the cable using a corrosion resistant label. Cables of different categories shall be tagged with the following subscripts and three digit numbers.

HV power	HV-P_ _ _
LV power	P_ _ _
Control	C_ _ _
Instrumentation	I_ _ _
Protection	PR_ _ _
Telecommunication	T_ _ _

G. Cable Drums

Cables shall be supplied in non-returnable wooden drums. The wood used for construction of the drum shall be properly seasoned and free from defects and wood preservative shall be applied to the entire drum. All ferrous parts shall be treated with a suitable rust preventive coating to avoid rusting during transit or storage.

The Bidder shall indicate in the offer, the maximum length for each size of cable, which can be supplied on one drum. The actual length supplied on each drum shall be within tolerance limit of $\pm 5\%$ without any tolerance on total ordered quantity of each size of

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cable. However before winding the cables on drums. Contractor shall obtain Employer's approval for the drum lengths.

Each drum or coil of cable shall be accompanied by a certificate stating the manufacturer's name, cable size, and number of cores, length, result and date of tests as required in the Employer's Requirements. Cables manufactured more than 12 months before delivery will not be accepted. All cables shall be delivered with cable ends effectively sealed by hygroscopic scaling caps. When a cable is cut from a drum both ends shall be immediately sealed to prevent ingress of moisture. Cables shall not be transported to site in loose coils but a number of short lengths of cable may be transported on the same drum. The Contractor shall be wholly responsible for the purchase and/or hire costs of all cable drums and for the removal of these drums from site after use.

H. Drawings and Data

All Drawings, data, technical particulars, calculations, detailed literature, catalogues, Test certificates etc shall be submitted along with the bid/ after award of contract as specified, " Bid/Contract Drawings" , Part 3, General Requirements, Volume-2 of Bid Documents.

13.11 CABLE CARRIER SYSTEM

A. General

The cable carrier system covers the supply of cable racks, cable trays and its supporting accessories.

B. Applicable Standards

Steel for general structural purposes	:	IS: 2062
Dimensions for hot rolled steel beam	:	IS: 808
Column channel and angle sections		
Code of practice for use of metal arc	:	IS: 816
Welding for general construction in		
Mild steel		
Hot deep galvanising of iron & steel	:	IS: 2629
Methods of testing uniformity of coating	:	IS: 2633
Of zinc coated articles		
Hot dip zinc coatings on structural	:	IS: 4759
Steel and other allied products		

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C. Cable Racks and Trays

- All cable trays, vertical raceways, cable racks and cable tray supporting structures shall be hot dip galvanised.
- Cable trays shall either be run in concrete trenches or run overhead supported from building steel, floor slab, cable racks, cable cum pipe racks, etc.,
- Vertical trays/raceways and outdoor cable trays shall be covered by removable 16 gauge GS sheet covers.
- The size of ladder/perforated cable trays to be supplied and installed shall be 150, 300, 450, 600 and 800 mm wide.
- The mounting structures/cable racks shall be fabricated from standard structural steel members (channels, plates, angles and flats).
- The cable racks and supports shall be painted after installation with one coat of red lead primer, one coat of oil primer followed by two finishing coats of aluminium paint

D. Galvanising

Wherever galvanising has been specified, the hot dip process shall be used. The galvanised coating shall be of uniform thickness. Weight of Zinc coatings for various applications shall not be less than those indicated below;

(a) Fabricated Steel

Thickness less than 2 mm, but not less than 1.2 mm

Thickness less than 5 mm, but not less than 2 mm

Thickness 5 mm and over

340 gms/sq.m

460 gms/sq.m

610 gms/sq.m

(b) Fasteners

Upto nominal size M10

Over M10

270 gms/sq.m

300 gms/sq.m

Galvanising shall be carried out after all drilling; punching, cutting, bending and welding operations have been carried out. Burrs shall be removed before galvanising. Any site modification of galvanised parts should be covered well by zinc rich primer and aluminium paint.

13.12 LIGHTING SYSTEM

A. General Requirements

- Refer Part 12 - Particular Requirements, Volume-2 of Bid Documents for the requirements of lighting system.
- All the indoor and outdoor luminaires shall be of LED type. If LED luminaires not available for a particular design conventional lighting may be used with prior approval from OIL. The rating of

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luminaires shall be considered in such a way that required lux level of that particular location should be achieved.

- (c) The Lighting system includes the following items.
- (i) Lighting fixtures complete with Lamps and accessories.
 - (ii) Lighting system equipment
 - Light control switches, receptacle units with control switch units, lighting wires, conduits and other similar items necessary to complete lighting system.
 - Lighting fixture supports, street lighting poles and flood light towers.
 - Main Lighting distribution board, lighting panels.
 - Multi core cables for street, boundary and flood lighting.
- (d) All Lighting Fixtures, luminaries shall be considered for Emergency Lighting and fed from Main Lighting Board supplied by both mains supply normally and DG Set during power failure.
- (e) DC Emergency Lighting shall be provided for Control rooms of Switchyards SCADA room, Switchgear and Control room of Pump houses.

B. Applicable Standards

The design, manufacture and performance of equipment shall conform to the latest standards specified below.

Lighting Fixtures & Accessories

Electrical lighting fittings general and Safety requirements	:	IS: 1913/ BS: 4533
Code of practice for industrial lighting	:	IS: 6665
Calculation of co-efficient of utilisation	:	IS: 3646 (Part - III)
Industrial lighting fittings with metal	:	IS: 1777

Reflectors

Decorative lighting outfits	:	IS: 5077
Dust proof electric lighting fittings	:	IS: 4012
Dust tight electric lighting fittings	:	IS: 4013
Flood lights	:	IS: 10322/BS: 4533
Luminaires for street lighting	:	IS: 10322 Part 5
Water tight electric lighting fittings	:	IS: 3553/ BS: 4533, 5225(I)

Bayonet lamp holders : **IS:1258/BSEN 61184IEC:60061**

Edision screw lamp holders : IS: 10276/BSEN 60238

Bi-Pin lamp holders for tubular : IS: 3323

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fluorescent lamps

Starters for fluorescent lamp : IS: 2215/BSEN 60155
 Holders for starters for tubular : IS: 3324/ BSEN 60400

fluorescent Lamps

Ballast for use in fluorescent lighting : IS: 1534
 fitting (Part 1)/BSEN 60920& 60921
 Transistorised ballast for fluorescent : IS: 7027
 lamps
 Ballast for HP mercury vapour lamp : IS: 6616
 Capacitors for use in fluorescent, IS:1569/ BSEN 61048
 HPMV & LP sodium vapour discharge & 61049 /IEC: 60586
 Circuits
 Vitreous enamel reflector for tungsten : IS: 8017
 Filament lamp
 Tubular fluorescent lamps : IS: 2418 (Part -1) /BSEN 60081
 IEC: 60081
 High pressure mercury vapour lamps : IS: 9900/BS: 3677/ IEC:
 60188
 Tungsten filament general electric lamps : IS: 418/IEC: 60432
 Cast acrylic sheets for use in Luminaries : IS: 7569
 Screwless terminal and electrical : IS: 10322
 connections for lighting fittings
 High pressure sodium vapour lamps : IS: 9974
 Emergency lighting units : IS: 9583
 Ignition proof enclosures, dust-tight for : IS: 11005
 Elect. Equipment
 Luminaires : IS: 10322 (Part I to V)

Lighting System Equipment

Arrangement for busbars, main connections : IS: 5578/ 11353/BS: 159
 and auxiliary wiring and marking
 Enclosed distribution fuse boards and : IS: 2675/ BSEN 60439
 cutouts for voltages not exceeding 1000V
 General requirements for switchgear and : IS: 13947
 control gear for voltages not exceeding
 1000 V
 Code of practice - installation and : IS: 10118/BS: 6423
 maintenance of switchgear BS 6626, BS 6867

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Factory built assemblies of switchgear and control gear for voltages upto and Including 1000 V AC and 1200 V DC	: IS: 8623/BS-5486/ IEC: 60439
Miniature air break circuit breakers for AC circuits	: IS: 8828/ BSEN 60898
HRC cartridge fuse links upto 650 V	: IS: 9224/BS: 88/ IEC: 60269
'D' Type fuses	: IS: 8187
Current transformers	: IS: 2705/BS: 7626/ IEC: 60185
Voltage transformers	: IS: 3156/BS: 7625/ IEC:60186
Direct acting electrical indicating Instruments:	IS: 1248/BS: 89/ IEC: 60051
A.C. electricity meters	: IS: 722/BS 5685
Electrical relays for power system protection:	IS: 3231/BS: 142/ IEC: 60255
Switches for domestic and similar purposes	: IS: 3854/BS: 3676
Three pin plugs and socket outlets	: IS: 1293/BS: 546
Boxes for enclosure of electrical accessories	: IS: 5133(1)
Rigid steel conduits for electrical wiring	: IS: 9537/BS: 31
Accessories for rigid steel conduits for electrical wiring	: IS: 3837/BS-31
Flexible steel conduits for electrical wiring	: IS: 3480
Rigid non-metallic conduits for electrical Installations	: IS: 9537/BS: 4607(2)
Fittings for rigid non-metallic conduits	: IS: 3419/BS: 4607(2)
PVC insulated cables for working voltages upto and including 1100 V	: IS: 694
Tubular steel poles	: IS: 2713
Specification for copper rods and bars for electrical purposes	: IS: 613
Code of practice for phosphating iron an steel	: IS: 6005/ BS: 3189
Fittings for rigid steel conduits for Electrical wiring	: IS: 2667

C. Lighting Fixtures (Only LED Luminaries)

- Luminaries shall be designed for continuous trouble-free operation without reduction in lamp life or without deterioration of materials and internal wiring. Outdoor fittings shall be weather-proof and rain-proof type.
- The Luminaires shall be designed so as to facilitate easy maintenance, including cleaning, replacement of lamps/starters etc.

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- (c) Connections between different components shall be made in such a way that they will not work loose by small vibration.
- (d) For each type of Luminaires the Contractor shall furnish the utilisation factor tables to indicate the proportion of the light emitted by the bare lamps which falls on the working plane.
- (e) All Luminaires shall be supplied complete with lamps suitable for operation on a supply voltage with the variation in supply voltage, frequency and combined voltage and frequency of $\pm 10\%$, $\pm 5\%$ and $\pm 10\%$ respectively.
- (f) The Luminaires and accessories shall be designed to have low temperature rise. The temperature rise above the ambient temperature shall be as indicated in the relevant Standards.
- (g) LED type, Luminaires shall be complete with accessories like lamps, ballasts, power factor improvement capacitors, starters, re-wirable fuse and fuse base. These shall be mounted as far as possible in the luminaire housing only. If these cannot be accommodated integral with the Luminaires then a separate metal enclosed control gear box shall be included to accommodate the control accessories together with a terminal block suitable for loop-in, loop-out connections. Outdoor type fixtures shall be provided with outdoor type weather-proof box.
- (h) Fluorescent type Luminaires with more than one lamp shall be provided with capacitors connected in lead-lag circuit for correction of stroboscopic effect.
- (i) Each luminaire shall have a terminal block suitable for loop-in, loop-out and T-off connection by 250/400 V, 1 core, PVC insulated copper/aluminium conductor wires upto 4 sq.mm in size. In outdoor areas the termination at the luminaire shall be suitable for 1100 V, PVC insulated, copper/aluminium conductor, armoured cables of sizes upto 6 sq.mm conductor. Terminals shall be of stud or clamp type. The internal wiring should be completed by means of standard copper wire of minimum 1 sq.mm size and terminated on the terminal block. Terminal blocks shall be mounted with minimum two fixing screws.
- (j) Mounting facility and conduit knock-outs for the luminaries shall be provided.
- (k) Earthing
 - (i) Each luminaire shall be provided with an earthing terminal suitable for connection to the earthing conductor of 12 SWG GI wire.
 - (ii) Where separate control gear box is provided for housing the accessories the same shall be provided with an earthing terminal suitable for connecting earthing conductor of 12 SWG GI wire.
 - (iii) All metal or metal enclosed parts of the luminaire/control gear box shall be bonded and connected to the earthing terminal so as to ensure satisfactory earthing continuity.
- (l) Painting/Finish

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- (i) All surfaces of the Luminaire/Control gear box housing accessories shall be thoroughly cleaned and degreased. It shall be free from scale, rust, sharp edges and burrs.
- (ii) When enamel finish is specified, it shall have a minimum thickness of 2 mils for outside surface and 1.5 mils for inside surface. The finish shall be non-porous and free from blemishes, blisters and fading.
- (iii) The luminaire housing shall be stove-enameled/epoxy stove-enameled-vitreous enamelled or anodised as indicated under various types of fittings.
- (iv) The surface shall be scratch resistant and shall show no sign of cracking or flaking when bent through 90 deg. over 1/2" dia. mandrel.
- (v) The finish of the luminaire shall be such that no bright spots are produced either by direct light source or by reflection.
- (vi) External control gear box provided for housing accessories shall be painted or galvanised.

D. LED Lighting

- (i) LED shall be operated at a forward current of less than 90% of the rated current.
- (ii) Colour Rendering Index (CRI) of the LEDs used in the luminaire shall be greater than 70.
- (iii) The illumination of the luminaire shall be uniform without dark bands or abrupt variations and soothing to the eye.
- (iv) Light Uniformity Ratio (E_{min} / E_{avg}) would be > 0.4 .
- (v) Luminary Body Temperature would be less than 30 °C above the ambient, even after continuous burning of Luminary for 24 Hrs.
- (vi) The Luminaire works on single phase three wire system (Phase, Neutral & Earth).
- (vii) The luminaire housing is made up of Corrosion free High Pressure Aluminum die cast thus confirming the luminaire to IP-68 protection and safety as per IEC 60598-1.
- (viii) The Luminaire is equipped with distortion free, clear, Heat Resistant toughened, UV stabilized glass cover in the front fixed to the die cast Aluminum frame which would be fixed to the housing by means of stainless steel screws.
- (ix) The **minimum technical specifications for LED lighting** will be as follows:
 - a) Powered by the latest bright LEDs with high efficiency and meeting LM-80 standard.

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- b) Luminaire efficacy of at least 80 Lumens/watt.
- c) Power factor > 0.9.
- d) THD < 15%.
- e) Ingress protection as per IP 68 for outdoor luminaries
- f) Operating temperature -5°C to 50°C
- g) Storage temperature -5° to 70°C
- h) Humidity 10% - 100%
- i) LEDs shall be operated at a forward current less than 90% of its rated current.
- j) The LEDs used in the luminaire shall have minimum angle of 120 degree.
- k) Colour rendering index (CRI) of the LEDs shall be greater than 70.
- l) Conform to Photo Biological Safety for the LEDs as per IEC 62471.

E. Decorative Luminaries

Fluorescent Luminaries

- (a) These luminaires shall be generally indoor type provided with cold rolled cold annealed (CRCA) sheet steel channel/rail cum reflector housing complete with all electrical control accessories mounted on it. The finish shall be stove enamelled.
- (b) Decorative fluorescent type luminaires shall be either open type, provided with translucent white opal acrylic diffusers, polystyrene lens prismatic or square polystyrene louvers.
- (c) Luminaires shall be suitable for the number of lamps of specified wattage, direct mounting on ceiling/wall/column pendant mounting or for recess mounting in false ceiling.
- (d) Decorative luminaires with mirror optic reflectors shall be of the wide angle dispersion type. Where these luminaires are mounted in control rooms and computer rooms, clip-on type adjustable reflectors which can be attached onto the tube shall be provided to direct the light output in the desired direction. This is mainly to reduce reflection of the light source from TV/monitor screens.
- (e) Luminaires mounted recessed in false ceiling shall be with reflector housing and spring loaded fixing arrangement for the diffuser/louver frame. It shall be possible to have access to the lamp and other accessories from below.

F. Industrial Luminaries

Fluorescent Luminaries

- (a) The luminaire shall be provided with CRCA sheet steel mounting rail with reflector of minimum 20 SWG thicknesses and complete with all control accessories mounted on it. The finish shall be vitreous enamelled.
- (b) Luminaires shall be suitable for the number of lamps of specified wattage, direct mounting on ceiling/wall/column/pendent mounting.

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- (c) The distribution of light shall be such that at least 80% of the total luminous flux from the luminaire shall be in the lower hemisphere.
- (d) The luminous output of the luminaire with reflector shall not be less than 75% irrespective of type of reflector used.

G. Bulk Head Luminaire

- (a) The luminaire shall be of robust construction, with cast aluminium/vitreous enamelled housing, heat and shock resistant prismatic or clear glass cover fixed with neoprene gaskets for sealing. For mechanical protection to the glass cover, round steel wire-guard with vitreous enamelled finish shall be provided.
- (b) The luminaire shall be suitable for direct mounting to ceiling/wall/column and used for general purpose indoor lighting.

H. High and Medium Bay LED Luminaries

- (a) High and medium bay luminaires shall be with cast aluminium housing, anodised aluminium mirror polished reflector canopy with eye bolt for suspension, cooling fins and glass cover.
 - (i) The control gear accessories shall be mounted integral with the luminaire.
 - (ii) High bay luminaires shall be used when the mounting height is above 8 metres while medium bay luminaires shall be used when the mounting height is around 6 to 8 metres.
 - (iii) High and Medium Bay Luminaries shall be LED Type.

I. LED Flood Light Luminaire

General purpose flood light luminaire

- (a) Flood light luminaires shall be of LED type, weather proof construction with cast aluminium housing, anodised aluminium mirror polished reflector, heat resistant, toughened glass cover and necessary neoprene gaskets to prevent ingress of dust.
- (b) The housing shall be supported on a cast iron base and capable of being swivelled in both horizontal and vertical directions and locked in any desired position.
- (c) For focussing purposes, knobs, shall be provided along with sector plate indicating the angle in degrees between 0 and 90 deg. in vertical direction.
- (d) The luminaire shall be provided with cable gland on the canopy in down ward direction for cable connection.
- (e) It shall be possible to adjust the lamp position to achieve wide beam, medium beam or narrow beam.
- (f) It shall be possible to replace the lamp from the canopy without opening the front glass.

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J. LED Outdoor Lantern Luminaries

Post top Lantern

- Post top lantern Luminaires shall be generally outdoor weather proof type for illumination of walkways, gate posts, gardens etc.
- The luminaire shall have cast aluminium spigot of around 50/60 diameter finished with corrosion proof paint for mounting, opal acrylic or high density polyethylene (HDP) diffuser bowl, complete with integral mounted control gear, neoprene gaskets, earthing terminal etc.
- The luminaire shall be LED type.

K. LED Sub-station Lantern

- Sub-station lantern shall be generally outdoor weather proof type for illumination of switchyard equipment.
- The luminaire shall have cast aluminium housing finished with corrosion proof paint, spigot for mounting on pole, prismatic glass refractor dome to give distribution of light in horizontal plane, anodised aluminium reflector to give light distribution at an angle 20 to 40 degrees, above the horizontal plane, complete with integral mounted control gear, neoprene gaskets, earthing terminal etc.

L. LED Street Lighting Luminaries

- Street lighting fluorescent luminaire shall be outdoor weather proof type for illumination of secondary roads, walkways, peripheral lighting of buildings etc.
- The luminaire shall be of semi-cut off or non-cut off type, with CRCA sheet steel housing, vitreous enamelled, plain or corrugated clear acrylic cover, complete with integral mounted control gear, neoprene gaskets, side pipe entry or top suspension type.
- Street metal halide luminaires shall be outdoor weather proof type for illumination of main roads, traffic islands etc.
- The luminaires shall be LED type, suitable upto 150 watts lamps and for mounting heights from around 4 metres to 12 metres.

M. LED Portable Emergency Light Luminaire

- Emergency light of Installite luminaire shall be LED indoor type for providing emergency light during failure of normal AC supply.
- The luminaire shall be with CRCA sheet steel enclosure, complete with metallised mirror reflector, leak proof re-chargeable battery rated for two hour discharge, battery charger, charger-on lamp, push button switches, automatic changeover switch/relay, two metre length cord with plug, mounting pads and other accessories required for satisfactory operation of the luminaire.

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- (c) The luminaire shall be suitable for connection to 240 V, 50 Hz single phase supply. On failure of normal A.C. supply the luminaire shall pick-up automatically and on restoration of A.C. supply the luminaire shall switch off automatically.

N. **Accessories for Luminaries**

Reflectors

- (a) The reflectors shall be made of CRCA sheet steel/aluminium/silvered glass/chromium plated sheet copper as indicated for above mentioned luminaries.
- (b) The thickness of steel/aluminium shall comply with relevant standards. Reflectors made of steel shall have vitreous enamelled finish. Aluminium used for reflectors shall be anodized/epoxy stove enamelled/mirror polished. The finish for the reflector shall be as indicated for above mentioned fittings.
- (c) Reflectors shall be free from scratches or blisters and shall have a smooth and glossy surface having an optimum light reflecting coefficient so as to ensure the overall light output specified by the Contractor.
- (d) Reflectors shall be readily removable from the housing for cleaning and maintenance without disturbing the lamps and without the use of tools. They shall be securely fixed to the housing by means of positive fastening device of captive type.

O. **Drawings and Data**

All Drawings, data, technical particulars, calculations, detailed literature, catalogues, test certificates etc shall be submitted along with the bid/ after award of contract as Specified, "Bid/Contract Drawings", Part 3, General Requirements, Volume-2 of Bid Documents.

13.13 LIGHTING SYSTEM EQUIPMENT

A. **Main Lighting Distribution Board and Lighting Panels (AC & DC)**

(a) Constructional Features

- (i) Boards and panels shall be sheet steel enclosed and shall be fully dust and vermin proof, providing a degree of protection of IP 52. Outdoor panels shall in addition be completely weather-proof with a sloping canopy for protection against rain and providing a degree of protection of IP 55. The sheet steel used for frame, frame enclosures, doors, covers and partitions shall be cold rolled 2 mm thick.
- (ii) All boards and panels shall be provided with hinged doors for access to equipment. Doors shall be gasketed all round with neoprene gaskets. For the main floor mounted distribution boards with the switch fuse units arranged in tier formation, the hinged door of each unit shall be interlocked so as to prevent opening of the door when the switch is ON and to prevent closing of the switch with the door not fully closed. However, a device for by-passing

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the door interlock shall be provided to enable the operation of the switch with the door open, when necessary, for examination/maintenance. For wall mounting 1-phase ways lighting panels when provided with MCBs, a hinged, latched front door shall be provided with key-locking facility and a slotted backelite sheet shall be provided inside. Only the MCBs operating knobs or the fuse cap covers shall project out of the backelite sheet slots for safe operation and neat appearance. Incomer to lighting panels shall be provided with TPN MCB with ELCB.

- (iii) All accessible live connections/metals shall be shrouded and it shall be possible to change individual fuses, switches, MCBs from the front of the boards/panels without danger of contact with live metal.
- (iv) For floor mounting type distribution boards, adequately sized mounting channels shall be supplied and for wall/column/structure mounting type panels suitable mounting straps shall be provided.
- (v) Adequate interior cabling space and suitable removable cable entry plates shall be provided for top/bottom entry of cables through glands and or conduits as required. Necessary number of glands to suit the specified cable sizes shall be provided. Cable glands shall be screwed on type and made of brass.
- (vi) Two earthing terminals shall be provided to suit the earthing conductor.
- (vii) All sheet steel parts shall undergo rust-proofing process which should include degreasing, de-scaling and a recognised phosphating process. The steel works shall then be painted with two coats of Zinc - chromate primer and two coats of final stove-enamelled finish paint of specified colour.
- (b) Busbars
 - (i) Busbars shall be of copper conductor of hard drawn (HD) and high conductivity. Busbars shall be fully insulated by encapsulation in epoxy resin with moulded caps protecting all joints.
 - (ii) Busbars shall be provided with at least the minimum clearances in air as per applicable standards for 500 V, 3 phase system.
 - (iii) Busbars shall be adequately sized for the continuous current rating such that the maximum temperature of the busbars, busbar risers/droppers and contacts does not exceed 85° C under site reference ambient temperature.
 - (iv) The busbars, busbar connections and busbar supports shall have sufficient strength to withstand thermal and electro-mechanical stresses of the fuse/MCB's let through/cut-off current associated with the specified short-circuit level of the system.
 - (v) Busbar supports shall be made from suitable insulating material such as Hylam sheets; glass reinforced moulded plastic materials, permali wood or cast resin. Separate supports shall be provided for each phase of the busbars.

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If a common support is provided for all three phases, anti-tracking barriers shall be incorporated.

- (vi) The neutral bus of the main 3 phase, 4 wire distribution board shall be rated not less than 50% of the phase busbars. The neutral bus of the 1 phase ways lighting panel shall be rated same as the phase busbars. The neutral bus should have sufficient terminals and detachable links for full number of single-phase outgoing lighting circuits.

B. Panels/Boards' Component Equipment (complete for the Plant)

(a) Switches/Miniature Circuit Breakers (MCB)

- (i) Switches/MCBs shall be hand operated, air break, quick make, quick break type conforming to applicable standards.
- (ii) The switch shall be protected by fuse and the MCB shall be provided with overload/short-circuit protective device for protection under overload and short-circuit conditions. The minimum breaking capacity of MCBs shall be 6 kA R.M.S. at 415 V/220 V D.C.
- (iii) Switch shall have provision for locking in both fully open and closed positions. MCBs shall be provided with locking facility.
- (iv) The connections between switch and fuse shall be insulated and all live connections shall be shrouded.

(b) Fuses

The protective device of the panel shall be MCCB/RCBO but if HRC type fuse shall be required the specification of HRC fuse shall be as follows:

- (i) Fuses generally shall be of the HRC cartridge fuse-link type having a certified rupturing capacity of 80 kA at 440 V. Fuses upto 63A for distribution systems of medium short circuit levels may be of HRC cartridge screw-cap, D type, having a certified rupturing capacity of not less than 46 kA at 440 V and 16 kA at 250 V D.C.
- (ii) Fuses shall be provided with visible indication to show that they have operated.
- (iii) Cartridge fuses shall preferably be mounted in moulded plastic carriers. If fuse-carriers are not provided, insulated fuse pulling handle shall be provided for each size of fuse for each switchboard.

(c) Indicating Instruments and Meters

- (i) Whenever required, instruments and meters shall be of the flush mounting type. They shall be suitably mounted so as to provide for easy access to CTs and small wiring.
- (ii) Instruments shall be of minimum 96 mm square size, shall have provision for zero adjustment outside the cover and black numerals on white dial.

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- (iii) Watt-hour meters shall be of direct reading electro-dynamometer type complete with cyclometer type dials and reverse running stops.
- (iv) Ammeter/Voltmeter selector switches having 3 positions and off, with stay-put contacts rated 10A shall be provided when specified.
- (v) Potential fuses shall be provided at the tap-off point from the busbars for the voltmeters.

(d) Instrument Transformers

- (i) Current and voltage transformers shall be of the dry type, of metering accuracy class 1.0. Unless otherwise specified, it shall be the responsibility of the Contractor to ensure that the VA burden of the instrument transformer is adequate for the meters connected to it.
- (ii) Test links shall be provided in both secondary leads of the CTs to easily carry out current and phase angle measurement tests. Facilities shall be provided for short-circuiting and grounding the CTs at the terminal blocks.
- (iii) Voltage transformers shall be provided with suitably rated primary and secondary fuses.

(e) Indicating Lamps

Indicating lamps shall be of the filament type and low watt consumption. Lamps shall be provided with series resistors.

(f) Internal Wiring

- (i) Panels/boards shall be supplied completely wired, ready for the external connections at the terminal blocks. Wiring shall be carried out with 650/1100V grade, PVC insulated, stranded aluminium/copper conductors. Conductors of adequate sizes shall be used to suit the rated circuit current.
- (ii) Engraved identification ferrules, marked to correspond with the wiring diagram shall be fitted at both ends of each wire.
- (iii) All wiring shall be terminated on terminal blocks. Terminal blocks shall be one piece moulded rated 500 V, of reputed make, preferably stud type for higher current ratings such that wires are connected by cable-lugs and complete with nuts and washers. Terminals shall be adequately rated for the circuit current; the minimum rating shall be 20 A.
- (iv) Terminals for circuits with voltage exceeding 125 V shall be shrouded.
- (v) Terminals shall be numbered and provided with identification strip for identification of the circuit.
- (vi) Terminal blocks for C.T. secondary lead wires shall be provided with shorting and disconnecting/earthing facilities.

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C. Labels & Diagram Plate

- All door mounted equipment as well as equipment mounted inside the switchboard/panels shall be provided with individual labels with equipment designation/rating. Also the boards/panels shall be provided on the front with a label engraved with the designation of the board/panel.
- Labels shall be made of non-rusting metal, 3-ply lamicaid or engraved PVC.
- Inside the door of the 1 phase ways lighting panels a circuit diagram/description shall be fixed for reference and identification.

D. Light Control Switches

- Light control switches of ratings and types, i.e. decorative/industrial shall be supplied as required. The switches shall be suitable for use on 240 V, 1 Ph, 50 Hz supply.
- Switches shall be of flush type for mounting behind an insulated plate or incorporated with a switch plate for mounting flush with the surface of wall or switch box/suitable enclosure. The switch box/enclosure may be recessed into or mounted on a wall as per the requirement of project layouts.
- The size of enclosure boxes shall be chosen to accommodate the number of switches to be installed at the particular location. The enclosures shall be 18 gauge sheet steel galvanised. The enclosure box shall be covered with perspex/insulating cover. An enclosure intended for surface mounting shall not have holes or gaps in its sides other than those expressly provided for cable entry.

E. Receptacle Units

- Receptacle units shall consist of socket outlet with associated switch and plug. The socket outlet and switch or MCB shall be flush mounted within galvanised 18 gauge steel enclosure with insulation cover. The box may be recessed into or mounted on a wall as per requirements of project layouts.
- The receptacle units shall be suitable for 240 V, 1 ph - N, 50 Hz/415 V, 3 Ph - N, 50 Hz supply as required.
- Single phase receptacles shall be associated with a switch/MCB of same current rating and the receptacle shall become live only when the associated switch/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.
- The plugs shall be provided with cord grips to prevent strain and damage to conductors/wires at connection and entry points.

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F. Lighting Wires

- The wires for wiring in lighting system shall be 250/440 V, 1/C, FRLS, PVC insulated, unarmoured with stranded copper conductors.
- The minimum area of conductors shall be
 - 'Lighting': 1.5 sq. mm,
 - 'Light Plug Point': 1.5 sq. mm,
 - 'Circuit Wiring': 2.5 sq. mm,
 - 'Power plug point': 4 sq. mm,
 - Sub-Main: 10 sq. mm,
 - Main: 10 or 16 sq. mm, depending on the installed load.
- The wires shall be coded white for phase/positive of D.C. and black for neutral/negative of D.C.
- Outdoor lighting shall be 3core 6 sqmm to 10 sqmm round armoured cable used

G. Conduits

- Rigid steel/non-metallic conduits and their associated fittings as required shall conform to applicable standards. The minimum size of conduit shall be 20 mm for surface installation and 25 mm for concealed installation. The conduit shall be of MMS grade
- Steel conduits shall be seamed by welding and hot dip galvanised. They shall be supplied in standard lengths of 5 m.
- Supply of conduits shall include all associated fittings like couplers, bends and tees as required for lighting system installation work.

H. Junction Boxes

- 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 14 gauge sheet steel 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.
- 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/MCB as required.
- 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 600 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.

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- (e) The boxes shall be painted with one shop coat of Red oxide zinc chromate primer followed by a finishing coat of paint.

I. Lighting Poles and Flood Light Pole Mounting

- (a) Lighting poles for street lights and flood lights shall be of stepped tubular or Octagonal steel poles construction as per applicable standard. These poles shall be coated with bituminous preservative paint on the inside as well as embedded outside surface. Exposed outside surface shall be painted with one coat of red lead oxide primer. After completion of installation two coats of aluminium paint shall be applied.
- (b) Poles for mounting flood lights shall be supplied whenever required and as per typical attached drawing. Unless otherwise specified, poles shall be painted with red lead oxide primer and two coats of aluminium paint. A steel ladder shall be provided. The length of each step of the ladder shall be at least 300 mm and spacing between two adjacent steps not more than 300 mm.
- (c) The supply of poles shall be complete with fixing bracket/necessary pipe reducer for fixing the fitting and also include the necessary associated pole mounted junction boxes. The required sizes of poles and the junction box shall be as indicated in the attached drawings.
- (d) Poles height and Space between shall be arrived on basis of Lux and width of the road. Poles height shall be 9 to 12 mtr, accordingly road width and diameter shall be standard as per the height of the pole. The vendor shall submit the design on instruction of the site in charge.

J. Drawings and Data

All Drawings, data, technical particulars ,calculations, detailed literature, catalogues ,test certificates etc shall be submitted along with the bid/ after award of contract as specified, “ Bid/Contract Drawings” , Part 2, General Requirements, Volume-2 of Bid Documents.

13.14 EARTHING AND LIGHTNING PROTECTION SYSTEM

A. General

- (i) The earthing and lightning protection system covers earthing conductors, earth electrodes and accessories.
- (ii) Metallic frame of all electrical equipment shall be earthed by two separate and distinct connections to earthing system. Crane rails, tracks, metal pipes and conduits also shall be earthed at two points.
- (iii) Steel RCC Columns, metallic stairs and rails of the building housing electrical equipment also shall be connected to nearby earthing grid conductor. Metallic sheaths/ screens and armour of multicore cables shall be earthed at both ends.

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Metallic sheaths and armour of single core cables shall be earthed at the switchgear end only.

- (iv) Every alternate post of switchyard fence shall be connected to the earth grid by GS flat and gates by flexible lead to earthed post.
- (v) Each Continuous laid length of cable tray shall be earthed at minimum two places by GS/GI Flats to earthing system, the distance between the earthing points shall not exceed 30m.
- (vi) Lightning Protection System shall compromise vertical / horizontal air terminations, down conductors, test limits and earth electrodes. Air terminations, down conductors and test links shall be of galvanised steel conductors and earth connection below the ground level shall be of mild steel.
- (vii) Lightning Protection System down conductors shall not be connected to other earthing conductors above the ground level.

B. Applicable Standards

The earthing and lightning protection system shall conform to the Indian Electricity rules, and the latest applicable standards indicated below:

Code of Practice for Earthing	:	IS: 3043
Code of Practice for the Protection of	:	IS/IEC: 62305
Building and allied structure against lightning		
Hot dip galvanising	:	IS: 2629, 2633, 4759
Structural steel	:	IS: 2062 & 808
Welding	:	IS: 816

C. Earthing Conductor

- (i) The electrical installation shall where required be connected to the general mass of the earth by an earthing conductor. The material used for the earthing conductor shall be as follows:
 - (a) Conductors above ground shall be galvanised steel flat;
 - (b) Conductor buried in the ground or embedded in concrete shall be mild Steel, rod /flat.
- (ii) Allowance shall be made for reduction in the cross section of the steel over the design life of the earthing system;
- (iii) The earth electrode system shall comprise one or more earth electrodes, earthing network, mesh or a combination of these in order to obtain the required earth electrode resistance.
- (iv) Earth electrodes where used shall be of heavy duty galvanised mild steel of not less than 40 mm NB and 3000 mm long. Where multiple electrodes are used they shall be separated by a distance of not less than the driven length.

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- (v) Each earth electrode pipe shall be welded at the top to a mild steel plate to which the earthing tapes shall be connected. These connections shall each be housed in individual concrete inspection chamber set flush to the finished ground level and shall allow disconnection for testing of individual electrodes. The chamber shall be permanently marked 'Electrical Earth'.
- (vi) All materials used for the earth electrode installation shall be purpose made for the application and site conditions and shall be approved by the Employer's Representative.
- (vii) Unless otherwise stated all excavation for the installation of the earth electrodes and the inspection pit shall be carried out by the Contractor.
- (viii) After the earth installation has been completed the Contractor shall demonstrate to the Employer's Representative that the resistance of the electrodes to earth and the continuity of the earth network are within the limits specified. Any additional earth electrodes and test instruments required for the tests shall be provided by the Contractor.
- (ix) Marker posts and plates shall be provided to mark the route of buried tape or conductor electrodes. The markers shall be similar to those provided for cable routes.
- (x) Lightning Protection System
 - a) The need of lightning protection has been established by
 - Calculating the overall risk factor for each building, structure etc., as per procedure given in IS/IEC 62305-2.
 - Analysing the zone of protection provided by air termination conductors on tall structures in the plant area.
 - b) Air termination system comprising of rods/mesh or combination of both will be provided and the following methods shall be used to determine the positioning of Air termination system will be as per IS 62305.
 - The protection angle method
 - The rolling sphere method
 - Mesh method
 - c) Air termination system will be connected to the earthing system by down conductors fixed along the outer surface of building. Number & layout of the down conductors will be as per IS/IEC 62305.
 - d) Each down comer will be terminated to a separate treated test earth electrode which in turn will be connected to station earthing system.
 - e) Test link will be provided in the run of each down conductor at approximately 1000 mm above ground level.

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- f) Air termination system shall be connected to earthing system below ground by down conductors. For this purpose separate treated earth pit to be constructed. The down conductors shall follow a direct path to earth. There shall not be any sharp bends, turns and kinks in the down conductors.
- g) All joints in the down conductors shall be of welded/brazed type. All metallic structures within 2 meters from down conductors shall be bonded to lightning protection system.
- h) The lightning protection system shall not be in direct contact with underground metallic service ducts, cables, cable conduits and metal enclosures of electrical equipment. However all metal projections, railings, vents, tanks etc. above the roof shall be bonded together to form a part of roof grid.
- i) The lightning protection air termination rods and/or horizontal air termination conductors shall be fixed in such a way that they remain in their installed position even during severe weather conditions. The necessary accessories such as cleats, clamps, welding materials, bolts, nuts, shall be supplied by CONTRACTOR.

D. Main Equipotential Bonding Conductor

- (i) Main equipotential bonding conductors shall be provided to connect the earth electrode system to conductive parts forming the Works. The conductor sizes shall be calculated as per IS 3043/IEEE 80 and any account of for the loss of material (steel) due to corrosion in soil has to be considered in the conductor size.
- (ii) Equipotential bonding conductors shall have the following **minimum sizes**.
 - a) Main Equipotential Conductors

- Main Earth Conductor buried in earth Rod	100 mm dia.	MS
- 11/0.433 kV transformers, main switchboard and standby generator installation.	50 x 10 mm	flat
- interconnection to lightning protection system	50 x 10 mm	flat
- interconnection to MCCs	50 x 10 mm	flat
 - b) Equipotential Conductors

- interconnection to CP s	25 x 3 mm	flat
- power factor correction capacitor panel	25 x 3 mm	flat
- local push buttons wire	14	SWG
- lighting distribution board wire	4 SWG	

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- lighting and receptacle system 12 SWG wire
- outdoor street lighting 8 SWG wire
- ladder rack and cable tray at suitable points 25 x 3 mm flat
- hand rails and metallic structures 25 x 3 mm flat
- building reinforcement 25 x 3 mm flat
- incoming and outgoing process services 25 x 3 mm flat
- steel structures comprising storage tanks, mezzanine platform, crane rails, air handling ductwork systems etc. 25 x 3 mm flat
- LV Motors
- up to 10 kW 8 SWG wire
- 10 to 20 kW 4 SWG wire
- 20 to 50 kW 25 x 3 mm flat
- Earth electrode 40mm dia 3000 mm long heavy Duty G.I. pipe electrode

Notes:

- 1 Equipotential conductors shall interconnect between the device to be bonded and the main equipotential conductor.
- 2 Connections to building structural steelwork or concrete reinforcement shall be made by a bolted connection to a tag welded to the steelwork or reinforcement bars. Unless otherwise specified at least two connections shall be made to the steelwork and reinforcement bars at the perimeter of each building at diagonally opposite locations.

E. Circuit Protective Conductors

- (i) An independent circuit protective conductor shall be provided for each circuit and may comprise one or any of the following as appropriate:
 - a separate core within a multicore cable;
 - a separate conductor installed within a conduit or trunking. Steel conduit or trunking shall not be used as a circuit protective conductor;
 - The metal sheath of an armoured cable. The sheath shall be bonded to the metalwork of the apparatus and to the apparatus earth bar if any;
 - the copper sheath of a mineral insulated copper sheathed cable;

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- an independent earthing conductor MS or GS conductor run adjacent to the circuit it protects.
- (ii) Circuit protective conductors associated with the main circuits supplying switchboards and large electrical loads, i.e. motors in excess of 75 kW shall form a separate core of a multicore cable feeding the device or shall be an independent insulated copper conductor run adjacent to the supply cable. The size of the circuit protective conductor shall be calculated in such a manner as not to take into consideration the contribution of any other parallel or fortuitous earth paths.
- (iii) The armouring of the supply cable shall not form the sole means of earthing a switchboard or large electrical load.
- (iv) Where the cable armouring or sheath is used as the circuit protective conductor it shall be securely bonded at both ends to the metalwork of the apparatus and to an earth bar. Particular care shall be taken to ensure continuity across items of apparatus situated within a cable run and should the design of such items of apparatus not give adequate and lasting continuity through its structural body then additional earthing clips and conductors shall be provided to independently bond the cable sheaths together. Similarly additional earthing clips shall be provided to bond the cable sheaths/armour to any piece of apparatus fitted with a special earth terminal should the earth connection for the termination gland be inadequate. Any additional earthing clips shall be fitted within the apparatus wherever possible.
- (v) Instrumentation Earth

An instrumentation earth bus, if required shall be provided in each control panel. This shall comprise a copper flat of cross section not less than 25 x 6 mm and length to suit the number of connections. It shall be mounted on at least two insulated supports and be provided with a single earth connection to the instrument earth. If due to the physical size of a control panel more than one instrument earth bar is required the additional bar shall be connected again with a single earth connection to the same point as before. In this fashion all instrument earths shall be connected radially from the same earth point.

- (vi) The earth pit for instrumentation system shall be separate. Electric earth pits shall not be used for earthing of instrumentation equipment. All signal cable screens (analogue and digital) shall be terminated onto the instrument earth bar. Signal cable screens shall be earthed at the control panel end only. Screens at the field end shall be tied back and insulated.
- (vii) SPDs associated with the control and instrumentation system shall be earthed to the instrument earth in accordance with the SPD manufacturers recommendations.

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F. Galvanising

Wherever galvanising has been specified, the hot dip process shall be used. The galvanised coating shall be of uniform thickness. Weight of Zinc coatings for various applications shall not be less than those indicated below:

a) Fabricated Steel	
Thickness less than 2 mm,	340 gms/sq.m
But not less than 1.2 mm	460 gms/sq. M
Thickness less than 5 mm, but not less than 2 mm	610 gm / sq.m
Thickness 5 mm and over	
b) Fasteners	
Upto nominal size M10	270 gms/sq.m
Over M10	300 gms/sq.m

Burrs shall be removed before galvanising. Any site modification of galvanised parts should be covered well by zinc rich primer and aluminium paint.

13.15 LIST OF MAKES/ MANUFACTURERS:

The list of preferred Makes/ Manufacturers is given below.

Equivalent makes can be proposed which meets the qualification criteria as mentioned in the notes below.

SL. NO	DESCRIPTION	MANUFACTURER/MAKE
1.	Power transformers	M/s ABB/ BHEL/ Siemens/ Areva T&D/ Crompton Greaves Limited OR Equivalent Make
2.	Auxiliary transformers	M/s ABB/ BHEL/ Siemens/ Areva T&D/ Crompton Greaves Limited/ Volt Amp/ Bharat Bijlee/ Kirloskar Electric OR Equivalent Make
	11 kV/6.6KV Metal enclosed switchgears /MCC	M/s Siemens/ ABB/ Crompton Greaves Limited/ Areva/ BHEL OR Equivalent Make
3.	HV Vacuum Circuit Breaker	M/s Siemens/ ABB/ Crompton Greaves Limited/ Areva/ BHEL OR Equivalent Make
4.	Numerical Relays	M/s ABB/Siemens/Areva OR Equivalent Make
5.	H.T & L.T Current Transformers	M/s ABB/ Areva T&D/ CGL/ BHEL OR Equivalent Make

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SL. NO	DESCRIPTION	MANUFACTURER/MAKE
6.	LV Switchgears /MCC	M/s Schneider Electric/ ABB/ Siemens/ GE/ L&T OR Equivalent Make
7.	L.T Power Capacitors	M/s ABB/ CG Power Systems/ Universal/ Madhav/ Shreem/ L&T
8.	Lighting Fixtures and Accessories	M/s Philips/ Crompton Greaves Limited/ Wipro/ Bajaj Electricals OR Equivalent Make
9.	MLDB's, LDB's, SDB's, MCB's, RCCB's	M/s Legrand/ L&T /Siemens/ Schneider Electric/ C& S Electric Limited OR Equivalent Make
10.	L.T Power Capacitors	M/s BHEL/ ABB/ CG Power Systems/ Universal Cables OR Equivalent Make
11.	Diesel Engines	M/s Cummins/ Caterpillar/ Kirloskar Oil Engines/ Perkins OR Equivalent Make
12.	Alternators for DG Sets	M/s Kirloskar Electric/ CGL/ BHEL/ Jyoti/ Stamford OR Equivalent Make
13.	LT Bus Ducts	M/s Star Drive/ Power Gear/ C& S Electric Limited OR Equivalent Make
14.	Variable Frequency Drives	M/s Siemens/ ABB/ Schneider Electric OR Equivalent Make
15.	Cables	M/s Universal Cables/ Polycab/ RPG OR Equivalent Make
16.	Battery	M/s Exide Industries/ AMCO/ HBL-NIFE/ Amararaja OR Equivalent Make
17.	Battery Chargers	M/s Universal Instruments/ Amararaja/ Chabhi Electricals/ HBL-NIFE OR Equivalent Make
18.	Cable Trays	M/s. Indiana / Profab / Sterlite/ Patni OR Equivalent Make
19.	Cable Termination Kits & Cable Jointing Kit	M/s. M-Seal (3M) / Raychem OR Equivalent Make
20.	Earthing Strip, and accessories	M/s. Indiana / Profab / Sadhana / Sterlite/ Shruti OR Equivalent Make
21.	FCMA Soft Starters	M/s. Innovative technomics/ Sunshine controls / Sakthi power innovative OR Equivalent Make
22.	11kV Cable termination	M/s Reychem/ Mahindra/ REPL/ 3M OR Equivalent Make

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Notes:

Other Makes, if offered, are subject to Specific Approval by the OIL/ OIL's Representative based on the Submission of the following documents by the bidder:

- (i) Copies of Type Test Certificate for the items offered.
- (ii) List of Clients to whom already the items have been supplied along with the year of Supply and Value of Orders
- (iii) Copies of Performance Certificate from the User's for the items.
- (iv) Copy of latest ISO Certification for the Manufacturer
- (v) Details of Manufacturing Facilities
- (vi) Turn Over of the Manufacturer
- (vii) Copies of Approval for the items from reputed Consultants.

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ELECTRICAL WORKS

(To be completed by the Tenderer)

5.1 High Voltage Metal Enclosed Switchboards

Sr. No.	Description	Unit	Technical Particulars
5.1.1	Make		
5.1.2	Type		
5.1.3	Applicable Standards		
5.1.4	Quantity	No.	
5.1.5	Dimensions	mm x mm x mm	
5.1.6	Switchgear cubicles and Bus bar ratings		
(a)	Rated voltage, phases and frequency		
(b)	System Neutral Earthing		
(c)	Maximum system voltage	kV	
(d)	One minute power frequency withstand voltage	kV (rms)	
(e)	12/50 μ sec impulse withstand voltage	kV (peak)	
(f)	Short circuit withstand		
(i)	Short time (1 sec) at rated voltage	kA(rms)	
(ii)	Dynamic rating	kA (peak)	
(g)	Reference ambient temperature		
(h)	Maximum temperature of bus bars droppers connectors and contacts at continuous current rating under site reference ambient temperature		
(i)	Continuous current rating of bus bar	A	
(j)	Bus bar material		
(k)	Bus bar Insulation		
(l)	Cable entry		
(m)	Cable type for Incoming and Outgoing feeders		
5.1.7	Switchgear constructional Requirement		
(a)	Thickness of sheet steel Frame, Frame enclosures, doors, covers and partitions	mm	
(b)	Degree of protection		
(c)	Colour finish shade		

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Sr. No.	Description	Unit	Technical Particulars
(d)	Earthing bus	i) Material	
		ii) Size	mm x mm
(e)	Earthing conductor	i) Material	
		ii) Size	mm x mm
5.1.8	Breaker Particulars		
(a)	Circuit breaker type		
(b)	Voltage, phases and frequency		
(c)	Rated operating duty		
(d)	Rated current at reference ambient temperature		
	(ii) Incoming breakers	A	
	(iii) Outgoing breakers	A	
(e)	Rated breaking capacity	kA (rms)	
(f)	Rated making current	kA (peak)	
(g)	Short time current withstand for 1 sec duration	kA (rms)	
(h)	Total break time		
(i)	Operating mechanism type (Normal)		
	Operating mechanism type (Emergency)		
(j)	Minimum no. of auxiliary contacts		
(k)	Withstand test voltage		
	(i) One minute power frequency	kV (rms)	
	(ii) 1.2/50 μ sec impulse	kV (peak)	
(l)	Auxiliary control voltage		
	(i) For closing / tripping coil		
	(ii) For spring charging motor		
	(iii) For space heaters and lighting		
(m)	Anti pumping feature		
(n)	Latching requirement		
5.1.9	Current Transformers		
(a)	Type		
(b)	Class of insulation		

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Sr. No.	Description	Unit	Technical Particulars
(c)	Rated current ratio and burden		
	(i) Incomers and bus couplers		
	(ii) Outgoing feeders		
(d)	Accuracy class		
	(i) Metering		
	(ii) Protection		
(e)	Short time 1 sec current rating	kA (rms)	
(f)	Dynamic rating	kA (peak)	
5.1.10	Voltage Transformers		
(a)	Type		
(b)	Rated Voltage		
	(i) Primary	V	
	(ii) Secondary – S1	V	
(c)	Method of connection		
	(i) Primary – P		
	(ii) Secondary – S1		
(d)	Application – S1		
(e)	Rated burden	VA	
(f)	Accuracy class		
(g)	Rated voltage factor		
	(i) Continuous		
	(ii) Short time		
(h)	Insulation class		
5.1.11	Meters		
(a)	Make		
(b)	Accuracy Class		
	(i) Indicating Meters		
	(ii) Energy Meter		
5.1.12	Protective Relays		
	Type		
	Auxiliary supply		
5.1.13	Annunciations Provided for 11kV Metal enclosed Switch board		
5.1.14	Whether Cubicle Components Provided as per Part 12 -Particular Electrical Requirement of Specification	Yes / No	
5.1.15	Auxiliary A.C. Supply Voltage & Frequency	V, Hz	

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Sr. No.	Description	Unit	Technical Particulars
5.1.16	Whether all the above details attached for all Switchgear cubicles at locations mentioned as per 5.1.13	Yes /No	

5.2 Power Transformers

5.2.1	Manufacturer		
5.2.25	Full load rating	KVA	
5.2.35	Number of Phases	One/ Three	
5.2.4	Rated no-load voltage		
	a) HV	KV	
	b) LV	KV	
5.2.55	Type of Cooling		
5.2.65	Rated percentage impedance	%	
5.2.7	Winding connections		
	a) HV		
	b) LV		
	c) Vector group		
5.2.8	Tapping on winding		
	a) On load/off load tap		
	b) Total tapping range	%	
	c) Tapping steps		
	d) On HV/LV windings		
5.2.9	Maximum temperature rise of		
	a) Oil by thermometer	° C	
	b) Windings by resistance method	° C	
5.2.10	Load loss at rated current at 75°C winding temperature (guaranteed, subject to + tolerance as per applicable standard)	KW	
5.2.11	No-load losses (core loss and dielectric loss) at 100% rated voltage and frequency, subject to + tolerance as per applicable standard	KW	
5.2.12	Magnetization current at rated voltage and frequency in percent of full load current	%	
5.2.13	Weight		
5.2.13.1	Windings	Kg	
5.2.13.2	Core	Kg	
5.2.13.3	Oil	Kg	
5.2.13.4	Tank, coolers & fittings	Kg	
5.2.13.5	Total (5.2.13.1 TO 5.2.13.4)	Kg	

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5.2.14	Efficiency at 75°C Full Load, U.P.F.	%	
5.2.15	Maximum Flux Density		
5.2.15.1	At rated voltage	Wb/m ²	
5.2.15.2	At 110% of rated voltage	Wb/m ²	
5.2.16	Drawing number of the general outline drawing enclosed with the bid, showing the transformer with all its fittings and accessories in plan, front and side elevations and other relevant details.		

5.3 Metal Enclosed Switchgears PCC/MCC

Sr. No	Description	Unit	Technical Particulars
5.5.1	Make		
5.5.2	415 V Switchgear And Busbar Ratings		
(a)	Rated voltage phase and frequency		
(b)	System Neutral Earthing		
(c)	Maximum system voltage	V	
(d)	One minute power frequency voltage		
	i) Power circuits	V	
	ii) Control circuits	V	
	iii) Aux. Circuits connected to Sec of CTS	V	
(e)	Continuous current rating of Busbars under site reference Ambient Temperature and type & material	Rating Material	
(f)	Busbar insulation		
(g)	Reference Ambient Temperature	° C	
(h)	Maximum Temperature of Busbars, Droppers and Contacts at Continuous current rating under site ambient temperature	° C	
(i)	Short Circuit current withstand for Busbars and droppers (i) Short time 1 sec	kA (RMS)	
	(ii) Dynamic Rating	kA (Peak)	
5.5.3	Switchgear Constructional Requirement		
(a)	Type of Construction		

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Sr. No	Description	Unit	Technical Particulars
(b)	Thickness of sheet steel (i) Frame, Frame enclosures, doors, covers and partitions	mm	
(c)	Degree of protection		
(d)	Colour finish shade		
(e)	Earthing bus	Material	
		Size	mm x mm
	Earthing conductor	Material	
		Size	mm x mm
(g)	Minimum clearances in air of live parts (i) Phase to Phase	mm	
	(ii) Phase to Earth	mm	
(h)	Cable entry to cubicles		
5.5.4	Change over Switch		
(a)	Applicable Standards		
(b)	Quantity	No.	
(c)	Rating	A	
(d)	Short circuit current capacity for 1 sec	kA (rms)	
(e)	Provision of Safety Key Lock	Yes /No	
(f)	Auxiliary Contacts		
5.5.5	Instrumentation Transformers		
(a)	Current transformer		
	(i) Ratio		
	(ii) Burden	VA	
	(iii) Accuracy Class		
(b)	Voltage transformer		
	(i) Ratio		
	(ii) Burden	VA	
	(iii) Accuracy Class		
5.5.6	Whether all the above details attached for all Switchgear cubicles at Process Air Blower Building	Yes /No	

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5.4 415 V Power Capacitor and Control Panel

Sr. No	Description	Unit	Technical Particulars
5.6.1	General		
(a)	Make		
(b)	Rated Capacity	KVAR	
(c)	Rated voltage	V	
(d)	Rated frequency and phases		
(e)	Ambient temperature	° C	
(f)	Cable gland required		
(g)	Type of cable		
(h)	Size of cable		
(i)	Cable entry		
5.6.2	Constructional Requirement		
(a)	Thickness of sheet steel i) Frame, Frame enclosures, doors covers and partition	Mm	
(b)	Degree of protection		
(c)	Colour finish shade		
(d)	Earthing bus	Material	
		Size	mm x mm
(e)	Earthing conductor	Material	
		Size	mm x mm
5.6.3	Design Requirement		
(a)	Insulation level	kV (rms)	
(b)	Capacitor bank connection		
(c)	Short circuit withstand for busbars i) Short time (1 sec)	kA (rms)	
	ii) Dynamic	kA (peak)	
(d)	Type of switching		
(e)	Switching steps		
(f)	Switch and Rating of contactor		
(g)	Incomer MCCB current rating		
(h)	O/L capacity of capacitors		

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Sr. No	Description	Unit	Technical Particulars
(i)	O/V capacity of capacitors		
(j)	Protections		

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5.5 Diesel Standby Generator Sets

Sr. No.	Description	Unit	Technical Particulars
5. 7.1	General		
(a)	Set Manufacturer		
(b)	Quantity & Type		
(c)	Applicable Standard		
(d)	Rating		
(e)	Provision of AMF Control Panel	Yes/ No	
(f)	Provision of Synchronising Panel	Yes/ No	
5. 7.2	Alternator		
(a)	Manufacturer		
(b)	Type		
(c)	Applicable Standard		
(d)	Rating	KVA	
(e)	Voltage	V	
(f)	Number of phases		
(g)	Frequency	Hz	
(h)	Power Factor		
(i)	Rated Current	A	
(j)	Overload Capacity		
(k)	Class of Insulation		
(l)	Degree of protection		
(m)	Winding Connection		
(n)	Short circuit current		
(o)	Type of rotor bearings		
(q)	Provision of temperature sensors in stator windings		
(r)	Exciter		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(s)	AVR		
(i)	Make		

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Sr. No.	Description	Unit	Technical Particulars
(ii)	Type		
(iii)	Applicable Standard		
(t)	Voltage regulation		
(u)	Outgoing Cable		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(iv)	Size		
5. 7.3	Diesel Engine		
(a)	Manufacturer		
(b)	Type		
(c)	Applicable Standard		
(d)	Rating	HP	
(e)	Speed	RPM	
(f)	Number of Cylinders		
(g)	Number of Strokes		
(h)	Type of Starting		
(i)	Duty		
(j)	Overload Capacity		
(k)	Radiator		
	(i) Make		
	(ii) Type		
	(iii) Fan power		
	(iv) Cooling air flow		
(l)	Exhaust system		
	(i) Type of Silencer		
	(ii) Exhaust temperature gauge range		
(m)	Governor		
	(i) Make		
	(ii) Type		
	(iii) Applicable Standard		
	(iv) Class of governor		
(n)	Cooling Water System		
	(i) Water temperature		
	(ii) Water Pressure		
	(iii) System Capacity		

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Sr. No.	Description	Unit	Technical Particulars
	(iv) Provision of High water temperature and low water level switches		
(o)	Lubricating oil system		
(i)	Grade of Oil		
(ii)	Oil Pressure		
(iii)	Oil temperature		
(iv)	Sump Capacity		
(v)	Oil Consumption per 100 hours		
(vi)	Recommended time period of Oil Change		
(p)	Fuel		
(i)	Fuel Specification		
(ii)	Fuel Consumption at rated Capacity		
(q)	Day oil tank		
(i)	Capacity	Litres	
(ii)	Provision of Level Gauge		
(r)	Bulk Storage tank		
(i)	Location		
(ii)	Type		
(iii)	Capacity		
5.7.4	AMF Control Panel		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(iv)	Constructional Features		
(a)	Thickness of sheet steel Frame, Frame enclosures, doors covers and partition	mm	
(b)	Colour finish shade - Interior		
(c)	Colour finish shade - Exterior		
(d)	Degree of Protection		
(v)	AMF Features Provided as per Technical Specification	Yes/No	

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Sr. No.	Description	Unit	Technical Particulars
5.7.5	Protections, Alarm, Indications & Control whether provided as per Specification	Yes/No	
5.7.6	Synchronising Panel		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(iv)	Constructional Features		
(a)	Thickness of sheet steel Frame, Frame enclosures, doors covers and partition	mm	
(b)	Colour finish shade - Interior		
(c)	Colour finish shade - Exterior		
(d)	Degree of Protection		
(v)	Synchroscope		
(a)	Make		
(b)	Type		
(c)	Applicable Standard		
5.7.7	Acoustic Enclosure		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(iv)	Constructional Features		
(a)	Thickness of sheet steel Frame, Frame enclosures, doors covers.	mm	
(b)	Degree of Protection		
(c)	Acoustic material		
(iv)	Sound level at 1m distance		
(v)	Whether certified to meet emission norms	Yes/No	
5.7.8	Battery		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(iv)	Voltage		
(v)	Capacity at 10 hours rate		

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Sr. No.	Description	Unit	Technical Particulars
(vi)	Number of successive starting permissible		
5.7.9	Battery Charger		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(iv)	AC Input to Charger		
(v)	DC Output of Charger		

5.6 Soft starters

Sr. No.	Description	Unit	Technical Particulars
5.8.1	General		
(a)	Make		
(b)	Type		
(c)	Applicable Standard		
(d)	Drive Application		
(e)	Quantity	Nos.	
(f)	Type of converters		
(g)	Inverter capacity at specified pf		
(h)	Rated Current		
(i)	Load power factor		
(j)	Max. continuous current		
(k)	Rated voltage with number of phases		
(m)	Rated frequency		
(n)	Converter Bridge		
(o)	Single Quadrant/Two quadrant/ Four Quadrant		
5.8.2	Control Characteristics		
(a)	Speed Control		
(b)	Rated speed		
(c)	Speed ratio		
(d)	Constant torque/constant power		
(e)	Speed accuracy		

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Sr. No.	Description	Unit	Technical Particulars
(f)	Closed loop/open loop		
(g)	Accel./ Deccel. time		
(h)	Possibility of Remote Operation	Yes / No	
5.8.3	Overall Harmonic Limitation	%	
5.8.4	Braking		
(a)	Type of braking		
(b)	Braking Torque		
5.8.5	Miscellaneous		
(a)	Soft-start	Yes/No	
(b)	Flying restart	Yes/No	
(c)	Auto restart	Yes/No	
(d)	Kinetic Buffering	Yes/No	
5.8.6	Confirm whether following minimum Indications on Drive Panel are Provided	Yes/No	
(a)	Motor running		
(b)	Motor stopped / trip		
(c)	AC mains 'ON'		
(d)	System Ready to start		
(e)	VFD system fault		
5.8.7	Confirm whether Digital Display of following Minimum parameters on the Drive Panels:-	Yes/No	
(a)	Input AC Voltage		
(b)	Input AC Frequency		
(c)	Input AC Current		
(d)	Output Voltage		
(e)	Output Current VFD/Bypass		
(f)	Output Frequency		
(g)	Motor speed		
(h)	Whether Necessary transducers provided for indicating motor speed & current in PLC/DCS.	Yes/No	

5.7 Battery

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Sr. No.	Description	Unit	Technical Particulars
5.9.1	Make		
5.9.2	Type of battery		
5.9.3	Applicable Standards		
5.9.4	Number of battery banks required		
5.9.5	Ambient conditions		
5.9.6	D.C. system voltage	V	
5.9.7	Ampere hour capacity of battery at 27 Deg. C at 5 hour rate to give final cell voltage of 1.16 volts/cell	Ah	
5.9.8	Momentary load/duration	A	
5.9.9	Emergency load/duration	A	
5.9.10	Continuous load/duration	A	
5.9.11	Nominal voltage	V	
5.9.12	Cell voltage - initial/final	V	
5.9.13	Number of cells per bank required to give rated voltage	Nos.	
5.9.14	Number of spare cells per bank	Nos.	
5.9.15	Overall dimensions		
A	Each Cell (L x W x H)	mm x mm x mm	
B	Complete battery in the rack	mm x mm x mm	
5.9.16	Mounting arrangement		
5.9.17	Charging method		

5.8 Battery Charger

Sr. No.	Description	Unit	Technical Particulars
5.10.1	General		
(a)	Make		
(b)	Applicable Standards		
(c)	Number required		
(i)	Battery charger	Nos.	
(d)	Rated Output voltage (DC)	V	
(e)	Rated Output	kW	
(f)	DC System Earthing		
(g)	Voltage regulation from no load to rated load	%	
(h)	Ambient Design Temperature	Deg. C	
(i)	Busbar material & size	-	
(j)	Overall dimensions	mm x mm x mm	
5.10.2	Battery Details		
(a)	Float/Trickle charging current of battery	mA	
(b)	Boost Charging Current of Battery (Maximum)	A	

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Sr. No.	Description	Unit	Technical Particulars
(c)	Boost Charging Voltage of Battery (maximum)	V	
(d)	Maximum Time for Boost charging of Battery	hr	
(e)	Battery capacity & no. of cells	Ah	
		Nos.	
5.10.3	AC System Data		
(a)	Supply Voltage	V	
	Phase		
(b)	(i) Variation in supply Voltage	%	
	(ii) Variation in supply frequency	%	
(c)	Short Circuit level	kA	
(d)	Type of earthing		
5.10.4	Performance		
(a)	DC voltage setting adjustment for float charger		
(b)	Voltage stabilisation for constant voltage regulator		
(c)	Maximum permissible variation in DC voltage (no load to full load)		
(d)	D.C. voltage setting adjustment for boost charging		
(e)	D.C. current adjustment for boost Charging		
(f)	Current stabilisation for constant current regulator for boost charger		
(g)	Minimum permissible power factor to rated continuous load		
(h)	Permissible ripple content at rated continuous load		
(i)	Relay for auto changeover from Float to boost mode to be provided (in case of float-cum-boost charger)		
5.10.5	Constructional Features		
(a)	Thickness of sheet steel Frame, Frame enclosures, doors, covers and partition	mm	
(b)	Degree of protection		
(c)	Colour finish shade		
(d)	Earthing bus	Material	
		Size	mm x mm
(e)	Earthing conductor	Material	
		Size	mm x mm
(f)	Cable entry		
(g)	Cable Sizes		
	(i) Battery	sq.mm	
	(ii) DC output	sq.mm	
	(iii) AC input	sq.mm	

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5.9 DC Distribution Board

Sr. No.	Description	Unit	Technical Particulars
5.11.1	General		
(a)	Make		
(b)	Applicable standards		
(c)	DC System voltage (Nominal)	V	
5.11.2	DC System Earthing		
5.11.3	Ambient Design Temperature	Deg. C	
5.11.4	Bus bar material , rating and size		
5.11.5	DC Bus Load		
(a)	Total continuous DC load	A	
(b)	Short time loads (Additional to continuous loads)		
	(i) DC lights/Facia lamps	A	
	(ii) Starting current and duration of Largest Connected DC Motor	A	
		Secs	
5.11.6	Constructional Features		
(a)	Thickness of sheet steel Frame, Frame enclosures, doors, covers and partition	mm	
(b)	Degree of protection		
(c)	Colour finish shade		
(d)	Earthing bus	Material	
		Size	mm x mm
(e)	Earthing conductor	Material	
		Size	mm x mm
(f)	Cable entry		
(g)	Cable Sizes		
	(i) DC Input from Battery	sq.mm	
	(ii) DC output to Load	sq.mm	

5.10 Non Segregated Bus Duct

Sr. No.	Description	Unit	Technical Particulars
5.12.1	Type of Bus Duct		
5.12.2	Type of Cooling		
5.12.3	Installation		
5.12.4	Nominal Service Voltage	V	
5.12.5	Rated Voltage Class	V	
5.12.6	Continuous Current Rating of Bus Ducts under Site Conditions	A	

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Sr. No.	Description	Unit	Technical Particulars
5.12.7	One minute Power Frequency Withstand Voltage	V	
5.12.8	Momentary Current Rating	kA	
5.12.9	Short Time Current Rating for one second - kA (RMS)	kA	
5.12.10	Maximum Temperature (Hot Spot) of Busbars at Rated Current - °C		
5.12.11	Maximum Temperature (Hot Spot) of Enclosure at Rated Current °C		
5.12.12	Busbar Material		
5.12.13	Busbar Section		
5.12.14	Bus Enclosure Material		
5.12.15	Shape of Enclosure		
5.12.16	Phase Clearance (Minimum) Phase to Phase Phase to Earth	mm mm	
5.12.17	Type of Joints between Adjacent Sections of Bus Conductor Welded/Bolted		

5.11 Cable

Sr. No.	Description	Unit	Technical Particulars
5.13.1	11kV (UE) XLPE Insulated Power Cables		
(a)	Make		
(b)	Type		
(c)	Applicable Standards		
(d)	Cable size selection whether done as per Specification	Yes /No	
(e)	Continuous current rating with cable laid in air/ground under specified ambient temperature	A	
(f)	Conductor material		
(g)	Conductor screening		
(h)	Insulation		
(i)	Screening on Insulation		
(j)	Identification of codes		
(k)	Inner sheath		
(l)	Filler material		
(m)	Armouring		
(n)	Outer sheath		
(o)	Overall diameter of the cable	mm	

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Sr. No.	Description	Unit	Technical Particulars
(p)	Recommended minimum bending radius	mm	
(q)	Standard length of cable on each drum	mts	
5.13.2	1100 V Grade XLPE Insulated Power Cables		
(a)	Make		
(b)	Type		
(c)	Applicable Standards		
(d)	Cable size selection whether done as per Specification	Yes /No	
(e)	Conductor material		
(f)	Insulation		
(g)	Inner sheath		
(h)	Armouring		
(i)	Outer sheath		
(j)	Overall diameter of cable		
(k)	Recommended minimum bending radius	mm	
(l)	Standard length of cable on each drum	mts	
5.13.3	1100 V Grade PVC Insulated Power Cables		
(a)	Make		
(b)	Type		
(c)	Applicable Standards		
(d)	Cable size selection whether done as per Specification	Yes /No	
(e)	Recommended minimum bending radius	mm	
(f)	Standard length of cable on each drum	mts	
5.13.4	650/1100 V Grade PVC Insulated Control Cables		
(a)	Make		
(b)	Type		
(c)	Applicable Standards		
(d)	Rated voltage		
(e)	Cable size selection		
(f)	Conductor material		
(g)	Insulation		
(h)	Inner sheath		
(i)	Armouring		
(j)	Outer sheath		
(k)	Standard length of cable on each drum	mts	

5.12 Lighting Fixtures and Accessories

Sr. No.	Description	Unit	Technical Particulars
5.14.1	General		

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Sr. No.	Description	Unit	Technical Particulars
(a)	Illumination levels at various premises whether considered as per Specification	Yes /No	
(d)	Normal supply voltage, phase and frequency	AC	
		DC	
(e)	Variation in supply:		
	(i) Voltage (AC & DC)	%	
	(ii) Frequency	%	
	(iii) Combined voltage & frequency	%	
(f)	Design ambient air temperature	°C	
5.14.2	Luminaire terminal suitable for		
(a)	Indoor area		
	(i) Conductor material		
	(ii) Cable size	Cores x mm ²	
(b)	Outdoor area		
	(i) Conductor material		
	(ii) Cable size	Cores xmm ²	
5.14.3	Luminaire earthing terminal suitable for		
	(i) Conductor material		
	(ii) Conductor size	SWG	
5.14.4	Luminaires		
(i)	Fluorescent Luminaires		
(a)	Make		
(b)	Type		
(c)	Rating		
(ii)	HPSV Luminaires		
(a)	Make		
(b)	Type		
(c)	Rating		
(iii)	Flood Light Luminaires		
(a)	Make		
(b)	Type		
(c)	Rating		

5.13 Lighting System and Equipment

Sr. No.	Description	Unit	Technical Particulars
5.15.1	System Particular		
(a)	Voltage		
	(i) 3 Phase, 4 wire 50 Hz system		
	• Rated	V	
	• Maximum	V	
	• One minute withstand voltage		
	(ii) D.C. system		
	• Rated	V	
(b)	System short-circuit level		

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Sr. No.	Description	Unit	Technical Particulars
	(i) At 415 V, A.C.	kA (RMS)	
	(ii) At 110 V.D.C.	kA (D.C.)	
(c)	Reference ambient temperature	⁰ C	
5.15.2	Distribution Board/Panels		
(a)	Main, floor mounted distribution boards		
(i)	Main Lighting distribution board(A.C.)		
	• Make		
	• Type		
	• Degree of protection		
	• Bus bar material		
	• Bus bar current rating	A	
	• Short circuit current rating	kA	
	• Details of Incoming and Outgoing feeders		
	• Cable entry		
	• Location		
(iii)	Single phase Lighting DBs (SLDBs), Three Phase lighting DBs (TLDBs) / Wall/ Structure mounting		
	SLDB/TLDB for indoor area		
	• Make		
	• Type		
	• Details of Incoming and Outgoing feeders		
	• Degree of Protection		
(iv)	SLDB/TLDB for outdoor area		
	• Make		
	• Type		
	• Details of Incoming and Outgoing feeders		
	• Degree of Protection		
(v)	Paint Finish		
	(ii) Colour shade:		
5.15.3	Street Light Poles And Flood Light Poles		
(a)	Street Light Pole		
	Type		
	Total Height:	MTRS	
	Quantity:	Nos.	
(b)	Floodlight Light Pole		
	Type		
	Total height :	MTRS	
	Quantity:	Nos.	
	No. Of floodlights to be fixed per pole	No.	

5.14 Earthing and Lightning Protection System

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Sr. No.	Description	Technical Particulars		
		Size	Material	No. of Leads & Quantity
5.16.1	Main Earthing Grid			
(a)	Buried in earth			
(b)	Buried in floor slabs in buildings			
5.16.2	Conductor Leads To Equipment (above ground)			
(a)	Transformers			
(i)	Transformer neutral to bottom of tank			
(ii)	From bottom of tank to earth grid			
(iii)	Transformer tanks and radiator bank			
(b)	Diesel Generator Set			
(i)	DG Set neutral earthing			
(ii)	DG Set body earthing			
(c)	Fence posts and gates (Flex. braid)			
5.16.3	11kV Metal Enclosed Switchboard, 415V switchgear/ MCC.			
5.16.4	Motors			
(a)	415V Motors above 10 kW			
(b)	415V Motors up to 10 kW			
(c)	Fractional horse power motors			
5.16.5	Other Items			
(a)	Capacitor panel, Battery charger panel, DC distribution board, Main lighting D.B, Control panels and sub-lighting distribution boards etc			
(b)	Hand Rails			
(c)	Cable trays			
(d)	Tanks			
(e)	Junction boxes			
(f)	Lighting fixtures, receptacles, lighting conduits			
(g)	Push button stations, limit switches			
5.16.6	Crane rail			
5.16.7	Street lighting, flood lighting poles and junctions boxes			
5.16.8	Metallic noncurrent carrying structures			
5.16.9	Lightning Conductors			
(a)	Lightning protection down comers for building			
(b)	Lightning protection horizontal roof conductor for building			
5.16.10	Electrodes			
(a)	Pipe electrode			

DISTRIBUTION TRANSFORMER

GENERATOR

MINIATURE CIRCUIT BREAKER

VACUUM/AIR CIRCUIT BREAKER

CAPACITOR

AMMETER

MASTER TRIP RELAY

TRANSFORMER DIFFERENTIAL RELAY

UNDER VOLTAGE PROTECTION RELAY

OVER VOLTAGE PROTECTION RELAY

ANNUNCIATOR

INDICATING LAMP

PUSH BUTTON

VOLT METER

MFM

AMMETER SELECTOR SWITCH

VOLT METER SELECTOR SWITCH

CURRENT TRANSFORMER

INSTANTANEOUS OVER CURRENT RELAY

INSTANTANEOUS ARTH FAULT RELAY

INVERSE TIME PHASE OVER CURRENT RELAY

INVERSE TIME EARTH FAULT RELAY

DIRECTIONAL INVERSE TIME PHASE OVER CURRENT RELAY

DIRECTIONAL INVERSE TIME EARTH FAULT CURRENT RELAY

ABBREVIATIONS :

A - AMPERE

AL - ALUMINUM

CU - COPPER

KW - KILO WATTS

KA - KILO AMPS

XLPE - CROSS LINKED POLY ETNYLENE

DV - DIGITAL VOLTAMETER

DA - DIGITAL AMMETER

MFEW - MULTI FUNCTIONAL ENERGY METER

KVA - KILO VOLT AMPERE

KVAR - KILO VOLT AMPERE REACTIVE

MCCB - MOULDED CASE CIRCUIT BREAKER

MCB - MINIATURE CIRCUIT NEUTRAL

SPN - SINGLE POLE NEUTRAL

TPN - TRIPLE POLE NEUTRAL

FP - FOUR POLE

P.F - POWER FACTOR

C.T - CURRENT TRANSFORMER

SC - SHORT CIRCUIT CURRENT

IP - INGRESS PROTECTION

CDS - CHANGE OVER SWITCH

AMF - AUTOMATIC MAINS FAILURE

RMU - RING MAIN UNIT

TR - TRANSFORMER

GEN - DIESEL GENERATOR

ACBS - AIR CIRCUIT BREAKER

MFEW - MULTI FUNCTIONAL ENERGY METER

O.C - OVER CURRENT

SC - SHORT CIRCUIT CURRENT

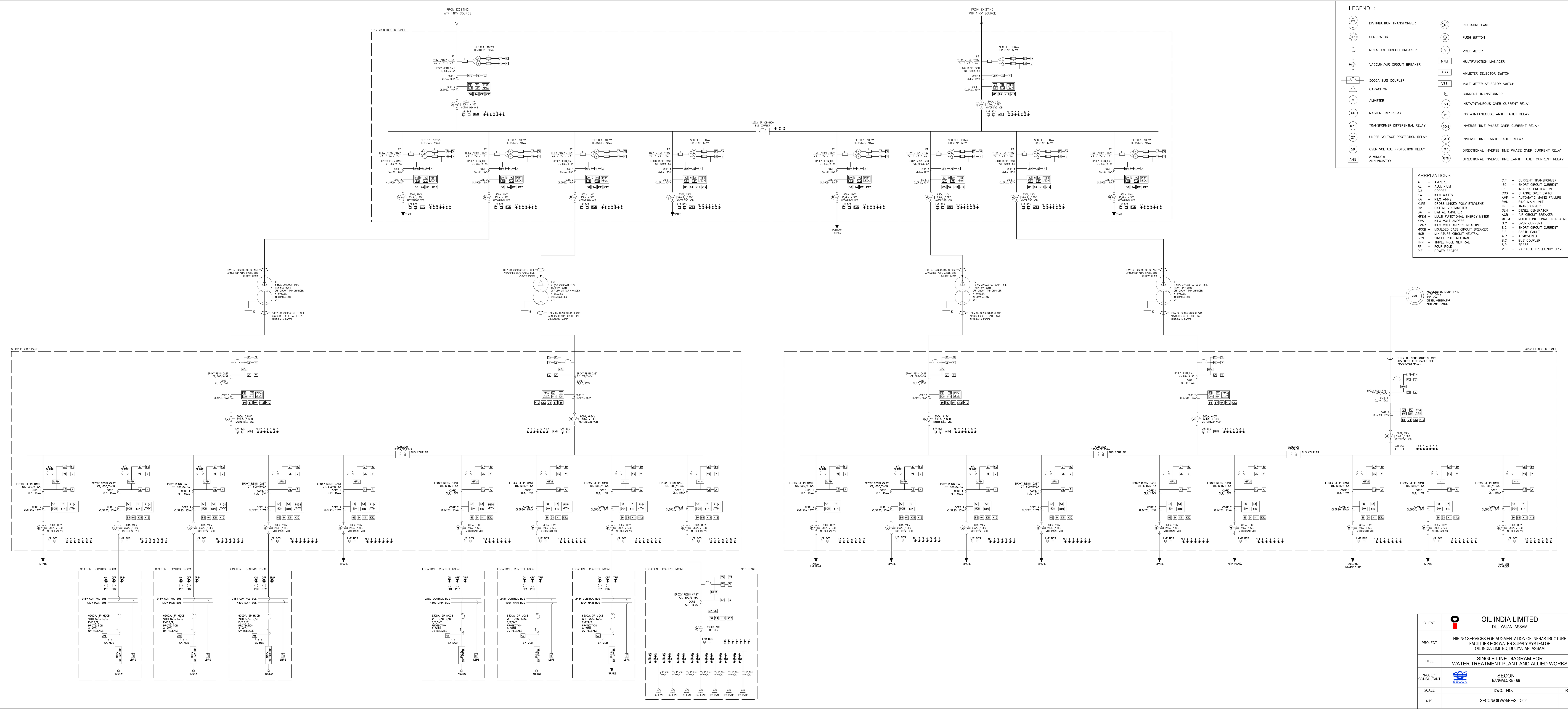
E.F - EARTH FAULT

A.R - ARMORVED

B.C - BUS COUPLER

S.P - SPARE

VFD - VARIABLE FREQUENCY DRIVE



CLIENT	OIL INDIA LIMITED DULYAJAN, ASSAM
PROJECT	HIRING SERVICES FOR AUGMENTATION OF INFRASTRUCTURE FACILITIES FOR WATER SUPPLY SYSTEM OF OIL INDIA LIMITED, DULYAJAN, ASSAM
TITLE	SINGLE LINE DIAGRAM FOR WATER TREATMENT PLANT AND ALLIED WORKS
PROJECT CONSULTANT	SECCO BANGALORE - 66
SCALE	DWG. NO.
NTS	SECON/OL/WS/EE/SLD-02
REV.	1

PROJECT TITLE	OWNER
DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, INSPECTION, SUPPLY, CONSTRUCTION AND COMMISSIONING ON LSTK BASIS OF WATER TREATMENT PLANT AND ALLIED BUILDINGS AT DULIAJAN, ASSAM, INDIA	 Oil India Limited Comparing Newer Horizons

ANNEXURE-III

Details of CIVIL AND STRUCTURAL ENGINEERING Jobs wrt

**DESIGN, ENGINEERING, PROCUREMENT,
FABRICATION, INSPECTION, SUPPLY,
CONSTRUCTION AND COMMISSIONING OF
8 MGD CAPACITY WATER TREATMENT
PLANT ON LSTK BASIS AT DULIAJAN,
ASSAM, INDIA**

PROJECT TITLE	OWNER
DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, INSPECTION, SUPPLY, CONSTRUCTION AND COMMISSIONING ON LSTK BASIS OF WATER TREATMENT PLANT AND ALLIED BUILDINGS AT DULIAJAN, ASSAM, INDIA	 Oil India Limited Comparing New Horizons

The list of items mentioned are indicative only. The Design, Supply, Construction, Installation, Inspection, Testing and Commissioning of all other items as mentioned in the SCC /drawing/ contract document for completion of the plant as per Project Definition shall be in the scope of the contractor. Contractor shall supply and execute the same without any additional cost. Also, if any other items/ tools/jobs not mentioned in contract document(SOQ/SCC/drawing etc.) but required for completion of the plant shall be in the scope of the contractor. The same shall be supplied and execute by the contractor without any additional cost.

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 Water Treatment Plant and allied buildings.

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 design 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

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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 or 0.5 M above the existing PWD Road level. (To be finalized during detailed engineering)

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.

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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 Water Treatment 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.

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E. Water treatment Plant

Dismantling / Demolishing of Existing Treatment Plant and allied buildings

General

- Contractor shall carry out dismantling of the existing structures. These dismantling works are critical and shall need meticulous planning to avoid time over run and damage to equipment and facilities in the vicinity
- All actions necessary to comply with environmental requirements, including noise attenuation.
- The Job involves demolition , decommissioning of all existing Structures/equipment of an old 1.5 MGD WTP located at the site of 8 MGD WTP to be constructed under the scope of this EPC Contract. The scope of work also includes removal, dismantling of Civil Structures, Mechanical Items, all piping, electrical items to make the site ready for construction of the 8 MGD WTP. All the dismantled Mechanical Items, all piping, electrical items and civil items to be lifted , transferred and dumped as per the direction of OIL's representative at a designated site for subsequent disposal by OIL. A few photographs of the old 1.5 MGD WTP is appended below for reference purpose only. All leveling, Earth Moving, Excavation etc required for making the site ready for construction of the 8 MGD WTP shall also be under scope of work of the EPC Contractor.
- Please note that the photographs are indicative only and are not exhaustive of the equipment installed at the 1.5 MGD WTP to demolished to make the site ready for construction of the 8 MGD WTP.



Fig:Indicative Photographs of old 1.5 MGD WTP

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Design of Treatment Plant

The design of Water Treatment Plant is done based on the parameter recommended by the CPHEEO, Manual on Water Supply and Treatment Govt. of India.

Inlet Chamber

Construction of Inlet chamber of minimum dimension of 4m length, 3m width and 2.2m height. Purpose of inlet chamber is to provide rapid mixing of the pre-treatment chemicals with the raw water.

The flash mixing chambers shall be reinforced concrete. The outlets from the chambers shall be provided with electrically operated sluice gates with facility of manual operation. The freeboard shall be 0.5m and minimum detention time will be 60 sec at the stipulated flows

Each flash mixer shall be equipped with an impeller type, high speed mixer. The driving motor of suitable capacity and other accessories shall be totally enclosed but easily accessible for maintenance. The shaft with the impeller shall be freely suspended from the driving gear mounted on a platform on top of the reservoir. No thrust or guide bearing shall be located below the liquid level. The shaft of the mixer and the impeller shall be of stainless steel - 316

The outlets of the chambers shall lead directly to the respective flocculators or clariflocculators. The pipes shall be rubber gasket jointed DI K9 pipes or channels as necessary. The top of the distribution and mixing unit is to be made accessible by the general walkway along the measuring channel. Each chamber shall be connected to the drainage system by means of a wall duct, puddle collar and a sluice valve of minimum DN 100

Poly Aluminum Chloride (PAC) /Alum dosing and Lime dosing unit

Construction of Alum and Lime dosing unit of minimum dimension of 16.00 m length, 13.70 m width. To prepare alum and lime solution, to pump alum and lime solution, to pump alum and lime solution to the flash mixer, to ensure proper mixing in the preparation of chemical solution and prevent solids formation in the alum dosing tank.

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Poly Aluminum Chloride (PAC) /Alum dosing unit

The alum / primary coagulant dosing shall be made by dosing metering pumps. The solution tanks and dosing devices have to be installed at a level to be in a position to feed the inlet chamber. This must be also possible in the case of repair of dosing pipe for lime solution when both media are conveyed in one pipe. The diameter of the pipes in the chemical plant and to injection points shall be reasonable compromise between a sufficiently wide diameter to prevent clogging and a satisfactory high flow velocity to prevent deposits.

Operation	Activity
Filling of solution tanks	Water: automatic and float controlled Alum bricks: with electric hoist
Stirrers of the solution tanks	Manual Automatic at intervals according to the timer
Outlet of dosing device	Manual Automatic when water pumps stop and start.
Flushing of dosing pipes after the stop of the dosing unit	Automatic
Handling of chemicals with the hoist	Control unit suspended from the hoist,; to be operated from the dosing room

Lime dosing unit

Lime solution dosing facilities will be provided in the chemical plant at the upper floor opposite to the alum dosing units. The different components are similar to those of the alum dosing plant.

Clariflocculators

Construction of Alum and lime dosing unit of maximum dimension of 26.00 m diameter, 4.30 m width TD. Primary treatment for removal of TSS and turbidity in the raw water.

Plant room

Construction of Plant room of minimum dimension of 50.00 m length and 30.00 m width. Plant room consists of submerged UF tanks, UF C.I.P. tank, neutralization pit, Hypo/Brine tanks, S.U.F. Backwash pumps, CIP pumps, Air blower for backwashing, Air compressor, Brine Electrolyser.

Neutralization tank

One neutralization tank of reinforced concrete shall be provided in the maintenance bay. The capacity should be adequate to neutralize two full chlorine cylinders. The tank should be suitably projected above the floor to prevent the entry of floor washings. It should be filled with suitable neutralizing agent such as caustic soda (NaOH). The opening of the tank should permit to place the chlorine cylinder into it in any position. Its top should be covered with some thin plywood type cover which can be broken up easily in the emergency by the cylinder itself. The

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tank should be lined from inside with suitable material so that the chemicals may not have any aggressive effect. The position of the tank should be such that the cylinder can be dumped into the tank easily by using the OHT crane for lifting the damaged cylinder.

Alternatively chlorine scrubber with suitably placed exhaust fan and piping can also be provided with flow of water and caustic soda solution from the top of scrubber. The capacity of exhaust of full cylinder chlorine air ratio 1:3.

Treated Water Tank

Construction of Treated water tank of minimum dimension of 56.00m Length, 30.00 m width and 4.55 m height. The purpose of Treated water tank is to collect treated water from Ultra filter system.

Chemical house

All Chemical dosing systems will have to be provided as per designed output capacity of filter in one building and shall include space for 30 days storage of alum and lime as 40mg/l and lime 20 mg/l, respectively. The chemical house shall have sufficient space and mechanized arrangement for loading/ unloading of the chemicals, wide corridors, office space, toilets etc.

UNIT OPERATIONS AND BRIEF SPECIFACTIONS

UNIT	PURPOSE	BRIEF SPECIFACTIONS
Inlet Chamber	Flow equalization and normalization	4.0m x 3.0m x 2.2 m LD + 0.5 F.B.
Flash Mixer	To provide rapid mixing of pre-treatment chemicals with raw water	3.0m x 3.0m x 2.1 m LD + 0.6 F.B.
Clariflocculators	Primary Treatment for removal of TSS and Turbidity in the raw water	26.0m dia. x 4.3m TD
Poly Aluminum Chloride (PAC) / Alum dosing tank	To prepare alum solution	16.0m x 13.7m
Poly Aluminum Chloride (PAC) / Alum dosing pump	To pump alum solution to the flash mixer	500 lph @ 2 bar
Poly Aluminum Chloride (PAC) / Alum dosing tank agitator	To ensure proper mixing in the preparation of chemical solution and prevent solids formation in the alum dosing tank	SS shaft, SS impellers, 720 rpm with 1.0 hp geared motor
Lime dosing tank	To prepare Lime Solution	16.0m x 13.7m
Lime dosing pump	To pump lime solution to Flash Mixer	300 lph @ 2 bar
Lime dosing tank agitator	To ensure proper mixing in the preparation of chemical solution and prevent solids	Paddle type agitator with 1.0 hp geared motor

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	formation in the lime dosing tank	
Air blowers	To provide air scouring prior to backwashing the RGF	1300 m ³ /hr @ 25 mwc
Backwash pumps	To backwash the sand filters	1000 m ³ /hr @ 25 mwc
UF Feed tank	To collect filtered water for subsequent downstream UF system	50m x 30.0m x 4.0 m LD + 0.5m F.B.
UF Feed pumps	To feed water to the UF system for tertiary treatment	750 m ³ /hr @ 20 mwc
UF Bag Filters	As protection to the UF system	PP bag in SS housing, 25 microns nominal rated bag filters
UF modules	UF system for bringing down to < 1 NTU	UF membranes with design operating flux of 75 LMH
UF backwash pumps	For backwash and fast flush of UF membranes	1000 m ³ /hr @ 20 mwc
UF CIP Tank	For CIP cleaning of UF system	3.0m x 2.5m LD + 0.5 F.B; 15m ³ each
UF CIP feed pumps	To feed CIP solution to the UF system	15 m ³ /hr @ 25 mwc
UF Micron Filters	For filtering out CIP solution before introduction to the CIP system	PP spun cartridge in SS housing, 750-1000 lph flow/10" cartridge length, 25 microns nominal rated
UF CEB Dosing systems	To dose various chemicals for chemically enhanced backwashing of the UF modules	1000 litres HDPE tank with 0-50 lph dosing pumps
Submerged UF House	Submerged UF House	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Submerged UF House. Sizing to be finalized during Design to accommodate all the equipment inclusive of all Electrical and Instrumentation Items.
Brine Tank	For preparation of brine solution for electrolysis	3.0m x 2.5m LD + 0.5 F.B; 15m ³ each
Brine Electrolyser	For in-situ generation of hypochlorite solution for disinfection	Titanium and MMO coated electrodes in PP/FRP housing for brine electrolysis to give 1.5 ppm as hypo solution
Disinfection Shed	For housing of the Disinfection equipment	Design, Procurement/ Fabrication/ Supply/

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		Construction/Installation, testing, inspection and Commissioning of Disinfection Shed. Sizing to be finalized during Design.
Treated Water Tank	To collect treated water from UF system	60m x 30m x 4.5 m LD + 0.5 m F.B;
Treated Water Distribution Pump House	To house the Treated Water Distribution Pumps	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of Treated Water Distribution Pump House. Sizing to be finalized during Design. The Finished GL of the Pump House should preferably be able to provide Positive Suction for the Treated Water Distribution Pumps.
Misc. Civil Structure	For the complete plant	Design, Procurement/ Fabrication/ Supply/ Construction/Installation, testing, inspection and Commissioning of All Civil Engineering Jobs for the complete plant for the facilities as detailed above along with Plant Room, Operator's Room, Control Room, Security Hut, Asphalt Roads for the complete plant, Generator area, Treated Water Pump House, Assembly Point, Emergency Gate, Landscaping etc.

- F. 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.
- G. 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.
- H. 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.

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I. 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 time 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.

J. 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

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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.

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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

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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 WTP 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)

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- (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: 4988 Glossary 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

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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

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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.

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- 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 site 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.

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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 be 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

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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

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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.

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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,

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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

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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 is 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

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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:

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- 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

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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

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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

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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 penetrometers 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 required shall be as given in Table 6-1.
85. Table 6-1 Size of Soil Sample Required

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 undisturbed soil sampling followed by in-situ vane shear test, followed by Standard Penetration Test.

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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

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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

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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

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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

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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.

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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
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 Specification	Characteristic Strength MPa	Elastic Modulus GPa
S 240	IS:432 Part I Mild Steel Bar	240	200

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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 (SO ₄)	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.*

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- (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

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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

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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 charging 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°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

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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

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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
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	

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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		
M20	17.16	25.50	13.24	19.61	20	quantity
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.

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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 $90^{\circ} \pm 0.5^{\circ}$.
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 $27^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 2 hours + 1/2 hr. from the time of adding water to the dry ingredients. Thereafter in clean, fresh water and kept at $27^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 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 7 days 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

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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

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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

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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:
- Fineness test
 - Test for normal consistency
 - Test for setting time
 - Test for soundness
 - Test for tensile strength
 - Test for compressive strength
 - Test for heat of hydration (by experiment and by calculations) in accordance with IS: 269.
71. Tests on Sand
- Sieve test
 - Test for organic impurities
 - Decantation test for determining clay and silt content
 - Specific gravity test
 - Test for unit weight and bulkage factor
 - Test for sieve analysis and fineness modulus.
72. Tests on coarse aggregate
- Sieve analysis
 - Specific gravity and unit weight of dry, loose and ridded aggregate
 - Soundness and alkali aggregate reactivity
 - Petrographic examination
 - Deleterious materials and organic impurities
 - 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 at 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

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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

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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

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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

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DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, INSPECTION, SUPPLY, CONSTRUCTION AND COMMISSIONING ON LSTK BASIS OF WATER TREATMENT PLANT AND ALLIED BUILDINGS AT DULIAJAN, ASSAM, INDIA	 Oil India Limited Comparing New Horizons

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 by Engineer 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 laying 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.

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DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, INSPECTION, SUPPLY, CONSTRUCTION AND COMMISSIONING ON LSTK BASIS OF WATER TREATMENT PLANT AND ALLIED BUILDINGS AT DULIAJAN, ASSAM, INDIA	 Oil India Limited Comparing Newer Horizons

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**

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DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, INSPECTION, SUPPLY, CONSTRUCTION AND COMMISSIONING ON LSTK BASIS OF WATER TREATMENT PLANT AND ALLIED BUILDINGS AT DULIAJAN, ASSAM, INDIA	 Oil India Limited Comparing Newer Horizons

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:

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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 deposited. 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

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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.

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.

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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

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	(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

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	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

PROJECT TITLE	OWNER
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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 Weldable 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.	

PROJECT DOCUMENT	OWNER
DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, INSPECTION, SUPPLY, CONSTRUCTION AND COMMISSIONING OF 8 MGD CAPACITY WATER TREATMENT PLANT ON LSTK BASIS AT DULIAJAN, ASSAM, INDIA	 Oil India Limited Oil India Limited Conquering Newer Horizons

ANNEXURE-IV

Basic Details of Instrumentation Items **wrt**

**DESIGN, ENGINEERING, PROCUREMENT,
FABRICATION, INSPECTION, SUPPLY,
CONSTRUCTION AND COMMISSIONING OF
8 MGD CAPACITY WATER TREATMENT
PLANT ON LSTK BASIS AT DULIAJAN,
ASSAM, INDIA**

PROJECT DOCUMENT	OWNER
DESIGN, ENGINEERING, PROCUREMENT, FABRICATION, INSPECTION, SUPPLY, CONSTRUCTION AND COMMISSIONING OF 8 MGD CAPACITY WATER TREATMENT PLANT ON LSTK BASIS AT DULIAJAN, ASSAM, INDIA	 Oil India Limited Oil India Limited Conquering Newer Horizons

BASIC INSTRUMENTATION LIST:

Indicative list of Instrumentation Items to be Designed, Procured/ Fabricated/Constructed, Supplied, installed, tested, inspected and commissioned for Final Commissioning of the 8 MGD WTP:

“The list of items mentioned in the SOQ/BOQ are indicative only. The Design, Supply, Installation, Testing and Commissioning of all other items as mentioned in the SCC /drawing/ contract document for completion of the plant shall be in the scope of the contractor. Contractor shall supply and execute the same without any additional cost. Also, if any other items/ tools/jobs not mentioned in contract document(SOQ/SCC/drawing etc.) but required for completion of the plant shall be in the scope of the contractor. The same shall be supplied and execute by the contractor without any additional cost.”

Sl. No.	Location	Remarks	QTY
A. WATER TREATMENT PLANT TILL TREATED WATER DISCHARGE TO TANK			
1.	Instrument Panel	As per plant philosophy	1
2.	Inlet Chamber feeding to Flash Mixer	Flow meter with recorder	1
3.	Inlet to Flash Mixer	Turbidity Meter with Recorder	1
4.	Clariflocculator underflow	Motorised Valve	1
5.	Clariflocculator	TOLA TORQUE OVER LOAD ALARM	1
6.	Poly Aluminum Chloride (PAC) /Alum dosing tank	Level switch with dry run trip of dosing pump	2
7.	Lime dosing tank	Level switch with dry run trip of dosing pump	2
8.	Submerged UF tank	Level Transmitter for flow into each cell	5
9.	Filtrate pump discharge	Pressure transmitter	7
10.	Filtrate pump discharge	Flow Controller + RecorderTo regulate permeate withdrawal from membrane	7
11.	UF Treated water discharge line	Turbidity Meter TRANSMITTER	1
12.	UF Treated water discharge line	pH indicating recorder	1
13.	UF BACK WASH PUMP	DPT with control to backwash each membrane	7
14.	BACK WASH PUMP	PRESSURE TRANSMITTER	1
15.	AIR COMPRESSURE	PRESSURE TRANSMITTER	1
16.	AIR BLOWER	PRESSURE TRANSMITTER	1
17.	Neutralization Tank	Level Transmitter	1
18.	CIP tank	Level Transmitter	1
19.	Brine Tank	Level Transmitter	1
20.	Hypo dosing pump discharge	FRC - RCIC - ORP TRANSMITTER	1

2. TREATED WATER TANK AND DISTRIBUTION SYSTEM:

1.	Treated water Tank	Level Transmitter - Radar / US type	1
2.	Treated water transfer pump discharge	Pressure Transmitter with LPS and HPS	7
3.	Treated water transfer pump discharge	Flow transmitter EMFM type for each manifold	1

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, Inspection, Supply, Construction and Commissioning of 8 MGD [Million Gallons Per Day] Capacity Water Treatment Plant on 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. a) It may be noted that as per DGMS circular & Gazette 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 need 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. 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.
- xii. 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.

- xiii. 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.
- xiv. 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.
- xv. 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.
- xvi. 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.
- xvii. Contractor's arrangements for health and safety management shall be consistent with those for the company.
- xviii. 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.
- xix. 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.
- xx. 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.
- xxi. The contractor should frame a mutually agreed bridging document between OIL & the contractor with roles and responsibilities clearly defined.
- xxii. 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.
- xxiii. 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.
- xxiv. The availability of First-Aid Fire Fighting equipment should be ensured by the Contractor at all working hours.
- xxv. Contractors/ Supervisor/ Contractor's personnel need 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).

- xxvi. 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.
- xxvii. Considering the ongoing Covid-19 pandemic, those who are engaged in the above operations should be followed the Covid-19 Protocol.
- xxviii. 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.
- xxix. Necessary cold and hot work permits including excavation clearance and permission for working at height, Confined Space Entry as applicable are to be obtained by the competent person of the Contractor before start of the job(s). Work Permit System should be inline as per guidelines issued by HSE Department.
- xxx. The Contractor's personnel should be aware about the existing as well as probable hazards and ensure their training to tackle such untoward events by the Contractor. If the Company (OIL) arranges any safety awareness program / training for the working personnel at site (company employee, Contractor worker, etc.) the Contractor will not have any objection to any such training.
- xxxi. Any requirement arise by the Statutory Authorities during the period of contract shall be applicable and binding for the Contractor.

(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 has 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 has 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 persone 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. Lockout and Tagout procedure should be followed strictly.
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, Inspection, Supply, Construction and Commissioning of 8 MGD [Million Gallons Per Day] Capacity Water Treatment Plant on 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 he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

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

.....
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. CDI0442P23

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 _____ 2022.

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. CDI0442P23

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. CDI0442P23 for **‘Hiring Services for Design, Engineering, Procurement, Fabrication, Inspection, Supply, Construction and Commissioning of 8 MGD [Million Gallons Per Day] Capacity Water Treatment Plant on 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. CDI0442P23

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.
CDI0442P23 for **'Hiring Services for Design, Engineering, Procurement,
Fabrication, Inspection, Supply, Construction and Commissioning of 8 MGD
[Million Gallons Per Day] Capacity Water Treatment Plant on 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.

BID SECURITY DECLARATION

(to be submitted on Bidder's letter head)

**To,
Oil India Limited
Contracts Department
Duliajan, Assam - 786602**

Sub: IFB No. CDI0442P23 for 'Hiring Services for Design, Engineering, Procurement, Fabrication, Inspection, Supply, Construction and Commissioning of 8 MGD [Million Gallons Per Day] Capacity Water Treatment Plant on LSTK Basis at Oil India Limited, Duliajan, Assam.'

Dear Sir,

I/We, the undersigned, declare that:

- 1.0 I/We understand that, according to your Tender conditions, bids must be supported by a 'Bid Security' in the form of a 'Bid-Securing Declaration'.
- 2.0 I/We the undersigned hereby declare that if we withdraw or modify our Bids during the period of its validity, or if we are awarded the contract and fail to sign the contract, or we fail to submit performance security before the deadline defined in the Tender document; we will be suspended for the period of two years. This suspension of two years shall be automatic without conducting any enquiry.

**Name and Signature of
Authorized Signatory and Company Seal**

**[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 Contract No. _____ to execute (Name of Contract and Brief Description of the Work) _____ (hereinafter called "the Contract").

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

AND WHEREAS we (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 TELEPHONE NO:
IFSC CODE OF THE BANK:

B. Controlling Office:

Address of the Controlling Office of the BG issuing Bank:

Contd.....P/2

Page No.2

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 be restricted up to Rs.....
- b) This guarantee shall be valid till
- c) 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).
- 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:

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 – HDFCINBBAL; 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

Page No.2

(a) PART-I	indicating the General Conditions of this Contract;
(b) PART-II	indicating the Schedule of work, unit, quantities & 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. CDI0442P23

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. 7.1) of
Tender No. CDI0442P23

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 Purchase Preference – Local Content

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 relieved 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, our 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

WITNESS NO.2

(Signature)
Full name and official address
(in legible letters)
Stamp

Attorney as per power of
Attorney No. _____
Dated _____

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, Inspection, Supply, Construction and Commissioning of 8 MGD [Million Gallons Per Day] Capacity Water Treatment Plant on LSTK Basis at Oil India Limited, Duliajan, Assam.’.**

We hereby undertake that we meet the mandatory minimum local content requirement as mandated by Ministry of Petroleum and Natural Gas, Government of India vide Notification No. FP-20013/2/2017-FP-PNG dated 17.11.2020 (or as amended from time to time). 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		

UNDERTAKING FOR WORKS INVOLVING POSSIBILITY OF SUB-CONTRACTING

(REF. CLAUSE NO. 19.6 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)

**UNDERTAKING TOWARDS COMPLIANCE OF CLAUSE NO. 19.1 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, Inspection, Supply, Construction and Commissioning of 8 MGD [Million Gallons Per Day] Capacity Water Treatment Plant on 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	Clearance/Development of Site Portion, A	-	-	-
20	SOR-2	Design And Detailed Engineering, B	-	-	-
30	SOR-3	Procurement and Supply Portion, C	-	-	-
40	SOR-4	Construction / Installation Portion, D	-	-	-
50	SOR-5	Pre-Commissioning, Mechanical Completion & Commissioning Portion, E	-	-	-
60	SOR-6	Reliability Run/ Site Acceptance Test Portion, F	-	-	-
TOTAL EST. CONTRACT VALUE = A+B+C+D+E+F			-	-	-
			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, 4, 5 and 6 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, 5 and 6. The SOR-Summary shall reflect the total of SOR's – 1, 2, 3, 4, 5 and 6.

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		Clearance/Development of site by demolishing an old 1.5 MGD WTP located at the site of 8 MGD WTP to be constructed as per details of bid document.			
Sl No.	Description of Items	UOM	Qty	Unit Rate (₹) (Ex GST)	Total (₹) (Ex GST)
1	Decommissioning, Removal, Lifting and Transportation of Mechanical Equipment & Piping.	Lumpsum	1		-
2	Decommissioning, Removal, Lifting and Transportation of Electrical Equipment & Cabling.	Lumpsum	1		-
3	Demolition Removal, Lifting and Transportation of Civil Structures.	Lumpsum	1		-
4	Site Clearance/ Site Development for construction of 8 MGD WTP	Lumpsum	1		-
TOTAL - Exclusive GST (₹)					-
Applicable GST Rate (in %)					
GST Amount (₹)					-
TOTAL - Inclusive of GST (₹)					-

FORM		SOR-2			
NAME OF WORK		Design and Detailed Engineering of 8 MGD capacity Water Treatment Plant (WTP) as per details of bid document.			
S1 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-3			
NAME OF WORK		Procurement and Supply Portion of 8 MGD capacity Water Treatment Plant (WTP) as per details of bid document.			
Sl No.	Description of Items	UOM	Qty	Unit Rate (₹) (Ex GST)	Total (₹) (Ex GST)
1	Procurement for Civil Engineering Portion.	Lumpsum	1		-
2	Procurement for Mechanical & Plant Piping Portion.	Lumpsum	1		-
3	Procurement for Electrical Engineering Portion .	Lumpsum	1		-
4	Procurement for Instrumentation Engineering Portion.	Lumpsum	1		-
TOTAL - Exclusive GST (₹)					-
Applicable GST Rate (in %)					
GST Amount (₹)					-
TOTAL - Inclusive of GST (₹)					-

FORM		SOR-4			
NAME OF WORK		Construction/Installation Portion of 8 MGD capacity Water Treatment Plant (WTP) as per details of bid document.			
S1 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	Installation of Electrical Engineering Portion.	Lumpsum	1		-
4	Installation of Instrumentation Engineering Portion.	Lumpsum	1		-
TOTAL - Exclusive GST (₹)					-
Applicable GST Rate (in %)					
GST Amount (₹)					-
TOTAL - Inclusive of GST (₹)					-

FORM		SOR-5			
NAME OF WORK		Pre-Commissioning, Mechanical Completion & Commissioning Portion of 8 MGD capacity Water Treatment Plant (WTP) as per details of bid document.			
S1 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		-
TOTAL - Exclusive GST (₹)					-
Applicable GST Rate (in %)					
GST Amount (₹)					-
TOTAL - Inclusive of GST (₹)					-

FORM		SOR-6			
NAME OF WORK		Six (06) months of reliability run/site acceptance test portion of 8 MGD capacity Water Treatment Plant (WTP) as per details of bid document.			
Sl No.	Description of Items	UOM	Qty	Unit Rate (₹) (Ex GST)	Total (₹) (Ex GST)
1	Reliability Run/Site Acceptance Test [O&M, HSE Compliance Expenses, Spares & Consumables Elements etc. for six (06) 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 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 policy linked with Local Content (PP-LC) notified vide Letter No. FP-20013/2/2017-FP-PNG dated 17.12.0020 by - MoPNG (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 PP-LC 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 shall be summarily 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 in the Government Notification No. FP20013/2/2017-FP-PNG dated 17th November, 2020 for PP-LC. (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: Bidder must have experience of executing at least one 'SIMILAR WORK' of minimum value ₹ 39,00,00,000.00 (Rupees Thirty-Nine Crore) only in previous 10 (ten) years reckoned from the original bid closing date in PSU/Govt. Organization/ Public Limited Company/Municipalities.			
3	Note to BEC-BRC Clause No. 2.1	'SIMILAR WORK' mentioned above means experience in successful completion of "Water Treatment Plant for Producing Potable Water of Minimum Capacity 4 MGD (Million Gallons per Day, the Unit of Measurement is Imperial Gallons, i.e. 1 Gallon = 4.54 Liters) with turbidity value of less than 1 NTU in the final treated /output water inclusive of Detailed Engineering Design, inspection, supply, construction, installation, commissioning of all Civil, Mechanical, Electrical, Instrumentation Engineering components".			

4	BEC-BRC CLAUSE NO. 2.2	The Bidder must provide an undertaking (as per Annexure-1 to BEC-BRC) in writing confirming to the Clause No: 16.0 (EPC Contractor's Personnel and Office) of the Project Document.			
5	BEC-BRC CLAUSE NO. 2.3	The bidder must provide the list of projects where they have successfully accomplished 'Similar Work' (as defined above under Note to BEC-BRC Clause No. 2.1) clearly indicating the Project Name, Client's name & Industry, Brief Scope of Work, Contract value, Contractual & Actual completion date with completion certificates, Client Representative & Contact details, Reasons for delay in completion (if any).			
6	BEC-BRC CLAUSE NO. 2.4	Engineering and Design Capability: The bidder should have in-house design and engineering capability for such EPC job. The bidder should provide their in-house set up for design and engineering with the details of their personnel who are on regular pay roll of the bidder. The CV of all such personnel should also be submitted with the bid.			
7	BEC-BRC CLAUSE NO. 2.5	Project Management: The bidder should provide along with the bid the details of the project management, inspection & expediting & quality management team of the bidder who will be involved in managing the planning, execution of the project activities and supervising the construction work progress at site meeting all the quality requirements. The bidder should provide their in-house set up for project management, inspection & expediting & quality management team with the details of their			

		personnel who are on regular pay roll of the bidder. The CV of such personnel should also be submitted with the bid.			
8	BEC-BRC CLAUSE NO. 2.6	Bidder 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 should be made with approval of client (OIL) by personnel of equivalent experience or more.			
9	BEC-BRC CLAUSE NO. 2.7	Bidder should submit the list of software available with them for carrying in-house engineering & Project planning and reporting. However, the following minimum engineering software's required for carrying out detail engineering has to be owned by bidder and license copy details of the same in name of bidder must be submitted to OIL along with bid. List is as enclosed. a) Piping network analysis - PIPENET, AFT or equivalent b) 3D modeling (piping, electrical, instrumentation & Structural) - PDMS V12.1 SP4 or equivalent c) All 2D drawings - AUTOCAD or equivalent d) Structural analysis and design - STAAD PRO or SAACS or equivalent e) Pipe stress analysis - CAESAR V7.3 or equivalent f) Project management tool - MS Projects or Primavera or equivalent			
10	BEC-BRC CLAUSE NO. 3.0	In case the bidder is a Consortium of Companies, the following requirement should be satisfied by the bidder:			

		a) One of the member should be leader of the consortium as per MOU of the consortium. b) Leader of the consortium member individually should meet the Technical Criteria as per Clause No: 2.1 above. c) The other members of the consortium should have commensurating work experience for the division of work. d) The leader of the consortium must submit bid on behalf of consortium of bidders. Consortium bids shall be submitted with a Memorandum of Understanding among the consortium members duly executed by the Authorized Executives of the consortium members and notarized. Such MOU/Agreement should be addressed to the Company, clearly stating that the MOU/ Agreement is applicable to this Tender and shall be binding on them for the entire contract period, including extension, if any. This MOU must accompany the technical bid which should clearly define the role/scope of work of each partner/member and should clearly define the leader of consortium. Memorandum of Understanding (MOU) must also state that all the members of consortium shall be jointly and severally responsible for discharging all obligations under the contract. However, the leader of the consortium must submit an undertaking along with the technical bid towards unconditional acceptance of full responsibility for executing the 'scope of work' of this bid document. The following provisions should also be incorporated in the MOU executed by the members of the Consortium: i. Only the leader of the consortium shall register in the E-portal and submit bid on behalf of the consortium.			

		The other members of the consortium shall ratify all the acts and decisions of the leader of consortium, which are taken in connection with and/or during the evaluation of the tender and execution of the contract. ii. The bid security declaration shall be furnished by the leader of the consortium on behalf of consortium with specific reference to consortium bid and name & address of consortium members The performance security shall be in the name of the leader on behalf of the consortium. iii. The leader of the consortium on behalf of the consortium shall coordinate with OIL during the period the bid is under evaluation as well as during the execution of works in the event contract is awarded and he shall also be responsible for resolving dispute/misunderstanding/undefined activities, if any, amongst all the consortium members. iv. The Leader of the Consortium shall be authorized to incur liabilities and receive instructions for and on behalf of the Consortium. v. The leader of consortium shall take full responsibility for performance of the contract. vi. Each member in a consortium shall be a legal entity and not an individual person. vii. The division in scope of work among Consortium Members shall commensurate with their past experience. The overall Project Management shall be performed by the Leader. All Members of the Consortium shall assume responsibility jointly and severally and shall submit Agreement/MOU along with the Bid clearly defining the scope and			

		responsibility of each member along with nomination of the Leader. This Agreement/MOU must remain in force at least till the end of Defects Liability Period and shall be extended if required as per the Company's advice. viii. The Consortium Leader and the distribution of work will be identified and set forth in the bid and will not be permitted to change thereafter without the consent of the Company. ix. No change in project plans, time tables or pricing will be permitted as a consequence of any withdrawal or failure to perform by a Consortium Member. x. Any correspondence exchanged with the leader of consortium shall be binding on all the consortium/joint venture members. xi. Payment shall be made by OIL only to the leader of the consortium towards fulfilment of contract obligations. xii. In case of consortium bids, the bid shall be digitally signed by the leader of consortium. The power of attorney from each member authorizing the leader for signing and submission of Bid on behalf of individual member must accompany the Bid. xiii. Documents/details submitted with the bidding document pertaining to qualification of the BIDDER must be furnished by each partner/member of consortium and should be complete in all respects clearly bringing up their experience especially in the form of work in their scope. xiv. Constitution of Consortium: The members of the consortium should not be more than three. If during evaluation of bid, a consortium leader proposes any			

		alterations/changes in the constitution or replacement or inclusion or expulsion of any partner(s)/member(s) of the consortium 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 consortium shall be liable for rejection. xv. Signing of Contract: In the event of award of contract to the consortium, the contract is to be signed by the members of the consortium and the liability of each one of them shall be jointly and severally. xvi. Members of the consortium are not allowed to quote separately/independently against this tender. All the bids received in such case will be summarily rejected. Further, all bids from parties with technical support from the same principal/Subsidiary/Co-Subsidiary/Sister subsidiary will be rejected. xvii. Certified copies (attested by Director/Company Secretary) of Board resolutions passed by respective Board of Directors of the companies (Consortium leader and members) agreeing to entering into such consortium with each other for submission of bid for the NIT and authorizing designated executives of each company to sign in the MOU to be provided along with the technical bid. xviii. The MOU/Agreement should be legally valid i.e. it should be on a non-judicial stamp paper and notarized. In case of involvement of overseas bidder/consortium partner, the MOU/Agreement should be notarized/endorsed by Indian Embassy.			

11	BEC-BRC Clause No. 4.1	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.			
12	BEC-BRC Clause No. 4.2	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.			
13	BEC-BRC Clause No. 4.3	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.			
14	BEC-BRC Clause No. 4.4	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.			
15	BEC-BRC Clause No. 5.0	1. For proof of requisite Experience (refer Clause No. 2.1), the following documents/ photocopy (self-attested/attested) must be submitted along with the bid: A. Contract document showing details of work, AND B. Completion certificate(s) or Payment certificate(s) issued by the client(s) for the			

		above contract or any other document(s), which can substantiate the successful execution of work. The submitted document(s) must contain the following: (i) Nature of job done and Work Order No. / Contract No. (ii) Gross Value of Work Done. (iii) Contract period and date of completion.			
		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. Following work experience will also be taken into consideration: (i) If the prospective bidder has executed a contract in which similar work is a component of the contract. • In case the document submitted as per Point No. 1 above, are not sufficient to establish the value/quantity/period of the similar work against Para 3 (i), above the bidder shall also have to submit the breakup of the works executed under such contract(s) clearly indicating the value/quantity/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).			
		SIMILAR work executed by a bidder for its own organization/subsidiary cannot be considered as experience for the purpose of meeting BEC.			
		The documents establishing experience of the JV or its member (as the case may be) shall be submitted as per Point 1/3 above.			
		NB: Any Documents submitted in languages other than English must have to be accompanied by a Notarized translation of the Same to English.			
16	BEC-BRC CLAUSE NO. 6.1	Time is the essence of this project. Completion period for the Main LSTK-EPC work is 20 Months from completion of mobilization period. Offers without confirmation of Completion period for the Main LSTK-EPC work of 20 Months or with Completion period for the Main LSTK-EPC work more than 20 Months will be summarily rejected.			
17	BEC-BRC CLAUSE NO. 6.2	During the tenure of the Project timeline of 26 Months and 15 days (15 days of Mobilization, 20 months of Main LSTK-EPC Contract and 06 Months of Reliability Run/Sit Acceptance test), OIL will be engaging a PMC contractor for assisting OIL in project execution and monitoring the project. Since, PMC Contract will be engaged by OIL for the entire project duration, in the event of failure on the part of EPC contractor to complete the project on time i.e. within the project completion period of 26 months and 15 days from the date of issue of LOA, the extra expenditure on PMC Contractor towards the extended period [attributable to EPC Contractor] will be recovered from the EPC			

		Contractor.												
18	BEC-BRC CLAUSE NO. 7.1	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 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 ₹ 18,00,00,000.00 (Rupees Eighteen Crore) 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).</td></tr><tr><td>2</td><td>Net worth</td><td>Net Worth of the bidder should be minimum ₹ 5,40,00,000.00 (Rupees Five Crore and Forty Lakh) only as</td></tr></table>	Sl. No	Parameter	Financial Criteria	1	Annual 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 ₹ 18,00,00,000.00 (Rupees Eighteen Crore) 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 ₹ 5,40,00,000.00 (Rupees Five Crore and Forty Lakh) only as			
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2	Net worth	Net Worth of the bidder should be minimum ₹ 5,40,00,000.00 (Rupees Five Crore and Forty Lakh) 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."			
19	Notes to BEC-BRC Clause No. 7.1	1) For proof of Annual Turnover & Net worth any one of the following document must be submitted along with the bid: (i) A certificate* issued by a practicing Chartered / Cost Accountant (with Membership Number and Firm Registration Number), 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 has to 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) In case of Consortium of companies: (i) The Annual Financial Turnover from operations of at least one member of the consortium in any of preceding 03 (three) financial / accounting years, reckoned from the original bid closing date should be minimum ₹ 18,00,00,000.00 (Rupees Eighteen Crore) only and the other members of consortium should have Annual Financial Turnover of minimum ₹ 9,00,00,000.00 (Rupees Nine Crore) only in any of preceding 03 (three) financial / accounting years, reckoned from the original bid closing date. (ii) Similarly, in case of consortium bidding the Net Worth of all the consortium partners individually should be positive and cumulative Net worth should be minimum ₹ 5,40,00,000.00 (Rupees Five Crore and Forty Lakh) only for the accounting year preceding the original bid closing date.			
		5) In case of Incorporated Joint Venture: In case the bidder is an Incorporated Joint Venture company, who does not meet financial criteria by itself and submits bid based on the financial strength of its member having more than 50% stake in the JV, then documents need to be			

		submitted along with the technical bid in support of the following: (i) Annual Financial Turnover from operations of the member having more than 50% stake in the JV during any of preceding 03 (Three) financial/accounting years from the original bid closing date should be minimum ₹ 18,00,00,000.00 (Rupees Eighteen Crore) only. (ii) Net worth of the member having more than 50% stake in the JV (supporting company) should be minimum ₹ 5,40,00,000.00 (Rupees Five Crore and Forty Lakh) only for the accounting year preceding the original bid closing date. (iii) 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 (iv) 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.			

20	BEC-BRC CLAUSE NO. 7.2	a) The Bidder should have minimum working capital equal to ₹ 5,40,00,000.00 (Rupees Five Crore and Forty Lakh) only as per immediate preceding audited financial year result. b) Similarly, in case of consortium bidding the minimum cumulative working capital should be equal to ₹ 5,40,00,000.00 (Rupees Five Crore and Forty Lakh) only for the accounting year preceding the original bid closing date. c) Similarly, in case the bidder is an Incorporated Joint Venture company, who does not meet financial criteria by itself and submits bid based on the financial strength of its member having more than 50% stake in the JV, then the member having more than 50% stake in the JV should have minimum working capital equal to ₹ 5,40,00,000.00 (Rupees Five Crore and Forty Lakh) only as per immediate preceding audited financial year result. d) 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-3.] e) In the event of award, the contractor shall open a project specific account in a nationalized bank located in the vicinity where the project is executed. The contractor shall deposit an amount equal to 10% of the annualized contract value within 15 days from the date of issue of LOA. All payment against the contract shall be remitted to the project specific account. Any withdrawal from this account shall be only after the first payment against the contract is made by OIL. [An undertaking is to be submitted by the bidder as part of the offer conforming to comply on opening of bank account, 10% deposit and minimum balance] f) At any point of time the minimum balance after first remittance by OIL against invoice from the contractor shall remain 5% of the annualized contract value. Note: Working Capital shall mean "Current Assets minus			

		Current liabilities” as per latest year’s audited consolidated annual Financial Statements.			
21	BEC-BRC CLAUSE NO. 7.3	Bid Capacity: The bidding capacity of the contractor or cumulative bidding capacity of the consortium should be equal to or more than ₹ 36,00,00,000.00 (Rupees Thirty-Six Crore) 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-4. Note: In case the bidder is an Incorporated Joint Venture company, who does not meet financial criteria by itself and submits bid based on the financial strength of its member having more than 50% stake in the JV, then the bidding capacity of the member having more than 50% stake in the JV should be equal to or more than ₹ 36,00,00,000.00 (Rupees Thirty-Six Crore) only.			
22	BEC-BRC CLAUSE NO. 7.4	Debt equity ratio: Debt equity ratio of the bidder or all consortium partners should not be more than 2:1. In case the bidder is an Incorporated Joint Venture company, who does not meet financial criteria by itself and submits bid based on the financial strength of its member having more than 50% stake in the JV, then the debt equity ratio of the			

		member having more than 50% stake in the JV should not be more than 2:1. Debt equity ratio shall mean long term borrowings/ Net-worth.			
23	BEC-BRC CLAUSE No. 7.5	OIL reserves the right to ask for any Original or other relevant document to verify the certification.			
24	BEC-BRC CLAUSE NO. 8.1	Bids arte 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.			
25	BEC-BRC CLAUSE NO. 8.2	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.			
26	BEC-BRC CLAUSE NO. 8.3	Bid Security is not applicable against this tender. However, bidders shall submit along with their bid a signed “Bid Securing Declaration” (Proforma V) accepting that, if they withdraw or modify their bids during the period of validity; or if they are awarded the contract and they fail to sign the contract; or if they fail to submit performance security before the deadline defined in the NIT; they will be suspended for the period of two years. This suspension of two years shall be automatic without conducting any enquiry.			

27	BEC-BRC CLAUSE NO. 8.4	Bid Documents / User Id & Password for OIL's E-Tender portal are not transferable.			
28	BEC-BRC CLAUSE NO. 8.5	Any bid received in the form of Physical document/ Telex/ Cable/ Fax/ E-mail will not be accepted.			
29	BEC-BRC CLAUSE NO. 8.6	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.			
30	BEC-BRC CLAUSE NO. 8.7	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.			
31	BEC-BRC CLAUSE NO. 8.8	Any bid containing false statement will be rejected and action will be taken by Company as per Bid Document.			
32	BEC-BRC CLAUSE NO. 8.9	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" .			
33	BEC-BRC CLAUSE NO.8.10	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			
34	BEC-BRC CLAUSE NO. 8.11	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.			
35	BEC-BRC CLAUSE NO. 8.12	Bid received with validity of offer less than 120 (One Hundred Twenty) days from Bid Closing Date.			
36	BEC-BRC CLAUSE NO. 8.13	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			
37	BEC-BRC CLAUSE NO. 9.1	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.			
38	BEC-BRC CLAUSE NO. 9.2	The bidders must quote their prices in the manner as called for vide Part-II, Schedule of Rates (SOR) i.e. SOR-1 for Clearance/Development of Site Portion. SOR-2 for Design and Detailed Engineering. SOR-3 for Procurement and Supply Portion. SOR-4 for Construction / Installation Portion. SOR-5 for Pre-Commissioning, Mechanical Completion & Commissioning Portion. SOR-6 for Reliability Run/ Site Acceptance Test Portion. SOR-Summary - Total of SOR-1, SOR-2, SOR-3, SOR-4, SOR-5 and SOR-6.			
39	BEC-BRC CLAUSE NO. 9.3	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, 5 and 6 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, 5 and 6. The SOR-Summary shall reflect the total of SOR's – 1, 2, 3, 4, 5 and 6.			

40	BEC-BRC CLAUSE NO. 9.4	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, 5 and 6 which will be considered for evaluation of the bid.			
41	BEC-BRC CLAUSE NO. 9.5	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.			
42	BEC-BRC CLAUSE NO. 9.6	Based on the evaluation of techno-commercially qualified bidders, the job will be awarded to the L-1 bidder.			
43	BEC-BRC CLAUSE NO. 9.7	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.			
44	BEC-BRC CLAUSE NO. 9.8	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.			
45	BEC-BRC CLAUSE NO. 9.9	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.			
46	BEC-BRC CLAUSE NO. 9.10	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.			
47	BEC-BRC CLAUSE NO. 9.11	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.			
48	BEC-BRC CLAUSE NO. 10.1	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.			
49	BEC-BRC CLAUSE NO. 10.2	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.			
50	BEC-BRC CLAUSE NO. 10.3	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.			

51	BEC-BRC CLAUSE NO. 10.4	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.			
52	BEC-BRC CLAUSE NO. 10.5	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.			
53	BEC-BRC CLAUSE NO. 10.6	The originals of such documents [furnished by bidder(s)] shall have to be produced by bidder(s) to OIL as and when asked for.			
54	BEC-BRC CLAUSE NO. 11	PURCHASE PREFERENCE POLICY (LINKED WITH LOCAL CONTENT) (PP-LC): Purchase preference policy-linked with Local Content (PP-LC) notified vide letter No. FP20013/2/2017-FP-PNG dated 17th November, 2020 of MoPNG shall be applicable in this tender. Bidders to check the provisions of the Notification for their eligibility to bid and seek benefits for Purchase preference, accordingly. Purchase preference will be applicable as per the Notification(s) and any amendment thereof. Bidders seeking benefits, under Purchase Preference Policy (linked with Local Content) (PP-LC) shall have to comply with all the provisions of the notification No. FP20013/2/2017-FP-PNG dated 17th November, 2020 or subsequent amendments, if any. 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 the amount of Performance Security towards fulfilment of conditions pertaining to Local Contents in accordance with the value mentioned in the			

		certificate of LC.																					
55	BEC-BRC CLAUSE NO. 12.1	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 GL- Oil & Gas)</td><td>a. mangesh.gaonkar@dnvgl.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></table>	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 GL- Oil & Gas)	a. mangesh.gaonkar@dnvgl.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			
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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			
56	BEC-BRC CLAUSE NO. 12.2	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 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.				
57	BEC-BRC CLAUSE NO. 12.3	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.			
58	BEC-BRC CLAUSE NO. 12.4	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 empanelled 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 empanelled 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 empanelled 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: • Check Bidder's PAN Card • Check Bidder's GST Certificate • Check ITR of company • Check Bidder's Certificate of Incorporation – Domestic Bidder. ➤ Additional Documents: (If applicable against the tender) • Joint Ventures Agreements – To cross-check with JV Partners • Consortium Agreements – To cross-check with Consortium Partners • Holding/Parent/Subsidiary/Sister Subsidiary/Co-Subsidiary Company – To check the Share Holding pattern ➤ Technical Criteria • To check Experience Proof • To Check the Completion Certificates – Letter of Appreciations of proper Execution • Reference contact verification and true copy verification • To check Original Work Order/Contract Copy • To check any other document(s), if called for vide BEC/BRC of the Tender. ➤ Financial Criteria • Check and verify Audited Balance Sheet/CA certificate – Turnover & Net Worth. • Check Notarization validity, if any • To check the Line of Credit, if incorporated in the tender.			

59	Note Under BEC-BRC Clause No. 12	Note: If any documents LOI/LOA/Contracts etc. are submitted towards BEC/BRC experience criteria issued by Oil India Limited, such documents need not be verified by TPI agency.			
60	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.			

Bidder's Name: _____**TENDER NO. CDI0442P23**

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 Declaration 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 (Linked With Local Content) (PP-LC)? (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 _____