



**IRRIGATION AND WATERWAYS DIRECTORATE  
GOVERNMENT OF WEST BENGAL  
MECHANICAL & ELECTRICAL DIVISION, MIDNAPORE  
Khasjungle, P.O-Abas, District- Paschim Medinipur, Pin: 721102**

Memo No: 39/10E-1

Date: 04.02.2025.

**[Invitation for Expression of Interest for Budgetary Quotation]**

**EOI No: - WBIW/EE/MEDM/e-E.O.I.-02/2024-25**

**Critical Dates of this E.O.I:**

<b>Sl. No.</b>	<b>Particulars</b>	<b>Dates</b>
<b>01</b>	<b>Start Date of Issuance of EOI Document</b>	<b><u>08.02.2025</u></b>
<b>02</b>	<b>Last date of submission of Queries</b>	<b><u>18.02.2025</u></b>
<b>03</b>	<b>Pre bid meeting</b>	<b><u>20.02.2025</u></b>
<b>05</b>	<b>Last Date of Issuance EOI Document</b>	<b><u>10.03.2025</u></b>
<b>06</b>	<b>Last Date and time for Submission of EOI</b>	<b><u>10.03.2025</u></b>
<b>07</b>	<b>Date of Opening</b>	<b><u>12.03.2025</u></b>

**NAME OF THE WORK:**

“Supply, installation, testing and commissioning including trial run and one year successful operation and maintenance of Eight (8) nos. Column Mounted Mixed Flow Submersible pump of capacity 25 Cusec (2550 M<sup>3</sup>/Hr) (each) along with electromechanical installation, Piping, valves, sluice gates (Draw & Flap) including its hoisting arrangements etc complete for proposed pump house with sluice over Dudher Bundh Khal out falling in river Silabati at Ward No.9 of Ghatal Municipality, in connection with the work of Ghatal Master plan in the District of Paschim Medinipur.”

**EXECUTING DIVISION: Mechanical & Electrical Division, Midnapore.**

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## SECTION-I

### **1.0 Invitation for EOI /Single stage of Bidding**

The Executive Engineer, Mechanical & Electrical Division, Midnapore (Nodal officer) invites EOI (for budgetary quote) from prospective bidders for the work **“Supply, installation, testing and commissioning including trial run and one year successful operation and maintenance of Eight (8) nos. Column Mounted Mixed Flow Submersible pump of capacity 25 Cusec (2550 M<sup>3</sup>/Hr) (each) along with electromechanical installation, Piping, valves, sluice gates (Draw & Flap) including its hoisting arrangements etc complete for proposed pump house with sluice over Dudher Bundh Khal out falling in river Silabati at Ward No.9 of Ghatal Municipality, in connection with the work of Ghatal Master plan in the District of Paschim Medinipur”**.

Executive Engineer, Mechanical & Electrical Division, Midnapore seeks EOI for budgetary quotes (estimating purpose) from Bidders of repute for the above work from Bidders whose the pre-qualification criteria specified in this document will be short-listed to have comparison of cost between various prospective bidder.

**A tentative BOQ, Scope of work & Technical specification and additional contract information are being included along with this EOI to conceive the work as a whole so that bidders may quote their rate against this EOI (for budgetary quote) on realistic basis. Bidders are requested to go through it carefully as same will be integral part in the formal request for e-NIT documents and subsequent contract agreement which will be brought out by the Superintending Engineer, South West Mechanical & Electrical Circle, Durgapur-2, Burdwan in later stage after obtaining administrative approval of the work.**

### **2.0 Brief Description of the Project:**

Proposed pumping station with sluice is set to be constructed over Dudher Bundh Khal out falling in river Silabati at Ward No.9 of Ghatal Municipality, in connection with the work of Ghatal Master plan in the District of Paschim Medinipur. Geo Location (Lat& Long in degree) are (22.672734N, 87.754001 E).

Ghatal Municipality is topographically low-lying area and it is bounded by two nos closed-circuit embankment, called Ghatal Circuit embankment & Chetua Circuit embankment. Ghatal Circuit embankment is situated in the left side Silabati River. During rainy season, the inside area of Ghatal circuit embankment gets inundated. These storm/ flood water not get drained for several days due to high discharge level of Silabati River and Drainage congestion occurs.

Objective of this proposed pump house cum sluice is to drain out rain & flood water accumulated inside of Ghatal circuit embankment to the Silabati River, thereby giving relief to the inhabitants of this Municipal Area. Capacity of this Pumping station shall be 150 Cusec comprising of 08 Nos (including 02 Nos standby) 25 Cusec (110 KW Motor) Column mounted, non-clog, mixed flow type Submersible pump. There will be 03 vent sluice along with this pump house.

A drawing of civil structure of this pump house cum sluice is attached herewith.

### **3. Instructions to Bidders:**

3.1 Bidders are advised to study all instructions, B.O.Q, forms, terms, requirements and other information in the EOI documents carefully. Submission of the bid shall be deemed to have been done after careful study and examination of the E.O.I documents with full understanding of its implications. **Rate should be quoted inclusive of all taxes and duties.**

3.2 The response to this E.O.I should be full and complete in all respects. Failure to furnish all information required by the E.O.I documents or submission of a proposal not substantially responsive to the E.O.I documents in every respect will be at the bidder's risk and may result in rejection of its proposal.

3.3 For better understanding of work, scope of work & technical specification and additional contract documents as per our preliminary assessment are given for better understanding of the project. In this stage bidder are requested to propose their work description, with quoting rate, so that in later stage under detailed NIT, complete & revised scope of work & technical specification and additional contract documents may be enclosed, so that bid may be evaluated on equal footing.

3.4 The Bidder shall be deemed to be fully conversant with the site conditions and the nature and complexity of the work to be undertaken and considering all eventualities which can arise before, during and after project execution.

3.5 Bid validity shall be 150 days.

#### **4.0 EOI proposal preparation, costs & related issues:**

4.1 The Bidder is responsible for all costs incurred in connection with participation in this process, including, but not limited to, costs incurred in conduct of informative and other diligence activities, participation in meetings/discussions/presentations, preparation of proposal, in providing any additional information required by this office to facilitate the evaluation process, unless explicitly specified to the contrary.

Department will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

4.2 These Expression of Interest (EOI) are purely for estimation purpose and to know the present market rate and under no circumstance, It shall be construed as quotation for placing the supply order. For competitive bidding separate notice inviting Tender will be published.

#### **5.0 Pre-bid Meeting**

Superintending Engineer, South-west Mechanical & Electrical Circle, shall hold a pre-bid meeting with the prospective Bidders on 20.02.2025 at 13:00 Hrs at O/O Office of the Superintending Engineer, South-West Mechanical & Electrical Circle, DVC New Colony, Durgapur-2, Paschim Bardhaman, Pin- 713202. The Bidders will ensure that their queries with regard to the EOI to the following address through E-mail on or before 18.02.2025 at 14:00 Hrs.

Office of the Executive Engineer  
Mechanical & Electrical Division, Midnapore,  
Khasjungle, P.O-Abas, District- Paschim Medinipur.  
Pin: 721102  
E-mail: ee.midmched-wb@wbiwd.gov.in, medm.midnapur@gmail.com  
Mobile: 9475851824

## **6.0 Responses to pre-bid queries and issue of corrigendum:**

EOI issuing authority will endeavour to provide timely response to all queries. However, the department makes no representation or warranty as to the completeness or accuracy of any response made in good faith.

6.1 At any time prior to the last date for receipt of bids, EOI inviting authority may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the EOI document by issuing a corrigendum.

6.2 The corrigendum (if any) & clarifications to the queries from all Bidders will be posted on the <<https://wbtenders.gov.in>>, ([www.wbiwd.gov.in](http://www.wbiwd.gov.in)) and emailed to all participants of the pre -bid conference.

6.3 Any such corrigendum shall be deemed to be incorporated into this EOI.

6.4 In order to afford prospective Bidders reasonable time in which to take the corrigendum into account in preparation of their bids, Purchaser may, at it's discretion, extend the last date for the receipt of EOI Bids.

## **7.0 Right to terminate the EOI Process:**

7.1 EOI issuing authority may terminate the EOI process at any time without assigning any reason. EOI issuing authority makes no commitments, expression or implied that this process will result in a business transaction with anyone.

## **8.0 Bid Submission Procedure**

<Option 1: In case of Online Submission on e-Procurement portal>

Bidders should submit their responses to an e-EOI as per the procedure specified in the designated Government of West Bengal tender website having URL <https://wbtenders.gov.in>, which is being used for this purpose. The e-tender can be searched by typing WBIW/EE in the search engine provided in the website/s.

The bidder must ensure that the bid is digitally signed by the Authorized Signatory of the bidding firm and has been duly submitted (freezed) within the submission timelines. The Department will in no case be responsible if the bid is not submitted online within the specified timelines.



All documents uploaded by the Tender Inviting Authority forms an integral part of the works contract in the latter stage. Contractors/bidders are required to upload the entire tender documents, bidder's technical proposal/ specification in relation to buyer's requirement along with all other relevant Eligibility & PQ Credential documents as asked for in the e-EOI, electronically, through the above portal within the stipulated date and time as notified in the e-EOI. Bids are to be submitted in two parts/folders at the same time, one being 'Technical Proposal' and the other 'Financial Proposal'.

The contractor/bidder should carefully go through all the documents of the e-EOI and upload the scanned copies of his/her/their original documents in 'Portable Document Format' (PDF) files in the designated links in the web portal as their 'Technical Bid' in the respective folder as below.

1. EOI-This EOI documents.
2. Forms: Application for e-EOI (Form-1)
3. Technical specification: Bidders' offer of technical specification as sought in 'Guaranteed technical particular sheet' available in this document along with GA drawing, pump curves, motor performance curves, QAP and other documents etc.
4. Drawing: Drawing attached with this EOI
5. My document: Other important Document (OID) for eligibility & pre-qualification credential.

He/she needs to fill up the financial offer/bid price /rates in the downloaded BOQ of the work in the designated cell in 'Excel sheet only', and upload the same in the designated link (BOQ folder) of the portal as their 'Financial Bid'.

Documents uploaded are virus scanned and required to be digitally signed using their 'Digital Signature Certificates' (DSC). Contractors/bidders should especially take note of all the Addenda or Corrigenda notices related to the e-EOI and upload all these documents forming a part of their e-bid as tender document. Documents digitally signed and uploaded in the e-Tender portal by the contractors/bidders containing requisite information & financial bid/rate comprising 'Technical bid' and 'Financial bid' are submitted concurrently, which cannot be changed after end date and time fixed for submission of the e-EOI.

OR

<Option 2: In case of physical submission of bids at office of Executive Engineer >

- a. All the documents except BOQ, sought in “Option-1” are required to be downloaded from the e-tender portal.
- b. These documents are to be duly filled (wherever applicable) & signed by bidder or its authorised representative.
- c. Technical specification i.e Bidders’ offer of technical specification, other important Document (OID) for eligibility & pre-qualification credential are required submitted duly signed.
- d. Bids shall be submitted in a single sealed envelope and superscripted<Name of the Work >and<Reference EOI No.>.This envelope should contain two hard copies of EOI proposal marked as “First Copy” and “Second Copy”. Bids are to be dropped in tender box kept in the O/O Executive Engineer, Mechanical & Electrical Division, Midnapore.
- e. Bidder shall submit their rate item wise (financial proposal) in the BOQ format attached with this document. **This is also to note that there are few items in this attached BOQ, of which rates are already available with the department, are marked as “need not to be quoted.” Rates for remaining items are required to be quoted by the bidders for framing the estimate for the work as a whole and placement to the department subsequently for administrative approval.**
- f. Envelope should indicate clearly the name, address, telephone number, E-Mail ID and fax number of the Bidder.
- g. Each copy of the EOI should be a complete document and all the pages of the Proposal document must be sequentially numbered and must contain the list of contents and shall be initialled by an authorized representative of the Bidder. Any deficiency in the documentation may result in the rejection of the Bidder’s Proposal.
- h. Different copies must be bound separately.

- i. EOI document submitted by the Bidder should be concise and contain only relevant information as required under the EOI.

**9.0 My Document [OID Cover]: Eligibility & Pre-qualification (PQ) criteria**

Sl. No	Category	Description/Documents
01.	Certificates	<p>1. Latest Professional Tax Payment Certificate (PTPC) or, PT deposits challan for current financial year or Government Order for exemption in other States where ever applicable.</p> <p>2. Valid PAN Card in the name of bidder/organisation</p> <p>3. Income Tax Return of current Assessment year or, IT Return of immediate preceding Assessment year whichever latest available.</p> <p>4. Valid GSTIN under GST Act &amp; Rules</p>
02.	Company Detail	<p>1. For Proprietorship Firms, Partnership Firms, Registered Companies, Registered Cooperative Societies, valid Joint Venture or Consortiums Valid Trade License/ acknowledgement or Receipt of application for Trade License Revalidation.</p> <p>2. For Partnership Firms: Legally valid Partnership Deed, Form-VIII/ Memorandum of Registration of Registrar of Firms</p> <p>3. For Companies: Incorporation Certificate, Memorandum of Articles of ROC, List of current owners/ Directors/Board Members</p> <p>4. For State Registered Co-operative Societies: Society Registration certificate from ARCS of the State, Society by-Laws, latest available Auditor's Report of Directorate of Co-operative Audit within proceeding five years as per Societies Act &amp; Rules</p> <p>5. For legally constituted Consortiums/ Joint Venture of Firms/ Companies: Registered MoU or Agreement for Consortium /JV, Registration under ACRS/ROC in addition to satisfying requirements stated earlier for individual constituent Firms/Companies forming the Consortium/JV</p> <p>6. The bidder shall be a reputed manufacturer in the related field having experience in design and manufacturing of pump having proprietary right or, Authorised agent or supplier should have to furnish a legally enforceable tender specific authorisation assuring full guarantee &amp; warranty as per general and special condition of contract.</p> <p>7. An undertaking in plain paper is to be submitted with the bid as a self-declaration by the applicant bidder that it is not debarred from participating in Govt. works/tenders by any State Govt or Govt. of India.</p>

		8. Already installed similar pumps of reputed pump manufacturer, have been under successful operation for at least last five years. Documentary proof required.
03	Credential of Work-1	<p>1. Bidder must have successfully completed at least following nos of work of 'similar in nature' under Government Sector within last five FYs on the date of publication of this e-EOI.</p> <ul style="list-style-type: none"> <li>• One project of similar nature of value is not less than 30% of the quoted value. It is 60 %, in case of Consortium/JV</li> <li>• OR, Two projects of similar nature of value each project is not less than 25 % of the quoted value. It is 50 %, in case of Consortium/JV</li> </ul> <p><b>“Similar nature of work”</b> means “Supply installation, testing &amp; commissioning of submersible pump (capacity greater than equal to 20 Cusec) capable of handling storm &amp; flood water.</p> <p>Bidders have to submit documentary proof in support of above-mentioned credential requirement. Such documents generally comprising of 'Award of contract along with BOQ &amp; offered technical specification' and 100% completion certificate.</p>
04	Credential of Work-2	<p>1. For electrical portion work, Electrical contractor license or undertaking that they will either obtain valid electrical licence at the time of execution of work or undertaking that they will engage a electrical contractor having valid electrical license of appropriate class &amp; credential. In that case, bidders shall be required to submit an agreement with such electrical contractor in non-judicial stamp paper of requisite value during participating in formal e-NIT, which will be brought out by the Superintending Engineer, South West Mechanical &amp; Electrical Circle, Durgapur-2, Burdwan in later stage.</p> <p>2. Pump manufacturer must have Customer service Centre / workshop in West Bengal. Documents along with list of machineries to be submitted. Such service center/ workshop may be subjected to physical verification by Department.</p>
05	Financial	1. Average of Gross Annual Turnover of the bidder

	Credential	<p>except for Consortiums and Joint Ventures for any three FYs within immediate preceding five FY on the date of publishing of EOI should be at least 30% of their quoted price.</p> <p>2. The above value for Consortiums or Joint Ventures should be at least 90% of their quoted price.</p> <p>3. Bidder's Net worth in any three preceding financial years within the zone of preceding five financial years should be positive (determined from Audited Profit &amp; Loss Accounts and corresponding audited balance sheets stated.</p>
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**(3,4 & 5 stated above should be simultaneously fulfilled as minimum PQ eligibility for qualifying in the Technical Bid Evaluation stage for final selection in financial bid stage based on quoted bid price, and all claims for eligibility are to be substantiated with valid legally authentic documents during submission of online bid itself.**

**10.0 Short listing criteria:**

10.1 Executive Engineer will shortlist Bidders who meet the Eligibility, pre-qualification credential, technical specification criteria mentioned in this EOI.

10.2. Any attempt by a bidder to influence the bid evaluation process may result in the rejection of its EOI proposal.

**11.0 Evaluation Process:**

11.01 All supporting documents & documentary evidence shall be evaluated. Inability to submit requisite supporting documents or documentary evidence, may lead to rejection of the Bidder's EOI proposal.

11.02 Each of the responses shall be evaluated to validate compliance of the Bidders according to the pre-qualification criteria, forms and the supporting documents specified in this EOI document.

11.03 The decision of the EOI issuing authority in the evaluation of responses to the EOI shall be final. No correspondence will be entertained outside the evaluation process conducted by the EOI issuing Authority.

11.04 The Executive Engineer may ask for meetings with the Bidders to evaluate it's suitability for the assignment

11.05 The Executive Engineer shall have the right to reject any or all proposals.

## **12.0 Examination of Bids and Determination of Responsiveness:**

The Bid will be evaluated whether each Bidder is satisfying the eligibility and qualifying criteria prescribed in the pre-qualification document and declare names of the qualified Bidders.

A substantially responsive bid is one which conforms to all the terms and conditions of the bidding documents without material deviations.

Assessment: The detailed assessment for pre-qualification shall be based on the following information submitted by the Bidder:

1. Data submitted in prescribed format given in tender documents.
2. Bidder's techno-commercial proposals for carrying out the entire works in accordance with the specifications in this document.
3. The techno-commercial submissions must principally demonstrate the adequacy of bidders' appreciation of the the project.
4. Design and detail engineering.
5. The methods proposed for mobilization and establishment of site installation and for the timely completion, testing and commissioning and O&M of the project.
6. The arrangements for the logistic support for completion, testing and commissioning of all works of the project.
7. Requirements of the Department.

## **SECTION-II**

### **1.0 Scope of Work:**

#### **1.1 Introduction:**

Description of item in B.O.Q shall be read in conjunction with this chapter along with drawing and appendices which provide further information and details. The rates to be provided in this B.O.Q. are inclusive of cost of all materials & machineries, transportation and carriage of material up to works site, labour, plant and equipment, tools and tackles, safety gadgets, insurance, incidentals, applicable GST, Excise duty, Custom duty (applicable for imported goods only), other chargeable taxes & labour cess etc., as may be required for execution of a particular item/works or items /works which is/are to be read in conjunction with the specification. The contractor shall confirm of having visited the site to conceive the work in totality and collected & verified the data relating to site conditions. The contractor acknowledges that any failure to acquaint itself with all such data and information shall not relieve its responsibility. Compliances with this specification do not limit the responsibility of the contractor for overall performance of the said system. Contractor can offer changes in design for better performance. Justification of such changes shall be provided by the contractor.

Unless otherwise stated, the rates to be provided in this B.O.Q are inclusive of all type of overhead cost as listed below and no separate claim by the contractor shall be entertained.

- i) Items which cover both fabrication and erection shall include conveyance and delivery, handling, unloading, storing, hoisting and all labour for finishing to required shape and size.
- ii) to establish, as per requirement, office at site with adequate space for contractor's personnel, inclusive of necessary furniture & furnishing, consumables etc., storage space for equipment, materials etc.
- iii) Temporary power connections from electricity board, alternative power arrangement telephones, construction and drinking water etc.
- iv) General works such as setting out, clearance of site before setting out and clearance of works after completion.

- v) Material testing cost.
- vi) Scaffolding charges.
- vii) All temporary works, form work and false work.
- viii) Cost of labour hutment
- ix) Guarding of Material.
- x) Cost for implementation of Quality Assurance Plan.
- xi) Any other item of work (minor in nature) which could not be specifically provided in the estimate but which is/are necessary for complying the works.

Notwithstanding anything contained in this document, contractor shall be adhered to General specification of USOR (M&E) of I&W Department [USOR(M&E) of I&W Department is available in the departmental website i.e., [www.wbiwd.gov.in](http://www.wbiwd.gov.in)]

### **1.2 Hydraulic Data of the proposed pumping station with sluice:**

Here the inlet canal i.e Dudher Bundh Khal will act as inlet pond. The shape and configuration are adopted in such a way that there is streamline flow entry into the Pump House and keeping the centre line elevation of discharge pipe at elevation at (+) 11.80 M, GTS which is 0.80 M above the HFL at outlet channel, the other levels as per BIS &Hydraulic Institute Standard (HIS) as below.

Sump bottom level= (+) 0.50 M GTS

MWL/Pump Stop Level=2.60 M GTS

FDL= 6 M GTS

HWL=9 M GTS

HFL=9.90 M GTS

Pump floor Level: 10.40 M GTS

Intermediate Catwalk Level (where column pipe will be fixed): 7.50 M GTS

C/L of discharge pipe (2<sup>nd</sup> Stage) = (+) 10.70 M GTS (This discharge line valve will be predominantly kept opened. Most of discharge shall take place through this discharge line when water level ranges from 6 M to 9 M. Below 6M valve may be kept closed)

C/L of discharge pipe (1<sup>st</sup> Stage) = (+) 8.50 M GTS (This discharge line valve will be predominantly kept closed. discharge shall take place through this discharge line only when water level is well below 6M)



Intake sump configuration given in the drawing adopted in such way that there is streamline flow entry into the Pump House

#### **1.4 Basic Scope of work:**

The contractor shall confirm of having visited site and collected and verified the data relating to site condition. The contractor acknowledges that any failure it acquaints itself with all such data and information shall not relieve its responsibility. The contractor shall be responsible for overall verification of equipment under the scope of work i.e., make, Model, Specification and responsible for details design of mechanical and electrical works of proposed pumping station. Compliances with these specifications do not limit the responsibility of the contractor for the overall performance of the pumping station. Contractor can offer changes in design for better performance. Justification of each change shall be provided by the contractor; such changes are subject to be approved by E.I.C.

Scopes of works are broadly classified into following categories.

- a) Design, Supply, installation, testing and commissioning including trial run and one-year successful operation and maintenance of Eight (8) nos. Column Mounted Mixed Flow Submersible pump motor set of capacity 25 Cusec (2550 M<sup>3</sup>/Hr) (each).
- b) All sort of electromechanical installation including transformers, HT & LT panels, switch gears, starter panels (FASD), wirings, illumination and other required electrical works.
- c) Sluice valves & Flap valves, pressure gauge, flow meter etc.
- d) Supply, installation, testing and commissioning of Trash rack and its hoisting system.
- e) Sluice gates (Draw & Flap) including its electrical hoisting arrangements
- f) Five (05) years (Reckoned from 2<sup>nd</sup> year after commissioning) comprehensive maintenance cum warranty of Pumps & allied electro-mechanical system.

#### **1.5 Selection of the Electrical System**

The HT supply from WBSEDCL at 11 KV (nominal) will be there. Suitable HT & LT panels, switch gears, starter panels (FASD), control equipment's, wirings, illumination, and other required electrical works are considered and to be executed by the contractor.

## **2.0 Technical specification:**

### **A. General specification**

#### **1.0 General Information:**

1.1 This specification intends to cover Engineering, supply and storage at site, erection, testing, commissioning, and trial run including operation and maintenance as specified elsewhere of various mechanical plant and equipment as per specification, schedule of items, requirements, terms and conditions and finally as per the direction of the Engineer to make different unit perfectly operative and successful in all respect.

1.2 Any plant, equipment or mechanical works which is found to be unsuitable for specific use under the stipulated conditions shall be dismantled and replaced by proper plant, equipment or mechanical works entirely at the cost of the Contractor for successful completion, commissioning and operation of the plant.

1.3 The Contractor shall provide all necessary tools and tackles required for erection of works and equipment and instruments for testing and commissioning including all other items necessary for testing and efficient execution of the contract. The Contractor will also provide all labour, supervising and administrative staff along with transport arrangement during erection and commissioning period.

1.4 The installation work includes supply of all fittings and fixtures, hardware, consumables and sundry items as required for successful installation and commissioning of the plant.

1.5 The scope of work shall not be limited to only supply of items as per schedule but also include all other items not specifically mentioned but required for successful installation and commissioning of the plant/ equipment and to operate properly as per relevant technical specification. The scope will include supply of materials at site in packed and good condition and any damage is to be rectified or the material to be replaced by the Contractor by new one without any extra cost.

1.6 The contractor shall provide and maintain proper secured and covered storage space for storage and protection of tools, materials etc and arrange for trained security personnel for protection of materials and executed works till the time the executed materials and works are handed over to I &W Department.

1.7 All plant and equipment shall be insured against all types of damages, theft etc. during transit, storage, erection and commissioning and insurance coverage will continue till the

maintenance period expires and the plant is handed over to the Govt at the cost of the Contractor.

1.8 For the purpose of design and construction the following data shall be considered:

- a) Peak ambient temperature 50<sup>0</sup> C
- b) Average ambient temperature 40<sup>0</sup> C
- c) Peak relative humidity 100%
- d) Average wind pressure 200 kg/m<sup>2</sup>
- e) Seismic zone as per IS: 1893 (Zone III)
- f) Climatic condition Hot, humid & dusty

However, the maximum temperature and humidity shall not occur simultaneously.

## **2.0 MATERIALS AND WORKMANSHIP**

### **2.1 Introduction**

This specification intends to cover the general standards of materials to be supplied and the workmanship required to be ensured by the Contractor. All component parts of the works must, unless otherwise specified comply with the provisions of this part and shall subject to the Engineer's approval of Manufacturer's Quality Assurance Plan (QAP).

### **2.2 Standards**

2.2.1 The proposed plant and equipment along with their material of construction must conform to the latest revision of relevant IS/ BS/ DIN/ ASTM/ ANSI/ ISO or to any other equivalent standard. The latest edition of all Indian Standard specifications/ other standards till 30 (thirty) days before the final date of submission of the tender, shall be adopted.

2.2.2 The Contractor may propose the use of any relevant authoritative internationally recognized Reference Standard including Indian Standard at no extra cost to department. The Govt, however, reserves the right to accept such proposal.

2.2.3 The equipment, material of construction and workmanship performed shall comply with these standards. In case any equipment/ item offered to standard other than those mentioned above, the material of construction shall be at least equal to or preferably superior to those specified and details of the superiority shall be furnished.

2.2.4 In the event of any dispute between this specification and the codes of equipment/ item, provisions of this specification shall govern.

2.2.5 All works shall be carried out according to technical specifications; the Indian Standard Code(s) of practice, Indian Electricity Act 1910, Indian Electricity Rule 1956 and Regulations framed there under, The Electricity Act 2003, S.O.R (Electrical) of WBPWD and USOR (M&E), I&WD, WB. Any work not covered in the Indian Standard Code(s) & specification, it shall be carried out as per best practice adopted in this country and /or reference may be made to other appropriate & relevant ASTM, ASME, DIN, JIS or BS according to the direction and satisfaction of the Engineer-in charge. Here are some relevant BIS references are included but not limited to the following:

<b>Standard No.</b>	<b>Title</b>
IS:210	Grey iron castings Specification
IS:318	Specification for leaded tin bronze ingots and castings
<b>Standard No.</b>	<b>Title</b>
IS:807	Design, erection and testing (structural portion) of cranes and hoists Code of practice
IS:1239	Steel tubes, tubulars and other wrought steel fittings Specification
IS:1367	Technical supply conditions for threaded steel fasteners
IS:1536	Centrifugally cast (spun) iron pressure pipes for water, gas and sewage
IS:1537	Vertically cast iron pressure pipes for water, gas and sewage
IS:1538	Cast iron fittings for pressure pipes for water, gas and sewage
IS:1710	Specification for pumps - Vertical turbine mixed and axial flow, for clean cold water
IS:2062	Hot rolled low, medium and high tensile structural steel
IS:2266	Steel wire ropes for general engineering purposes Specification
IS:2312	Propeller type AC ventilating fans
IS:2685	Code of practice for selection, installation and maintenance of sluice valves
IS:2974 (Parts 3 & 4)	Code of practice for design and construction of machine foundations: Rotary type machines
IS:3109	Specification for short link chain, Grade M (4)
IS:3177	Code of practice for electric overhead travelling cranes and gantry cranes other than steel work cranes

IS:3618	Specification for phosphate treatment of iron and steel for protection against corrosion
IS:3624	Pressure and vacuum gauges
IS:3938	Specification for electric wire rope hoists
IS:4460 (Parts 1 to 3)	Gears Spur and helical gears : Calculation of load capacity
IS:4736	Specification for hot-dip zinc coatings on mild steel tubes
IS:5120	Technical requirements for rotodynamic special purpose pumps
IS:5312 (Part1)	Specification for swing check type reflux (non return) valves for water works purposes : Single door pattern
IS:5312 (Part 2)	Specification for swing check type reflux (non return) valves for water works purpose : Multi door pattern
IS:5382	Specification for rubber sealing rings for gas mains, water mains and sewers
IS:5600	Pumps : Sewage and drainage Specification
IS:6005	Code of practice for phosphating of iron and steel
IS:6280	Specification for sewage screens
IS:8329	Centrifugally cast (spun) ductile iron pressure pipes for water, gas and sewage Specification
IS:9137	Code for acceptance test for centrifugal, mixed flow and axial pumps Class C
IS:9523	Ductile iron fittings for pressure pipes for water, gas and sewage Specification
IS:10981	Class of acceptance test for centrifugal mixed flow and axial pumps Class B
IS:11388	Recommendations for design of trash racks for intakes
IS:11592	Selection and design of belt conveyors Code of practice
IS:13095	Butterfly valves for general purposes
IS:13349	Specification for single faced cast iron thimble mounted sluice gates
IS:14845	Resilient seated cast iron air relief valves for water works purposes Specification
IS:14846	Sluice valve for water work purposes (50 to 1200 mm size) Specification
IS:15310	Hydraulic design of pump sumps and intakes Guidelines

IS:15560	Point hooks with shank upto 160 tonne Specification
IS 13591 (1992):	Criteria for design of lifting beams
IS 11388 (2012):	Recommendations for Design of Trash Racks for Intakes
BIS/ ISO/ DIN/ Equivalent	Column mounted diffuser type submersible pumps

### 2.3 Materials General

2.3.1 Each and every equipment/ item covered in the works shall be most suitable for the duty concerned and shall be new and of reputed make/ approved quality, free from any defect and selected for long life and minimum maintenance. Non-destructive tests, if asked for in this specification, shall be carried out.

2.3.2 Any equipment/ item supplied, if proved to be unsatisfactory after installation, the Engineer shall have all the right to operate/ use the same till the rectification/ replacement is carried out by the Contractor. The rectification/ replacement shall be done without interfering with the overall plant operation as far as possible. Unless otherwise specifically agreed upon in advance the maximum allowable period for the above rectification/ replacement shall not **exceed six months**.

2.3.3 All submerged moving parts of the plant e.g. shaft, spindle, rotating element, faces etc. and all parts in direct contact with water shall be completely resistant to corrosion and abrasion and shall maintain their properties without ageing due to the passage of time, operating load, environment, heating due to operation or any other cause.

### 2.4 Workmanship General

2.4.1 Workmanship and finish in general shall be best of its quality and must be in accordance with latest workshop practice.

2.4.2 Full interchangeability must be maintained among all components of similar type of equipment/ item. Material of construction of the spares shall be same as it is for original component and shall be interchangeable among similar equipment. Machining limits and fits on renewable parts shall be accurate and to specified tolerances so that replacements can be done easily.

2.4.3 Noise and vibration level shall never exceed the allowable limit for particular equipment.

The rotating parts shall be both statically and dynamically balanced so that when running at normal speed at any load up to the maximum, there shall be no vibration beyond permissible limit due to lack of balance.

2.4.4 All parts, which can be worn or damaged by dust, shall be totally enclosed in dust proof enclosure.

2.4.5 All necessary accessories required for satisfactory and safe operation of the plant shall be supplied by the Contractor unless it is specifically excluded from the scope.

2.4.6 Provision of lifting lugs, eye bolts etc. shall be provided to facilitate handling of heavy equipment.

2.4.7 All flanges shall be drilled as per IS:1538.

2.4.8 All flanges shall be full or spot faced at the back and thickness shall be uniform throughout. The periphery of the flange shall be concentric with the bore and finished smooth.

2.4.9 All castings and fabricated items shall be finished smooth all over.

### **3.0 EQUIPMENT DESIGN**

3.1 All the plant and equipment under this specification must be new and of proper grade and quality suitable for prevailing climatic and working conditions at site. They shall be of sound workmanship, robustly designed for long reliable operating life and shall be capable of 24 hours per day continuous operation for prolonged period with minimum maintenance. Special care shall be taken for changes in temperature, stability of paint finish for high temperatures, de-rating of machinery, thermal overload services, cooling systems and the choice of lubricants for anticipated high and prolonged operating temperatures. The manufacturer may be called upon to demonstrate this for any component part either by service records or evidence about similar equipment already installed elsewhere or by relevant type test. As far as possible, routine maintenance and repair should not require the services of highly skilled personnel.

3.2 The material of construction of the equipment/ item shall be so selected that the economic life of the plant is not less than 15 years taking into account their location and service.

3.3 The equipment shall be designed to provide easy access to and replacement of parts which are subject to wear without the need to dismantle/ replace the whole plant. All parts shall have a minimum life of 10 years from new to replacement or repair.

3.4 Design features shall include the protection of plant against any damage caused by vermin, dirt, dust and dampness and to reduce the risk of fire. Plant shall operate without undue noise and vibration and components shall be designed to withstand the maximum stresses under the most severe condition of normal duty. At site installation the magnitude of peak-to-peak vibration shall be limited to 50 microns and noise level shall be limited to 85 dBA at a distance of 1.86m. The materials shall be highly resistive to change their properties due to passage of time, climatic condition and service environment or due to any other cause which may have an adverse effect on the smooth and trouble-free performance or life of the equipment.

3.5 Outdoor installed plant shall have additional features to prevent unauthorized operation or tampering.

#### **4.0 TESTING AT WORKS**

##### **4.1 General**

4.1.1 Tests by manufacturer of the equipment/item at manufacturer's works shall be carried out in accordance with the specifications and the Engineers approved QAP. All inspections, examination and testing shall be performed conforming to relevant Standards. However, The Engineer shall witness the tests at 'state of art testing facility in India' and inspect important plant and equipment as specified in this specification of relevant equipment/item. In respect to other equipment, the manufacturer shall carry out the tests and test results to be furnished.

4.1.2 The instruments used for such tests shall be calibrated and certified by an approved independent testing authority not more than 15 days prior the test date in which they will be used. The test results/ certificates shall be furnished to the Inspecting Officer after commencement of the tests. The Engineer reserves the right to impound any instrument immediately after test for independent testing. Manufacturer's test certificate showing the readings obtained, calculations and details of relevant calibration certificates shall be produced prior to every test.



4.1.3 Only defect-free and sound material meeting the technical requirements of this specification and in accordance with a high standard of engineering would be acceptable to the Engineer.

4.1.4 If during or after testing, any equipment/ item fails to achieve the specified duty or otherwise proved to be defective the same shall be modified/ replaced as required, retested and re-inspected, if required, by the Engineer.

4.1.5 At least 21 days advance notice shall be served to the Engineer for witnessing any test.

4.1.6 No material will be accepted without the above-described inspection having been carried out unless officially waived in writing by the Engineer.

4.1.7 The inspection of all Electro-Mechanical items may be carried out by Third Party Agency (TPA), if required, by the Govt, at manufacturer's Test facility situated in India. Pump manufacturer shall have 'state of art test' facility in India. In case of engagement of TPA, the fees as well as cost involved for transportation, boarding and lodging of Third Party shall be borne by the Govt during inspection.

#### **4.2 Test Certificate**

4.2.1 Each consignment of plant delivered to site must have been tested at manufacturer's works or at other approved test house in accordance with the relevant IS or approved standard (such tests being referred to herein as Works Tests). The test reports for each such consignment must be furnished to the Engineer before delivery at site.

4.2.2 Certificates shall be clearly identified by reference number to the material being certified and shall include information required by the relevant reference standard/ specification clause.

### **5.0 WELDING**

#### **5.1 General**

5.1.1 All welded fabrication shall be done as per the latest revision of BS:5135/ equivalent and the Contractor shall submit the detailed drawings of fabrication showing the sizes of welds, weld preparation together with the details of application codes, electrode specification etc. to the Engineer before the commencement of fabrication for approval. No welding shall be carried out without approval of the Engineer and no alteration shall be made to any approved details of weld preparation or size without prior approval of the authority.

#### **5.2 Welding Requirements**

5.2.1 Inspection and quality of surveillance shall not be limited to the examination of finished welds. All aspects of materials, fabrication procedures and tests procedures shall be subject to the approval of the Engineer. The equipment used shall be most suitable for the quality of work specified. The method employed shall produce best results and to be tested at site by actual demonstration.

5.2.2 Haphazard striking of electrodes for checking arc are not permitted. The arc shall be struck either on the joint or a starting tag. The starting tag shall be of the same material or a material compatible with the base metal being welded. In case of any inadvertent strike on place other than the welding, the zone affected should be ground finished and examined by dye penetration test.

5.2.3 Final welds shall be suitable for appropriate fabrication of the non-destructive tests of the weld. While grinding is required, the weld shall be blended into the parent metal without gouging or thinning of the present metal in any way. Uneven and excessive grinding may be a cause for rejection. Fillet weld shall preferably be convex and free from undercutting and overlap at the toe of weld. The specified leg lengths, convexity and concavity shall not exceed 1.5 mm.

5.2.4 The non-pressure parts e.g. lugs, brackets etc. shall also be done by qualified welders in accordance with the design details and material specifications. Temporary attachments shall be removed in such a way that the parent metal is not damaged. The temporary attachment zone shall be dressed smooth and examined by dye penetration test.

5.2.5 All tack welds shall be made as per specified methods and by qualified welders. The quantity and size of tack welds shall be kept as minimum as possible but shall be of adequate strength to maintain joint alignments. All tack welds shall be visually checked and if found defective, the same shall be completely removed. During final run of weld, tack welds shall either be removed completely or shall be properly prepared by grinding/filling their starting ends so that they may be satisfactorily incorporated in the welds. The defects shall be removed by grinding/ chipping/ gouging.

5.2.6 All welding repairs shall be carried out as per the proper welding methods and by qualified welders. Preparation of weld repair shall have prior approval of the Engineer. Re-welded zones shall be checked as per the procedures followed for original welds and the repair procedures shall be approved by the Engineer.

## **6.0 CASTINGS**

6.1 Cast iron used for various equipment shall be of close grained, gray, standard quality. The homogeneous structure shall be free from non-metallic inclusions and other injurious defects. The un-machined surfaces of castings shall be smooth and free from all foundry irregularities.

6.2 Minor casting defects in depth not exceeding 12.5% of total wall thickness and which will not in any way affect the strength and service of the casting may be repaired by approved welding techniques with prior intimation to the Engineer. The Engineer shall be notified of large defects and no repair welding of such defects shall be carried out without prior written approval from the Engineer. If the removal of metal for repair reduces the stress-resisting cross-section of the casting by more than 25% or to such an extent that the computed stress in the remaining metal exceeds the allowable stress by more than 25%, then the casting shall be rejected. Test pieces cast along with the main casting shall be marked, if specified or otherwise, by the Manufacturer to check the physical and chemical properties of the casting.

6.3 Any defect considered to be a major defect by the Engineer is not acceptable. Welding repaired castings for minor defects shall be stress relieved.

6.4 All castings subject to hydraulic pressure shall be pressure tested to at least 1.5 times the maximum expected pressure or 2 times the working pressure whichever is higher and certified copies of the test results shall be forwarded to the Engineer for acceptance of the casting. Non-destructive tests as desired by the Engineer would be required for any casting having defects whose extent cannot otherwise be judged, or to determine the soundness of repair welds.

## **7.0 FORGINGS**

7.1 All major stress bearing forgings shall be manufactured to standard specifications. Forgings shall be subjected to either magnetic particle test or dye penetration test at the areas of fillets and change in sections. The testing shall be conducted after proof machining (10 microns). Any defect, which will not be finally machined shall be gouged out fully, inspected either by dye penetration test or by magnetic particle test to ensure that the defect is fully removed and repaired adopting approved repairing procedure. Any indication, which proves to penetrate deeper than 2.5% of the finished thickness of the component,

shall be informed to the Engineer giving all details, e.g. location, length, width and depth. For the magnetic particle inspection, the choice of wet or dry particles shall be the manufacturer's discretion. All forging shall be demagnetised after test and shall be heat treated for stress relief. The name of the maker and particulars of the heat treatment proposed for each such forging shall be submitted to the Engineer. The Engineer may inspect such forgings and identify test pieces to check physical and chemical properties and witness such tests at manufacturer's works.

## **8. FASTENERS AND WASHERS**

8.1 All bolts, studs, nuts and washers used in the plant shall conform to the requirements of the relevant standard. The fasteners shall be of the best quality of specified grade and machined as required. Bolts shall be of one-piece construction and shall be of sufficient length so that only one thread shall show through the nut in fully tightened condition.

8.2 Fit bolts shall be of light drive fit in the reamed holes they occupy and shall have the threaded portion of such diameter that it will not be damaged in driving. The fit bolts shall have identification mark to ensure correct assembly at site.

8.3 Washers, locking devices and anti-vibration arrangements shall be provided wherever required. Jointing hardware for the entire plant shall be provided with sufficient spares to cater for 1 year for site losses.

8.4 Bolts for structural members shall be provided with taper washers wherever necessary to ensure that no bending stress is caused on the bolt. Where there is a risk of corrosion, the fastener's design shall take into account the corrosion allowance and the maximum stress shall not exceed half the yield stress of material under any condition. The fasteners subject to frequent adjustment, removal etc. for regular operation and maintenance shall be made of nickel bearing stainless steel.

8.5 The manufacturer shall supply all holding down, alignment and levelling bolts complete with anchorage, nuts, washers, dowel pins, packing etc. required to erect the plant on its foundation along with base plates, frames and other structural parts necessary to spread the loads transmitted by the plant to foundations without exceeding the design stresses.

8.6 The Contractor shall provide to the satisfaction of the Engineer, reasonable excess quantities to cover wastage of those consumable which may be normally subject to waste during erection and commissioning period.

## **9. LUBRICATION**

9.1 The equipment manufacturer shall furnish a complete schedule of recommended oils and other lubricants to the Engineer. The number of different types of lubricants shall be kept to minimum. The details of lubricant such as quantity required, viscosity, make, number etc. to be submitted to the Engineer for approval before incorporating the same in the Maintenance Manual. For grease lubricated roller type bearings lithium base grease is preferred.

9.2 The equipment manufacturer shall also indicate indigenously available equivalent lubricants with complete details to enable the Govt to arrange for regular supply in case of non-availability of specified brand.

9.3 For grease lubrication it is preferred to have pressure system which does not require frequent adjustment or recharging. Frequent, for this purpose, means more than once in a month and grease systems having shorter periods between greasing shall be avoided. Wherever required for accessibility, grease nipples shall be placed at the end of the extension piping and when a number of such points can be grouped conveniently, the nipples shall be brought to a battery plate mounted in a convenient position. The grease nipples shall be of same type and size for each part of the plant. Arrangements shall be provided to prevent bearings being overfilled with either grease or oil.

9.4 If more than one type of grease is required for particular plant, separate grease gun for each type to be supplied with permanent marking.

9.5 Oil container shall be supplied complete with oil level indicator of sight glass type; where this is not applicable, the container shall be provided with dipstick. The indicator shall show the levels at all temperatures, which may occur during plant operation. The maximum and minimum levels shall be clearly visible in the sight glass type from the operating floor and the same shall be easily dismantled for cleaning. The sight glasses shall be firmly held and encased in metal protection in such a manner that they cannot be accidentally dislodged.

9.6 The lubrication systems shall be designed not to cause any fire and pollution and special protection must be taken to prevent any leakage of lubricant and coming in contact with any electrical equipment, heated surfaces or any other source of fire.

9.7 Initial filling of oil, grease, electrolyte and similar material for relevant plants shall be done by the Contractor.

9.8 All types of lubricants as required for one year operation of entire plant shall be supplied by the Contractor.

#### **10.0 NAME PLATES, RATING PLATES AND LABELS**

10.1 Name plate and rating plate made of stainless steel shall be permanently fixed at conspicuous position of each item of the plant. These plates shall incorporate manufacturer's name and address, serial number, type, details of duty at which the equipment has been designed to operate, diagrams, direction of closing/ opening for valves, direction of rotation of pumps etc. as may be required. The operating and indicating devices shall have securely attached to them or engraved the designations of their function and manner of use.

10.2 Details of proposed inscriptions shall be submitted to the Engineer for approval before taking for manufacture.

10.3 Above plates and labels on electric equipment shall be of non-flame propagating materials, either non-hygroscopic or transparent plastic with engraved lettering of contrasting colours. Fixing shall be done by means of non-corrosive screws or drive rivets. Uses of adhesives are not permitted.

10.4 Warning labels shall be provided wherever necessary to warn against risky circumstances or substances. Inscriptions or graphic symbols shall be in black on yellow background and of internationally accepted standards.

10.5 Instruction labels shall be provided where safety procedures to be followed, such as, wearing of protective clothing are essential to protect personnel from hazardous or potentially hazardous situations are inscribed. These labels shall have inscriptions or graphic symbols in white on a blue background.

#### **11.0 OPERATION AND MAINTENANCE MANUAL**

11.1 The Contractor shall furnish 6 (six) Hard copies and two Soft copies of operation and maintenance manual specific for the plant equipment and installation, giving detailed description, 'As build' assembly, drawings, parts lists, operating instructions, repairs and periodical maintenance. The said manual shall not merely contain manufacturer's literature and brochures, which shall be in addition to detailed manual prepared for the plant. All records, drawings, wiring diagrams, curves etc. shall also be a part of the manual.

11.2 The Operation and maintenance manual shall include the followings:

- 11.2.1 Schedule of equipment supplied along with manufacturer's name and address, model number, catalogue number etc.
- 11.2.2 Schedule of routine, periodic, preventive and breakdown maintenance for all the equipment
- 11.2.3 Schedule of spares supplied with their part identification numbers
- 11.2.4 Schedule of tools and tackles supplied
- 11.2.5 Sectional arrangement drawings of major item e.g. pumps, valves, EOT crane, Monorail crane, lifting beam, sluice gate & hoisting arrangement, Trash rack etc. with part identification list, metallurgy of component and with dismantling procedures
- 11.2.6 General arrangement drawing of whole plant showing the 'As built' installation.
- 11.2.7 Schematic diagram showing cooling and lubricating system of bearings
- 11.2.8 Full and comprehensive operation and maintenance instructions including fault detection for all equipment supplied
- 11.2.9 Copies of Test Certificates
- 11.2.10 Pump performance curves as tested
- 11.2.11 System head curves with superimposed pump curves.
- 11.2.12 Schedule of recommended lubricants and their equivalents, which must be locally available.
- 11.2.13 Schematic diagram of Electrical installation (System Panel, Control Panel etc).

## **12.0 PAINTING**

### 12.1 General

- 12.1.1 The equipment manufacturer shall clean, prepare the surface and apply primer/protecting coating as per specification at their works.
- 12.1.2 Parts to be painted may be cleaned but surface defects shall not be filled in before testing at manufacturer's works. The item subject to hydraulic test shall be tested before any surface treatment. After test, all surfaces shall be thoroughly cleaned and dried out, if required, by washing with an approved dewatering fluid prior to surface treatment. Unless otherwise specified, all painting shall be done strictly in accordance with the paint manufacturer's instructions.

12.1.3 All protective coating shall be suitable for use in hot and humid climates and toxic zone.

## **12.2 Painting at Shop**

12.2.1 All stages of painting including cleaning, surface treatment etc. at the manufacturer's works may be inspected by the Engineer at his discretion.

12.2.2 Cast iron and mild steel items shall be sand blasted to near mirror cleaning before painting. Sharp corners, edges etc. shall be broken before sand blasting.

12.2.3 A primer coat of zinc rich epoxy resin base coating of at least 100 microns dry film thickness is to be provided. In addition, the parts are to be provided with adequate number of coats of coal tar epoxy polyamine coating to a dry film thickness of at least 250 microns including primer coating.

## **12.3 Painting at Site**

12.3.1 After site receipt, all items of plant shall be examined for damage of paint and the damaged portions shall be cleaned to the bare metal; rust, if any, to be removed; procedures as mentioned above to be followed and finally paint coats to be done with similar paint.

12.3.2 Cast iron and mild steel parts received at site shall be provided with adequate number of further coats of coal tar epoxy polyamine coating to a total dry film thickness of 350 microns inclusive of the primer coats. All sharp edges, fasteners and other items difficult to be painted shall receive brush coats of specified paint before application of each coat of epoxy-based coal tar paint giving a total dry film thickness of at least 350 microns. For fabricated steel work the same shall be done after assembly.

12.3.3 Before finalizing the paints, the Contractor/ manufacturer shall submit to the Engineer the full details of paints he proposes to use together with colour charts for gloss finishes for approval.

12.3.4 All paint and coating thickness shall be measured by approved Elcometer or coating thickness guage.

## **13.0 PACKING AND PROTECTION**

13.1 Before despatch from manufacturer's work, the equipment shall be adequately protected and packed so as to reach the site intact and undamaged. The method of protection and packing must be suitable to withstand the conditions, which may be



experienced in shipment and delivery to site. It shall also be suitable to withstand long period of storage at outdoor. The Engineer shall be given at least 15 days' notice before packing.

13.2 Any crate/ package should not contain items of plant intended for incorporation in more than one part of the works.

13.3 All items of plant shall be clearly marked for identification as per packing list, which shall be placed in each crate/ package and protected in a waterproof cover.

13.4 All crates and packages shall be clearly marked with water and weatherproof paint to show the weight and position of sling attachment. They shall also be marked to identify the packing lists.

13.5 Bearing surfaces and similar bright parts shall be protected from corrosion by application of rust preventive lacquer, high melting point grease or similar fluid. Sufficient quantity of appropriate solvent shall be provided with the packing for removal of this protection.

13.6 Each crate/ package shall have a clear indelible and as far as possible, indestructible unique identification cypher, also quoted in the packing list inside it. Three copies of packing lists shall be sent separately to the Engineer at the time of shipment.

13.7 All flanges and matching surfaces shall be protected by wooden templates or similar. The fasteners used for securing these templates shall not form part of final installation.

#### **14.0 GUARANTEE**

15.1 All equipment/ items shall be guaranteed against defective design, manufacture and/ or workmanship for a period of 18 months from the date of despatch or 12 months from the date of successful commissioning whichever is later. The Contractor shall be responsible for complete operation and routine maintenance as well as breakdown maintenance of the installation including supply of all spares and consumables during the guarantee period and the cost shall be included in the offer, as per details provided in the BOQ. No extra payment will be made on this account.

15.2 In case the electromechanical equipment are installed but cannot be commissioned due to unavailability of sewage/storm water to the pumping station, the following shall be ensured by the Contractor:

(a) The defects liability period of the electromechanical equipment including all works of pumping station shall be one year from the date of the taking over of pumping station as per contract.

(b) In case of non-commissioning of the pumping stations due to reasons cited above, all remedial measures shall be taken up by the Contractor to ensure performance of all electromechanical equipment as per specifications without any additional cost to the Govt.

15.3 In case the electromechanical equipment are not installed in order to match the sequence of completion of drainage network, the supplied electromechanical equipment are to be stored in an covered lockable storage space to avoid any deterioration of the quality of the electromechanical equipment. All remedial measures shall be taken up by the Contractor to ensure performance of all electromechanical equipment as per specifications without any additional cost to the Govt.

**15.0 DESIGN AND PERFORMANCE REQUIREMENTS**

16.1 The wastewater/ storm water transportation systems described shall be capable of conveying their rated capacity as specified in ‘Particular specification’.

16.2 Pipe sizes, unless specified otherwise shall be selected by the Bidder based on optimization studies. The procedures and results of the optimization studies shall be furnished by the Bidder as part of his Bid Proposal. However, for the purpose of such pipe sizing, recommended velocities at pump discharge shall be guided by the velocity chart as given below:

**Recommended Velocity Chart for Pipe Sizing:**

Sl. No	Description of pipe	Velocity for pipe size (m/sec)	
		50-150 mm(D)	200 mm and above(D)
01	Pipelines at pump discharge & column pipe	1.5-2	1.8-2.5
02	Pipelines at pump suction / Bell Mouth	1- 1.2	1.2-1.5

16.3 Unless otherwise specified, the Bidder shall provide standard pipes in respect of size, in all services covered under this specification.

16.4 The total dynamic head (TDH) of all pumps shall be obtained by conducting detailed system resistance calculations. The Bidder shall furnish these calculations and system resistance curves superimposed on pump modified characteristic curves along with his bid proposals. The indicative TDH are furnished in 'Particular specification'. However, actual TDH shall be finalised by the bidder and following general guidelines shall be adhered to by the Bidder towards computation of the same.

a) The duty point static head in pumping system shall generally be obtained by considering the average water level, unless specifically mentioned and maximum discharge points elevation.

b) Frictional losses in pipes shall be calculated based on Hazen & Williams Formula considering C value for different pipe materials as given below. For fittings minimum 15% margin shall be provided over and above the calculated frictional losses.

Steel main with inside cement mortar lining: 145

Ductile iron pipes with inside cement mortar lining: 140

Steel main with inside epoxy painting of required DFT: 140

c) The friction coefficient of fittings for calculation of the frictional losses in fittings shall be calculated as per Hydraulic Institute Standard/ BIS.

16.5 All pipes and fittings shall be designed to withstand a pressure not less than 2 (two) times the working pressure of the respective system pumps.

## **16.0 INFORMATION TO BE FURNISHED WITH THE OFFER**

17.1 The following drawings, data, curves and information are to be submitted along with the offer.

17.2 The offer shall comprise of a complete and detailed specification of all the plant offered describing the basis of design, material of construction, method of construction and manner of operation including all duty parameters.

17.3 In addition to the schedule information, the Bidder shall submit all relevant characteristic curves, catalogues, printed descriptive literature etc. to justify the superiority of the plant offered.

17.4 The Bidder shall submit General Arrangement drawing and Sectional Arrangement drawing along with part identification list and dimensions for all the plant and equipment

offered. The Bidder shall also submit a layout drawing showing the equipment installation and confirming the overall dimensions.

#### 17.5 Drawings

1) General arrangement drawing should show the major dimensions such as minimum submergence of the suction pipe/ bowl assembly/ pump, bottom clearance of the suction bell mouth, clearance between two pumps, overall height of pump and motor including the height of the column pipe, overall dimensions of pipes & fittings etc. to be accommodated inside the pump house. The general arrangement drawing shall be prepared taking into account all the provisions for future phase, wherever specified.

2) Typical cross-sectional drawing showing various components of equipment i.e Pump motor set, Valves, EOT crane, Monorail crane, lifting beam, sluice gate & hoisting arrangement, Trash rack etc. should be offered.

3) Illustrative literature regarding all of the equipment should be offered.

#### 17.6 Calculations

1) Detailed calculations of frictional head losses, determination of static head and total dynamic head of pump at rated capacity for both present and future phases (if mentioned specifically) to be furnished.

2) Calculations confirming the margin between NPSHA and NPSHR for both LWL and HWL in the sump to be submitted.

#### 17.7 Curves

Performance curves showing the following characteristics and duly stamped and signed by the manufacturer shall be furnished.

a) Capacity vs. Head, Power, Efficiency, NPSHR with actual size of impeller

b) Family curve of the pump showing the above mentioned in (a) with minimum and maximum sizes of impeller

c) Torque vs. Speed curve of the pump(s)

d) System resistance curves for both low water level and high-water level, superimposing pump modified capacity vs. head characteristic curves

#### 17.8 Data Sheets and Testing Facilities

a) Completely filled "data sheet for technical particulars" enclosed must be furnished along with this offer.

b) Details of testing facilities available in the equipment manufacturer's works to at least cover stipulations mentioned in standard specification to be furnished.

## **17.0 INFORMATION TO BE FURNISHED AFTER THE AWARD OF CONTRACT**

18.1 The successful bidder shall furnish the following drawings/ data/ manual/ calculations within 30 days of issuance of "Letter of Invitation/ Acceptance" to the Govt for approval. All the supplies and inspection shall be carried out as per the approved drawings and specifications:

- a) Final versions of all the drawings, documents etc. of the equipment showing all dimensions and major parameters.
- b) Cross-sectional drawings of the equipment incorporating part identification list and material of construction.
- c) Foundation drawings showing details of fixing, grouting, total weights of equipment, plinth sizes, anchor bolts etc. along with all design loads and their direction and points of application.
- d) Piping arrangement drawings for sealing, lubricating, cooling etc. for all equipment.
- e) Manufacturer's certified performance curves of the equipment indicating all parameters along with all relevant technical specification/ particulars.
- f) Drive data
- g) Water volume and pressure requirements for stuffing box sealing and bearing lubrication etc. with complete details of all ancillary equipment including water pumping system, piping, valves etc. and interface requirements for work by others, if any.
- h) Details of grease/ oil lubrication system including the proper quantity of grease/ oil and frequency of bearing lubrication.
- i) Equipment/item manufacturer's QAP to be submitted for approval.
- j) All other drawings, data, documents etc., which the supplier feels to be approved by the Govt/ Engineer.
- k) Operation and maintenance manual (before commissioning of the plant).

## **B. Standard Specification:**

### **1. Sluice gate:**

1.1 There is provision for three (03) vent sluice comprising of 03 nos draw shutter & 03 Nos Flap shutter along with 03 Nos stop log gates for draw shutter. Sizes of these gates & its detail are specified in 'particular specification'.

1.2 Embedded parts, here, are comprising of guide channel, side seal path, bottom seal path & Top seal path. All these paths are to be lined up by SS 304 of 6 mm thick.

Quality of Gate functioning is largely affected by embedded parts. Anchor bolts shall be provided to hold the 2nd stage embedded parts. The anchor bolts shall be with double nuts and washers having suitable length and minimum diameter of 12mm. Contractor is required to provide sufficient & skilled manpower along with all necessary T&P in time so that insert plates are installed during 1st stage concrete along with the progress of work of civil counterpart. Contractor to give due attention and vigilance during concreting work (in both 1<sup>st</sup> stage and second stage) so as to ensure verticality of pier & designed size of concrete block out. No bulging of concrete into the block out should happen. It will not only facilitate the fitting, fixing of 2nd stage embedded parts successfully but also provide free passage to the gate so as to move up & down freely.

1.3 The sluice gate shall be in MS construction and designed to ensure tight enclosure while maintaining freedom of door movement during operation so as to minimize sliding wear of sealing faces. The sluice gate shall be suitable for seating and unseating head application and shall be upward opening type. The sluice gates shall be designed as per applicable IS code.

1.4 Gates shall be provided with Rubber seal as per approved design. The faces of the strip/MS flat shall be hand scraped to watertight finish and operation of opening and closing.

1.5 The spindle of sluice gate (draw shutter) shall be rising type. Gate shall be electrically operated. Draw shutter shall be operated through bevel geared headstock coupled with Motorised actuator of designed capacity. Operating force that are required at the rim of hand wheel at Actuator does not exceed 100 N. Direction of opening and closing shall be marked on the hand wheel. The headstocks shall be mounted on CI pedestal & properly secured and fixed with foundation bolts. Motorised actuator shall have equipped with position indicator, limit & torque switch etc. Flap shutter are also to be provided with electrical hoist through Motor, winch machine, rope & EM brake. However, contractor shall execute these hoist system as per approved design.

1.6 Painting on gate & its allied parts are to be painted as per general specification.

1.7 Here are some relevant BIS references for sluice gates are included but not limited to the following:

IS 13623 (1993): Criteria for choice of gates and hoists

IS 5620 (1985): Recommendations for Structural Design Criteria for Low Head Slide Gates

IS 9349 (2006): Recommendations for structural design of medium and high head slide gates

IS 4622 (2003): Recommendations for Structural Design of Fixed-Wheel Gates

IS 11228 (1985): Recommendations for design of screw hoists for hydraulic gates

IS 7718 (1991): Recommendations for inspection, testing and maintenance of fixed wheel and slide gates

IS 11855 (2004): Guidelines for Design and Use of Different Types of Rubber Seals for Hydraulic Gates

IS 15466 (2004): Rubber seals for hydraulic gates

IS 14177 (1994): Guidelines for painting system for hydraulic gates and hoists

1.8 The sluice gate shall be inspected and tested in presence of the Engineer as per manufacturer's QAP approved by Engineer.

## **2. Trash Rack:**

### **2.1 GENERAL SCOPE OF WORK**

The Scope of the work covers the following items of works:

- (a) Manufacturing and supplying including galvanizing and transport, erection, testing and commissioning of trash rack.
- (b) The scope of work also covers manufacture, transport, supply and erection of all the guide channel and anchorages including all embedded parts required to be complete the work as a whole.
- (c) The scope of work also covers proper storing of all components, sub-assemblies, electromechanical parts etc. of the items to be furnished under this tender and keeping them in safe custody till they are taken over by the E.I.C. in the final installed form.
- (d) The entrusted contractor shall also carry out at his own expense all the preliminary and enabling works and all other incidental works such as establishing a field workshop and

stores, furnishing and installing erection aids, cranes if necessary, scaffoldings, ladders, temporary bracings and supports etc. complete as required to facilitate execution of work and shall also carry out at his own expense all other operation covered under the meaning and intent of conditions and specifications in the tender documents. The cost tendered by the Bidder for the above items shall be deemed to be inclusive of all expenses required to be incurred by him for executing the work.

2.2 The effective area of opening of the screen which is the vertical projected area of the screen openings from the invert of the channel to the flow line) shall be such as to produce a velocity through the screen opening not exceeding 0.9 m/sec at maximum expected flow. Screen size (clear spacing between the flats): 90 mm at the first stage of screening and 75 mm for the 2nd stage of screening.

All fasteners/anchor fasteners shall be of stainless steel AISI 304

2.3 The screens shall be provided for two stage screening- the first stage of screening with a clear gap of 90 mm and the 2nd stage of screening with a clear gap of 75 mm. The screens shall be made of MS materials. **Approximate size of screen is 4 M (w) x 9.3 M (h) in three equal parts like stop log gate.**

The flats shall not be less than 10 mm in thickness and not less than 50 mm deep. The flats shall not have any joint. The spacing between the flats shall be uniform and preferably so maintained by adequate number of spacers, which shall be so located as not to interfere with the raking /cleaning operation. For cleaning operation, any of the screens shall be lifted by motorized operation through 02 Nos Monorail crane through the control panel complete with all control and protection features. 02 Nos lifting beam are also to be provided. The control panel shall be located at operating floor level in close proximity to the screen or on the maintenance platform.

2.4 Painting on Trash rack, its allied parts are to be painted as per general specification.

2.5 This shall be inspected and tested in presence of the Engineer as per manufacturer's QAP approved by Engineer.

**3. Mono rail Crane & Lifting beam:** Scope of work shall consist of

a) Design, manufacture and supply of 5 M.T. capacity straight monorail (2 Nos.) placed at a distance of 1500 mm. approx. suitable for travel length of 19 mtrs (approx). Both the monorails shall be supported on 09 nos. goal post structure. Both hoist and longitudinal travel shall be electrical and to be operated by 2 Nos. 5 M.T. capacity wire rope type



electrical hoist with electrical trolley. The height of lift shall be 12 mtrs. for both the hoist. The top of goal post structure shall be covered by suitable sheet metal to protect the hoist from direct sun and rain. Quantity: 02 set

b) Design, manufacture and supply of 2 sets of Down shop lead arrangement i.e. power feeding arrangement to the hoist along the longitudinal travel comprising of 4 line PVC shrouded type GI conductor with supporting brackets and a set of current collector for each hoist. One set of DSL with current collector shall be required for each hoist. 2 Nos. isolating switch of suitable rating shall also be provided at two ends for connecting the DSL cable. Quantity: 02 set

c) Hoist Data for Monorail Structure

Type	: Straight monorails supported on 11 Nos. independent goal post structures.
Number of monorail	: 2
Capacity of monorail	: 5000 Kgs. each.
Length of monorail	: 19000 mm each.
Height of lift	: 12000 mm for each hoist.
Distance between two nos. monorails	: 1500 mm approx.
Width of goal post structure i.e. center Of goal post columns	: 3000 mm approx.
Height of goal post structure	: 7000 mm approx.
Number of rope falls and rope dia	: 4, 12 mm dia.
Operating speeds with motor ratings	
Hoist motion	: 4.5 M/Min, 7.5 H.P motor.
Longitudinal speed	: 15-20 M/Min, 0.75 HP motor.
Power supply	: 415 V +/- 10% 3 phase 50 cycles AC.

Headroom of hoist block	: 1000 mm approx.
Method of control	: Both the hoist shall be controlled from floor by 4 way independent push button switch having an operating voltage of 110 V AC.
Power supply	: Both the hoist shall be provided with power supply by means of 4 line PVC shrouded type GI conductor with supporting brackets and a set of current collector for each hoist.
Top cover	: The top of monorail structure shall be covered with suitable sheet metal to protect the hoist from direct sun and rain.
Motor	: Both the hoist and longitudinal motors for the hoist block shall be high torque Sq. cage type, 40% CDF rating, class F insulated, IP-55 enclosure, S-4 duty conforming to IS:325.
Brake	: Both hoist and longitudinal motion shall be provided with electromagnetic disc type AC brake, fail safe type.
Limit switches	: Both hoist and longitudinal motion shall be provided with suitable limit switches.
Protective device	: The hoist shall be provided with protective devices like air break contactor, overload relays, HRC fuses and step down transformer.
Class & duty	: The monorail structure with electric hoist shall be designed for M-5 (class-II)duty indoor operation conforming to

IS:807 and IS:3938 as and where applicable.

Painting

: The monorail structure and goal post structure shall be supplied duly painted with one coat of red lead primer and two coats of synthetic golden yellow enamel paint prior to dispatch from the works.

c) Design, manufacture and supply of two nos lifting beam of 5MT capacity for automatic engagement and disengagement purpose as per relevant IS.

d) This shall be inspected and tested in presence of the Engineer as per manufacturer's QAP approved by Engineer.

#### **4. COLUMN MOUNTED SUBMERSIBLE PUMP & MOTOR**

##### **4.1 General**

**4.1.1** The pump head, inclusive of all losses in the inlet, discharge in Column pipe & outlet pipe of the pump, sluice valve & exit etc including static head shall be calculated by the bidder to arrive TDH at Maximum & Minimum discharge condition and optimum duty point, so as to pump may cover entire static head range successfully. The flow rate and minimum submergence for continuous operation and maximum allowable dry running period of the Pump shall be stated in their offered bid.

The design, manufacture and performance of the pumps shall conform to the latest version of IS/BS/DIN Standards / Specification.

However, based on hydraulic data, TDH (at duty Point) is calculated to be **7.5 M MWC** (Tentative) with the rated discharge of 2550 M<sup>3</sup>/Hr.

Other requirements are:

Acceptable operating (capacity) Range (AOR): 70% to 140%

Acceptable TDH Range: 3.5 M to 9 M

However, bidders are requested to carry out their own calculation to satisfy the system requirement.

**4.1.2** The pump shall be vertical, non-clog, submersible, mixed flow, (impeller with internal spirals to avoid clogging) single stage, bottom suction, column mounted, diffuser type, driven by single speed submersible motor suitable for pumping all kinds of storm water containing plastics and fibrous materials. The pumps shall be suitably designed so that silt, plastics, fibrous and other stringy materials shall not affect the pump performance. The speed of the pump should not be more than 750 rpm (8 pole) and pump efficiency not less than 80%. Maximum efficiency shall occur at duty point. Motor efficiency shall not be less than 92% (IE3 Premium Efficiency) and shall have non-overloading characteristic. The pump performance must be stable from zero discharge to run out condition. The bidder shall furnish characteristic curves of pump. The bidder shall furnish with the tender the characteristic curve so prepared and superimposed on system head curve. The pump shall be capable of developing the required total head at rated capacity for continuous operation. The head discharge curve shall be continuously rising towards the shut off with highest shut off point. Impeller shall preferably be non- overloading type. Pump shall run smooth without undue noise and vibration.

#### **4.1.3 NPSH requirements**

The pump will be operated over a range of capacities and not a fixed duty point and driven by a constant speed motor. It is most important that the pump can function properly over the full operating range of the system curve. For this NPSH margin of minimum 2 meter is required to avoid any damage to the pumps in entire operating range. For calculation purpose following data may be used.

- (i) Atmospheric Pressure: 10 MWC
- (ii) Vapor pressure of water: 0.3MWC

#### **4.1.4 Class of Operation**

The pumps shall be suitable for non- stop continuous 24 hours operations without interruptions.

**4.1.5** The motor shall be of 8 pole construction with adequate kW rating with the usual 20% (at least) safety margin to drive the pumps. Starting frequency in emergency shall be maximum 6 hot starts per hour and the motor starting method will be Auto Star Delta Starting as per standard norms.

**4.1.6** The design, manufacture and performance of the submersible pump-motor sets shall

comply with the latest applicable Indian/ International standards. In particular, the equipment must conform to the latest revision of applicable specification. The pump shall be capable of developing the required total dynamic head at rated capacity. The head-capacity curve of the pump shall be continuously rising towards the shut-off with highest head at shut-off. The pump shall be designed to be protected against reverse direction of rotation due to sewage returning through the pump. The set rotor assembly weight and unbalanced hydraulic thrust of the impeller shall be carried by the thrust bearings provided in pump assembly. The pump shall operate trouble free, smooth and without any undue noise and vibration. Pump vibration at shop and at site installation shall be limited to Gr 6.3 of ISO: 1940 or Eq. International Std.

**4.1.7** The pump installation design shall be such as to facilitate installation and removal of pumps without having entry into the pump column or sump.

**4.1.8 CFD Analysis / Sump Model study of sump**

It is obligatory on the part of the contractor to carry out sump model tests at C.W.P.R.S., Pune or Indian Institute of Science, Bangalore, or any such reputed laboratory with prior approval of the Engineer, at his own cost and at the earliest after issue of the work order. The contractor must fully satisfy himself about the suitability of the proposed design and layout of the sump, to ensure vortex free and Cavitation free operations of the pumps. Two representatives of the Department. will be deputed for inspection of this test, if so desired by the Department. The contractor will have to bear the expenses towards their traveling, boarding and lodging, etc. for attending the above test. Minor modifications to the sumps as are acceptable to Department and as are possible considering the then stage of civil works, will be carried out at the cost of Department, and as per contractors' proposal in writing. Test results in triplicate of the contractor's sump model testing, should immediately be sent to the Engineer - in charge, along with proposals by the contractor for his consideration. If the changes proposed by the contractor in the design of the civil works construction is not viable, it is obligatory on the part of the contractor, to modify the design of his equipment to the extent possible, which would suit the sump finalized by the Department and to ensure hydraulically smooth operation. Arrangement of flow guides, baffles, splitters etc at the sump to achieve smooth pump operation free from vortex, pre-rotation, swirl etc are acceptable. Such modification in the design of the equipment is deemed to be covered under the agreement rate for the item.

## **4.2 Constructional Features**

### **4.2.1 Diffuser Casing**

The pump diffuser casing, made of cast iron, shall be hydrostatically tested at 1.5 times the shut-off head with maximum impeller size or 2 times the pump duty pressure whichever is higher. The diffuser shall be of robust construction and the internal liquid passage shall be finished smooth.

### **4.2.2 Impeller**

The non-clog, semi-open/ open/ skew type impeller of stainless steel and will be both statically and dynamically balanced. This will be keyed and positively held on the shaft. The impeller will also be secured against damages, in case the direction of rotation reverses due to liquid flowing backward through the pump. **The impeller shall be capable of handling soft solids up to 100 mm x 100 mm size.** The leading edge of the vanes shall be rounded and cut back to prevent rags, stringy materials etc. from impinging on the vanes.

### **4.2.3 Shaft**

The shaft, made of stainless steel shall be finished to close tolerance at the impeller and bearing diameters. The impeller shall firmly be secured to the shaft by key and/ or nuts. The size of the shaft shall be calculated on the basis of maximum combined stresses. While designing the shaft, the critical speed of the shaft must be taken into account which shall be at least 20% above/ below the operating speed. The rotor shall be dynamically balanced to avoid any vibration during operation.

### **4.2.4 Seal**

The pump shall have two mechanical seals in tandem arrangement. The lower mechanical seal shall have SiC/ SiC face combination. Upper mechanical seal shall have Sic/Sic face combination.

### **4.2.5 Bearing**

Maintenance free antifriction deep grooved, permanently grease filled ball / roller bearings should be provided and this should take care of axial and radial thrust at any point of operation and life of minimum 1 lakh hours.

### **4.2.6 Submersible Motor**

The motor shall be dry, squirrel cage, non-overloading type, suitable for 3 ph, 415  $\pm$ 10% V, 50 Hz supply, designed, manufactured and tested conforming to IE3-Premium Efficiency as per IEC60034-2-1 with latest revision equivalent international standard. The Motor should

be Rated for continuous duty with **IP 68 protection and Class-F insulation or better**. However, the motor frame size shall be liberally designed to restrict temperature rise as per Class-B insulation. All squirrel cage induction motors shall be provided with electrolytic grade Copper winding for stator. The cable from the submersible motor shall be rubber insulated copper core water proof cables of adequate core and size, which shall be brought through water sealed terminals from the stator body to enable the motor to be connected with the switch on the pump floor. The submersible cable (Power and Control) of the pump sets shall be **40 m** length to avoid any joint or break in the route from the submersible motor to the junction box.

The motor shall be capable of delivering rated output with the terminal voltage differing from this rated value by not more than +/- 6 percentage and the frequency differing from its rated value by not more than +/- 3 percentage.

Induction Motor (submerged) design the motor shall be of squirrel cage, Induction type, air Filled yet capable of water Immersion up to 20 MWC for S1 duty- Motors with Oil or water filled windings shall not be allowed

Motor shall be capable of starting and accelerating the load with the applicable method of starting without exceeding the acceptable winding temperature, when the supply voltage is in the range of 10% above of the rated motor voltage.

Motor shall be designed to withstand 120% of the rated speed for two minutes without any mechanical damage in either direction of rotation.

Motor should be wound using Dual Coated, Super Enameled, copper wire with high temperature index as per I.S. 4800 Part-13, PVC/Poly propylene- poly ethylene insulation for winding wires shall not be allowed. Motor's Insulation should be Vacuum Varnish Impregnated & Oven Baked to ensure Moisture Impervious & Mechanically Robust insulation. Dip or Pour type Air Dry Varnishing shall not be allowed.

#### **4.2.6.1 Operational requirement**

The motors shall be designed to operate continuously (S1 duty) at its rated output over the entire range of the output of the driven equipment. It shall be also have at least 15% margin over the input power requirement of the driven equipment at rated output duty point. The motor characteristic shall match with the requirements of the driven equipment so that adequate starting torque, pull up, pull out and full load torques is available for the intended service. The motor  $GD^2$  value must be greater than the  $GD^2$  value of the driven equipment

and shall be so designed as to give smooth and uniform starting and running of the driven equipment at all load conditions.

The motors shall be designed to run continuously at rated output over the entire range of voltage and frequency variations. The motors shall be capable of operating satisfactorily at its full load for 15 minutes without injurious heating with 75% rated voltage at motor terminals.

Motors shall be designed for operations with Fully Automatic Start Delta (FASD) starter with starting current not exceeding 3 times. All the stator winding terminals and other items like space heaters, embedded temperature detectors bearing temperature detectors (DE & NDE) etc. shall be brought out to separate terminal boxes as per IS as per requirement. All motors shall be suitable for bi-directional rotation unless otherwise specified.

All motor driving pump units shall be protected against dry running of the pumps through suitable sensing devices like float/level sensing switches/probe and total sensing device along with all the relevant control apparatus and wiring and cabling shall be included in the scope of work.

The motor shall be capable of withstanding the stresses imposed if started at 110% rated voltage, Motor shall start with rated load and accelerate to full speed with 80% rated voltage at motor terminals. Motor shall be capable of six equally spread starts per hour, three starts in quick successions from cold conditions and three restart from hot conditions. Motors subject to reverse rotation shall be designed to withstand the stresses encountered when starting the non-energized shaft rotating at 125% rated speed in reverse direction. Provision for LT Capacitor Banks across motor terminals should be provided as per specification.

#### **4.2.6.2 Provision for Earthing**

Earthing of the motor shall be done as per IS 9283 in accordance with the relevant provisions of IS 3043, For satisfactory purpose it shall be ensured during installation that the earthing is capable of taking care of leakage current. In case of PVC pipe used as discharge pipe, a separate non corrosive, low resistance conductor from earth terminal to control panel shall be provided for earthing. In case of non-corrosive GI pipes and clamps are used for the purpose of earthing the motor, earthing connection may be made to the discharge pipe clamp and to control panel earth terminal.



#### **4.2.6.3 Terminal marking and direction of rotation**

Terminal making shall be in accordance with IS 9283. The direction of rotation of pump set is designated clockwise or anti-clockwise as observed when looking at the pump shaft from the driving end. The direction of rotation shall be clearly and securely marked by incorporating an arrow on the pump set.

#### **4.2.6.4 Cable**

A watertight cable junction Box sealed from the motor shall be provided for motor power and signaling cables. The cable shall be of minimum 40 m to be terminated in MCC (Minimum 40 mtr. Length without any joint). It should be Copper Cored, Dual sheathed EPRS/PVC type.

A water tight cable junction box sealed from the motor shall be provided for the motor power and signaling cables complete with all external corrosion resistant cable glands. The cable shall be brought directly out of the submersible motor without joints, and shall be of sufficient length, minimum 30 m to be terminated in an IP 68 junction box outside adjacent to the wet well. They shall be sized in accordance with the electrically utility regulations and BS 7671.

The size of the conductor shall be adequate and suitable for continuous use under water and air. If four core cables are used, the fourth core is to be used for earthing.

#### **4.2.6.5 Stuffing box/oil chamber**

1. The pressurized entry of water into the motor (From the pump's volute casing) should be prevented by two separate mechanical seals in mounted in a tandem mode within an oil chamber.
2. The primary (In board) seal should be of silicon carbide or tungsten carbide faces to withstand erosive wear due to any silt particles. The secondary (Out board) seal should be of carbon v/s cast chrome Molybdenum steel or silicon carbide or tungsten carbide – i.e., thermally unstable materials like Alumina/ Aluminum Oxide shall not be allowed.
4. Seals must be capable of withstanding rotation in either direction.
5. A detector shall indicate when moisture is leaking past the first seal.
6. These mechanical seals should be of bi-directional mechanical seals permitting reverse running due to accidental back flow.

#### **4.3 Internal Protection Features**

4.3.1 The pump sets shall at the minimum be provided with the following internal protections. The leads of all the protecting sensors shall be brought out from the motor with Separate control cables.

#### **4.3.2 Winding Temperature**

The motors shall be provided with 3 sets of PTC temperature sensors embedded in the winding for monitoring the winding temperature, protection, and annunciation.

#### **4.3.3 Bearing Temperature**

For detection of mechanical faults, both bearings, at drive end and non-drive end shall be provided with PTC type temperature sensors for monitoring the bearing temperature, protection and annunciation.

#### **4.3.4 Moisture Sensors**

The motors shall be provided with DI moisture sensor to sense moisture contamination in the motor housing & connection chamber. The sensor shall generate alarm/ trip signals at the annunciator panel.

#### **4.3.5 Monitoring Seal Leakage Chamber**

The pump sets shall be provided with a DI moisture sensor assembled in the seal leakage collection chamber. In the event of any leakage, this sensor will give the tripping signal. The contacts of the DI moisture sensor shall be rated for operation on 110-230V AC supply.

#### **4.3.6 Interlocks**

1. The pump will not start unless water level indicator command is passed on.
2. The pump should be stopped as soon as water level decreases below POL.

### **4.4 Material of Construction**

Diffuser casing: Cast Iron IS:210, FG 260/ EN-GJL-250/ BS:1452, FG 260

Impeller: EN 10213-4-1-1.4470 (Duplex stainless steel)

Shaft: SS ASTM A276 Type 316 / SS 316

Motor housing: Cast Iron IS:210, FG 260/ EN- GJL-250/ BS:1452, FG 260

Stator winding: Electrolytic grade copper/bar

Rotor: Copper / Die Cast Aluminium

Fasteners: SS ASTM A276 Type 316

Lifting chain: SS ASTM A276 Type 304

Mechanical seal: Silicon carbide/ Silicon carbide

Column pipe: MS, 12 mm thick as per IS 2062

Material of Construction of any other International Standard may also be considered.

#### **4.5 Acceptable Makes**

The equipment offered shall be of reputed make (like KBL, KSB, GRUNDFOS, SULZER, Willo Mather and Platt, XYLEM (FLYGT) or equivalent approved by E.I.C. with proven performance and ISO:9000/ 14000 organization. The manufacturer must have supplied equipment of similar types and duties as indicated in the specifications. The Govt reserves the right of selecting the make of the pumps and other major items envisaged for the bid. The Contractor shall take prior approval from the govt before placement of order to their vendors/ suppliers

**The pumps shall be manufactured in Manufacturer's overseas works (Europe) and shipped from the respective European country to India.**

#### **4.6 Painting**

The pump set shall be painted with two coats of high-quality epoxy primer (lead and chromium free) plus two coats of epoxy paint. Total DFT of paint shall not be less than 350 microns. The paint shall be spray applied and dried in a painting booth to avoid ingress of foreign particles especially when the painted surface is not completely dry.

#### **4.7 Inspection & Testing at manufacturer's Work**

The manufacturer shall submit their QAP for Engineer's Approval including the following inspections and testing which will be carried out at the manufacturer's work.

##### **4.7.1 Hydrostatic Test**

The pump diffuser assembly will be hydrostatically tested for any leakage, with water at a pressure 1.5 times of closed valve pressure with maximum impeller size or 2 (two) times of pump duty point pressure whichever is higher. Unless otherwise stated the minimum duration of testing will be 30 minutes.

##### **4.7.2 Static Balancing**

All major rotating components must be statically balanced individually.

##### **4.7.3 Dynamic Balancing**

In addition to static balancing of individual component, the whole rotor assembly of pump must be dynamically balanced at rated operational speed to VDI 2060-Q6.3/Gr 6.3 of ISO.

##### **4.7.4 Performance Test**

**4.7.4.1** Each assembled pump shall be shop tested at manufacturer's work by the manufacturer in presence of Employer/ Engineer to determine the following characteristics as furnished in the characteristics curve.

- i) Capacity vs. Total Dynamic Head curve
- ii) Capacity vs. Brake Power (BkW) curve
- iii) Capacity vs. Efficiency (%) curve
- iv) Capacity vs. NPSHR curve

**4.7.4.2** While testing the following are also to be recorded:

- i) Vibration level
- ii) Bearing temperature

**4.7.4.3** The above tests for each pump for its full operating range at rated speed shall be conducted in accordance with the latest revision of IS 5120/ISO 9906 Gr. 2/HIS standards.

**4.7.4.4** During pump testing, reading to the extent possible shall be taken corresponding to its full working range.

**4.7.4.5** Each pump performance shall be documented by obtaining concurrent readings showing motor voltage and amperage, pump suction head, pump discharge head, pump discharge etc. Such readings shall be documented for at least ten pumping conditions including one at the shut-off head and each power load shall be checked for proper current balance.

**4.7.4.6** The curves produced from the above readings shall be used to determine the capability of pump sets to meet the guaranteed performance at site.

**4.7.4.7** Bearing temperatures shall be determined by PTC type temperature detector. A running time of at least 30 minutes shall be maintained for this test at shut off head if sufficient water is not available for a complete test.

**4.7.4.8** After the test runs have been performed to the satisfaction of the Employer/ Engineer that the pumping equipment complies with the stipulated specifications, the Engineer shall be provided with manufacturer test certificate.

**4.7.4.9** All instruments and equipment required for such test shall be provided by the manufacturer and the instruments shall be calibrated and certified by an approved independent testing authority which they will be used. Calibration certificates as per international practice shall be provided.

**4.7.4.10** In the event of any pump failing to meet the specified test requirements, it shall be modified and retested until the requirements are attained.

**4.7.4.11** For motor following test certificates shall be provided-

(a) Motor type test certificate as per IEC 60034.3.31 (one per motor type)

(b) IP-68 leakage test after assembly.

(c) Insulation test (Class-F) & High Voltage test as per VDE 0530

#### **4.7.5 Raw Material Tests**

**4.7.5.1** Physical and chemical tests of raw materials for major components of each pump shall be done. These tests shall be conducted in accordance with relevant IS/ BS/ DIN/ISO/DIN ENI 0204:2665-01 standards. All material test certificates shall be submitted, with proper correlation with the pump components, to the Employer/ Engineer for review and approval. Approved test certificates shall be produced during pump performance tests.

#### **4.7.6 Visual Inspection**

Pumps shall be offered for visual inspection to the Employer/ Engineer before despatch. The pump assembly/ any component shall not be painted before inspection.

#### **4.8 Testing at Site**

All the pump sets shall be tested at site in the presence of manufacturer's expert. The QH Parameters shall be measured with the electromagnetic flowmeter installed at the rising main for. The testing shall be arranged by the contractor at no extra cost.

#### **4.9 Comprehensive Maintenance contract**

Submersible Pump Motor set shall be placed under comprehensive maintenance contract for Five (05) calendar year after completion of one (01) year of defect liability period. Pump Motor set along with its allied system shall be maintained as per maintenance manual provided by the manufacturer.

In the event Defects of components/ sub- components/ Assemblies/ Sub-Assemblies is surfaced, same to be repaired. If, not repairable, same to be replaced free of cost under this clause.

Separate items are provided in the BOQ for Comprehensive Maintenance contract Contractor shall have to quote their rate per year basis.

A Service level agreement in respect of this item will be executed in due course of time separately after successful commissioning of the project.

## **5. Valves**

### **5.1 Sluice Valve**

**5.1.1** Unless otherwise specified all the sluice valves shall be rising spindle type, flat face, bolted bonnet with solid wedge disc and manually operated by hand wheel. The valves above and including 400 DN shall be provided with spur/ bevel gear arrangement for ease in operation and be fitted with by-pass arrangement.

**5.1.2** The sluice valve shall be as per IS: 14846/ BS:5150/ DIN:3352 at their latest revision. The pressure rating of the valve shall be as per the specific standard followed taking into account the operating pressure. Wherever specifically mentioned, the valve shall be fitted with extended spindle, head stock along with hand wheel for easy operation from the operating platform. There will be no play in the XX & YY axis of the valve gate within the guide channel of the valve.

Design Pressure - 20 MWC

#### **5.1.3 Material of Construction**

Body, bonnet, wedge, stuffing box gland: Cast iron (IS:210, FG 260)

Spindle: Stainless steel (AISI410)

Body seat and disc seat: Stainless steel (SS 304)

Packing: Greasy jute packing

Fasteners: IS:1367, Class 4/ 4.6

Extended spindle: Mild steel (BS: 970, EN8)

Head stock: Cast iron (IS: 210, FG 260)

Hand wheel: Cast iron (IS: 210, FG 260)

#### **5.1.4 Acceptable Makes**

IVC/ Fouress/ Audco/ Sigma Flow/ Kirloskar / Fouress / Durga / AVK/ Venus/Kalpana Valves/ equivalent

### **5.3 Flap valve**

**5.3.1** Each pump will be provided with flap valve in its delivery pipe end. The flap valve will be of 600 mm dia. C.I. Single flange, swing type double hung flap valve with pressure rating as per specific standard and following specification.

For Rated flow - 2550 M<sup>3</sup>/Hr,

Velocity at rated flow - 2.5m/sec

Design Pressure - 20 MWC

Leakage as per IS 13349 class 3

Testing as per IS 14858

#### **5.3.2 Material of Construction**

Body, flap Cast iron, IS: 210, FG: 260,

Body & disc set: stainless steel, AISI 304,

Hinge pin: Stainless steel AISI 410,

Flange standard IS 1538,

#### **5.3.3 Acceptable Makes**

Any reputed make approved by Engineer in charge.

### **5.4 Painting**

All the valves shall be painted with zinc rich epoxy primer plus two coats of epoxy paint. The paint shall be spray applied and dried in a painting booth to avoid ingress of foreign particles especially when the painted surface is not completely dry.

### **5.5 Inspection and Testing**

The valve shall be subjected to seat and body test in accordance with relevant IS at the manufacturers works in presence of Engineer or his representative, before delivery. The test certificates shall be furnished in triplicate.

All the major components of each valve shall be physically and chemically tested by approved independent testing authority to confirm the material quality. The manufacturer shall intimate the Client, the relevant Standard to be followed for testing. All components subject to testing shall be identified, and only those which are tested successfully shall be used for the manufacture of final product. All test results shall be submitted for Engineer's approval.

### **Hydrostatic Test**

The pressure retaining components of all valves shall be tested at the pressure stipulated in the relevant standard followed. The manufacturer should inform the Client regarding the pressure ratings of the valves and all the test certificates to be submitted before dispatch of the materials.

### **6. Pressure gauges**

All the pumps shall be provided with dial type pressure gauges of suitable range at delivery flanges complete with copper tubing and control cocks. The gauges shall be of direct mounted stainless steel diaphragm sealed type. The dial size of each pressure gauge shall not be less than 150 mm. The material of construction shall be suitable for sewage/ drainage pumping station installations. Each pressure gauge shall be complete with pressure snubber and of suitable class of enclosure. Accuracy shall be  $\pm 1.0\%$  of full-scale range or better. Scale range shall be selected so that normal system pressure is approximately 50% of full scale. The Gauges should conform to the latest revision of IS:3624/ BS:1780/ equivalent.

Testing as per IS 3624.

### **7. EOT crane:**

Double Girder 15 MT capacity semi EOT Crane:

#### **7.1 Scope of supply:**

**7.1.1** Design, manufacture and supply of 15 M.T. capacity x 5.5 mtrs. span x 8 mtrs. lift double girder pendant controlled semi EOT overhead travelling crane having hoisting & CT motion electrical by pendant operation from floor. LT motion shall be manual and to be Operated from floor by hand chain. Quantity: 01 no



**7.1.2** Design, manufacture and supply of steel gantry girder with square rail suitable for the above crane for a travel length of 22 mtrs. and to be designed for maximum column pitch distance of 3 mtrs. Steel gantry girder shall be supported on column brackets to be provided with suitable base plate and side insert plates during casting. The total length of steel gantry girder shall be  $22 \times 2 = 44$  mtrs. Quantity: 01 set

**7.1.3** Design, manufacture and supply of Down shop lead arrangement for feeding power to the crane along the longitudinal travel comprising of 4-line PVC shrouded type GI conductor with supporting brackets and a set of current collectors. The length of DSL shall be 22 mtrs. Quantity: 01 set

## **7.2 Code and Standards**

The crane shall be designed, manufactured, erected and tested in accordance with the following or their latest version of IS Codes.

- (i) IS 3177 -1999 – Indian Standard Code of Practice for Electric Overhead Crane.
- (ii) IS 807-2006 - Indian Standard Code of Practice for design, manufacture, Erection, and testing (Structural portion) of Cranes and Hoist.
- (iii) IS 2266 – Specification for steel wire ropes for General Engineering purposes.
- (iv) IS 325- Specification For three phase induction motor.
- (v) IS 5749 – Specification for forged hooks
- (vi) IS 800-2007 – Design of Steel structure

### **EOT crane data:**

Type	: Overhead travelling crane
Construction	: Double girder
Capacity	: 15000 kg
Crane span	: 5500 mm
Height of lift (total lift)	: 8000 mm
Number of rope falls	: 8, 14 mm dia.

## Operating speeds

Hoist motion	: 2 M/Min, 7.5KW motor
C.T. motion	: Manual by hand chain to be operated from floor. Suitable reduction shall be provided for long travel motion to reduce the pulling effort and ease in operation.
L.T. motion	: 10-12 M/Min, 0.55 KW geared break motor
Power supply	: 415V +/- 10%, 3Ph, 50 cycles AC
Method of control	: The hoist and LT motion shall be controlled from floor by pendant push button switch. CT motion shall be controlled by hand chain.
Recommended rail size	50 mm square rail
Max. Wheel load without impact	: 9.25 Ton
Wheel base	: 2300 mm approx.
Centre line of gantry rail	: 250 mm on either side
Brakes	: Hoist motion shall be provided with electromagnetic / electro hydraulic thruster brake, fail safe type. CT motion shall be provided with EM AC/DC disc brake.
Limit switch	: Hoist & CT motion shall be provided with suitable limit switch for upward and downward motion and cross traverse motion respectively.
Protective device	: Electrical control components shall have protective devices like air brake contactors, MCB and step down transformer.
Class & Duty	: The semi EOT crane shall be suitable for M-5 (class-II) duty indoor operation conforming to IS: 807 and IS: 3177 as and where applicable.
Painting	: The crane structure and supporting gantry structure shall be supplied duly painted with one coat of red lead primer and two coats of synthetic golden yellow enamel paint.

**7.3 Brakes:** Hoist motion shall be provided with electromagnetic / electro hydraulic thruster brake, fail safe type. CT motion shall be provided with EM AC/DC disc brake.

**7.4 Limit switch:** Hoist & CT motion shall be provided with suitable limit switch for upward and downward motion and cross traverse motion respectively.

**7.5 Protective device:** Electrical control components shall have protective devices like air brake contactors, MCB and step-down transformer.

**7.6 Class & Duty:** The semi EOT crane shall be suitable for M-5 (class-II) duty indoor operation conforming to IS:807 and IS:3177 as and where applicable.

**7.7 Painting:** The crane structure and supporting gantry structure shall be supplied duly painted with one coat of red lead primer and two coats of synthetic golden yellow enamel paint.

**7.8 Load Testing:**

The crane shall be designed with 25% overload capacity as per IS 807. The load and overload test of the crane shall be carried out at manufacturers works in the presence of EIC or his representative before dispatch. The test and guarantee certificate of the crane shall be submitted along with the supply.

**7.9 Rigid Control Safety**

- (a) The crane should be rigid, robust, and sturdy construction.
- (b) Crane controls should be conveniently located. The various controls should be suitably interlocked to prevent accidental movement of the crane.
- (c) Suitable limit switches, one each for cross travel and two each for main and auxiliary hoists, should be provided to stop the crane and prevent over travel of various moving parts of the crane.
- (d) Electrical interlocks should be so provided that two operations of traversing and traveling can be performed simultaneously, but while hoisting it is not possible to undertake the traversing or traveling.

(e) Suitable buffer should be provided to prevent over travel of the crane mechanism in both longitudinal and cross traverse directions.

(f) Suitable guards or enclosure should be provided on the crane to prevent inadvertent contact with down shop lead, or any other exposed electric conductors and cables.

(g) Sheaves shall be provided with rigid guards to retain the wire ropes in the grooves. The guard shall fit close to the flange having a clearance not more than one-fourth of the diameter of the wire between the sheave and the inside of the guard. Bottom block sheaves shall be enclosed except for wire rope openings.

(h) The fully commissioned crane should be rigid and robust to withstand the pump house environment with an ambient temperature ranging up to 50 °C and relative humidity 100 %.

#### **7.10 Maintainability**

(a) All electrical cables should be so laid that they are not liable to damage and can be easily inspected and maintained. The cable should be weather proof.

(b) All components of cranes of identical capacity and duty shall be interchangeable unless otherwise required.

(c) Materials used for equipments and structures should be free from cracks, blowholes, laminations, pitting etc. Except of areas where a superior grade of material is required. Steel Grade 'B' quality shall be used throughout to IS 2062(latest) . The supplier should submit material test certificates for structural steel and mechanical component such as couplings, gears, gearboxes, rope drum, brake drum, shaft, wheels etc.

(d) A tool box containing all tools required for the maintenance of the crane.

(e) Fasteners of pedestal blocks, gear boxes, etc. should be easily removable from the top of the platform.

(f) Standardization and unification shall be carried out to the maximum extent for the various sub-assemblies constituting the mechanism of various cranes. Unit shall be designed such that they can be dismantled quickly without disturbing of the installation of the

neighboring unit with which they are connected. Units as a whole as a whole, such a wheel assembly gear box, brake, rope drum assembly etc. Shall be replaceable and interchangeable with other identical units.

### 7.11 Structural Details

(a) All welded subassemblies of box girder should be stress relieved before final welding of the box girder.

(b) Position of Weld joints in top plate, side plate and bottom plate of the box girder assembly should be specified with respect to the maximum deflection plane (i.e. the plane passing through the centre point of the box Girder.)

(c) In the main bridge girder, in addition to the required full-length diaphragms, short diaphragms should be inserted wherever require to transmit the trolley wheel load to web plate and to limit the maximum stress in the trolley rail to safe permissible limits. All diaphragms must bear against the top flange. Steel plate used for bridge girder and diaphragms should be as per IS 2062 (latest).

(d) All fasteners should be hot dip galvanized. All load bearing fasteners should be of high tensile grade. It should be of reputed Make. Manufacture should submit a test report for mechanical testing for the same.

(e) The Bridge Girder should be connected to the end carriage by large gusset plates. Ground tight fit bolts in reamed holes should be used for bolted connections.

(f) All Butt welds on structural members of bridge girders subjected to tension should be radio graphically tested. All other welds should be subjected to Magna Flux or dye penetration test.

### 7.12 Tolerance

The entrusted agency shall ensure that the crane shall be manufactured as per the tolerance specified below:

01	Span over LT Wheel	± 6 mm up to 40 meters
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02	Wheel Base	
	LT	± 5 mm
	CT	±3 mm
03	Difference in diagonal	
	LT	± 5 mm
	CT	± 3 mm
04	Long Travel wheel alignment	±1 mm
05	Tilt of wheels or balancer axle	±1mm/1000(Horizontal/ vertical)
06	Trolley wheel gauge	± 3 mm up to 7500 span ± 5 mm above 7500 mm span
07	Difference in height between trolley rails (H) in relation to the trolley track gauge(S) shall be within the following tolerances :	
	'S' (mm)	"L' (mm)
	Up to 2500	4
	Above 2500 and up to 4500	6
	Above 4500	10
08	Horizontal bend of girder in plan	Span/2000
09	Shift of web plate of main & ens girders from vertical over height 'H' measured near the mid span and	H/200

	close to the main diaphragm	
10	Twist of main Girder	Span/1500
11	Axis of flame Plates from the axis of the beam	H/250
12	Over Buffer length	± 5 mm
	(over buffer dimension on two sides shall be same)	
13	Height of centre of Buffer	±5 mm
	(From top of track rail)	

### 7.13 Testing after erection

- (a) Insulation test and other test mentioned in IS 3177-1999 shall be carried out.
- (b) Deflection test: The deflection test of bridge girder shall be carried out as IS 3177-1999. After the deflection test with safe working load, the crane shall be tested for deflection with 25 % overload and there shall not be any permanent set after the removable of the load.

### 7.14 Speed Test:

All motion of the crane shall be tested with rated load on all the notches at the time of commissioning of the crane at side and the speeds shall be attained within the tolerance limit.

All motion of the crane shall be tested with 25 % over load in which case the specified speed need not be attained but the crane shall follow itself capable of dealing with the over load without difficulty.

### 7.15 Brake Test:

The hoist brake shall be capable of breaking the movement with rated as well as overload. However, the breaking path with rated load shall not exceed hoisting speed/120 for class 2 duty cranes.

The long travel and cross travel brakes shall be capable of arresting the motion with in a distance in meters equal to 10 % of speed in meters/min.

The crane shall be completely assembled and tested in the supplier's work for full load and 25 % overload on hoisting and cross traverse motion, in presence of E.I.C. representative in addition to other tests as specified in IS 3177-1999.

## **7.16 Mechanical Details:**

### **7.16.1 Rope Drum**

The rope drum shall be designed to with stand the compressive stresses caused by the rope wound on it and the bending stress due to beam action of the drum.

The drum shall be rolled or centrifugally cast steel as per IS 2328 flanged end, if required not less than 2.5 mm in thickness and not less than 65 mm , beyond the pitch diameter of the drum. Crane shall be designed with nos. of rope having 4 falls.

### **7.16.2 Rope Sheave**

All the sheaves should be of cast/ forged steel. They should be identical, with the exception of the equalize sheaves. The equalizer sheaves should be mounted above the trolley floor and should be easily accessible and removable from the trolley floor level. The equalizer sheaves should be arranged to turn and swivel in order to maintain rope alignment under all circumstances. Sheave groove should be smooth finished for getting increased rope life. The supplier should further ensure that wire ropes are parallel with each other.

### **7.16.3 Wire Ropes**

Hoisting ropes, if of the conventional type, type should be 6 x37 up to 16 mm diameter and 6 x 36 above 16 mm diameter construction and made out of the best plough steel having tensile strength of 180 kg/ sq.mm. Rope should be parallel right hand lay as per IS 2266-1976(latest) . The wire rope shall comply to **clause 8.3 of IS 3177-1999.**



#### **7.16.4 Hook Block**

The sheaves shall be full encased in closed fitting guards fabricated out of steel plates. Smooth opening shall be provided in the guards to allow the free movement of rope, and hole shall be provided for drainage of the oil.

#### **7.16.5 Gearing**

The gearing for all motion should be of suitable case carburizing low carbon alloy steel and should conform to relevant Indian standards. They shall generally be in accordance with IS 4460-1967( or latest) . All gears and pinions must be made from forged blank only. All gear should be hardened and profile ground for longer life and silent operation. The minimum surface hardness of pinion shall be between 266 to 300 BHN and that for gears shall be between 217 to 255 BHN . The difference in hardness of pinion and Gear must not be less than 20 BHN.

Worm wheels and bevel gears must not be used. At all stages helical Gears should be used., except in planetary gear boxes, which can be spur type. Overhung or split gears and pinion should not be used.

#### **7.16.6 Gear box**

All gear boxes shall be of completely enclosed splash lubricated type. All gear boxes shall be of oil tight and sealed with compound or gasket. All gear shaft shall be supported in anti-friction bearing mounted in the gear boxes. Gear box shall be cast, wrought and from low/ medium carbon alloy steel and suitably heat treated. The fabricated gear box shall be stress relieved before machining and the method of doing so shall be explained in details in the offer. The internal surface of the gear box shall be painted with oil resistant paint. Gear Box shall be provided with breather vent, easily accessible drain plug, and a suitable oil level indicator, such as dip stick. Adequate radial clearance between the gear box inner surfaces and outside diameter of the gear shall be ensured and the clearance proposed to be provided shall be indicated in the offer. The facial clearance between the inner surface of the gear box and the face of the nearest gear/ pinion shall be at least 10 mm.

#### **7.16.7 Connection Between Rope Drum and Gear Box**

One of the following arrangements shall be adopted for connecting the rope drum with the Gear Box. Flexible joint, incorporating flexible geared coupling housed within the drum. Fully flexible geared coupling between the drum and gear box.

#### **7.16.8 Track Wheel**

All Track wheel shall be double flanged. The Blank shall be made by roll forming, forging and casting from grades of steel appropriate to the forming process. Wheel shall be mounted in an anti friction roller bearing housed in 'L' shaped bearing bracket for easy removal during maintenance.

Wheels from 400 mm diameter and above may consist of hardened, rolled / forged steel tyre of not less than 60 mm thickness .

The wheel should be shrink fit on the axles, rather than being keyed on.

#### **7.16.9 Coupling**

Motor shaft shall be connected to the Gear box input shaft through flexible shock absorbing coupling. Rotating parts shall be suitably covered by 3.15 mm thickness thick sheet steel hinged cover for safety. In case of single motor centre drive for long travel motion, Output shaft of the Gear box shall be connected to the line shaft through half geared coupling .Half geared coupling with floating shaft shall be provided between the wheel and the wheel and the line shaft .

#### **7.16.10 Bearing**

Anti friction bearings shall be used throughout except where required otherwise for technical reasons.

#### **7.16.11 Buffers**

Spring loaded buffer shall be provided in all the four corners of the bridge girder and the end carriages for cross and long travel motion respectively.

#### **7.16.12 Brakes**

For LT & CT motion, the maximum braking torque to arrest long travel and cross traverse motion should not be less than 125 % of full load torque for each brake. The LT & CT motion brakes should be provided with **Electro Mechanical (EM) fail DC disc type- 01 nos. (for each)**

**For hoist motion, two brake should be used** and the braking torque for each brake should not be less than 125 % of full load torque. One of the two hoist brake shall be applied with a time lag of 3 sec in relation to the first. The hoisting motion should be provided with **Electro Hydraulic Thruster (EHT) Brake- 01 nos. and Electro Mechanical (EM) fail safe D.C. Disc Brake – 01 nos.**

**Brake release should be depended on motor torque. The brake should be released only if 100 % torque is developed in the motor.**

#### **7.16.13 Lubrication**

Grouped grease lubrication system shall be used for class M3, M5 and M7 duty cranes. Lubrication of the Gears and Pinions in the Gear Boxes shall be splash fed from the sump. In case of three reductions, vertically mounted Gear box (having limited motion) an oil pump shall be fitted to ensure lubrication of all gears.

#### **7.16.14 Lifting Blocks**

Standard plain shank type trapezoidal action hooks should be used. The hook shall be solid, forged, heat treated, of rugged construction and provided with a standard depress type safety latch. Lifting shall have swivels and operate on thrust bearing with hardened race. Lock to prevent hook from swiveling shall be provided. These hooks shall be conformed to the relevant Indian standard Specification IS: 3815 (latest). Certificate of test and examination to be submitted by the bidder. Certificate should indicate Sl. No. and date of testing.

### **8. Mechanical level indicator**

**8.1** Level Indicators shall be provided in the wet well for indication of sewage level. The indicators shall be mechanical float chord type complete with bottom anchor, guide wire, spring tension assembly and friction free pulleys. The pulleys and the chord shall be with

weather proof enclosure. The scale shall be with black graduation on white background with red pointer attached to the counter weight.

## **8.2 Material of Construction**

Float: SS 316

Float guide: SS 316

Chord: SS 316 wire

Pulleys: Cast aluminium alloy

## **9. Flow measuring system**

### **9.1 General**

**9.1.1** Flow measuring system shall consist of flow sensor, flow transmitter, digital flow indicator and integrator and any other items required to complete the flow measuring system in totality.

**9.1.2** Flow sensor shall be rugged in construction and shall be suitable for continuous operation. Flow sensor shall have waterproof construction and shall be suitable for installation on underground/ above ground pipelines.

**9.1.3** To avoid the effects of disturbances in the velocity profile, a straight and uninterrupted run, upstream as well as downstream from the location of the flow sensor shall be provided, as required by the flow meter manufacturer and in line with applicable standards.

Contractor shall finalize the exact location of flow transducers in consultation with Employer/ Engineer.

**9.1.4** The flow transmitter shall be suitable for remote mounting (at pumping station) and shall accept input from the flow transducer. It shall process the input signal and provide 4 - 20 mA DC output proportional to flow rate. Flow transmitters shall have LCD display to indicate instantaneous flow rate.

### **9.2 Design Criteria for Design/ Selection of Instruments**

**9.2.1** The design/ selection criteria to be applied for flow and pressure measuring/transmitting instruments shall be as follows:

- a) All instruments shall be suitable for continuous operation
- b) All transmitting instruments shall have a 4 - 20 mA linear output

- c) All digital outputs shall be potential free
- d) All instruments shall be designed for the ambient conditions of temperature and humidity
- e) All wetted parts of instruments sensors shall be non-corrosive and suitable for use with potable water containing residual chlorine
- f) All instrumentation systems for outdoor application shall be protected to IP 65/ IP68
- g) All analogue displays shall be of the digital type with no moving parts
- h) Instrumentation shall utilize solid state electronic microprocessor technology and avoid the use where practical of any moving parts
- i) Instruments shall resume operation automatically on application of power following a power failure

### **9.3 General Requirements of Flow Measuring Instruments**

**9.3.1** Flow measuring system shall consist of flow sensor/ transducers, flow integrator & flow

transmitter, digital flow indicator & integrator and any other item required to complete the system.

**9.3.2** Flow transducers shall be rugged in construction and shall be suitable for continuous operation. Flow transducers shall have waterproof construction and shall be suitable for installation on underground/ above ground pipe lines.

**9.3.3** To avoid the effects of disturbances in the velocity profile, a straight and uninterrupted

run in the upstream as well as downstream from the location of the flow sensor shall be provided, as required by the flow meter manufacturer.

**9.3.4** The flow transmitter shall be suitable for field mounting and shall accept input from the

flow transducer. It shall process the input signal and provide 4 - 20 mA DC output proportional to flow rate. Flow transmitters shall have LCD display to indicate instantaneous flow rate. The flow range shall be adjustable. The flow meters shall be suitable for measuring flow at velocities of water from 0 to 4 m/sec.

**9.3.5** The flow computer shall be microprocessor based and shall have self-diagnosis facilities.

**9.3.6** The scope shall include supply of all related fittings, fixtures at site including counter flanges, masonry chamber etc. as required for the flow meters. The scope shall also include supply of hardwares and softwares required for the data logging/monitoring system.

#### **9.4 Description of Flow Measuring Equipment**

##### **9.4.1 Electromagnetic Full Bore Type Flow Meter**

**9.4.1.1** The full-bore electromagnetic flow meter shall consist of flow sensor (i.e. flow tube) equal to the diameter of the pipeline and shall be provided with remote mounted flow transmitter and flow indicator and integrator and any other item required for completing the flow measuring system. Flow measurement shall not be affected by physical properties of water viz., temperature, pressure etc., within given limits. The flow meter shall be suitable for by directional flow.

**9.4.1.2** The flow computer and transmitter shall be a single unit suitable for remote mounting. It shall accept inputs from flow tube, process the signals and shall provide an output proportional to the flow rate. The output shall be suitable for transmitting over a long distance.

##### **9.4.1.3 Calibration**

The electromagnetic flow sensor shall be wet calibrated and the calibration information and factory settings matching the sensor shall be stored in an integral mounted memory unit. Such memory unit shall store the sensor calibration data and signal converter settings for the life time of the product.

##### **9.4.1.4 Digital Panel Meters**

Digital panel meters (DPM) shall be microprocessor based and modular in design. They shall accept 4 - 20 mA DC signals from transmitters. The DPM's shall provide an output of 4 - 20 mA DC proportional to input signal for re-transmitting. The DPM'S shall have back-lit LED display . Digital panel meters shall provide excitation voltage to the respective transmitters.

##### **9.4.1.5 Acceptable Makes**

Krohne / Siemens/ Endress Hauser/ ABB/ equivalent

## **10. High voltage vacuum circuit breaker panel**

### **10.1 Scope**

This specification covers the requirement of design, manufacture, supply erection testing and commissioning of floor mounted extensible type H.V. Vacuum Circuit Breaker Panel. The HT supply from WBSEDCL at 11 KV (Nominal) shall be received on H.V. Vacuum Circuit Breaker Panel for feeding power to Transformers (two nos, 11KV/0.433 KV) of the substations for the Pumping Station.

There shall be one power transformer to step down the supply voltage from 11 KV to 433V to provide supply to the 433V (nominal) pump motors and station auxiliaries like lighting and other ancillary power loads etc through 415V, TPN, L.T panel boards and Distribution Boards.

### **10.2 Ambient Condition**

The switchboard shall be suitable for continuous operation at rated load at maximum ambient temperature of 50 degree centigrade and maximum Relative Humidity of 100%, the maximum temperature and humidity, however, shall not occur simultaneously.

### **10.3 Standards & Codes**

The switchgear and other equipment incorporated in the switch board shall comply with, but not limited to the following:

IS 13118/1991 – High Voltage A.C. Circuit Breakers.

IS 2705 (Part I to IV/1992) – Current Transformers.

IS 2099/1986 – Bushings for Alternating Voltages.

IS 13010/2003 IS 13779/1999 – Energy Meters

IS 3231/1986 & 87 – Relays.

IS 1248/2003 – Ammeters & Voltmeters.

IS 13947/Pt 1/93 – Degree of protection provided by Enclosures.

### **10.4 Technical Requirements**

#### **10.4.1 H.V. Panel**

The Panel board shall be of indoor type, having the incoming sectionalization and outgoing switch gears as per IS 13118: 1991 of VCB, IEC 62271-100 for Breakers and -200 for Panels/ IS 3427 of switch board. The degree of enclosure protection shall be IP-4X.

#### **10.4.1.1 Rating**

All panels assembled to form a board shall be suitable for the nominal operation voltage and rupturing capacity as specified. They should be rated as specified with a minimum of 630 Amps. and suitable for operation on 11 KV, 3 phase 50 Hz system. Type test certificate for the breaking capacity of the panel shall be supplied. A circuit breaker for a given duty in service is best selected by considering the individual rated values required by load conditions and fault condition.

#### **10.4.1.2 Type**

The HV Panel Board shall be metal clad, indoor, floor mounting, free standing type. It shall be totally enclosed dust, damp and vermin proof.

#### **10.4.1.3 General Construction**

Separately earthed compartments shall be provided for circuit breakers, bus bars, relay & instruments, CT&PT and cable boxes, fully and effectively segregating these from one another so that fault in any one compartment do not cause damage to equipment(s) in other compartment(s).

The housing shall be of bolted construction to ensure compact and rigid structure, presenting a neat and pleasing appearance. The sheet steel used should not be less than 2 mm thick.

The panels shall be bolted together to form a continuous flush front switch gear suitable for front operation of board and for extension at both ends.

#### **10.4.1.4 General Design Aspect**

The HV panel board shall be designed such that the switchgear, instruments, relays, bus bars, small wiring etc. are arranged and mounted with due consideration for the following: -



(i) Facility for inspection, maintenance and repairs of testing terminals and terminal boards for ease of external connection.

(ii) Minimum noise and vibrations.

- Risk of accidental short circuits and open circuits.

- Secured and vibration proof connections for power and control circuits.

(iii) Risk of accidental contact and danger to personnel due to live connections.

(iv) Mountings at approachable height.

## **10.5 Circuit Breaker**

### **10.5.1 General Arrangement**

The circuit breaker panels shall be complete with the following:

(a) Racking in / Racking out mechanism.

(b) Isolating plugs and sockets.

(c) Mechanical inter-locks and safety shutters.

(d) Mechanical ON/OFF indicator.

(e) Minimum of 4 NO and 4 NC Auxiliary contacts directly operated by the circuit breaker. Additional NO & NC contacts can be provided with auxiliary contractors.

(f) Anti condensation space heaters suitable for operation on 240V, 1 $\phi$  50 Hz A.C. for each panel wherever specified.

(g) Suitable tripping arrangement.

### **10.5.2 Type**

The circuit breaker shall be of horizontal/ vertical isolation, horizontal draw out pattern

### **10.5.3 Breaker Truck**

The breaker carriage shall be fabricated from steel, providing a sturdy vehicle for the circuit breaker and its operating and tripping mechanism. The carriage shall be mounted on wheels, moving on guides, designed to align correctly and allow easy movement of the circuit breaker and for removing the carriage for inspection and maintenance purposes. Vacuum interrupters shall be hermetically sealed and shall be designed for minimum contact erosion, fast recovery of dielectric strength, maintenance free vacuum interrupter, suitable for auto-reclosing. The drive mechanism shall preferably be provided with facility for pad locking at any position namely, "Service", "Test" and "Fully Isolated". It should be possible for testing the circuit breaker for its operation without energizing the power circuit in the "Testing" position. The contacts shall be made only after the breaker is inserted into service position. Interlocking should prevent contacts from being disconnected if circuit breaker is tried to be moved from service position.

#### **10.5.3.1 General Feature**

Single break contacts are provided in sealed vacuum interrupter.

#### **10.5.3.2 Rating**

The circuit breakers shall be continuously rated as specified with a minimum rated current of 630 Amps. with voltage rating and breaking capacity as specified.

#### **10.5.3.3 Operating Mechanism**

The operating mechanism shall be one of the following as specified: -

Manually operated spring charged / motor wound spring charged with both mechanical and electrical release for closing. The operating mechanism shall be trip free. External auxiliary supply shall be made available for charging motors & heater operation.

### **10.6 Bus Bar Section**

#### **10.6.1 General Requirement**

The switch board shall be **single bus bar pattern** with air insulated encapsulated bus bars housed in a separate compartment, segregated from other compartments.

#### **10.6.2 Material**

The bus bars shall be of high conductivity electrolytic copper rated as specified with a minimum rated current of 1250 Amps. The bus bars shall be sized for carrying the rated and short circuit current without over-heating. Maximum bus bar temperature shall not exceed 95-degree C.

### **10.6.3 Current Transformer**

#### **10.6.3.1 General requirements**

Accommodation shall be provided in the circuit breaker panel to mount one set of three numbers dual core dual ratio CTs for metering and protection purposes. Access to the CTs for cleaning, testing or changing shall be from the front, back or top of the panel.

#### **10.6.3.2 Rating**

Dual core & dual ratio CTs of suitable burden (but not less than 15 VA) shall be preferred with 5 Amps secondary. The ratio shall normally be one of the following as specified:

(a) 400/200/5/5 (b) 300/150/5/5

(c) 200/100/5/5 (d) 100/50/5/5

(e) such other as required

**Note:** CT ratio shall be compatible with the loading pattern on HV side.

The CTs shall conform to relevant Indian Standards. The design and construction shall be robust to withstand thermal and dynamic stresses during short circuits. Secondary terminals of CTs shall be brought out suitably to a terminal block which will be easily accessible for testing and terminal connections. The protection CTs shall be of accuracy class 5 P 10 of IS 2705- Part III-1992.

The metering CTs shall conform to the metering ratio and accuracy class 0.5 of IS2705-1992 for incomer and class 1 for outgoing panels.

### **10.6.4 Voltage Transformer**

A voltage transformer of burden not less than 150 VA and of proper ratio as specified shall be provided at the incoming panel.

The accuracy class for the VT shall be class 0.5 as per IS 3156 Parts I to III for incomer and class 1 for outgoing panels.

The transformer shall be of cast epoxy resin construction. It shall be fixed/withdraw able type. HRC fuses/ MCBs shall be provided on both HV and LV sides.

## **10.7 Protection and Tripping arrangement**

### **10.7.1 Protection**

The Relays shall be microprocessor based numerical relays with O/L, E/F and S/C protection Tripping relay shall be used for tripping signal to the Shunt Trip Coil of Circuit Breaker operating on 24 V/ 30 V D C supply / Power pack / 110 V VT supply.

Alternatively, Power Pack converters fed through PT/ 230V externally could be provided with 2 Nos., 12/ 15-volt, 7 AH SMF batteries (Power pack with condenser/ capacitor backup are also available which do not need batteries, these should not be used) for tripping. In cases where tripping is fed through PT, VA burden of PT shall be suitably increased (say 200 VA) as recommended by the manufacturer depending upon the number of panels and connected controls. In addition, external 24 volt / 30-volt DC supply shall be provided for indications etc. through 2 No. SMF batteries of 12/ 15volts of minimum 26 AH capacity with a battery charger as per recommendation of the manufacturer.

### **10.7.2 Relays**

Over current Relays shall have adjustable setting for current from 50% to 200% and earth fault from 10% to 40% or 20% to 80%. These should be of manual reset type. All relays shall have a LED indicator which will indicate operation for each function. It shall be possible to reset it only by manual operation. The number and types of relays shall be as specified.

## **10.8 Small Wiring**

The small wiring shall be carried out with minimum 1.5 sq. mm FRLS/ HFFR insulated copper conductor cables. CT wiring shall be done with minimum 2.5 sq mm wires with colour code:

R/Y/B, Gray for auxiliary DC circuits and Black for auxiliary AC circuits. The wiring shall be securely fixed and neatly arranged to enable easy tracing of wires. Identification tags shall be fitted to all wire terminals to render identification easy and to facilitate checking in accordance with IS 375. Necessary terminal blocks and cable entries shall be provided for RTD relay wiring, power supply etc.

## **10.9 Instrument and panel accessories (Digital)**

### **10.9.1 Instrument Panel**

The instrument panel shall form part of the housing. Relays, meters and instruments shall be mounted as per general arrangement drawings to be submitted by the tenderer. They shall be preferably of flush mounting type at a maximum height of 1800 mm

### **10.9.2 Instrumentation**

(a) A voltmeter of class 1.5 accuracy as per IS 1248 shall be provided at each incomer panel, with selector switch. The instrument shall be calibrated for the ranges specified.

(b) Energy meters of class 1.0 conforming to IS 722 (Part IX) and power factor meter of class of accuracy of 2 shall be provided, if specified.

(c) Ammeter of specified range of class 1.5 accuracy as per IS 1248 shall be provided at both incomer and outgoing panels along with necessary selector switches.

(d) The panel assembly shall also take care of the following requirements:

(i) Lamp indication shall be provided to indicate ON/ OFF (by red green respectively) of switch gear.

(ii) Panel illuminating lamp.

(iii) Mechanical indication for spring charged status. If possible an indicating lamp could be provided.

(iv) Lamp indicating tripping at fault status.

(v) Healthy trip supply shall be indicated by clear lamp.

(vi) Separate fuses/ MCBs shall be provided for lamps, heaters, voltmeter sand other instrumentation etc. on each panel.

(vii) Anti-condensation space heaters shall be provided, and shall be suitable for operation on 240 V, 1 phase, 50 Hz A.C. for each panel if specified.

(vii) Where there is more than one incomer and bus sections, these shall be castle key interlocked as per interlocking scheme as specified.

#### **10.10 Cable Box**

Provision for top (bus ducts preferred for top entry) / bottom or such other side entry shall be made as per requirement with sufficient head room for cable termination. 3mm thick removable gland plate shall be provided for cable termination.

#### **10.11 Earthing**

The earthing of the breaker body and moving portion shall be so arranged that the earthing of the non-current carrying structure to the frame earth bar is completed well before the main circuit breaker plugs enter the fixed house sockets. The entire panel board shall have a common tinned copper earth bar of suitable section with 2 earth terminals for effectively earthing metallic portion of the panels. The frame earthing of panel shall be in accordance with his specifications.

#### **10.12 Installation**

The installation work shall cover assembly of panels lining up, grouting the units etc. In the case of multi panels switch boards after connecting up the bus bar all joint shall be insulated with HV insulation tape or with approved insulation compound. A common earth bar shall be run preferably at the back of the switch board connecting all the sections for connecting the earth system. All protection, indications & metering

Connections and wirings shall be completed.

Where trip supply battery is installed the unit shall be commissioned, completing initial charging of the batteries. All relay instruments and meters shall be mounted and connected with appropriate wiring. Calibrations checks of units as necessary and required by the

licensee like CTs, VTs Energy Meters etc. shall be completed be for pre-commission checks are undertaken.

### **10.13 Testing and Commissioning**

Procedure for testing and commissioning of relay shall be in general accordance with good practice.

Commissioning checks and tests shall include in addition to checking of all small wiring connections, relays calibration and setting tests by secondary injection method and primary injection method. Primary injection test will be preferred for operation of relay through CTs. Before panel board is commissioned, provision of the safety namely fire extinguishers, rubber mats and danger board shall be ensured. In addition all routine megger tests shall be performed. Checks and test shall include following:

- (a) Operation checks and lubrication of all moving parts.
- (b) Interlock function checks.
- (c) Continuity checks of wiring, fuses etc. as required.
- (d) Insulation tests.
- (e) Trip test and protection gear tests.
- (f) The complete panel shall be tested with 5000 V megger for insulation between poles and poles to earth. Insulation test of secondary of CTs and VT to earth shall be conducted using 500 V megger.
- (g) Any other tests as may be required by the Licensee / Inspector shall be conducted.
- (h) Where specified, the entire switch board shall withstand high voltage test after installation.
- (i) Any other test required by the consignee/ inspecting officer.

### **11.0 Transformer**

#### **11.1 Scope**

This specification covers the design, manufacture, testing, supply, delivery at site according to the following specifications of the following transformer.

It is not the intent to specify completely herein all the details of the design and construction of equipment. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation up to the Bidder's guarantee, in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance there with. The offered equipment shall be complete with all components necessary for their effective and trouble-free operation. Such, components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

### **11.2 Code and Standards**

The oil filled transformers shall comply with the following Indian Standards as amended up to date:

(i) IS 2026 - Part I to V - power transformers.

(ii) IS 335 - Transformer oil.

(iii) IS 10028 (Part II & III) - Installation and Maintenance of Transformers.

IS 2099 - Bushings.

(v) IS 2705 - Current Transformers.

(vi) IS 6600 - Guide for loading of oil immersed transformers.

### **11.3 General Requirement**

The transformer shall be indoor or outdoor type as specified. Unless otherwise specified the transformer in addition shall have thermal and dynamic ability to withstand external short-circuit as per clause 9 of IS 2026 (Part I): 1977.

### **11.4 Insulating oil**



Insulation oil shall conform to IS 335. Transformer oil to be supplied with initial fill of filtered oil.

### **11.5 Temperature Rise**

The reference ambient temperatures assumed for the purpose of this specification are as follows: -

- (a) Maximum ambient air temperature 50°C.
- (b) Maximum daily average ambient air temperature 40°C.
- (c) Maximum yearly weighted average ambient temperature 32°C.
- (d) Minimum yearly weighted average ambient temperature (-)5°C.

The temperature rise at the above conditions and at the altitude not exceeding 1000 meters shall be as follows: -

By resistance method 55°C (maximum temperature being 95°C).

By thermometer 50°C.

If the site conditions indicated for a particular job is more severe than the refereed ambient temperature mentioned above, the temperature rise shall be suitably scaled down such that the hot spot temperature shall not exceed the values for the reference conditions.

### **11.6 Tap Changing Device**

Tap changing device shall be provided on H.V side, circuit type, externally hand operated with necessary indications for tap position and locking arrangement at any of the tapping positions. It shall be designed for bi-directional operation and shall be of self-positioning type and shall have the following steps:  $-\pm 2.5\% \pm 5\% -7.5\% -10\%$  (if required)

### **11.7 Voltage Ratio**

Unless otherwise specified, the transformer shall be suitable for a voltage ratio of 11 KV/433 V.

### **11.8 Vector Group**

In case of step-down transformers, the winding connections shall conform to vector group dy. 11 unless otherwise specified. In case of step-up transformer, the vector group unless otherwise specified shall be star/ delta.

### **11.9 Cooling**

Unless otherwise specified, the transformer shall be oil immersed natural air-cooled type (ONAN).

### **11.10 Accessories**

The transformer shall be a single tank type with termination on bushings or cable end box as specified both on HV and MV side. The MV side shall be suitable to receive bus bar trunking or MV cable inter-connection suitable for full load current of the transformer.

### **11.11 Fittings**

The transformer shall be complete with the following fittings: -

- (a) Oil conservator with oil level indicator, minimum level marking and drain plug for all transformers of capacity 50 KVA and above.
- (b) Off circuit type tap changer with position indicator and locking arrangement for all transformers.
- (c) Thermometer pocket with plug for all transformers of capacity 100 KVA and above.
- (d) 100 mm dial type /stem type thermometer with metal guard Dial type thermometer may have max. temperature indicator and resetting device for all transformers of capacity 250 KVA and above.
- (e) Lifting lugs for all transformers.
- (f) Bi-directional /Unidirectional Rollers to be specified.
- (g) Rating diagram and terminal marking plate for all transformers.
- (h) Explosion vent for all transformers of capacity 400 KVA and above
- (i) Additional Neutral separately brought out on a bushing for earthing for all transformers.
- (j) Earth terminals (2 Nos.) for body earthing for all transformers.
- (k) Valves for filtration, drainage and filling etc. with necessary plugs for all transformers.
- (l) Radiator assembly for all transformers.
- (m) Silica gel breather for all transformers.

- (n) Air release plug for all transformers.
- (o) First filling of oil to IS 335:1993 including make-up fill during installation for all transformers.
- (p) Facility to connect up Buchholtz relay for all transformers of capacity 800 KVA and above.
- (q) Inspection covers on tank cover for access to terminal connections for all transformers.
- (r) Bushing terminations or cable box terminations as specified.
- (s) Necessary hardware, clamps, lugs etc. for termination on HV/MV etc. for all

### **11.12 Explosion Vent**

Explosion vent or pressure relief device shall be provided of sufficient size for rapid release of any pressure that may be generated within the tank and which might result in damage to the equipment. The device shall operate at a static pressure less than the hydraulic test pressure for transformer tank. Means shall be provided to prevent the ingress of moisture and of such a design to prevent gas accumulation.

### **11.13 Accommodation for Auxiliary Apparatus**

Where specified, such as, for restricted earth fault protection, facilities shall be provided for the mounting of a neutral current transformer.

#### **11.13.1 Rating and Diagram Plate**

The following plates shall be fixed to Transformer in a visible position.

- (a) A rating plate of weather proof material bearing the data specified in the appropriate clauses of IS 2026:1977.
- (b) A diagram plate showing the internal connection and the voltage vector relationship of the several windings in accordance with IS 2026:1977 and a plan view of the transformer giving the correct physical relationship of the terminals.

#### **11.13.2 Joints and Gaskets**

All gaskets used for making oil tight joints shall be of proven material such as granulated cork bonded with synthetic rubber gaskets or synthetic rubber or such other good.

### **11.13.3 Gas and Oil Actuated Buchholtz Relay**

Buchholtz Relay shall be provided for transformers of capacity 800 KVA and above. The design of the relay mounting arrangements, the associated pipe work shall be such that mal-operation of the relays shall not take place under normal service. The pipe work shall be so arranged that all gas arising from the transformer shall pass through the gas and oil-actuated relay. The oil circuit through the relay shall not form a delivery path in parallel with any circulating oil pipe, nor shall it be tied into or connected through the pressure relief vent. Sharp bends in the pipe work shall be avoided.

All wiring connections, terminal boards, fuses and links etc. connected with gas actuated relays shall be suitable for tropical atmosphere. Any wiring liable to be in contact with oil shall have oil resistant insulation and the bared ends of stranded wire shall be sealed together to prevent seepage of oil entering connection boxes used for cables or wiring.

### **11.13.4 Cable Box**

Cable box shall not be mounted on the tank covers. It shall be feasible to remove the tank covers for inspection during maintenance etc. without recourse to breaking the joints or disturbing the cables already terminated. Necessary removable links in oil approachable through inspection cover in tank cover etc. after lowering oil shall be provided for test purpose.

## **11.14 Test**

### **11.14.1 Test at Work**

All routine and other tests prescribed by IS 2026 shall be carried out at the manufacturer's works before dispatch of the transformer in the presence of inspecting officer if required. Copies of the test certificates shall be furnished to the department. In addition to the prescribed routine tests, temperature rise test shall be invariably done on one transformer of each design. A copy of the impulse test certificate done on the same type/ design of the transformer shall be furnished in accordance with IS for purpose of record. If no impulse test was done in an earlier unit of the same design and capacity, one transformer will be subjected to impulse test in consultation with the Inspector at the firm's cost. Copies of the

certificates for pressure test, test for bushings, and type test for short circuit shall be supplied to the Department.

#### **11.14.2 Test at site**

In addition to tests at manufacturer's premises, all relevant pre-commissioning checks and tests conforming to IS code of practice No. 10028 (Part II & III) shall be done before energization. The following tests are to be particularly done before cable jointing or connecting up the bus bar trunking:

- (a) Insulation test between HV to earth and HV to MV with 5000 volts Megger.
- (b) Insulation test between MV to earth with 500 volts Megger.
- (c) Di-electric strength Test on oil.
- (d) Buchholtz relay operation by simulation test when fitted.

All test results are to be recorded and reports should be submitted to the department.

#### **11.15 Installation and Commissioning**

11.15.1 The transformer shall be installed in accordance with IS 10028 (Part II & III)-Code of practice for Installation and maintenance of transformer. Necessary support channels shall be grouted in the flooring.

11.15.2 The transformer shall be moved to its location and shall be correctly positioned. Transformer wheels shall be either locked or provided with wheel stoppers. All parts of the transformers which are supplied loose, such as conservator, radiator banks, Buchholtz relay, dial thermometer, bushing etc. shall be fitted on the transformer. Transformer oil supplied in drums shall be topped up into the transformer after duly testing/filtering up to the correct level required.

11.15.3 Wiring of devices such as Buchholtz relay, dial thermometer etc. shall be carried out as per drawings, Earthing of neutral and body of the transformer shall be done in accordance with these specifications.

11.15.4 Drying out of transformer winding will be necessary when the di-electric strength of the oil is lower than the minimum value as per IS10028 or the transformer has not been energized within 6 months of leaving the works or where the radiator assembly is done at

site. The transformer shall be dried out by one of the methods specified in IS 10028. Drying out with centrifugal or vacuum type filters will, however, be preferred. The contractor shall carry out the process of drying without interruption and shall maintain a log sheet indicating time, oil temperature and insulation resistance.

11.15.5. After complete drying out of the transformer, oil sample shall be collected by the contractor and shall be tested for di-electric strength as specified in IS 335:1993 with approved test kit.

13.15.6. All devices such as dial type thermometers, Buchholtz relays and main alarm and trip contacts shall be checked for satisfactory operation.

13.15.7. All tests specified in these specifications shall be carried out by the contractor in the presence of inspecting officer of the department at free of cost.

## **12.0 H.T. CABLE**

The HT cables shall be of aluminium conductor and it shall be XLPE insulated and sheathed, steel tape armoured and PVC served and suitable for 11 KV grade (UE) as per IS specification.

Manufacturer's test certificate, in triplicate, shall be furnished along with the cable. For this purpose test certificate for the full drum length of cables supplied by the manufacturers from which the required quantity has been cut will be acceptable.

The HT cable shall be laid on ready MS cable trays and clamped on the perforated trays at intervals of 600 mm of cable run.

Wherever HT and LT cables run on the same tray, there will be insulating barriers between HT and LT cables. The run of HT cables shall be at one extreme end of the trays as suitable. More than one cable (HT) running side by side and touching shall be clamped together. HT cables shall be marked properly at every 3,000 mm approx. and at each bend. The cables shall rise to their respective equipment installed above ground floor slab through openings in the floor slabs as per site requirement.

### **12.1 Cable Termination of 11 KV XLPE Cables**

For XLPE cables either reputed make epoxy resin compound type or heat shrinkable type cable jointing kits shall be used. The epoxy jointing kit shall be of good quality and the jointing work shall be done by an experienced licensed and skilled cable jointer.

## **12.2 HT Cable Insulation Tests**

The HT cable after installation and end terminations shall be subjected to following tests:

Insulation resistance tests with 5.0 KV meggar. The insulation value shall not be less than 1000 meg ohms for each cable (along with transformer winding wherever applicable).

## **13.0 LT PANEL AT PANEL ROOM**

### **13.8.1 Scope**

This specification covers the requirements of design, manufacture, supply testing erection and commissioning of extensible, multi-tier, multi-panel cubicle type double or single front construction switch board as per requirement and to be installed in the substation LT room and pump house.

The LT supply shall be received by the L.T switch board at the incoming point either from the Transformer secondary independently for feeding the loads of the substation of the pumping stations.

### **13.8.2 Ambient Conditions**

The Switchboard shall be suitable for continuous operation at rated load for maximum ambient temperature of 50 C and maximum relative humidity of 100%, the maximum temperature and humidity, however, not occurring simultaneously.

### **13.8.3 Standards & Codes**

All switch-gear and other equipment incorporated in the switch board shall comply with, but not be limited to the following :

I.S 13947 (IEC 60947) : Air Circuit Breaker

I.S 13947 (IEC 60947) : Moulded Case Circuit Breaker

I.S 13947 (IEC 60947) : Fuse Switch Units, contactors etc.

I.S 13947 (IEC 60947) : Metal enclosed switchgear

I.S 2705 : Current Transformers

I.S 1248 & 2419 : Indicating Instruments

I.S 3231 : Protective Relays

I.S 375 : Bus bar Markings

I.S 1554 : Cables

#### 13.8.4 Electrical System

HT supply Voltage	11 KV $\pm$ 10%
Transformer	
Primary	10 KV Delta
Secondary	i) 0.433 KV Star with directly earthed neutral
Short Circuit Level	1500 MVA Symmetrical at 33 KV 35 MVA Symmetrical at 415 V
L T Voltage	433 volts, 3 phases, 4 wires (earthed neutral) (OCV)
Frequency	50 Hz $\pm$ 3%

#### 13.8.5 Operational requirements

The LT switchboard shall be extensible type and suitable for coupling for future extension of switch boards through the bus bars on either side.

#### 13.8.6 Equipment Details



### **13.8.6.1 General**

LT switchboard shall be floor mounting, vertical fully compartmentalized front operated free standing with jig set pressed and formed sheet steel cubicle having tiered compartments. The switch board shall be extensible on either sides with double or single front arrangement as per requirement with two sides access. The thickness of sheet steel of the enclosures shall be not less than 2.0 mm for outside walls and the partition walls not less than 1.6 mm.

The compartments housing Air Circuit Breaker, with indicating instruments and protection equipment (as necessary), and front operated either MCCB units with components mounted on chassis plate having incoming and outgoing power and control terminals in the cable compartment.

All Panel doors shall be interlocked with corresponding switches enclosed and all live parts shall be fully shrouded. All cable termination points shall have insulating/ metal shields to prevent accidental contacts during maintenance and inspection of cable alleys. All terminals shall be bus bar type suitable to connect the required number and size of cables considered. Feeder compartments and cable compartment shall be provided with hinged door with screw knob arrangement whereas the bus bar compartment shall be provided with bolted type arrangement. Truck for racking out Air Circuit Breaker shall be provided.

### **13.8.6.2 Equipment Details**

All technical requirements of different circuits of switchboard are furnished in the schematic electrical single line diagram and schedule of items attached. The switch board shall comprise of all component units of reputed makes. Only one make for ACB/MCCB shall be used.

### **13.8.6.3 Switchboard Construction**

The switchboard shall be constructed from 14 SWG (2 mm thick). M.S Sheets with integral angle iron frame work as required.

The switch board shall be provided with mounting channels (size ISMC 100 x 50 mm) at bottom, covered by skirting. Foundation bolt hole shall have easy accessibility.

Each section of the vertical panel shall comprise of one bus bar chamber / compartment, one feeder equipment compartment and one cable chamber/compartment. Each chamber shall be fully segregated with 1.6 mm thick sheet steel all round.

All cables shall enter from bottom having drilled gland plates for fixing compression type cable gland and routed through a cable alley.

The hinged doors, as well as other detachable covers shall be provided with heat resistant type neoprene rubber gaskets. The switchboard shall have IP 54 degree of protection.

The switch board shall have an Earth Bus running the entire length of switch board and shall have provision of extending the same on either side in future. The earth bus section shall be not less than 50 x 6 mm tinned copper with green colour identification. The overall height of the switchboard shall not exceed 2,400 mm.

The incoming ACB (LT) shall have proper termination arrangement for connection of requisite nos. of 3.5 core or appropriate numbers of single core (AL) PVC armoured cable from bottom or top or bus duct at the top as per requirement.

The switch board shall be finished with powder coated paints (Siemens-Grey) after proper surface treatment by 7 tank process of cleaning. Switchboard shall be touched up after installation and commissioning at site as necessary.

Name plate, inscription plates and labels etc shall be on laminated white phylum plates of 3 mm thick and 12 mm high black engraved lettering to be screwed on the front door panel of all the feeder compartment as well as on the main panel. The panel markings shall be provided on the top with 100 mm laminated phylum plate and 75 mm letter size. Each side and openable back cover of cable and bus bar chamber doors shall be provided with appropriate type of danger board

#### **13.8.6.4 Active Component Details**

The active components to be housed in the switchboard shall be as follows:

#### **13.8.6.5 Bus bars and Connections**

The bus bars shall be extensible type of hard drawn high conductivity electrolytic grade tinned copper as specified with complete PVC sleeving except at the joints. Three bus bars for phases and one bus bar for neutral of adequate capacity shall be provided for each set.

Maximum current density of 1.50A/sq.mm for copper shall be considered. Mounting insulators shall be of DMC, SMC or equivalent type. The bus bar supports shall be placed not more than 450 mm apart. (Technical data sheet of the insulation support shall be furnished by vendor). Minimum clearance between phase bars shall be 32 mm and between phase and earth shall be 25 mm. The bus bars shall be properly insulated and colour coded. The construction of the switchboard shall be robust enough to withstand system fault of minimum 35 MVA.

#### **13.8.6.6 Air Circuit Breaker**

The Air Circuit Breaker shall be of reputed make and of rating as stated elsewhere. The basic unit shall be triple pole and neutral or four pole horizontal draw-out type complete with six / eight sets of isolating contacts and proper termination arrangement with bus ducting or cables as per requirement indicated. It shall also have –

- a) A certified minimum rupturing capacity of 35 MVA at 433 volts. The symmetrical breaking capacity, peak making capacity, and short time current rating etc. shall be as per IS 13947
- b) Independent manual operated hand spring charged with independent mechanical closing and trip free mechanism with trip coil of 240 VAC.
- c) ON/OFF/TRIP/TRIP CIRCUIT SUPERVISION-HEALTHY lamp Indicators with HRC protection fuses.
- d) Push Button for manual emergency tripping and trip circuit healthy test lamps.
- e) 4 Nos spare Normally Open auxiliary Contacts.
- f) 4 Nos spare Normally Closed auxiliary contacts.
- g) CT operated direct acting microprocessor based solid state over current and short circuit releases with CTs. The O/C releases shall be provided with time delay and it shall be possible

to set the O/C releases to operate within 70 – 100% of maximum rating. The protection CTS shall be mounted on the draw out portion of the circuit breaker.

h) 3 Nos. CT operated 96 mm. sq digital Ammeter (Cl. 1.0) & current transformers of ratio matching with breaker rating.

i) 96 mm. sq digital Voltmeter (Cl. 1.0) with selector switch and protection HRC fuses.

The ACB unit shall have three (3) distinct and separate positions of the circuit breaker marked (easily identifiable) on the circuit breaker cradle viz :

Service: All main and secondary isolating contacts in services.

Test: Main contacts separated; secondary isolating contacts in service.

Isolated / Maintenance: All main and secondary isolating contacts isolated.

It should be possible to lock the ACB in each of the first two positions. In the third position, complete access for routine maintenance including removal of arc chutes, arcing contacts, etc shall be possible.

For three phase and neutral systems, neutral shall be automatically isolated when the circuit breaker is withdrawn from "Service" position.

The trip circuit shall be continuously monitored with trip circuit supervision relay indication lamp with push buttons.

The circuit breaker to be used as incoming and bus coupler units shall be TPN type with under voltage releases.

The circuit breaker shall be used for feeding normal incoming power supply to the LT switch boards and shall be provided with three nos. phase indication lamps (R-Y-B) in the incoming side of the circuit breaker.

The draw out portion of the circuit breaker shall be effectively connected to the earth bus bar through scraping contacts.

There shall be provision of Earthing Terminals in the Cradle/Housing the Circuit Breaker.

Truck for racking out ACB(s) shall be provided with necessary handles.

Test Certificate from CPRI - Bangalore/Bhopal shall be submitted with offer.

#### **13.8.6.7 Moulded case Circuit Breaker**

The Moulded Case Circuit Breakers (MCCB) shall be used in the L.T switch board/Power Control Centre/Motor Control Centre wherever specified. These shall be having rupturing capacity not less than 50 KA at 415 V unless stated otherwise (CPRI tested). The MCCBs shall be either TP & N or 4 poles as specified in the tender schedule.

The MCCBs shall be provided with built in solid state adjustable type over current and earth fault releases with current setting range 70-100% for over current elements and 20-80% for earth fault with time delay setting element for the above.

The MCCBs shall be panel mounting type and shall be provided with operating handle fixed with the door frame for operation of the MCCB from the front of the panel with the cubicle door in closed position. The MCCB operating handle shall be door interlocking type with defeat mechanism and padlocking facility.

The MCCBs shall be provided with 2 NO + 2 NC auxiliary 240 V, 10A, AC change over contacts for control and indication purposes. Shunt trip or under voltage releases shall be also fitted and supplied with the MCCB as per requirement.

All the feeders specified with MCCBs shall be provided with ON/OFF indication lamps in front of the compartment door with suitable HRC type protective fuses wherever specified.

#### **Combination Fuse switch/switch fuse units**

The ratings for various CFS/SFU units shall be as per requirement stated elsewhere.

The rotary type CFS units (Load Break Switches) shall be reputed make. The basic features of CFS/SF units shall be:

i) Load make/break type with adequate short circuit withstand capacities AC-3 duty

(CPRI-Bangalore/Bhopal tested) as per IS specifications unless and specified otherwise.

ii) Operating mechanism for operation from the front of panel with ON/OFF position indicated with padlocking feature in any position.

iii) Provided with HRC fuse links of ratings specified.

iv) CT operated 96 mm. sq digital Ammeters (3 no.), current transformers with adequate CT ratio as specified.

v) Door interlock shall be provided so that cubicle door cannot be opened with

CFS/SFU in 'ON' position. Door defeat mechanism shall also be provided.

#### **13.8.6.8 Ammeters**

Ammeters shall be digital type and of reputed make, 96 mm sq. dial, 1.0 class accuracy.

All ammeters shall be 5 Amps CT operated unless specified otherwise and ammeter (3 nos.) shall be provided.

#### **13.8.6.9 Current Transformer**

The current transformer shall be as follows:

i) Metering of specified rating and adequate VA burden accuracy class 1.0

ii) Protection CT of adequate VA burden and accuracy class 5P10 or compatible with various protective relays as specified.

#### **13.8.6.10 Voltmeters**

Voltmeters shall be digital type and of reputed make, 0-500V AC. 96 mm sq dial. 1.0 class accuracy. HRC fuses with fuse base and carriers shall be provided for voltmeter and phase indication lamps, wherever specified. Each voltmeter shall be provided with voltmeter selector switch.

#### **13.8.6.11 Voltmeter Selector Switches**

These shall be of reputed make standard instrument switches permitting measurement of all the three line & phase voltages as necessary with an off position.

#### **13.8.6.12 Protective Relays, Releases etc**

The microprocessor solid state type releases for fault tripping of circuit breaker shall be provided as specified in drawing and shall be of same make as that of ACB, Each releases shall have suitable connection diagram affixed at the back of releases.

#### **13.8.6.13 Wiring**

Internal wiring for fixed and draw-out chassis - mounted active parts of all panels, ACB sets shall be carried out as follows :

- a) Minimum conductor section for power and control wiring shall be of 2.5 sq. mm copper.
- b) Control wiring shall be multi-strand flexible type. 1.1 KV grade PVC insulated and PVC sheathed.
- c) Power wiring with section 2.5 sq. mm copper or above and shall be multi strand flexible type.
- d) Conductor insulation shall be 1.1 KV grade PVC.
- e) All cable ends shall be sleeved, ferruled and terminated at external terminal box with crimped sockets.
- f) Rectangular shaped conductors shall be of tinned copper having PVC insulation covering of 1.1 KV grade.

#### **13.8.6.1 4. Identification Labels**

All feeder Panels shall be provided with identification labels having 12 mm high black engraved lettering on 3 mm thick white laminate materials.

#### **13.8.6.1 5. Earth Bus bar**

An earth bus of minimum size of 50 x 6 mm tinned copper with PVC sleeveings shall be provided all along the length of the switch board. This shall be extensible on either side.

The earth bus of the switch board shall be suitable for connection with earth conductor at the place of installation at two points from the two sides of switchboard.

All metal stationary items of the panels shall be directly connected with the Earth Bus.

The frame of each ACB carriage shall be earthed through heavy multiple finger contacts provided in the ACB fixed section.

#### **13.8.6.16 Cable compartments**

Fully segregated cable compartment of adequate size shall be provided in the panels for easy termination of all incoming and outgoing cables entering from bottom or top. Adequate and proper supports shall be provided in cable compartments to support cables. All incoming and outgoing terminals shall be brought out to terminal blocks in the cable compartment.

#### **13.8.6.17 Tests**

The switch boards shall be accepted on the basis of routine and type / performance tests conducted as per latest issue of ISS/IES at manufacturer's premises, complete test reports shall be submitted to the Employer/Employer's representative before despatch of the switchboard.

#### **13.8.6.18 Painting**

All sheet metal parts (both inside and outside) of the switch board shall be given anticorrosive treatment by seven tank process and powder coated finish of approved shade unless specified otherwise.

#### **13.8.6.19 Guarantee**

The switch board and all components shall be guaranteed for 18 months from the date of despatch or 12 calendar months from the date of commissioning and handing over whichever is later against defective design material and/or workmanship. The bidder shall be responsible for complete operation and routine as well as breakdown maintenance of the board including supply of all spares and consumables (except HRC fuses and lamps) during 1 year defect liability period. The cost of the same shall be included in the offer. No extra amount will be paid on this account.



## **14.0 EARTHING SYSTEM**

### **14.1 SCOPE**

This section covers the general requirements of the earthing system for Sub-station installation. G.I. plate earthing with G.I. strip for sub-stations of 500 KVA capacity and copper plate earthing for sub-stations of higher capacity shall preferably be used.

### **14.2 SYSTEMS**

Earthing system shall comprise earth electrodes in accordance with these specifications. For every additional transformer 2 more separate and distinct earth electrodes shall be provided for neutral earthing. The body earthing for transformers, HV & MV panels shall be done to a common earth bus connected to two separate and distinct earth electrodes.

**Note:** For a single transformer Sub-station, the total number of earth electrodes shall be 4 (2 for neutral and 2 for connection to a common earth bus for body earthing). For a two transformer Sub-station total number of earth electrodes shall be 6 (4 for neutral earthing, two each for two transformers, and 2 for connection to a common earth bus for body earthing).

### **14.3 ELECTRODES**

The earth electrodes shall be as per specification in the B.O.Q.

### **14.4 LOCATION OF EARTH ELECTRODES**

Normally an earth electrode shall not be situated less than 1.5 m from any building. Care shall be taken that the excavation of earth electrode may not affect the column footings or foundation of the building. In such cases electrodes may be farther away from the building. Location of the electrode earth will be a place where the soil has reasonable chance of remaining moist. As far as possible, entrances, pavements and road ways, are to be definitely avoided for locating the earth electrode.

### **14.5 WATERING ARRANGEMENT**

Method of watering arrangement shall comply with as per standard practice in industry.

## **14.6 SIZE OF EARTH LEAD**

The recommended sizes of copper earth bus lead in case of Sub-stations shall be in accordance with B.O.Q. However, the minimum size of earth lead shall be 25 mmx 5 mm copper or equivalent GI strip.

## **17.7 INSTALLATION**

All joints shall be riveted and sweated. Joints in the earth bar shall be bolted and the joints faces tinned. Where the diameter of the bolt for connecting earth bar to apparatus exceeds one quarter of the width of the earth bar, the connection to the bolt shall be made with a wider piece of flange of copper jointed to earth bar. These shall be tinned at the point of connection to equipment and special care taken to ensure a permanent low resistance contact to iron or steel. All steel bolts, nuts, washers etc. shall be cadmium plated, main earth bars shall be spaced sufficiently on the surface to which they are fixed such as walls or the side trenches to allow for ease of connections. Copper earthing shall not be fixed by ferrous fittings. The earthing shall suitably be protected from mechanical injury by galvanized pipe wherever it passes through wall and floor. The portion within ground shall be buried at least 60 cm deep. The earthing lead shall be securely bolted and soldered to plate or pipe as the case may be. In the case of plate earthing the lead shall be connected by means of a cable socket with two bolts and nuts. All washers shall be of the same materials as the plate or pipe. All iron bolts, nuts and washers shall be galvanized.

## **14.8 TESTING**

After installation, the tests as specified in relevant IS code shall be carried out and results recorded.

## **15.0 POWER FACTOR IMPROVEMENT**

### **15.1 SCOPE**

This section covers the specification for supply, installation, testing and commissioning of 433 volts, 3 phase, 50 Hz capacitor banks and other such devices.

### **15.2 REQUIREMENTS**

Capacities of the capacitor banks shall be indicated in the B.O.Q.

### **15.3 CONSTRUCTION**

15.3.1 The capacitor banks shall generally conform to IS 13341: 1992, 13340: 1993.

15.3.2 The capacitor units shall be indoor type, air-cooled with low viscosity impregnated paper dielectric hermitically sealed. The impregnation used shall be non- inflammable, non-oxidizing, lower freezing point type synthetic compound. Each individual cell shall be provided with pressure sensitive disconnectors / devices.

15.3.3 Main connections from the active element shall be brought out through porcelain bushing. Care shall be taken to solder the bushing to the cover to ensure perfect hermetic sealing.

15.3.4 Capacitor units shall be provided with externally mounted discharge resistors to reduce the residual voltage to less than 50 Volts in one minute of switching off.

15.3.5 Individual unit shall be provided with HRC fuses/ adequate capacity of MCBs/MCCBs, contactors (capacitor duty) bus bars and terminal chambers to make bank of required KVAR. Terminal chamber shall be suitable for bottom/top cable entry. Two earth terminals shall be provided to each capacitor bank.

### **15.4 TESTS AT MANUFACTURER'S WORK**

All routine and type tests as per IS 2834 relevant to capacitor banks as amended up to date shall be carried out at manufacturer's works and test certificates shall be furnished to the department.

### **15.5 INSTALLATION**

Capacitor banks shall be installed at least 30 cm away from the walls on suitable metal frame work of welded construction. The earth terminals provided on the body of capacitor bank shall be bonded to the main capacitor panel earth bus with 2 Nos. 8SWG copper or 6 SWG GI earth wires.

### **15.6 TESTS AT SITE**

Insulation resistance with 500 V DC Megger shall be carried out and test results recorded.

## **16.0 SPECIFICATION FOR ELECTRICAL WIRING**

### **16.1 General Requirements**

This specification covers the requirements of wiring in pump house and sub stations for lighting and power point installation work. The lighting installation shall be designed conforming to IS : 3646 and in accordance with the guide lines given in the National Electrical code (EC) and other similar standards.

### **16.2 Wires & Cables**

All wires and cables to be used in electrical wiring shall have ISI marking on it. If the suppliers indicate that ISI marking on wires/cables is not possible because of manufacturing process, the cables/wires shall be accepted with the submission of test certificate and copy of licence issued by B.I.S. to the manufacturers (Finolex/Havells)

### **16.3 Conduits**

The conduits to be used in wiring shall conform to I.S 9537 (Part-II)-1981 or latest in all respects. The contractors using the particular brand of conduit shall furnish test certificate from N.T.H or any Government Approved Laboratory with each quantity of supply along with supply of conduits.

### **16.4 Materials**

All materials, fittings, appliances, used in electrical installations, shall conform to Indian Standard Specifications wherever these exist. Only approved make of PWD schedule materials shall be used. Materials not included in the list shall be got approved by the Employer / Employer's representative prior to actual use

### **16.5 Main Switch Gear**

Iron clad switch fuse and isolator units should conform to IS: 13947 & IEC 60947. The quick make and break mechanism shall be self-interlocked with the cover. In "Off" position there must be two breaks per pole.

Main switch gear shall be properly earthed with two numbers conductors if M.V and one number of L.V.

#### **16.6 Busbar Chamber (B.B.C)**

This shall be totally enclosed, metal clad type fabricated from rust proof I6 SWG sheet steel on angle iron frame and provided with sheet steel or cast iron detachable front cover and undrilled detachable end plates, suitable for mounting on wall or angle iron floor stand and painted with high quality enamel paint. G.I. bolts and nuts shall be used for assembly with suitable packing materials to ensure dust proof finish. Meters shall be provided on suitable sheet steel boxes. Switch shall be provided with cable end boxes as required.

The depth of B.B.C. shall be 150 mm (minimum). Minimum clearance of phase bars to earth shall be 25 mm and between bus bars shall be minimum 32 mm.

Copper bus bars conforming to relevant I.S. specification and shall not be more than the current density of 1000 Amps per sq.in./1.5 Amp. Sq.mm.

The cross section of the neutral bus bar shall be the same as that of the phase bus bar of capacity up to 200A and for higher capacity neutral bus bars are to be rated to carry 60% of phase current. These shall be carried on glazed porcelain/DMC/SMC supports of proper dielectric and mechanical strength and shall be appropriately colour coded for identification of Phases, Neutral & Earth as per relevant IS Code.

Lettering shall be done for identification of switches as directed. The contractor shall submit fully dimensioned drawing of the board with the physical disposition of the switches and other components to the Employer's representative for their approval before the same is fabricated.

There shall be two nos. of Earth Terminals. Suitable Danger Board shall be provided.

#### **16.7 Interconnection B.B.C, Switch Fuse, Meters, Etc**

For ratings above 100 Amps these shall consist of insulated copper strips as per specification of adequate section. For rating below 100 Amps PVC copper cable tails of appropriate size,

terminating in tinned copper sockets may be used. The above are to be enclosed either in sheet metal trunking or conduits so that no part is exposed.

### **16.8 Distribution Boards**

This totally enclosed metal clad type Distribution Boards with hinged lids shall be in accordance with I.S. 2147 - 1952 and 2675 - 1966 and shall be welded/bolted construction and fabricated from rust proof sheet steel and finished with anticorrosive powder coated paint and have provision for fixing on wall with earthing /terminals as per IS code.

Power Distribution Boards (400 volts TPN) shall be constructed from I6 SWG sheet steel and Branch Distribution Boards (230 volts SPN from I8 SWG sheet steel).

The minimum ratings of phase and neutral bus bars shall be 67% (approx) of the total rating of fuse ways. Above 32 Amps Neutral Bus bars may be half the size of the Phase Bus bars.

The fuses shall be mounted on glazed porcelain DMC/SMC supports of proper dielectric& mechanical strength. TPN units should have phase separation barriers between fuse banks.

Cables shall be connected to a terminal by crimped lugs.

Where two or more B.D.B's feeding low voltage circuits are fed from different phases of a medium voltage supply, these B.D.B's shall be installed at least two meters apart.

All three phases power distribution boards shall be properly earthed with two number I0 S.W.G galvanized iron wires and provided with suitable Danger Board. All SPN B.D.B's shall be properly earthed with one number I0 SWG galvanized iron wire each unless otherwise specified.

### **16.9 Switches**

All switches for lights, fans and plug points shall be either piano key type switches in sheet steel switch board, unless specified otherwise.

### **16.10 Cables and Conductors**

All cables shall conform to relevant Indian Standard. Conductors of all cables except for flexible cables, shall be of aluminium, unless specified otherwise.

### **16.11 Flexible Cables**

Conductors of flexible cables shall be of copper. The minimum size of core acceptable is 0.50 sq. mm (14/0.193 mm). The maximum weight to which the following twin flexible cords may be subjected are as follows: -

Twin 16/0.20 mm : 3.3 lbs (1.5 kgs.)

Twin 23/0.0076 inch : 5.0 lbs (2.3 kgs.)

### **16.12 Installation of Main Switch Board, BDB's Mains, Sub mains, Distribution Wiring to Individual Points**

The exact positions of all main switch board, BDB's and all runs of mains and sub mains, and distribution wirings to individual points including the exact position of all light fittings and switch boards shall be first marked on the buildings and shall be approved by the Employer / Employer's representative before actual commencement of the work. The D.Bs shall generally be installed at a height of 2.13 m (7 ft) from floor level.

### **16.13 Installation of Switch Boards**

These shall be installed at a height of 1.5 mtrs (5'-0") and above the floor level.

### **16.14 Installation of Ceiling Fans**

Unless otherwise specified all ceiling fans shall be hung not less than 2.75 M (9 ft) above floor. The suspension and clamp shall be painted with approved paint without involving extra cost.

### **16.15 Installation of HPSV and Fluorescent Light Fittings**

HPSV type light fittings shall be used for pump house indoor and outdoor lighting with suitable suspension arrangement for indoor lights and pipe brackets for outdoor lights. and fluorescent light fittings shall be used for low height areas. The fluorescent light fittings are either suspended from ceiling or mounted directly on wall. The fittings are suspended from ceiling by two down rods, or fixed to ceiling/beam wall directly, shall be made with Mechanical/Metal fasteners. Electrical drill only shall be used while making holes for the

fasteners which shall be capable of sustaining at least 10 kg of dead weight for fluorescent fittings and 25 kg for HPSV lighting fittings.

The down rods and accessories shall be painted with approved paint without involving extra cost.

Unless otherwise specified these should be suspended 2.60 M (8'-6") above the floor.

#### **16.16 Installation Of Exhaust Fans**

Exhaust Fans shall be fitted by means of rag bolts embedded in the wall. The required holes in the wall shall be made and finished neatly with cement plaster and brought to the original finish of the wall

#### **16.17 Installation of Socket Outlet**

No socket outlet shall be provided in the bath room at the height less than 130 cms (4'-3") from the floor.

No switches shall be provided inside the bath rooms.

Socket outlet at locations other than bath rooms shall be either 25 cms (10") or 1.5 mtrs(5'-0") from the floor as per requirement. All switch sockets out lets shall be provided with one 6A or 16A controlling switch.

#### **16.18 Testing of Installation**

Before a completed installation or an addition to an existing installation is put into service, the following tests shall be carried out by the contractor in presence of the Employer / Employer's representative.

##### **a) Polarity of Switches**

It must be ensured by test that all single pole switches have been fitted on the live side of the circuits they control

##### **b) Insulation Test**



i) By applying a 500 volt megger between earth and the whole system of conductors or any section thereof, with all fuses in place and all switches closed, all lamps in position or both poles of installation otherwise electrically connected together:- The result in meg ohm shall not be less than 50 divided by the number of points on the circuit, and should not be less than 1 meg-ohm.

ii) Between all conductors connected to one phase and all such conductors connected to the neutral or to the other phase conductors of the supply after removing all metallic connections between the two poles of the installation and switching on all switches. The insulation resistance shall be as in (i) above.

### **c) Earth Continuity Test**

The earth continuity conductor including metal conduits and metal sheaths of cables in all cases shall be tested for electrical continuity. Electrical resistance of the above along with the earthing lead but excluding any resistance of earth leakage circuit breaker, measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

### **d) Earth Resistance Test**

To ensure effectiveness of installation earth, the value of earth resistance shall be within 5 ohm for installation capacity up to 5 KW and one ohm for installation of higher capacity for 415 / 240 V AC supply system. The 11 KV and 6.6 KV supply system shall have minimum value of earth resistance not more than one ohm for individual earth stations and the equivalent (combined) earth resistance shall not be more than 0.50 ohms. The total number of earth stations shall be calculated on the basis of actual value of soil resistivity measured at site to obtain the above equivalent earth resistance.

The completed work will be taken over only if the results obtained in above tests are within the limits mentioned above, and in accordance with I.E. Rules.

On completion of the installation work, a certificate shall be furnished by the contractor holding valid Electrical contractor licence, countersigned by the supervisor under whose direct supervision the installation was carried out. The supervisor counter signing the test

result shall have valid supervisory licence from the Authority. This certificate shall be in a prescribed form as required by the local Electric Supply Authority. The installation shall not be considered as complete unless the installation is got inspected and passed by the Electrical Inspector, Directorate of Electricity.

The contractor shall have to take all initiatives and follow up the matter at his own cost for early approval of the installation for permanent energisation of the installation from the Directorate of Electrical Safety, Local supply Authority No extra amount will be paid on this account.

### **16.19 Special Specifications**

a) Illumination level for the pump house indoor areas shall be designed on the basis of IS: 3646 with average minimum illumination level of 250 lux within the pump house. The outdoor areas shall be provided with an average illumination level of 15 – 20 lux

b) Before fixing all switches, fittings etc. should be produced before Employer / Employer's representative and get approved.

c) All metal switch boards and switch/regulator boxes to be used in work shall be painted with two coats of anti-rust primer (red lead paint) prior to erection. After erection they shall be again painted with two coats of enamel paint of approved quality.

d) Before execution of any portion of conduit work for wiring a neat proper layout should be made out by the contractor and got approved from the Employer /Employer's representative. For this purpose contractor is advised to get acquainted with the layout drawings of the Employer's representative.

e) While laying the conduits for concealed wiring in the ceiling or in the beams & columns and before casting the contractor must ensure that all the inlets and both ends of the conduits are plugged by means of dead end socket so that no foreign matter can enter the conduits and choke them.

f) Damage to any fitting during erection and before handing over the installation by contractor shall be set right or replaced by the contractor at his own cost.

g) Caution Board of proper size wherever required, shall be provided, as per I.E.E. regulations for which no extra payment will be admissible.

h) Any damages made on wall shall be repaired and should match with the surrounding surface otherwise same will be got done through Building Contractor at the cost of the Electrical Contractor and the cost thereof shall be recovered from their dues.

i) Earthing Installation shall be done in the presence of Employer's representative.

j) The installations should not be energized without adequate earthing.

k) The I.C. switches and Distribution Boards shall be provided with neat lettering in block letters with paint for identification of the I.C. switches and for the points connected to each fuse way of the D.B's for which no extra payment will be admissible.

#### **16.20. Completion Drawings**

The contractor shall be required to submit along with Final bill; the under-noted drawings on CD, along with three copies of Ammonia print each.

1. Plan (as per site layout drawing) of each floor (not less than 1:100 metric scale) showing:-

i) Location of Main Switch Board, Distribution boards (with the circuit numbers controlled by them).

ii) The runs of mains and sub mains.

iii) Location of lights, fans, wall brackets/ fittings and, other power consuming devices together with type of fittings and fixtures including circuit numbers.

iv) Position of Lightning Conductors and route of running conductor.

v) Position of Earthing Stations for light and power and Lightning Conductor Installation.

2. Schematic lines layout diagram of each floor showing (i) Layout and connections of Main and Sub-board, B.D.B. having descriptions of the size, capacity, type and their numbers, the system and the source of supply, (ii) Location, Size, Type, length of main and sub main cables (iii) Loading of each B.D.B. indication of phases,

Departmental mark on each B.D.B and switchgear.

The drawings shall be very neatly drawn and submitted properly without folding them.

3. Cable route should be marked on site plan with measurements from permanent structures.

## **16.21 Conduit Wiring System**

### **16.21.1 Type and Size of Conduit**

All conduit pipe shall be heavy duty M.S conduit conforming to IS: 9537 wall thickness not less than 14 SWG thickness conforming relevant IS in all respects. The conduits are to be free from burrs and internal roughness. No conduits less than 20 mm in dia shall be used, unless specified.

### **16.21.2 Accessories**

Only good quality approved accessories are to be used when necessary. All metal accessories shall be painted and the bare thread portion is to be painted with anti-corrosive preservative.

### **16.21.3 Fixing of Conduits**

Conduit pipes shall be fixed by heavy gauge saddles metal bars, secured to wall/ceiling by screws driven into wood plugs at an interval of not more than 76 cm apart for vertical run and 50 cm apart for horizontal run; but on other side of couplers or bend of similar fittings-saddle shall be fixed at a distance of 30 cm from the centre of such fittings. The minimum thickness for saddles shall be 24 SWG, for conduits up to 25 mm dia and 20 SWG for larger sizes.

### **16.21.4 Outlets**

All outlets for fittings, switches etc. shall be fixed on boxes of suitable metal for either surface mounting system or flush mounting system. In case of cast iron boxes the wall thickness shall be at least 3 mm and in case of welded mild steel sheet box the wall thickness shall not be less than 16 gauge. Except where otherwise stated 3 mm thick insulated laminated sheets shall be fixed on the front with screws.

Where conduits are terminated special care shall be taken for securely fixing conduits to outlets so as to any possibility of damages to cables / wires when drawn.

#### **16.21.5 Cables to be Used**

Unless stated otherwise only single core PVC insulated cables of approved manufactures shall be used for wiring in conduit system. The number of single core cables drawn in one conduit shall not be greater than maximum set out in Table II of Indian Standard (I.S. 732-1963) Code of Practice (revised) for electrical wiring installation(system voltage not exceeding 650 volts).

#### **16.21.6 Looping-In-System**

Distribution wiring in conduit to light, points etc. shall be done in looping system. In this system no joints or connections shall be made anywhere of the system except at terminating points such as at terminals of switches, ceiling roses, etc.

#### **16.21.7 Earthing Continuity Wires**

For conduits and accessories for distribution wiring should be provided with earthing attachment by number 14 SWG G.I. wire, unless specified otherwise.

For looping earthing G.I.wire shall be run on conduits being fixed with saddles. This wire shall not be normally visible after installation when run with the conduit. Where the wire has to be taken without the conduits this will be fixed with 'U' nails at 2' feet intervals.

#### **16.21.8 Painting**

Conduit and all conduit fittings and accessories shall be painted with two coats matt paint. Painting of conduits shall be done to harmonize with colour bearing surface, i.e. wall, joists, trusses etc. after installation and as approved by the Employer / Employer's representative.

### **16.22 Cable Installations**

#### **16.22.1 General**

All PVC / XLPE insulated and unarmoured / armoured cables to be used shall conform to I.S. 1554 part I 1964 and of 1100 volt grade. Old and used cables must not be used for

installation. Only one make of cable shall be used. All cables brought to site must be tested and got approved by the Employer / Employer's representative before these can be laid. The cables shall be despatched to site on wooden drums with ends sealed. Exact lengths shall be determined by the Contractor after measurement at site

#### **16.22.2 Laying of Cables**

##### **a) Direct in Ground**

Trenches shall be 750 mm deep (minimum) for LT Cables and 0.915 M (3'-0") deep (minimum) for HT Cables from ground level and trenching work shall include all pumping and bailing out water. These trenches shall be wide enough to accommodate all the cables with brick separations as per the requirements specified in the relevant I.S.

When more than one multi core cable is to be laid in the same trench, a minimum horizontal interaxial spacing between cables will be as per relevant I.S.

After excavation of the trench of proper size, the bottom of the trench shall be dressed and levelled and filled with a 75 mm layer of fine sand. The cable shall then be laid with bricks on both sides of the cable continuously. After having the space within the bricks, filled and packed up to a level of 75 mm (3") above top of cable with fine sand, the top layer of bricks shall be placed side by side in continuous series as protective cover. Total No. of bricks required being 16 per metre run. The remainder of the trench shall be filled with riddled soil, well rammed and watered to a level of 75 mm (3") above surrounding ground level. The ground level surface of the whole trench route shall be restored properly after completion of cable laying.

##### **b) Inside Building**

Cables shall be laid on walls/ceiling/structure, unless specified otherwise, with M.S. Brackets and suitable clamps or over claw type aluminium cleats fixed on M.S. Brackets spaced not more than 450 mm apart. G.I Bolts of suitable sizes are to be grouted on the wall properly for fixing the brackets.

**c) Minimum** bending radius permissible is 12D for PVC Armoured Cables and 15D for HT XLPE Armoured cables. At joints and terminations, the individual core of multi core cables

should never be bent so that the radius is less than 12 times the diameter over the insulation for L.T. cables and 15 D for H.T cables.

### **16.22.3 Cable Jointing**

All cable joints shall be carried out by experienced and licensed jointers under strict supervision. Electro plated brass cable glands, aluminium / tinned copper cable sockets and approved jointing materials must be used. The price for cable jointing and finishing the ends of the cable shall include all materials and shall also provide for tools and plants for the work. The cable armouring is to be properly terminated. All cable accessories and other associated materials shall conform to Indian Standard Specification where applicable. Proper earthing of cable glands and armoured shall be included in the job.

### **16.22.4 Testing of Cables**

Immediately after the initial laying and jointing work is completed, a pressure test shall be applied to all cables. Cables of 1.1 KV grade suitable for use on medium voltage should withstand for one minute a test with a 1000 volt constant pressure "Megger" Insulation Tester. If the test is unsatisfactory, the cost of all repairs and replacements and all extra work of removal and relaying will be made good by the contractor.

### **16.22.5 Testing of Installation**

Before the completed installation is put into service or handed over to Employer, the installation is to be subjected to the above tests to the satisfaction of the E.I.C. The completed work will be taken over only if the results are acceptable to the E.I.C.

## **17.0 SAFTY REQUIREMENTS**

### **17.1 SCOPE**

This section covers the requirements of items to be provided in the sub-station for compliance with statutory regulations, safety and operational needs.

### **17.2 REQUIREMENTS**

Safety provisions shall be generally in conformity with the B.O.Q as per instruction in writing by E.I.C. But, in particular following items shall be provided:

(a) Insulation Mats

Insulation mats conforming to IS 15652: 2006 shall be provided in front of main switch boards as well as other control equipments as specified.

(b) First Aid Charts and First Aid Box

Charts (one in English, one in Hindi, one in Regional language), of giving artificial respiration to a recipient of electrical shock shall be provided at appropriate place. Standard first aid boxes containing materials as prescribed by St. John Ambulance brigade or Indian Red Cross should be provided in each sub-station.

(c) Danger Plate

Danger Plates shall be provided on HV and MV equipments. MV danger plate be 200 mm x 150 mm made of mild steel at least 2 mm thick vitreous enamel white on both sides and with the descriptions in signal red colour on front side as required. Notice plates of other suitable materials such as stainless steel, brass or such other permanent nature material shall also be accepted with the description engraved in signal red colour.

(d) Fire Extinguishers

Portable CO<sub>2</sub> conforming to IS 2878: 1976/ chemical conforming to IS 2171:1976 extinguishers, HCFC Blend A (P-IV) shall be installed in the sub-station at suitable places. Other extinguishers recommended for electric fires may also be used.

(a) Fire Buckets

Fire buckets conforming to IS 2546: 1974 shall be installed with the suitable.

(b) Tool Box

A Standard tool box containing necessary tools required for operation and maintenance shall be provided in the sub-station.

(g) Caution Board

Necessary number of caution boards such as "Man on Line" 'Don't Switch on' etc. shall be available in the sub-station.



(h) Key Board

A keyboard of required size shall be provided at a proper place containing castle keys, and all other keys of sub-station and allied areas

**C. Particular specification:**

**1. Mechanical work**

**1.1 LIQUID DATA: -**

Sl no	Parameter	Unit	Ghatal Pump House-1
01	Liquid to be handled	-	Drainage/Storm water
02	Ambient temperature	°C	Peak=50 Avg=40
03	Total dissolved solids	(mg/lit)	50-150
04	Total suspended solids	(mg/lit)	200-1200
05	Sp. Gravity		1.04
06	Total BOD <sub>5</sub>	(mg/lit)	25-50

**1.2 CIVIL AND HYDRAULIC DATA:-**

Sl No	Particulars	Data
01	Channel bed level	1 M (GTS), upstream of channel
02	Sump level	(+) 0.50 M GTS
03	F.D.L.	(+)6 M(GTS)
04	HFL	(+)9.90 M GTS
05	Pump Floor Level	(+) 10.40 M(GTS)
06	MWL/ Pump Stop Level	(+) 2.60 M(GTS)
07	H.W. L	(+) 9 M(GTS)
08	Intermediate Catwalk Level (where column pipe will be fixed)	(+) 7.50 M GTS
09	C.L. of Discharge pipe ( 2 nd stage)	(+) 10.7 M(GTS)
10	C.L. of Discharge pipe ( 1 <sup>st</sup> stage)	(+) 8.50 M(GTS)

**1.3 REMOVABLE SCREEN/TRASH RACK: -**

Sl No	Particulars	Data
01	Type	Manually cleaned

02	Size, mm x mm in approx.	4000 mm x 9300 mm in three equal parts.
03	Nos. required	8 nos.
05	Operating Floor Level	+10.40 M(GTS)
06	Design & Constructional feature	As per Standard Specification
07	Material of Construction	As per Standard Specification
08	Supply of accessories and service	As per Standard Specification
09	Hoisting	As per Standard Specification

#### 1.4 PUMPS

Sl No	Particulars	Data
01	Service	Drainage/ storm water
02	Type	Column mounted submersible pump with motor
03	Designation	SWF Pumps
04	Duty	Continuous
05	Location	Indoor
06	Design Capacity	25 Cusec
07	Nos. Required	8 nos..
08	Minimum Static Head in Mtr	1.70 Mtr
09	Maximum Static Head in Mtr	8.10 Mtr.
10	Speed	Less than equal 750 r.p.m. (Synchronous)
11a	Minimum efficiency of pump required	80
11b	Maximum pump efficiency	Shall occur at duty point
12	Motor capacity	110 KW
13	Minimum efficiency of motor required at design capacity (%)	92(IE-3)
14	Nos. of pumps working in parallel	Not Applicable
15	Range of Operation	Between 70% and 140% of rated capacity
16	Design & Constructional feature	As per Standard Specification
17	Material of Construction	As per Standard Specification
18	Supply of accessories and service	As per Standard Specification
19	Tests and Inspection	As per Standard Specification
20	Column Pipe	900 mm Dia, 12mm Thk
21	Delivery pipe	600 mm dia 12 mm Thk

#### 1.5 VALVES

Sl.no	particulars	Data
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(A) FLAP VALVES		
01	Type	Single flange, swing type double hung flap valve
02	Design pressure	20 MWC
03	Size, Dia in mm	600 mm
04	Nos. required	16 Nos.
	Velocity at rated flow	2.5 m/sec
(B) SLUICE VALVES		
01	Design & Constructional feature	As per Standard Specification
02	Material of Construction	As per Standard Specification
03	Supply of accessories and service	As per Standard Specification
04	Tests and Inspection	As per Standard Specification
05	Nos. required	16 nos.

#### 1.6 GAUGES: -

Sl No	Particulars	Range(kg/cm <sup>2</sup> )	Qty
01	Pr. Gauge at delivery side	20 MWC	8
02	Construction & features	As per Standard Specification	

#### 1.7 FLOW METER: -

Sl No	Particulars	Data
01	Type	Electromagnetic Full Bore Type Flow Meter
02	Construction & features	As per Standard Specification
03	Nos. required	8 nos.

#### 1.8 OVERHEAD TRAVELLING GRANTY CRANE AND HOIST (E.O.T)

Sl No	Particulars	Data
01	Type	Electric Operated Travelling Double Girder.
02	Nos. Required	One
03	Capacity	15 + 5 (Aux) Ton
04	Span	5500 mm
05	Lift, mm (Approx)	8 Mtr
06	Design & Constructional feature	As per Standard Specification
07	Material of Construction	As per Standard Specification
08	Supply of accessories and service	As per Standard Specification
09	Tests and Inspection	As per Standard Specification

## 1.9 MONORAIL CRANE WITH CHAIN PULLEY BLOCK

Sl No	Particulars	Data
01	Nos. Required	One
02	Capacity	5 Ton
03	Lift, mm(approx)	12 Mtr
04	Design & Constructional feature	As per Standard Specification
05	Material of Construction	As per Standard Specification
06	Supply of accessories and service	As per Standard Specification
07	Tests and Inspection	As per Standard Specification

## 1.10 SLUICE GATE & HOISTING

Sl No	Particulars	Data
01	Embedded parts	As per Standard Specification
02	Size of Draw shutter	1350 mm x 1600 mm, 03 Nos
03	Size & Nos of Emergency Gate for Draw shutter	1350 mm x 2600 mm, 03 Nos
04	Size & Nos of Flap shutter	1350 mm x 2000 mm, 03 Nos
05	Hoist system	As per Standard Specification
06	Design & Constructional feature	As per Standard Specification
07	Material of Construction	As per Standard Specification
08	Supply of accessories and service	As per Standard Specification
09	Tests and Inspection	As per Standard Specification

## 2. Electrical work

### 2.1 Substation and Associated Works

Sl. NO.	Description	Pumping Station
1	Incoming supply V, AC (Proposed)	11 KV
2	Supply Authority	WBSEDCL
3(c)	Breaking capacity (MVA) (Symm.)	50 MVA(25/26.3 KA) for 11 KV
4	Type of H.T Panel	Cubical draw out type extensible on either side
5(a)	Total Number of Transformers	2
5(b)	Rating of Each Transformer	2 No. 1000 KVA, 11/0.433 KV

<b>5(c)</b>	Impedance (%)	As per IS (upto 5% for transformer up to 1600 KVA and up to 6.25% for transformer up to 2500 KVA)
<b>5(d)</b>	Type of Transformer	OUTDOOR, ONAN type
<b>5(e)</b>	Type of Enclosure	IP 55
<b>6(a)</b>	Type of H.T Panel	Cubical – vertical free standing extensible on either side
<b>6(b)</b>	Nominal Voltage (V)	0.433 KV
<b>6(c)</b>	Fault level (MVA) (Symm.)	35 MVA
<b>6(d)</b>	Type of Enclosure	IP 54
<b>6(e)</b>	Rating of Incoming Unit	1250A, 11 KV (26.2 KA), VCB – 2 Nos.
<b>6(f)</b>	Rating of Outgoings	400A TPN 500/415V, AC 50KA breaking capacity MCCB- 9 nos
<b>7(a)</b>	Type of L.T Panel	Cubical – vertical free standing extensible on either side
<b>7(b)</b>	Nominal Voltage (V)	415 V, TPN
<b>7(c)</b>	Fault level (MVA) (Symm.)	35 MVA
<b>7(d)</b>	Type of Enclosure	IP 54
<b>8</b>	H.T Cables	As specified in BOQ
<b>8a</b>	Supply authority's panel to consumer 3 panel VCB to 1000 KVA transformers	11 KV, 1x3C, 240 Sq. mm (Al) PVCA/XLPE Cable
<b>8b</b>	1000 KVA transformers to consumer 1 panel ACB.	1.1 KV, 1x3.5C, 300 Sq. mm (Al) PVCA/XLPE Cable
<b>8c</b>	Outgoings ( L.T panel to L.T motors and capacitors]	1.1 KV, 1x3C, 240 Sq. mm (Al) PVCA/XLPE Cable
<b>9</b>	L.T Cable	As specified in BOQ
<b>10</b>	Capacitor bank of MPP-H type with HRC fuse and inductor coil	(i) LT 415 V 95 KVAR
<b>11</b>	Control Cables (i) for inter panel wiring & interlocking (ii) For Local push button stations	1.1 KV, 14/C, 2.5 Sq.mm (Cu) PVC Armd cable 1.1 KV 7/C, 2.5 Sq.mm (Cu) PVC Armd. cable
<b>12</b>	Starters Type	(i) Motor KW – 125 KW (LT) FASD (ii) Others as per specification
<b>13</b>	Starter Location	(i) Motor KW – 125 KW (LT) ( L.T Panel at pump house) (iii) Others in L.T Panel at pump house.

<b>14</b>	START / STOP Facility	Both at MCC and at Local control Station with Local /remote selector switch in MCC Panel. STOP push button near motor shall be lockable type i.e. press to lock and turn to reset type.
<b>15</b>	Number of Earth Station	As shown in layout Drg, BOQ and to provide desired earthresistance specified. Additional earth stations, if required shall be provided to obtain the specified combined earth resistance
<b>16</b>	Size of Main Earth Grid/ Mat (i)Transformer / H.T Panel Room& Pump Room, (ii)L.T Room	75 x 8 mm G.I  50 x 6 mm G.I
<b>17</b>	Individual starter Motor Earthing Lead	As specified in the standard Technical Spec.
<b>18</b>	MCB Dist. Board (415/240V, TPN/SPN) i) Lighting ii) Power	As specified in BOQ & SLD

## **SECTION-III**

### **Additional contract Information**

#### **1.0 Additional Information to the bidder**

##### **1.1 Time of Completion**

Project Engineering, procurement of equipment and construction works shall be completed in its entirety within **8 Months (Eight months)** (including rainy or any other disruptive or non-working seasons up to commissioning) from the date of issue of Letter of award and up to commissioning, successful trial run and handing over the pumping station.

##### **1.2 Disqualification**

Even though the bidder satisfies the above requirements, they are subject to be disqualified if they have

- (a) Made untrue or false representations in the forms, statements and attachments required in the pre-qualification documents and/or.
- (b) Record of proof of performance such as abandoning the work, not properly completing contracts etc. or financial failures.

##### **1.3 OEM/Authorized Dealer/Agents of Supplier**

When a bidder is other than O.E.M of pump, the bidder is also required to attach, in its bid, the manufacturer's authorization certificate and also manufacturer's confirmation of extending the required warranty for that product. This is necessary to ensure bid from a responsible party offering genuine product, also backed by a warranty obligation from the concerned manufacturer.

##### **1.4 Deviation from bid documents / additional clauses**

All bidders shall note that the bids in response to e-NIT, containing any deviation whatsoever from the basic parameters in respect of General and special Terms and conditions and technical specifications shall be judged by the High Value Tender Evaluation Committee, herein after termed as HTEC. The HTEC shall be sole judge for assessment of acceptability/ non acceptability of deviations / additional clauses. The decision of the tender accepting authority in this respect shall be final.

### **1.5 Fraudulent Practice**

“Fraudulent Practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Purchaser and includes collusive practice among Bidders (prior to and after Bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Govt. of the benefit of free and open competition.

The Govt. will reject a proposal for award if it determines that the Bidder recommended for award has engaged in fraudulent practices in competing for the contract in question.

The Govt. will declare the bidder ineligible, either indefinitely or for stated period of time, if at any time it determines that the firm has engaged in fraudulent practices in competing for, or in executing the contract.

Failure of successful bidder to comply with requirements of different clauses of tender documents shall constitute sufficient grounds for the annulment of award and forfeiture of Earnest Money.

### **1.6 Site Visit**

The Bidder is advised to visit and examine on his own and the site of works and its’ surrounding and obtain for its’ own responsibility all information that may be necessary for preparing the Bid and entering into a contract for the design-build and completion and commissioning of the works. The costs of visiting the Site and investigation etc. shall be at the bidders (or tenderers) own expense.

### **1.7 Clarification of tender documents and pre-bid meeting**

- (a) A prospective Bidder requiring any clarification of the tender documents may notify the tender inviting authority in writing or by e-mail or by fax at the mailing address preferably within 15 (fifteen) days of start tender document download. The tender inviting authority will respond in writing to any request for clarification or modification of the tender documents that it receives prior to the deadline for submission of bids prescribed by the purchaser. Written copies of tender inviting authority’s response (including an explanation of the query but not identification of its source) will be uploaded in the portal.
- (b) The Bidder and any of its personnel or agents will be granted permission by the authority to enter upon its premises and lands for the purpose of such inspection.
- (c) The bidder’s designated representative is invited to attend a pre-bid meeting which, if convened, will take place at the venue and time stipulated in the NIT. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage. The bidder is requested for as possible, to submit any questions in



writing or by e-mail or by fax, to reach the tender inviting authority before the meeting. It may not be practicable at the meeting to answer questions received late, but questions and responses will be transmitted as indicated hereafter. Any modification of the tender documents which may become necessary as a result of the pre-bid meeting shall be made by the tender inviting authority exclusively through the issue of an addendum and through the minutes of the pre bid meeting.

### **1.8 Amendment of bidding document**

At any time prior to the deadline for submission of bids, the tender inviting authority may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, or as a result of pre-bid meeting modify the tender documents by issuing and amendment, any amendment thus issued shall be part of the tender documents and shall be uploaded in the tender portal. To give prospective bidders reasonable time to take an amendment into account in preparing their bids, the purchaser may extend, if necessary, the last date for submission of bids.

### **1.9 Payment terms**

The tendered percentage as accepted while entering into contract will be made for arriving of item wise tendered rates (Only for purpose of making payments for item or complete part of the time of B.O.Q.) for item wise payment will be governed as below. The tendered rates will be treated as inclusive of all taxes, duties, excise etc.

- 1) Delivery of item of accepted quality in full at work site – 60% of item price.
- 2) Completion of erection of all at the items. -15% of item price.
- 3) Commission and trial run including 72 hrs. Continuous operation as detailed in the item description. -15% of item price.

Deduction of Income Tax (IT), GST and Security Deposit will be done as per the existing law in force during contract period

## **2.0 GENERAL CONDITIONS OF CONTRACTS**

### **2.1 Interpretation**

In this General Conditions of Contract, unless the whole context requires otherwise.

- (i) Words shall have their normal meaning under the language of the Agreement unless specifically denied.
- (ii) The title of the Agreement and descriptive heading of sections are used solely for convenience of reference and are not interpret the provisions of this Agreement.
- (iii) Any reference to any law shall be deemed to include a reference to such law as is re-enacted, modified or amended from time to time.
- (iv) Unless that context otherwise requires, (a) words importing the masculine gender shall also include the feminine gender and vice versa, and (b) the use of the singular shall include the plural and vice-versa.

### **2.2 Interpreting Specification**

In interpreting specification, the following order of decreasing importance shall be followed in case contradictions.

- (a) B.O.Q.
- (b) Technical Specification.
- (c) Drawing (if any).
- (d) Relevant BIS or other international code, in the case of BIS code is not available.

### **2.3 Documents on Site**

The Contractor shall keep on the site one complete set of the documents forming the Contract, the Construction Documents, other communications given or issued and the documents mentioned in Sub-clause (Technical Standards and Regulations). The EIC and his Representative and assistants shall have the right to use such documents at all reasonable times.

### **2.4 Communications**

Whenever provision is made for the giving or issue of any notice, instruction, consent, approval, certificate, determination by any person, unless otherwise specified such communication shall be in writing and shall not be unreasonably withheld or delayed.

Wherever provision is made for a communication to be "written" or "writing", this means any hand or printed communication, including the agreed systems of electronic transmission.

All certificates, notices or written orders to be given to the Contractor by the Engineer-in-charge and all notices to be given to the Engineer-in-charge by the Contractor, shall either be delivered by hand against written acknowledgement of receipt, or by sent by registered post or one of the agreed systems of electronic transmission to Engineer-in-charge.

## **2.5 General Obligation of the Contractor**

The works as completed by the Contractor shall be wholly in accordance with the Contract and fit for the purpose for which they are intended, as define in the Contract. The works shall include any work which is necessary to satisfy the Contract, Contractor's proposal and schedule, or is implied by the contract, or arises from any obligation of the contractor, and all works not mentioned in the Contract but which may be inferred tom be necessary for stability or completion or the safe, reliable and efficient operation of the works. The Contractor shall carry out detailed engineering design (to the extent as per scope of work), execute and complete the works, providing completion Documents, within the Time for Completion, and shall provide all superintendence, labour, materials. Contractor's Equipment, Temporary works and all other things, whether of a temporary or permanent nature, required in and for such design, execution, completion and remedying of defects. Before commencing design, the Contractor shall satisfy himself regarding the design criteria and parameters. The Contractor shall bring to notice of the Engineer-in-charge of any error, fault or other defect in the design criteria and parameter.

The Contractor shall carry out and be responsible for the design of the works. Design shall be prepared by qualified designers who comply with the criteria (if any) stated in the technical schedules. The Contractor holds himself, his designers and design Sub Contractors as having the experience and capability necessary for the design. The Contractor undertakes that the designers shall be available to attend discussions with the Engineer-in-charge at all reasonable times during the Contract Period.

The Contractor shall take full responsibility for the adequacy, stability and safety of all methods of construction and of all the works, irrespective of any approval or consent by the Engineer-in-charge.

## **2.6 Co-ordination of the works**

The Contractor shall be responsible for the co-ordination and proper execution of the work. The Contractor shall, as specified elsewhere in the document afford all reasonable opportunities for carrying out their work to:

- i. The workmen and Engineer-in-charge or his authorized representative, and

- ii. The workmen and any legally constituted public authorities who may be employed in the execution on or near the site of any work not included in the contractor, which the Engineer-in-charge may require.

The Contractor shall obtain, co-ordinate and submit to the Engineer-in-charge for his information all details (including details of work to be carried out off the site) from Sub-contractors. The Contractor shall ensure that there is no conflict with the work of other Sub-contractors, the contractor or other contractors.

The contractor shall coordinate his work and cooperate with other agencies by exchange of all technical information like details of foundation, if required, weight, overall dimension, clearance other technical data required for successful and proper completion of work of his portion of work in relation to the works of other contractor without any reservation.

## **2.7 Extent of work**

The work comprises of entire labour including supervision and all materials necessary to make a complete Installation and such tests and adjustments and commissioning, as may be required by the department. The term complete installation shall not only mean major items of the plant and equipment's covered by the specifications but all incidental sundry components necessary for complete execution and satisfactory performance of installation with all layout charts whether or not those have been mentioned in details in the tender document in connection with which this contract as this is a turnkey job.

## **2.8 Contractor's Risks**

The Contractor shall be responsible for all risks of loss or damage to physical property and of personal injury and death which arise during and in consequence of its performance of the Contract.

### **2.9.1 Insurance against Injury to Persons and Damage to Property**

The Contractor shall insure against liability to third parties, in the joint names of the Engineer-in-charge, the Contractor and Sub-Contractor, for any loss, damage, death or bodily injury which may occur to any physical property or to any person, which may arise out of the performance of the Contract and occurring before the issue of the Performance Certificate.

### **2.9.2 Insurance for Workers:**

The Contractor shall affect and maintain insurance against losses and claims arising from the death or injury to any person complied by the Contractor or any Sub-contractor, in such manner that the Engineer-in-charge and his Representatives are indemnified under the policy of insurance. For a Sub-

contractor's employees, such insurance may be affected by the Sub-contractor, but the Contractor shall be responsible for compliance with this Clause.

### **2.9.3 Inland Transit Insurance**

The agency should be asked well in advance for insurance. In case of loss or damage to store in transit where the store has been insured by the supplier against such risk, he/she will take up the matter with insurer which should invariably be a nationalized insurance company/ corporation and recover the loss from them.

## **2.9 Quality Control of works**

### **2.9.1 Identifying Defects.**

The Engineer-in-charge or his representative shall check the Contractor's work and notify the Contractor of any Defects which are found. Such checking does not affect the Contractors responsibilities. The Engineer-in-charge may instruct the Contractor to search for a defect and to uncover and test any part of the works, which the Purchaser considers, may have a Defect.

### **2.10.2 Quality Assurance**

Unless otherwise indicated elsewhere in this Contract, the Quality Assurance and Quality Control (QA/QC) documents for each element of work/equipment shall be prepared by the Contractor along with its Engineering documents and three copies of the same shall be supplied to Engineer-in-charge for his approval. Engineer-in-charge's hold point shall be clearly marked against critical check points for witnessing test/inspection by Purchaser's representative. The Engineer-in-charge shall mark his comments or give his approval on one copy and return the same to Contractor. The Contractor shall implement the comments and send three copies of revised documents again to the Engineer-in-charge. After getting approval of Engineer-in-charge, three copies of approved QA/QC documents shall be supplied to purchaser for inspection of works/equipment at site manufacturer's works.

The Contractor shall institute a quality assurance system to demonstrate compliance with the requirement of the Contract. Such system shall be in accordance with the details stated in the contract. Compliance with the quality assurance system shall not relieve the Contractor of his duties, obligations or responsibilities.

Details of all procedures and compliance documents shall be submitted to the Engineer-in-charge for his information before each design and execution stage is commenced. When any document is issued to the Engineer-in-charge, it shall be accompanied by the signed quality statements for such document, in accordance with the stated in the Contract. The Engineer-in-charge shall be entitled to audit any aspect of the system and require corrective action to be taken. Contractor shall allow any authorized persons by Engineer-in-charge or his authorized representative to inspect and check the test and quality control for the work.

### **2.10.3 Correction of Defects**

The Engineer-in-charge shall give notice to the Contractor of any Defects before the end of the Defect Liability period, which begins at Completion.

Every time notice of a Defect is given, a Defect Correction period for the notified Defect begins. The contractor shall correct the notified defect within the Defect Correction period at cost to the Purchaser. The length of the Defects Correction Period is the length specified by Engineer-in-charge of his representative's notice.

The Contractor shall correct Defects which he notices himself before the end of the Defect Liability Period. If the defect or damage is such that it cannot be remedied expeditiously on the site, the Contractor may, with the consent of Engineer-in-charge, remove from the site for the purpose of repair any part of the works which is defective or damaged.

The Contract period shall be extended by a period equal to the sum of any periods, after the works are taken-over, during which the works or any section or item of plant cannot be used, for purposes for which they are intended, by reason of a defect or damage.

## **2.10 Delivery and Documents**

Delivery of the Civil, Electro & Hydro-mechanical works shall be made by the Contractor in accordance with the terms specified by the Engineer-in-charge in its schedule of requirements and the special conditions of Contract. In case spare parts and tools are also ordered with the Civil, Electro-mechanical works, bidder will undertake to offer spare parts and tools for delivery along with the main Civil, Electro- mechanical works only and not before.

## **2.11 Prices**

It is a firm percentage rate price contract. Prices charged by the contractor for Civil, Electro-mechanical works delivered and services performed under the contract, shall not vary from the contract agreement prices mentioned in Contract Agreement.

The taxes and duties viz., GST and other levies, cost for packaging & forwarding, insurance, freight, import duty shall be deemed to have included in the bid of the contractor as applicable for supplies and works will be borne by Contractor as per actual.

### **2.11.1 Security of site**

The Contractor shall be responsible for keeping unauthorized persons off the site and authorized persons shall be limited to the employees of his sub-contractors and persons authorized by the Engineer-in-charge.

### **2.11.2 Contractor's personnel**

The contractor shall employ (or cause to be employed) only persons who are careful and appropriately qualified, skilled and experienced in their respective trades or occupations. The Engineer-in-charge may require the contractor to remove (or cause to be removed) any person employed on the site or works, including the contractor's Representative, who in the opinion of the Engineer-in-charge.

- (a) Persists in any misconduct,
- (b) Is incompetent or negligent in the performance of his duties,
- (c) Fails to conform with any provisions of the Contract, or
- (d) Persists in any conduct which is prejudicial to safety, health, or the protection of the environment. If appropriate, the contractor shall then appoint (or cause to be appointed) a suitable replacement person.

## **3.0 SPECIAL CONDITION OF CONTRACT (S.C.C.)**

### **3.1 General**

The data and information given in the Tender Documents are based on the investigations, planning and designs carried out so far. The data considered for the project planning have been included in the bid documents. The contractor shall, therefore, satisfy himself about the adequacy and accuracy of the said data/information and interpretation hereof and collect fresh data/additional data/information and carry out/conduct further investigations and studies. The Purchaser shall not be responsible for the accuracy/adequacy of the data/information and interpretation thereof by the Contractor.

The following special conditions of Contract shall supplement the General Conditions of Contract. Whenever there is a conflict, the provisions herein shall prevail over those in the General condition of Contract.

### **3.2 Work Schedule / Re- Scheduling & Progress of work**

The Contractor shall submit a detailed BAR CHART and PERT network within 15 days of award of contract. The PERT network shall consist of adequate number of activities covering key phases of the works such as design, procurement, manufacturing, shipment, installation of equipment, assembly and commissioning of units. This network shall also clearly indicate the interlinking/interdependence of relative activities of civil works, Electro-Mechanical Works. The Contractor shall also make the PERT network in computer aided project management software to generate Bar Chart based on

network technique. Contractor shall discuss the network so submitted with the Engineer and the agreed network shall form part of the Contract to be signed within 30 (thirty) days from the date of receipt of Letter of Award of contract.

The Works shall be executed and performed in accordance with the agreed Master Control Network. The program shall be received jointly by the Engineer-in-charge and the Contractor, at least once in a month where in the hold ups/delay, if any, in the progress of works, with reference to the agreed schedule shall be given special Attention. Necessary modifications (updating/Revisions) of the program, within the overall time for Completion, shall be carried out by mutual agreement between the Engineer-in-charge and the Contract.

If for any reason, any parts of the works of the Project are delayed, then the total program may be re-scheduled by mutual agreement between the Engineer-in-charge and the contractor, if necessary, keeping the overall completion schedule of the project unaltered, no extra cost whatsoever, on account of such re-schedule shall be payable to the Contractor.

Progress Report: Monthly progress reports for execution of the Project shall be prepared by the Contract and submitted to the Engineer in four copies. The first report shall cover the period up to the end of the calendar month, in which the commencement date occurred. Report shall be submitted monthly thereafter, within 5 days of the following month, Report continue until the contractor has completed all work, which known to be outstanding at the completion date, stated in the taking-over Certificate for the works. Each report shall include:

- (a) Photographs and detailed descriptions of progress, including each stage of design, procurement, manufacture, delivery to site, construction, erection, testing and commissioning;
- (b) Chart showing the status of Construction document, purchase orders, manufacture and construction;
- (c) For the manufacture of each main item of plant and Materials, the name of manufacturer, manufacture's location, percentage progress.

### **3.3 Replacement of Defective Materials**

If during the progress of manufacture or supply of the plant the Engineer decides and notify in writing to the Contract that the Contractor has manufactured any plant or part of plant unsound or imperfect or has supplied any plant inferior in quality, the Contractor, on receiving details of such defect or deficiency, shall alter, reconstruct or remove such plant or part of plant or supply fresh materials up to the standard of the specification at his own expenses. In case the contractor fails to do so, the owner may on giving the Contractor 7 (seven) days' notice in writing of his intention to do



so, proceed to alter, reconstruct or remove such plant or part or supply all such material at the Contractor's cost provided that nothing in this clause shall, be deemed to deprive the owner or affect any rights of the Contractor which he may otherwise have in respect of such defects or deficiencies and provided that such replacement shall be carried out by the owner within a reasonable time and at a reasonable price and when reasonable possible to the same specifications and under competitive conditions.

### **3.4 After Sales Service**

The equipment supplied against this specification shall be attended to by the contractor when referred to by the E.I.C. at contractors' price remain within guarantee period and at Govt. price beyond that immediately so that the equipment does not remain idle on account of Contractors service.

Necessary spare parts shall be made available till the life of the equipment. Before going out of the production of the spare parts, the contractor shall give advance notice to the Govt. so that the Govt. may procure his requirements then. Necessary drawings and materials specification of such spare in such circumstances shall be made available by the contractor to the Owner enabling him to fabricate the same or procure from elsewhere.

### **3.5 Work to be executed in Accordance with Specifications, Drawing, and Orders etc.**

The contractor shall executive the whole and every part of the work in the most substantial and workmen like manner and both as regards materials and otherwise in every respect in strict accordance with specifications. The contractor shall also confirm exactly, fully and faithfully to the designs, drawings and instructions in writing relating to the work signed by the purchaser and lodged in his office, and to which the Contractor shall be entitled to have access at such office or on the site of the work for the purpose of inspection during office hours, and the specifications and of all such designs, drawings and instructions as aforesaid.

### **3.6 Negligence**

If the Contractor shall neglect to executive the work with due diligence and expedition or shall refuse or neglect to comply with any reasonable orders given to him in writing by the Engineer-in-charge in connection with the works or shall contravene the provisions of the contract, the owner may give notice in writing to the contractor calling upon him to make good the failure, neglect or contravention complained of. Should the Contractor fail to comply with such notice within a period considered reasonable by the owner from the date of service thereof, in the case of failure, neglect or contravention capable necessary for making it good, then and in such case

of Owner shall have the option and be liberty to make the work wholly, or in part, out of the Contractors hand may carry on the work necessary to complete the work envisaged in the contract either by himself or his agents or may reconstruct at reasonable price with any other person or persons to execute the same or any part thereof and provide any other materials tool, tackle or labour for the purpose of completing the works of any part thereof.

### **3.7 Trial Run and Commissioning**

On the completion of work, the whole system shall be tested and commissioned as envisaged in Technical Specification. All the tests as specified in technical specification part should be completed. The unit shall be put to 72 hrs. continuous run. After completing 72 hours test run, pump will be declared suitable for operation.

### **3.8 Commissioning Report**

The Executive Engineer and Contractor shall properly maintain in the agreed format their respective records of all observations and measurement taken in respect of all tests and operations. Joint protocol shall be signed on completion of each and every test/check till the commissioning. During commissioning all reading shall be jointly maintained and signed. On successful completion of the commissioning, a report shall be jointly prepared and signed indicating results of all the tests/checks.

### **3.9 Training of Departmental personnel**

The Contractor shall arrange for training of Engineering-in-charge's personnel in operation and maintenance of the pump. The Contractor shall provide a detailed training plan for all operation and maintenance procedures and submit maintenance manual after completion of the project.

### **3.10 Documents for Payment of domestic product**

The Contractor submits the requisite documents to the paying Authority to enable effecting the payment.

(a) Indigenous items (Manufactured in India): Payment of bills will be made on submission of the following documents by the Seller to the Paying Authority along with the bill:

- (i) Ink-signed copy of Contractor bill/Commercial Invoice.
- (ii) Inspection Note (and User Acceptance, if applicable).
- (iii) Time extension letter. If applicable.
- (iv) Claim for statutory and other levies to be supported with requisite documents/proof of payment. Like GST Invoice, Excise Duty Challan (wherever applicable), Customs Duty

Clearance Certificate, proof of payment for EPF/ESIC contribution with nominal roll of beneficiaries, etc., as applicable.

- (v) Exemption Certificate, if applicable.
- (vi) Bank Guarantee for advance, if any paid.
- (vii) Guarantee/Warranty certificate.
- (viii) Name and address, Account type, Account number, IFSC code, MICR code.
- (ix) Any other document/certificate that may be provided for in the consequent supply order/Contract.
- (x) Inspection certificate by Quality Management Department of Equipment Manufacture countersigned by Owner's Engineer as per agreed Quality plan in 3 copies.

### **3.11 Documents for payment for imported Goods**

The documents, which are needed from the supplier for release of payment, are to be clearly specified in the contract. The paying authority is also to verify the documents received from the supplier with corresponding stipulations made in the contract before releasing the payment. Documents, which the supplier is to furnish while claiming payment, are specified in the Letter of Credit, but usually are:

- (i) Supplier's original invoice giving full details of the goods including quantity, value, and so on;
- (ii) Packing list;
- (iii) Certificate of country of origin of the goods to be given by the seller or a recognized chamber of commerce or another agency designated by the local Government for this purpose;
- (iv) Certificate of pre-dispatch inspection by the purchaser's representative;
- (v) Manufacturer's test certificate and guarantee;
- (vi) Certificate of insurance;
- (vii) Bill of lading/airway bill/rail receipt or any other dispatch document, issued by a government agency (like the Department of Posts) or an agency duly authorized by the concerned Ministry/Department, indicating;
  - (a) Name of the vessel/carrier;
  - (b) Bill of loading/airway bill;
  - (c) Port of loading;
  - (d) Date of shipment;
  - (e) Port of discharge and expected date of arrival of goods; and any other document(s) as and if required in terms of the contract.

### **3.12 Taxes, Duty and Levies**

- (a) GST: Rate of GST or any other Tax chargeable shall be inclusive in their quoted rate.
- (b) Whenever Excise Duty is applicable and payable, bidder will assume that the rates quoted are inclusive of taxes.
- (c) Customs Duty:
  - (i) In case of imported stores offered against forward delivery, the Bidders shall quote prices inclusive of customs duty. (CIF price along with installation, testing and commissioning).

### **3.13 Insurance**

The equipment/machinery supplied under the contract shall be fully insured in a freely convertible currency against loss or damage incidental to manufacture or acquisition, transportation, storage and delivery in the manner specified in the contract. If considered necessary, the insurance may be done for coverage on an "all risks" basis including war risks and strike clauses. The amount to be covered under insurance should be sufficient to take care of the overall expenditure to be insured by the purchaser for receiving the goods of the destination.

The contractor shall take the policy in the name of the consignee of the Department, the insurance policy they will be assigned to the contractor for further operation. The insurance shall be full and shall cover any loss or damage in accordance with what is said above. The damaged materials will be set right or replaced by the contractor, free of cost. The claim arising out of composite insurance policy shall be dealt with or handled by the contractor at his own cost after receipt of preliminary damage/loss intimation given by the Department of damage/loss noticed by the contractor himself.

The insurance of plant up to a period of satisfactory commissioning and operations and satisfactory performance and guarantee test shall be on the account of contractor.

### **3.14 Acceptance of Stores against Supplier's Inspection Report and Warranty**

In case of store to be imported from abroad, pre-dispatch inspection of goods at supplier's premises may be waived and substituted by the pre-dispatch inspection by the purchaser's inspector with the manufacturer's house inspection report and warranty. However, Manufacturing Company of foreign origin, having facility in India, may conduct pre-dispatch inspection in their own factory in India.

### **3.15 Purpose of Drawing and Specification and confirmation thereto and error, omission, discrepancies etc.**

The contractor drawing read together with the contract specification and intended to show and explain the manner of executing the works and to indicate the type of class of the material to be used. The work shall be carried out in accordance with direction of Engineer-in-charge and in accordance with the drawing and specification which from part of the contract and in accordance with such further drawing, details and inspection as may from time to time to given by the Engineer-in-charge.

It shall be responsibility of the contractor to promptly bring to the notice of the Engineer any error or discrepancy in the contract documents and obtaining his order thereon.

(a) In case of error omission and / or disagreement between written and scaled dimensions on between the drawings and specifications, the following orders or preference shall apply.

- Between actual scaled and written dimensions or description or drawings and corresponding one in the specification, the latter shall be adopted.
- Between other quantities in the schedule of the quantities and those arrived at from the drawing, the former shall apply.
- Between the written description of the item in the schedule of the quantities and the detailed specifications of the same item the latter shall be adopted.

(b) The information in connection with the work and work site as well as specification are contained in this book of contract in general and in particular in two parts viz. special condition and specification for item of work. In case of any discrepancy or repugnancy in the clauses in these sections the specifications will prevail over special condition.

(c) The special condition of contract and the specification shall prevail over various clause of EPC contract agreement.

In all cases on omissions and/or doubts or discrepancies in the dimensions or description of any item reference shall be made to the Engineer-in-charge whose Elucidation, Elaboration or Decision shall be considered as authentic and final. The contractor shall be held responsible for any error that may occur in the work through lack or such reference and precaution.

### **3.16 Standard of acceptance of branch tests**

Acceptance of bench test to be conducted at manufacturing works shall be governed as below. The acceptance of performance test for verification of guarantee of head and discharge shall be governed by Para 9.4 of IS 10981 of 1983, similarly the acceptance of test for verification of guaranteed sufficiency should be governed by Para no. 9.4.2 of IS 10981 i.e., **combined efficiency of the pump/motor at the point of intersection shall be at least 0.975 of that guaranteed.**

If during the test it is found that the pump sets do not meet the required guaranteed performance, the pump sets will be out rightly rejected. The same pump sets may be accepted only after making necessary modifications alternations and retesting to meet the guaranteed performance at the contractor's cost.

### **3.17 Standard of acceptance of field tests**

Acceptance of the field tests to be conducted at the work site shall be governed as below. The acceptance of performance test for verification of guarantee of head and discharge shall be governed by Para 9.4 of IS, 9137 of 1978, similarly the acceptance of test of guaranteed efficiency shall be governed by Para 9.4.2 of IS 9137 of 1978 (i.e., the combined motor pump units i.e., overall efficiency at the point of intersection shall be as per specified in schedule B). If during the test it is found that the pump set does not meet the required guaranteed performance, the pump set will be dismantled, transported to manufacture work for modification, alteration, etc. and re-transported to site re-assembled, re-installed and re-commissioned to the satisfaction of the Engineer by the contractor at his cost.

### **3.18 Errors in Submission**

The contractor shall be responsible for any error or omission in the drawing and the other particulars supplied by him, whether such drawing/particular have been approved by the E.I.C. or not.

### **3.19 Departure from Technical specification**

If the tenderer wishes to depart from the provision of the technical specification, he shall clearly mention such. Departure giving his reason there of unless this is done, the installation offered should be deemed to comply in every respect with this specification and all terms and conditions of the specification shall apply into.

### **3.20 Tools and Plants for Erection, Testing etc.**

The contractor shall provide all types of tools, lifting, tackles, erection appliances or any other machine that may be required for installation of complete equipment under this contract.

### **3.21 Quality Assurance, monitoring and supervision**

The contractor shall establish a quality control mechanism to ensure compliance with the provision or this agreement.

The contractor shall, within 15 (fifteen) days of agreement, submit to the E.I.C. its quality assurance plan which shall include the follows:

- (a) Organization, duties and responsibilities procedure, inspections and documentations.
- (b) Quality control mechanism including sampling and testing of materials, test frequencies standards, acceptance criteria, testing facilities, reporting, recording and interpretation of test results, approvals, check list for site activities, and proforma for testing and calibration in accordance with the specification and good industry practice.
- (c) Internal quality Audit system.

The E.I.C. shall convey its comments to the Contractor within a period of 15 days of receipt of the QAP stating the modification, if any, required and the Contractor shall incorporate those in the QAP to the extent required for conform with the provisions under this Clause.

### **3.22 Third Party Inspection**

Inspection may also be entrusted to a third-party inspection authority (like C.W.P.R.S, Pune). If it becomes necessary to conduct a type test, acceptance test or special test at external laboratories, (National Accredited Laboratory) when facilities of these test are not available in house of the supplier or carrying out of confirmatory test is considered desirable before accept the good. Normally unless otherwise intended in the contract, charge for routing testing, testing of material, and charges of special test to be borne by the contractor.

## SECTION-IV

### GUARANTEED PERFORMANCE AND TECHNICAL PARTICULARS. COLUMN MOUNTED SUBMERSIBLE PUMP

**(Technical Data sheet to be submitted along with the tender by bidder)**

ITEM -01

PART-A

Sr. No.	Description	Data ( to be filled by the bidder)
(1)	Pump type.	
(2)	Manufacturer & his type designation.	
(3)	Standard to which manufactured.	
(4)	Design capacity	
(5a)	Design head (meters)	
(5b)	Shut off head (meters)	
(6)	Number of stages.	
(7)	Speed (RPM).	
(8a)	Pump efficiency (%) at duty point	
(8b)	Maximum Pump efficiency (%) in operating range	
(9a)	Power absorbed (KW).	
(9b)	Max Power absorbed (KW) in entire operating range	
(10)	Type of impeller (Radial /Mised/ Axial flow).	
(11)	Diameter of impeller (millimeter).	
(12)	Minimum submergence required, measured from bottom of floor level in mm.	
(13a)	Operating Range (Capacity)	
(13b)	Operating Range (TDH)	
(14)	Thrust bearing make and manufacture number.	
(15)	Life of bearing (hours).	
(16)	Type & Capacity of thrust bearing (Kg.).	
(17)	(i) Hydraulic thrust at normal head.	
	(ii) Hydraulic thrust at shut off.	
	(iii) Weight of rotating element (Kg.).	
	(iv) Total design thrust.	
	(a) Normal head.	
	(b) Shut off.	
	(v) (a) Total static load acting at motor floor.	
	(b) Total vertical dynamic load acting at motor floor.	
	(c) Total horizontal dynamic load acting at motor floor.	
	(vi) (a) Total static loads at floor.	
	(b) Total dynamic load vertical /horizontal acting at floor.	



## ITEM -01

## PART-A

Sr. No.	Description	Data ( to be filled by the bidder)
(19)	Type and make of shaft bearings.	
(20)	Time required for accelerating the pump from Zero to full speed, with proposed driver (seconds).	
(21)	Whether pump is suitable for starting against a closed delivery valve (Yes/No).	
(22)	Weight of pump (Kg).	
(23)	Weight of largest single part to be handled at a time of erection/ dismantling of the pump.	
(24)	Capacity of E.O.T. Crane suggested considering all the loading factors/ water column, etc under extreme conditions.	
(25)	Materials for: Pumps.	
	Impeller	
	Casing	
	Bell mouth	
	Strainer	
	Pump shaft	
	Shaft bearings	
	Sole Plate	
	Column Pipe	
	Bolts, nuts and washers	
	Mechanical seal	
	Lifting chain	
(26)	Diameter of column Pipe	
(27)	Diameter of delivery pipe	

## ITEM -01

## PART-A

Sr. No.	Description	Data ( to be filled by the bidder)
(28)	Other particulars.	
	shaft diameter	
	First critical speed (RPM)	
	Length of Delivery, m	
	Thickness of column pipe walls	
	Flange thickness for column pipes (mm)	
	Length of each a) Column pipe (meters) b) Lifting Chain	
	Bell mouth diameter and length (mm)	
	Cavitations free operation zone of the pump in percentage of rated discharge	
	Overall size of the pump (Length x width x Height) (Meter)	
	Impeller shaft diameter in mm	
	Combined shear stress Kg/cm <sup>2</sup>	
	Axial trust of the line shafts including hydraulic thrust and weight of shafts and all rotating parts.	
	Ultimate tensile strength of the shafts used	
(29)	Solid passage capacity (mm)	
(30)	Minimum vane opening (mm)	
31	Details of Internal protection features	
	Winding Temperature	
	Bearing temperature	
	Moisture sensor	
	Seal leakage chamber	

**PART B**  
**COLUMN MOUNTED SUBMERSIBLE PUMP**

Sr. No.	Description	Data ( to be filled by the bidder)
(1)	Rated Discharge (Q)	
(2)	Rated head (Effective) (h)	
(3)	Water Horse Power (Qxh)/102	
(4)	Pump Efficiency at Rated Head & Discharge	
(5)	Input to pump	
(6)	Loss in shaft bearing	
(7)	Loss in thrust bearing	
(8)	Input to Bowl Assembly	
(9)	Head loss in column assy & discharge head (hc)	
(10)	Head loss at Bowl wntrance, strainer Bell mouth and Suction Casing (hs).	
(11)	Bowl assembly Head (H=h+hdc=hs) Pump Head.	
(12)	Bowl Efficiency (HQ/102 x Sr.No.3).	
	Recommended Motor Rating	
(13)	Motor Efficiency at Rated condition and steady state temperature.	
(14)	Input to Motor Sr.No./5/Sr.No.13	
(15)	Overall Efficiency of Pump Motor set (i) Sr.No. 3/ Sr.No. 14 (ii) Sr.No. 4 x Sr.No. 13	
(16)	Maximum NPSH required under operation at: Normal Water Level (meter) Lowest Water Level (meter)	
	Pump specific speed (as per IS 5120 )	
	Pump suction specific speed	
(17)	Location of eye of lowest impeller from bottom floor level (Either firm or range should be stated)	



## ITEM -02

## MOTORS (continue)

Sr. No.	Description	Data ( to be filled by the bidder)
(16)	Break away torque	
(17)	Pull out torque	
(18)	Moment of Inertia	
(19)	Power factor (without capacitors) At full load At 75% load At 50% load	
(20)	Power factor (with capacitors connected) a) At full load b) At 75% load c) At 50% load	
(21)	Total Losses a) At full load b) At 75% load c) At 50% load d) At 10% overload	
(22)	Efficiency with capacitors a) At full load b) At 75% load c) At 50% load d) At 10% overload	
(23)	Characteristics curves (Enclose the characteristic curves) a) Efficiency b) Speed torque	
(24)	Class of insulation	
(25)	Temperature rise a) At full load b) At 75% load c) At 10% overload	
(26)	Starting time for electric Motors a) Under no load b) Under full load	
(27)	Over load capacity	
(28)	Short Circuit	
(29)	Gross Weight of motor (Kg)	

**GUARANTEED PERFORMANCE AND TECHNICAL PARTICULARS**

**FLAP VALVE.**

**(Technical Data sheet to be submitted along with the tender by bidder)**

**ITEM - 03**

<b>Sr. No.</b>	<b>Description</b>	<b>Data ( to be filled by the bidder)</b>
(1)	Manufactured by	
(2)	Type	
(3)	Standard to which manufactured	
(4)	Class	
(5)	Rating	
(6)	Size	
(7)	No. of Doors	
(8)	Material of construction a) Body b) Disc c) Disc facing d) Seating in body	
(9)	Weight Kg.	
(10)	Working pressure bar	
(11)	Maximum working pressure Kg/cm <sup>2</sup>	
(12)	Test Pressure (a) Body (bars) (b) Seating (bars)	
(13)	Arrangement drawing No.	
(14)	Maximum permissible velocity as per manufacturer (m/sec.)	
(15)	Maximum velocity on site (m/sec.)	
(16)	Closing time required to close the valve completely (in seconds).	

**GUARANTEED PERFORMANCE AND TECHNICAL PARTICULARS  
SLUICE VALVE**

**(Technical Data sheet to be submitted along with the tender by bidder)**

**ITEM - 05**

Sr. No.	Description	Data ( to be filled by the bidder)
(1)	Make	
(2)	Type	
(3)	Size of valve (mm)	
(4)	Class	
(5)	Rating	
(6)	Standard to which manufactured	
(7)	Materials of construction	
	(a) Body, bonnet, wedge, stuffing box gland	
	(b) Spindle	
	(c ) Body seat & Disc seat	
	(d) Packing	
	(e) fasner	
	f)Head stock	
	g)hand wheel	
	h) Extended spindle	
(8)	Working pressure (Kg/cm <sup>2</sup> )	
(9)	Test Pressure (a) Body (Kg/cm <sup>2</sup> )	

**GUARANTEED PERFORMANCE AND TECHNICAL PARTICULARS**

**SECONDARY GRATINGS**

**(Technical Data sheet to be submitted along with the tender by bidder)**

Item- 06

Sl.No.	Description	Data ( to be filled by the bidder)
	SECONDARY GRATINGS	
(1)	Manufacturer	
(2)	Manufacturing standard	
(3)	Numbers offered	
(4)	Materials of screen	
(5)	Overall dimensions, mm x mm.	
(6)	Size of flat, mm X mm	
(7)	Clear space between flats, mm	
(8)	Total effective area of screen	
	At lowest water level, m <sup>2</sup>	
	At highest water level, m <sup>2</sup>	
(9)	Water velocity through screen	
	At lowest water level, m/sec.	
	At highest water level, m/sec.	
(10)	Pressure drop across 100% clean screen	
	At lowest water level, MWC	
	At highest water level, MWC	
(11)	Pressure drop across 50% clean screen	
	At lowest water level, MWC	
	At highest water level, MWC	
(12)	Frame angle size, mm x mm x mm	
(13)	Section and length of guide channels, mm	
(14)	Single piece to be handled by Monorail crane.	



**GUARANTEED TECHNICAL PARTICULARS**

**(EOT) CRANE**

**(Technical Data sheet to be submitted along with the tender by bidder)**

Item- **07**

<b>SI No</b>	<b>Description</b>	<b>Data ( to be filled by the bidder)</b>
<b>1</b>	<b>General</b>	
1.1	Manufacture	
1.2	Model	
1.3	Design according to standard service class/ Load class	
1.4	Nominal Load carrying capacity	
1.5	Span	
1.6	Highest position of Hook	
1.7	Lowest position of Hook	
1.8	Lifting sling Length	
<b>2</b>	<b>Speeds</b>	
2.1	Long traveling speed	
2.2	Cross traveling speed ( Main & Creep)	
2.3	Hoisting Speed ( Main & Creep)	
<b>3</b>	<b>Clearance and Hook approaches</b>	
<b>4</b>	<b>Type of control proposed</b>	
<b>5</b>	<b>Constructional features</b>	
5.1	Weight of complete crane	
5.2	Weight of Trolley	
5.3	Weight of Hoist	
5.4	Maximum wheel load	
<b>6</b>	<b>Hoisting system</b>	
6.1	Rope	
6.2	Rope Diameter	
6.3	Rope Construction	
6.4	Rope Material	
6.5	Rope Strength	
6.6	No of rope Falls	
6.7	Factor of safety	
<b>SI No</b>	<b>Description</b>	<b>Data ( to be filled by the bidder)</b>

6.8	Drum Diameter and length	
6.9	Drum Material	
6.1	Stressed relieved	
6.11	Type of Bearing/ Make	
<b>7</b>	<b>HOOK</b>	
7.1	Hook material	
7.2	Safety latches provided	
7.3	sheaves	
7.4	Lower sheave diameter	
7.5	Lower sheave material	
7.6	Equalizing Sheave Diameter	
<b>8</b>	<b>Hoist Brake</b>	
8.1	Type/Make	
8.2	Size	
8.3	Torque	
8.4	Brake drum	
8.5	Material	
8.6	Width	
8.8	Coupling type	
8.9	Gear Material	
8.1	Pinion Material	
8.11	Type of gear/ pinion	
8.12	Limit switch	
8.13	Type/ number /Make	
<b>9</b>	<b>Cross Travel</b>	
9.1	CT Brake	
9.2	Type/Make	
9.3	Size	
9.4	Torque	
9.5	Brake Drum	
9.6	Material	
9.7	Width	
9.8	Coupling type	
<b>10</b>	<b>Gear Box</b>	

SI No	Description	Data ( to be filled by the bidder)
10.1	Gear Box input	
10.2	Gear Box Out put	
10.3	Gear Material	
10.4	Pinion Material	
10.5	Type of Gears/ pinion	
<b>11</b>	<b>Wheel</b>	
11.1	Material	
11.2	Hardness	
11.3	Type	
11.4	Diameter	
11.5	Wheel bearing Make	
11.6	Limit switches	
11.7	Type/ Make	
11.8	Type of stopper	
11.9	No. of driven wheel	
11.1	No. of total wheel	
<b>12</b>	<b>Long Travel</b>	
12.1	End carriage Length	
12.2	Coupling type	
12.3	Gear Box	
12.4	Gear box input & Gear Box out put	
12.5	Material of gears	
12.6	Material of Pinion	
<b>13</b>	<b>LT Brakes</b>	
13.1	Type	
13.2	Make	
13.3	Size	
13.4	Torque	
13.5	Brake drum	
13.6	Material	
13.7	Width in mm	
<b>14</b>	<b>Motors</b>	
14.1	Make	

<b>SI No</b>	<b>Description</b>	<b>Data ( to be filled by the bidder)</b>
14.2	Type	
14.3	Rating	
14.4	Permissible stars/ hr	
14.5	Rated torque	
14.6	Crane Control	
14.6	Inching speed control	
14.7	Detailed write up furnished on inching speed control	
14.8	Individual control panel furnished for all crane motion ?	
14.9	Details write up on speed control furnished?	
<b>15</b>	<b>Drive</b>	
15.1	Make & Model	
15.2	Rating	
<b>16</b>	<b>MCCB</b>	
16.1	Make& Model	
16.2	Current Rating	
16.3	Nos. of Poles	
<b>17</b>	<b>Contactor</b>	
17.1	Make & Model	
17.2	Current rating	
<b>18</b>	<b>Power Cable</b>	
18.1	Make	
18.2	c/s of cable	
18.3	Type of insulation	

**GUARANTEED PERFORMANCE AND TECHNICAL PARTICULARS**

**H.T. PANEL**

**(Technical Data sheet to be submitted along with the tender by bidder)**

**ITEM - 08**

<b>Sr. No.</b>	<b>Description</b>	<b>Data ( to be filled by the bidder)</b>
(A)	General	
1	Makers Name	
2	Standards applicable	
3	Rated voltage of switch gear (KV).	
4	Service voltage of switch gear (KV).	
5	Maximum continuous voltage at which the switch gear can operate (KV)	
(B)	CIRCUIT BREAKERS	
1	Rated voltage (KV)	
2	Current rating	
	a) Continuous rating as per manufacture standard (Amps)	
	b) Short circuit rating RMS 3sec (Amps)	
	c) Breaking capacity based on ISI duty cycle	
3	B.3 MIN-M.B.3 MIN-MB	
	a) Symmetrical (KA)	
	b) Asymmetrical (KA)	
	c) Maximum rate of rise in recovery voltage of which the circuit is designed at its rated voltage and at its service voltage.	
4	Making capacity (Amps. Peak).	
	CONSTRUCTION AND DESIGN FEATURES OF H.T. PANEL	
5	Type of main contacts	
6	Type of arching contacts and/or are control device	
7	Material of contacts	
	a) Main	
	b) Arching	
	c) Whether contacts are silver plated	
8	Insulation level of breakers	
	a) One minute power frequency with stand (KV-RMS)	
	b) Impulse with stand lest voltage with 1.8 x 50Micro sec. Wave (KV-Peak).	

Sr. No.	Description	Data ( to be filled by the bidder)
9	Minimum clearance a) Between and phase and live part (mm) b) Between live parts and earth (mm) c) Center to center distance between phases (mm)	
10	Quantity of oil per 3 pole circuit breaker (liters)	
11	Whether the circuit breaker is fixed trip or trip free	

#### METHOD OF CLOSING

12	Type of closing mechanism	
13	Normal voltage of closing mechanism (volts)	
14	a) Power of normal voltage of closing mechanism (watts)	
	b) Power at 70% of normal voltage of closing mechanism (watts)	
15	Type of tripping mechanism	
16	Normal voltage of tripping mechanism(volts)	
	a) Power of normal voltage (watts)	
	b) Power at 70% of normal voltage for tripping coils (watts)	
17	Spring charging Motor (for stored energy mechanism)	
	a) Rating (KW)	
	b) Voltage (volts)	
	c) Time required by motor to charge the spring completely (sec)	
	d) Current (Amps)	
	<b>ADDITIONAL TECHNICAL DETAILS</b>	
18	(a) Number of operation the circuit breaker is capable of performing without inspection, replacement of contacts, or other main parts.	
	i) At 50% rated current	
	ii) At 100% rated current	
	iii) At current corresponding to 50% rated breaking capacity	
	iv) At current corresponding to 100% rated breaking capacity.	

Sr. No.	Description	Data ( to be filled by the bidder)
	<b>(b)</b> Number of operations the circuit breakers is capable of performing without replacing oil.	
	i) At 50% rated current	
	ii) At 100% rated current	
	iii) At 50% rated breaking capacity	
	iv) At 100% rated breaking capacity	
	<b>(c) GROUND BUS</b>	
	i) Material	
	ii) Area (mm <sup>2</sup> )	
	<b>(d) CURRENT TRANSFORMERS</b>	
	1) Make and type	
	2) Standard applicable	
	3) Ratio	
	4) Class of insulation	
	5) Over current rating	
	i) Thermal 3sec. rating	
	ii) Temperature rise for 3 sec. Rating (C°)	
	iii) Rated dynamic current (Amp)	
	(1) Whether CTs are mounted on draw out track of stationery cubicles	
	(2) Rated VA output	
	(3) Class of accuracy	
	<b>(e) POTENTIAL TRANSFORMERS</b>	
	1) Make and type	
	2) Ratio	
	3) Accuracy class	
	4) Class of insulation	
	5) Rated VA output	
	6) Dry one minute withstand voltage (KV-RMS)	
	7) Impulse withstand voltage (KV-RMS)	
	8) Fuses for potential transformers	
	a) High tension side	
	i) Type and make	

Sr. No.	Description	Data ( to be filled by the bidder)
	ii) Interruption rating (MVA)	
	iii) Maximum short circuit that can be interrupted (Amps).	
	b) Low voltage side	
	i) Type and make (attach pamphlet)	
	ii) Rating of fuses	
	iii) Whether PT are mounted on draw out	
	<b>(f) SWITCH GEAR CUBICLES</b>	
	1) Clearance	
	a) Between phases (live parts-mm)	
	b) Between live parts and eath (mm)	
	2) Material and thickness of	
	a) Front panels(mm)	
	b) Back panels (mm)	
	c) Panels between unit (mm)	
	d) End panels (mm)	
	3) Overall dimensions of cubical (L x B x H)	
	a) Incomer	
	b) Outgoing motor feeder	
	4) Total weight of cubical including circuit breaker	
	a) Incomer	
	b) Outgoing motor feeder	
	5) Impact loading for foundation design to include dead loads plus impact value on operating at maximum interrupting rating in terms of equivalent dead load.	
	a) Incomer	
	b) Outgoing motor feeder	
	6) Net weigh of circuit breaker with oil and operating mechanism	
	a) Incomer	
	b) Outgoing motor feeder	
	7) a) Dimension and weight of the largest package (meters/Kg). b) Interlocks of Incomer/ Load Switch breakers.	



Sr. No.	Description	Data ( to be filled by the bidder)
	8) Minimum and recommended clearance for installation	
	a) In front of cubical to permit draw out of switch gear track.	
	b) In front of cubical to permit draw out of switch gear rows facting each other.	
	c) Behind cubical	
	9) Speace Heater	
	a) Voltage (Volts)	
	b) Rating (Watts)	

**GUARANTEED PERFORMANCE AND TECHNICAL PARTICULARS**

**TRANSFORMER**

**(Technical Data sheet to be submitted along with the tender by bidder)**

**ITEM: 09**

Sr. No.	Description	Data ( to be filled by the bidder)
1	Make	
2	Type	
	(a) Type of winding	
	(b) Type of enclosure	
3	Output in KVA ( continuous rating )	
4	Frequency	
5	Voltage between phase ( HV on no load )	
6	Voltage between phase ( LV on no load )	
7	Impedance at normal voltage ratio at 75 deg. C	
8	Efficiency at unity power factor	
	(a) Full Load	
	(b) $\frac{3}{4}$ load	
	( c ) $\frac{1}{2}$ load	
9	Iron losses at normal voltage ratio	
10	Copper losses at normal voltage ratio at full load	
11	Regulation at unity power factor at 75 deg. C	
12	Reactance at normal voltage and ratio	
13	Resistance of HV winding at 75 deg. C	
14	Regulation at 0.8 PF at 75 deg. C	
15	Resistance of MV winding at 75 deg. C	
16	Over Load: The Transformers are capable of carrying overload as follows	
	(I) When Starting Cold ( in hours )	
	Percentage Load	
	(a) 25%	
	(b ) 50 %	
	(c ) 100%	

Sr. No.	Description	Data ( to be filled by the bidder)
	<b>(II)</b> After Running continuously ( in hours )	
	Percentage Load	
	(a) 25%	
	(b ) 50 %	
	(c ) 100%	
17	Over all dimensions of the transformer	
<b>CPRI Type test certificates for all types tests applicable as per I.S.</b>		

**GUARANTEED PERFORMANCE AND TECHNICAL PARTICULARS**

**L.T. DISTRIBUTION PANELS**

**(Technical Data sheet to be submitted along with the tender by bidder)**

**ITEM -10**

<b>Sr. No.</b>	<b>Description</b>	<b>Data ( to be filled by the bidder)</b>
1	Air Circuit Breaker	
	i) Type	
	ii) Breaking capacity	
	iii) Details of contact and relays	
2	Bus Bars	
	i) Materials	
	ii) Size of main bus bar	
	iii) Size of linking bus bar	
	iv) Current density	
3	Overall Dimensions of L.T. Panel	
	i) Length	
	ii) Width	
	iii) Breadth	
	iv) Gauges of MS sheet (Gauge)	
4	Details of vermin proof arrangements	
5	Cable jointing system adopted	
6	Drawings and Diagrams	
	i) Schematic drawing in plan, elevation and view	
	ii) Wiring diagram	

**GUARANTEED PERFORMANCE AND TECHNICAL PARTICULARS**

**CAPACITORS BANK**

**(Technical Data sheet to be submitted along with the tender by bidder)**

**ITEM - 11**

<b>Sr. No.</b>	<b>Description</b>	<b>Data ( to be filled by the bidder)</b>
(1)	Make	
(2)	Type	
(3)	Rating	
(4)	Method of connection	
(5)	Loss angle	
(6)	Maximum continuous KVAR permissible at 10% over voltage.	
(7)	Type and rating of HRC fuses	
(8)	Overall dimensions of enclosures	
(9)	Gross weight of capacitor cubicles (Kg).	
(10)	Detailis of isolating switches.	

**GUARANTEED PERFORMANCE AND TECHNICAL PARTICULARS**

**Soft Starter**

**(Technical Data sheet to be submitted along with the tender by bidder)**

**ITEM - 12**

<b>Sr. No.</b>	<b>Description</b>	<b>Data ( to be filled by the bidder)</b>
(1)	Make	
(2)	Type	
(3)	Rating	
(4)	Method of connection	
(5)	Service Voltage	
(6)	Maximum continuous voltage at which the switchgear can operate.	
(7)	Current rating	
(8)	Overall dimensions of enclosures	
(9)	Other details	

**GUARANTEED PERFORMANCE AND TECHNICAL PARTICULARS**

**BATTERY**

**(Technical Data sheet to be submitted along with the tender by bidder)**

**ITEM - 13**

<b>Sr. No.</b>	<b>Description</b>	<b>Data ( to be filled by the bidder)</b>
1	Type of Battery	
2	Normal voltage	
3	a) Total No. of cells including regulating cells (Nos)	
	b) No. of regulating cells (if any)	
	Discharge capacity	
4	a) 3 Hrs. rate (Amp. Hrs.)	
	b) 10 Hrs. rate (Amps.-Hrs.)	
5	a) Normal trickle charge rate without load (Amps)	
	b) Voltage at which cells will normally be floated (volts)	
6	a) Normal rate of charge (Amps)	
	b) Maximum rate of charge (Amps)	
7	a) Normal charging time after complete discharge	
	b) Period of discharge of fully charged battery with 1/40 loading continuously to 1.85 volts of any accumulators voltage.	
8	a) Amp. Hour efficiency at 1 Hr. rate (%)	
	b) Watt hour efficiency at 1 HR. rate (%)	
9	a) Amp. Hour efficiency at 10 Hr. rate (%)	
	b) Watt. Hour efficiency at 10 Hr. rate (%)	
10	Voltage across battery terminals when under quick charge (volts).	
11	Voltage at specified tapping when under quick charge max. rate (volts).	
12	a) Voltage for cell at the end of full charge at normal rate (Volts).	
	b) Minimum voltage of cell at which it can operate satisfactorily (volts).	
13	Type of container	

Sr. No.	Description	Data ( to be filled by the bidder)
14	No. of Plates in each cell (Nos)	
15	Plate dimension	
	a) For positive	
	i) Width (mm)	
	ii) Height (mm)	
	iii) Thickness (mm)	
	iv) Area (mm <sup>2</sup> )	
15	b) For negative	
	i) Width (mm)	
	ii) Height (mm)	
	iii) Thickness (mm)	
	iv) Area (mm <sup>2</sup> )	
16	Type of Negative Plates	
17	Final cell voltage	
	a) For Hr. Discharge (Volts)	
	b) For 5 Hr. Discharge (Volts)	
	c) For 10 Hr. Discharge (Volts)	
18	Final electrolyte temperature reached	
	a) For Hr. Discharge (C°)	
	b) For 5 Hr. Discharge (C°)	
	c) For 10 Hr. Discharge (C°)	
19	Thickness of separators (Roda or dowels)	
20	Type and material of separators.	
21	Clearance between bottom of plate and bottom of box (mm).	
22	Clearance between top of plate and top of box (mm).	
23	Type of electrolyte	
24	Quantity of electrolytes per cell (Liters)	
25	Specific gravity for first filling	
26	Overall dimension of cell	
	1) Length (mm)	
	2) Width(mm)	
	3) Height (mm)	
27	Cell centers (mm)	

Sr. No.	Description	Data ( to be filled by the bidder)
28	a) Weight of cell (gms)	
	b) Weight of cell complete with electrolyte (gms)	
29	Filling level of electrolyte above the top edge of plates (mm)	
30	Whether ilds sealed	
31	Material and method of insulation provided to the containers.	

**BATTERY CHARGER**

**ITEM - 14**

1	Input supply (volts)	
2	Input current per phase (Amps)	
3	Voltage output range (volts)	
4	Current output range (Amps)	
5	Efficiency at Normal output voltage	
	100% full load (%)	
	75% full load (%)	
	50 0% full load (%)	
	25% full load (%)	
6	Efficiency at maximum output voltage	
	100% full load (%)	
	75% full load (%)	
	50 0% full load (%)	
	25% full load (%)	
7	Instruments provided and size	
8	Grade of instruments	
9	Weight of complete cubical (Kg)	
10	Weight of the complete package (Kg)	

**FORM 1**



(To be submitted in plain paper/letter head as per specimen, duly filled up and uploaded with digital signature which shall be treated as the self declaration of the bidder)

**APPLICATION FOR e-EOI**

To

The Executive Engineer  
Mechanical & Electrical Division, Midnapore,  
Khasjungle, P.O-Abas, District- Paschim Medinipur.

Sub: - RESPONSE TO – EOI

Dear Sir,

We, the undersigned, offer the following information in response to the Expression of Interest sought by you vide your EOI No. .... Dated ....

1. We are duly authorized to represent and act on behalf of \_\_\_\_\_ (hereinafter the “respondent”)
2. We have examined and have no reservations to the EOI Document including Addenda No(s) \_\_\_\_\_
3. I/We understand that
  - a) This EOI is intended for the work “Supply, installation, testing and commissioning including trial run and one year successful operation and maintenance of Eight (8) nos. Column Mounted Mixed Flow Submersible pump of capacity 25 Cusec (2550 M3/Hr) (each) along with electromechanical installation, Piping, valves, sluice gates (Draw & Flap) including its hoisting arrangements etc complete for proposed pump house with sluice over Narayani Khal out falling in river Silabati at Ward No.3 of Ghatal Municipalty, in connection with the work of Ghatal Master plan in the District of Paschim Medinipur” by Irrigation and waterways Department , Govt. of West Bengal.
  - b) Irrigation and waterways Department , Govt. of West Bengal may float a separate Tender ( based on their requirement ) , with all conditions like Eligibility Criteria , and our participation in this EOI doesn’t guarantee any qualification to that tender .
4. We are attaching with this letter, the photo-copies of all documents sought in this EOI.
5. We shall assist Irrigation and waterways Department, Govt. of West Bengal or its

authorized representatives to obtain further clarification from us, if needed.

- a) Executive Engineer of Mechanical & Electrical Division, Midnapore or his/her authorized representative, may contact the following nodal persons for further information on any aspects of the Response :

Sl No.	Contact Name	Address	Telephone	E-mail

6. This application is made in the full understanding that:

- a) Department Reserves the right to reject or accept any or all applications, cancel the EOI and subsequent bidding process without any obligations to inform the respondent about the grounds of same .
- b) We confirm that we are interested in participating in the selection process through this EOI.

7. We certify that our turnover and net worth in the last three years is as under :

Financial Year	Turn over	Net worth

8. The undersigned declare that the statements made and the information provided in the duly completed application are complete, true, and correct in every detail. We also understand that in the event of any information furnished by us being found later on to be incorrect or any material information having been suppressed , may delete our name from the list of potential bidders. We further understand that Irrigation and waterways Department, Govt. of West Bengal will give first preference to the applicants considered relevant for the purpose.

Yours sincerely,

(sign)

Name

In the Capacity of

Duly authorized to sign

the response for and on behalf of

## **SECTION-V**



Sd/-  
Executive Engineer  
Mechanical & Electrical Division, Midnapore,  
Khasjungle, P.O-Abas, District- Paschim Medinipur.

**Memo No: 39/4/10E-1**

**Date: 04.02.2025.**

Copy submitted and forwarded for information and taking necessary action please for wide publication to: -

1. The Chief Engineer, Mech & Elect, I&W Directorate, 2nd Floor, Jalsampad Bhawan, Govt of West Bengal.
2. The Superintending Engineer, South-West Mechanical & Electrical Circle, DVC New Colony, Durgapur-2, Paschim Bardhaman, Pin- 713202.
3. The Executive Engineer, West Midnapore Division, Sekhpura Irrigation Colony, I. & W. Dte.
4. Office Notice board.

Sd/-  
Executive Engineer  
Mechanical & Electrical Division, Midnapore,  
Khasjungle, P.O-Abas, District- Paschim Medinipur.

Enclosure to e-EOI No. WBIW/EE/MEDM/e-EOI-01 /2024-25

Quote Bid Price in this BOQ

SCHEDULE OF WORK (BOQ)

Name of the project: “Supply, installation, testing and commissioning including trial run and one year successful operation and maintenance of Eight (8) nos. Column Mounted Mixed Flow Submersible pump of capacity 25 Cusec (2550 M3/Hr) (each) along with electromechanical installation, Piping, valves, sluice gates (Draw & Flap) including its hoisting arrangements etc complete for proposed pump house with sluice over Dudher Bundh Khal out falling in river Silabati at Ward No.9 of Ghatal Municipality, in connection with the work of Ghatal Master plan in the District of Paschim Medinipur.”

Sl. No.	Description of work	Qty	Unit	Description of work proposed by the bidder (for budget quotes)	Quantity (for budget quotes)	Unit (for budget quotes)	Rate of GST	Rate (Rs., Incl of all taxes) (budget quotes)	Total Amount (Rs). (budget quotes)
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Sl. No.	Description of work	Qty	Unit	Description of work proposed by the bidder (for budget quotes)	Quantity (for budget quotes)	Unit (for budget quotes)	Rate of GST	Rate (Rs., Incl of all taxes) (budget quotes)	Total Amount (Rs.) (budget quotes)
1	Supply, delivery, storing at site, installation, testing & commissioning of vertical, non-clog, mixed flow, single stage, bottom suction, column mounted, diffuser type, wet installed Submersible pump-Motor set of capacity 25 Cusec (2550 M <sup>3</sup> /Hr) (each) along with Column pipe, Discharge Tee, Discharge pipe and other accessories etc conforming to the latest revision of IS 1710/IS 5120 and Hydraulic Institute standard USA conforming to detailed specification, painting. Pump should be suitable for pumping solid bearing liquid such as wastewater, industrial discharge, storm or flood drainage etc.	8	set						
	a) Pump capacity - 2550 M <sup>3</sup> /Hr (each)								
	b) Pump efficiency = 80% (Minimum) (Max. Efficiency shall occur at duty point)								
	c) AOR capacity 70%-140%								
	d) Acceptable TDH range = 3.5 MWC to 9 MWC								
	d) TDH (Duty Point)= 7.5MWC (Tentative)								
	e) Maximum static head = 8.10 MWC								
	f) Minimum static Head= 1.7 MWC								
	g) Column pipe dia. = 900 mm								
	h) Discharge pipe dia 600 mm								
	i) Lifting chain- Size & length as per design								
	i) Motor speed <= 750 rpm								
	j) Motor: 125 KW, 3ph squirrel cage induction motor, IE3 type as per Standard IEC 60034, 50Hz, 415V, IP-68 protection, S-1 duty, insulation class- F or better, temp. rise class-B,								
	Alongwith 40 m submersible cable of required size.								
	k) Motor efficiency=92%								
	l) Solid handling capacity= 100 mm x 100 mm								
	<u>Hydraulic Data</u>								
Sump bottom level= (+) 0.50 M GTS MWL/Pump Stop Level=2.60 M GTS FDL= 6 M GTS HWL=9 M GTS HFL=9.90 M GTS Pump floor Level: 10.400 M GTS Intermediate Catwalk Level (where column pipe will be fixed on base plate): 7.50 M GTS C/L of discharge pipe (2nd Stage) = (+) 10.70 M GTS C/L of discharge pipe (1st Stage) = (+) 8.50 M GTS									
<u>Material:</u>									
Diffuser casing: Cast Iron IS:210, FG 260/ EN-GJL-250/ BS:1452, FG 260 Impeller: EN 10213-4-1-1.4470 (Duplex stainless steel) Shaft: SS ASTM A276 Type 316 / SS 316 Motor housing: Cast Iron IS:210, FG 260/ EN- GJL-250/ BS:1452, FG 260 Stator winding: Electrolytic grade copper/bar Rotor: Copper / Die Cast Aluminium Fasteners: SS ASTM A276 Type 316 Lifting chain: SS ASTM A276 Type 304 Mechanical seal: Silicon carbide/ Silicon carbide Column pipe: MS, 12 mm thick as per IS 2062									

Sl. No.	Description of work	Qty	Unit	Description of work proposed by the bidder (for budget quotes)	Quantity (for budget quotes)	Unit (for budget quotes)	Rate of GST	Rate (Rs., Incl of all taxes) (budget quotes)	Total Amount (Rs). (budget quotes)
2	<p>Cost iron double flanged, non rising type, manually operated sluice valves generally conforming to IS 14846 : 2000, IS 1367. Nomoinal Diameter in mm =600 Material:  Body, bonnet, wedge, stuffing box gland: Cast iron (IS:210, FG 260)  Spindle: Stainless steel (AISI410)  Body seat and disc seat: Stainless steel (SS 304)  Packing: Greasy jute packing  Fasteners: IS:1367, Class 4/ 4.6  Extended spindle: Mild steel (BS: 970, EN8)  Head stock: Cast iron (IS: 210, FG 260)  Hand wheel: Cast iron (IS: 210, FG 260)  (Make: IVC/ Fouress/ Audco/ Sigma Flow/ Kirloskar / Fouress / Durga / AVK/ Venus/Kalpana Valves/ equivalent)</p>	16	Each						
3	<p>Supply, delivery, storing at site, installation, testing &amp; commissioning of 600mm. dia. C.I. Single flange, swing type, double hung flap valve with pressure rating as per specific standard (Body, flap Cast iron, IS:210, FG:260, Body &amp; disc set: stainless steel, AISI 304, Hinge pin: Stainless steel AISI 410), flange standard IS 1538, leakage as per IS 13349 class 3 and as per specificaton -</p> <p>Rated flow - 2550 M<sup>3</sup>/Hr, Velocity at rated flow - 2.5 m/sec</p> <p>Design Pressure - 20 MWC</p> <p>Testing as per IS 14858</p> <p>Make: any reputed make approved by Engineer in charge</p>	16	set						
4	<p>Supply, delivery, storing at site, installation, testing &amp; commissioning of Electromagnetic Full Bore Type Flow Meter comprising of flow sensor (i.e. flow tube), remote mounted flow transmitter, flow indicator (LED display of suitable size) and integrator and any other item required for completing the flow measuring system in single unit.Acceptable Makes  Krohne / Siemens/ Endress Hauser/ ABB/ equivalent</p>	8	Each						
5	<p>Supply, delivery, storing at site, installation, testing of Pressure guage of suitable range at delivery flanges complete with copper tubing and control cocks. The gauges shall be of direct mounted stainless steel diaphragm sealed type. The dial size of pressure gauge shall not be less than 150 mm. The material of construction shall be suitable for sewage/ drainage pumping station installations. Each pressure gauge shall be complete with pressure snubber and of suitable class of enclosure. Accuracy shall be ±1.0% of full-scale range or better. Scale range shall be selected so that normal system pressure is approximately 50% of full scale. The Gauges should conform to the latest revision of IS:3624/ BS:1780/ equivalent.  Testing as per IS 3624. Make: any reputed make approved by Engineer in charge</p>	8	Each						
6	<p>Supply, delivery, storing at site, installation, testing of Mechanical Level indicator mechanical float chord type complete with bottom anchor, guide wire, spring tension assembly and friction free pulleys. The pulleys and the chord shall be with weather proof enclosure. The scale shall be with black graduation on white background with red pointer attached to the counter weight. Material of Construction  Float: SS 316  Float guide: SS 316  Chord: SS 316 wire  Pulleys: Cast aluminium alloy (Make: any reputed make approved by Engineer in charge)</p>	8	Each						

Sl. No.	Description of work	Qty	Unit	Description of work proposed by the bidder (for budget quotes)	Quantity (for budget quotes)	Unit (for budget quotes)	Rate of GST	Rate (Rs., Incl of all taxes) (budget quotes)	Total Amount (Rs.) (budget quotes)
7	Electrically operated monorail crane with supporting MS structure for trashrack lifting lowering. Design, supply, delivery, storing at site, installation, testing & commissioning of 5 M.T. capacity straight monorail (02 nos) placed at a distance of 1.5 mtr(approx.) for travel length of 19 mtr.(approx). Both the monorails shall be supported on goal post steel structure and top of goal post structure shall be covered by suitable sheet metal to protect the hoist from direct sun and rain. Both hoisting and LT motion electrical and to be operated by 2nos 5MT capacity wire rope type electrical hoist with electrical trolley and lift 7 mtr. The crane shall be suitable for outdoor operation of M-5 (Class II) duty, indoor operation as per IS: 807, IS: 3177or equivalent at its latest revision. This work also includes design, manufacture supply & fixing of 2sets of DSL arrangement and isolating switch for feeding power to the crane along longitudinal travel comprising of 4 line PVC shrouded type GI conductor with supporting brackets and a set of current collector for each hoist. The crane should be marked with safe working load (SWL). The whole work must be completed in all respect as per direction of E.I.C.	2	set						
8	Design, supply, delivery, storing at site, installation, testing & commissioning of 5 MT capacity MS lifting beam as per IS IS 13591 (1992) for automatic engagement and disengagement of trash rack with all necessary accessories and as per direction.	2	set						
9	Design, supply, delivery, storing at site, installation, testing & commissioning of 15 M.T. capacity x 5.5 mtr span x 8.0 mtrs. lift double girder pendent controlled semi EOT travelling crane having hoisting and LT motion electrical and CT motion manual, to be operated from floor by hand chain. The crane shall be of M-5 (Class II) duty, indoor operation as per IS: 807, IS: 3177or equivalent at its latest revision. This work also includes manufacture supply & fixing of long travel steel gantry girder with square rail for travel length of 22.00 mtr. and designed for maximum column pitch distance of 3 mtr. and DSL arrangement for feeding power to the crane along longitudinal travel comprising of 4 line PVC shrouded type GI conductor with supporting brackets and a set of current collector. The crane should be marked with safe working load (SWL). The whole work must be completed in all respect as per direction of E.I.C.	1	set						
10	Comprehensive maintenance contract of Submersible Pump Motor set for Five (05) calendar year after completion of one (01) year of defect liability period. Pump Motor set along with its allied system shall be maintained as per maintenance manual provided by the manufacturer.								
10.1	i) 1st Year	1	Per Job						
10.2	ii) 2nd year	1	Per Job						
10.3	iii) 3rd year	1	Per Job						
10.4	iv) 4th year	1	Per Job						
10.5	v) 5th year	1	Per Job						
11	Carrying out CFD analysis of the sump as per design and drawing, based on details of pump being offered at reputed educational institute/ laboratory with prior approval of E.I.C. and to provide suitable arrangement of flow guides, buffers, splitters etc. at the sump to achieve smooth pump operation free from vortex, pre rotation, swirl etc.	1	Per Job						
	Supply, installation, testing and commissioning of 3-Ph., 415V AC, 50 HZ, on/off and inching duty. Multiturn Electrical Actuator having with following specification and features. * Rated Output torque is 200 N-m (minimum) at 48 r.p.m (Running: 65 N-m, seating 195 N-m) *Totor:Power rating not more than 1.5 KW (2HP), squirrel cage AC induction having 52-15 min duty cycle rating, Class-F insulation, efficiency standard IE3. *Drive unit:High precision Spur Gears & Pinions, Material-HSLA steel and High precision Worm & Worm Gear, Material-HSLA steel & phosphor Bronze respectively.								



Sl. No.	Description of work	Qty	Unit	Description of work proposed by the bidder (for budget quotes)	Quantity (for budget quotes)	Unit (for budget quotes)	Rate of GST	Rate (Rs., Incl of all taxes) (budget quotes)	Total Amount (Rs.) (budget quotes)
12	*Travel time:816 sec. *Overall Actuator efficiency-75% (minimum) *Torque & limit switch with mechanical selection and end position latching. *Integral Reverse forward starter. *Current position transmitter (CPT, 4-20 mA) along with mechanical position display. Enclosure having IP68 rating *Hand wheel along with clutch mechanism. Relay protection single phasing , thermal, instantaneous reversal (automated time delay circuit) Make: ROTORK, LIMITORK, FLOWTORK, AUMA or equivalent.	6	Each						ITEM RATE NOT TO BE QUOTED.
13	Supply and Installation of Gearing arrangement comprising of high precision Bevel Gear & pinion on existing hoist nut wuth supply, fabrication of suitable MS frame, Shaft, Plummer Block fitted with gun metal bush, flange coupling and required keys etc. as per following specification and details.  Bevel Gearing specification: No of teeth of Pinion (Zp)=20, Gear ratio=3:1, Module=6 No of teeth of Gear (Zg)=60 Material: HSLA steel Finish: High precision, specification of other components: a) MS frame shall be assembled with existing MS pedestal, capable to withstand static & dynamic load of Actuators: Aprox weight is 15 kg. b) Shaft: 01 No. 30 mm dia. length 450 mm approx., cut 08 job per job with keyway, Matl.: SS316. c) Plummer Block : 02 No.,ID-50 mm, fitted with Gunmetal bush of thickness 10 mm. Matl.-Cast steel. d) Flange coupling: Hub flange coupling in pairs ID & OD=30 mm & 100 mm respectively, Matl.-Cast steel.	6	Each						ITEM RATE NOT TO BE QUOTED.
14	Supply & fixing of AC solenoid Brake assembly,Type of brake S-4,Wheel dia-4",Max Torque-13.6Nm, Duty-Continuous,AC Solenoid-pulltype,type-B,Make BCH ElectricLtd or eqv.	3	Each						ITEM RATE NOT TO BE QUOTED.
15	Supply & fitting fixing of round strand (steel core/fibre core) steel wire rope (ungalvanised, IWRC) of 6x36 construction of 1960 tensile designation as per IS-2266 (make: Usha Martin, Bharat Wire Ropes ltd or BIS approved makes), rope clamp with Dishakle and fitting fixing of said material with correct alignment and position inclusive of all cost of labour, T&P, scaffolding charges & all other incidental charges as necessary to complete the job in all respect upto the satisfaction of E.I.C								ITEM RATE NOT TO BE QUOTED.
15.1	18 mm dia (steel core)	60.00	RM						
16	Supplying, fitting & fixing of winch machine of suitable capacity having compound geartrain comprising of open spur gears/pinions of required nos, plummer/ pillow block , CI bush, shafts, rope drum, MS frame, MS cover along with locking arrangement as per approved drawing & direction of Engineer in charge. .								
16.1	M.S Frame	367.00	kg						
16.2	Cast Iron Rope Drum	152.00	kg						
16.3	EN-8 Shaft	64.00	kg						
16.4	Gears/Pinions	214.00	kg						ITEM RATE NOT TO BE QUOTED.

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16.5	Plammer block	36.00	kg						
16.6	Poul Ratchet Locking Arrangement	3.00	Each						
16.7	C.I Bush	11.00	kg						
17	Fabrication , supply, erection and commissioning of embeded parts consisting of seal beam, Guide channel with all accessories for vertical gate of canal/river made of MS material consisting of angle, channel, beam, plate, flat, etc. conforming to IS : 2062 - 2011/latest revision manufactured as per approved drawing and direction including cost of Materials, Machinaries , Manpower, Cutting, Aligning, Anchoring, Welding, Finishing, Consumables, Carriage and all overheads with all leads and lifts complete as per specification (without painting) Remarks:Cost for civil work to be taken PWD(R) directed seperately.							ITEM RATE NOT TO BE QUOTED.	
17.1	Insert plate welded with J hook	4815	Kg						
17.2	Seal beam	929.83	Kg						
17.3	Guide channel/Guide path/Top seal path.	3426	Kg						
18	Fabrication , Supply, erection and commissioning of new Slide type vertical lift regulator service gates of Canal/River as per IS: 5620 - 2000/Latest Revision consisting of skin plate, vertical and horizontal grider, stiffener etc. made of MS material consisting of angle , channel, beam, plate, flat, etc. conforming to IS : 2062 -2011/latest revision manufactured as per approved drawing and direction including cost of Materials, Machinaries , Manpower, Cutting, Aligning, drilling, Welding, Finishing, Consumables, Carriages and all overheads with all leads and lifts complete as per specification (without painting).							ITEM RATE NOT TO BE QUOTED.	
18.1	Width of Gate shuteer size upto 2 metre	2666	KG						
19	Fabrication , Supply, erection and commissioning of new Flap/Fall board shutter of Canal/River as per IS: 5620 - 2000/Latest Revision consisting of skin plate, vertical and horizontal grider, stiffener etc. made of MS material consisting of angle , channel, beam, plate, flat, etc. conforming to IS : 2062 -2011/latest revision manufactured as per approved drawing and direction including cost of Materials, Machinaries , Manpower, Cutting, Aligning, drilling, Welding, Finishing, Consumables, Carriages and all overheads with all leads and lifts complete as per specification (without painting).							ITEM RATE NOT TO BE QUOTED.	
19.1	Width of Gate shuteer size upto 4 metre.	1444	kg						
20	Supplying, fitting & fixing of cast iron pedestal stool of suitable size, conforming to I.S 210 of latest revision and as per approved drawing, & direction of Engineer in charge. The cost includes cost of materials, man power employed for dismantling and fitting fixing, civil works consumables like cutting tools, anchor bolt of required size, hire charges of machineries, like lathe/shaping machine, grinding machine, drilling machine, tools & tackles etc including carriage loading & unloading.	550	kg					ITEM RATE NOT TO BE QUOTED.	
21	Supplying, fitting & fixing of screw hoisting arangement made of MS bottom plate, top plate, coller with necessary holes on base plate and top plate to accomodate thrust bearing of suitable size as per approved drawing & design and as per direction of Engineer in charge. The cost includes cost of ms plate as per IS : 2062 -2011/ latest revision, man power employed for dismantling and fitting fixing, consumables like cutting tools, bolt & nuts of required size, hire charges of machineries, like lathe/shaping machine, grinding machine, drilling machine, tools & tackles etc including carriage loading & unloading but excluding the cost of lifting Nut/Bush, thrust bearing & wheel supplied seperately.	276	kg					ITEM RATE NOT TO BE QUOTED.	
22	Supply of Bearing							ITEM RATE NOT TO BE QUOTED.	
22.1	h) Bearing no.51215 (SKF)(Thrust bearing)	6.00	Each						

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23	Supplying, fitting & fixing Gun Metal Nut as per requirement having 1.5/2 T.P.I square thread for screw gearing arrangement, perfectly meeting with the screw rod/gear rod for lifting the draw shutter as per direction of E.I.C. The cost includes cost of materials, man power employed, consumables like cutting tools, emery paper, cloths, , hire charges of machineries, tools & tackles etc including carriage loading & unloading.	113.00	KG						ITEM RATE NOT TO BE QUOTED.
24	Supplying, fitting & fixing of screw rod having square thread of 1.5/2 T.P.I, Material bright steel [EN-8/EN9/forged CI-4 (45C8) as per IS :1875 1992/latest Revision]. dia and thread length as required and providing with a drilled hole of required dia on the other end after flattened and supplying with one no. bolt and nut of required size and all other components as required as per direction of Engineer-In - Charge. The cost includes cost of material, man power employed, consumables like cutting tools, emery paper, cloths, , hire charges of machineries, tools & tackles, grease, mobil etc including carriage loading & unloading as per direction of Engineer in charge.								ITEM RATE NOT TO BE QUOTED.
24.10	(Length above 5 mtr)©	1630.00	KG						
25	Supply, installation, testing and commissioning of following items for hoisting system and gear box as mentioned below as per direction including cost of Materials, Machinaries , Manpower, Cutting, Machining, Aligning, Anchoring, Welding, Finishing, Consumables, Carriage and all overheads with all leads and lifts complete as per specification (without painting)								
25.1	Bush(GM)	2.88	kg						
25.2	Plummer block(CI)	72.00	kg						
25.3	SS-304	16.64	kg						
25.4	M.S Manual Operating handle.	36.00	kg						
25.5	Base frame (MS)	600.00	kg						ITEM RATE NOT TO BE QUOTED.
25.6	TEFC SQUIRREL CAGE MOTOR : (3 phase crane duty, RPM :1000) 2HP	3.00	Each						
25.7	Rotary Limit switch	3.00	Each						
25.8	Sheve/Pulley(CS)	60	Kg						
25.9	Coupling (Mat: C45)	72	Kg						
25.10	MS cover for central drive unit and rope drum	121.00	kg						
26	Fabrication, supply, erection and commissioning of embeded parts consisting of hinge bracket with its accessories for vertical flap gate shutter of distributories/branch canal/minor canal/channel made of MS material consisting of angle, channel, beam, plate, flat, etc. conforming to IS : 2062 -2011/latest revision manufactured as per approved drawing and direction of Engineer in charge. The cost includes cost of Materials, Machinaries , Manpower, Cutting, Aligning, Anchoring, Welding, Finishing, Consumables, Carriage and all overheads with all leads and lifts complete as per specification (without painting).	258.00	kg						ITEM RATE NOT TO BE QUOTED.
27	Cost for supplying and fitting fixing of Flat rubber seal (Make : Universal Moulders & Engineer/Popular Rubber Works (Pvt) Ltd/SAB Industries/Unique Polymer Works/equivelant approved make conforming to IS : 11855 -2011/Latest Revision) for different types of gate shutter as per direction of E.I.C. The cost includes cost of man power employed for fitting fixing, cost of rubber seal, hire charges of tools & tackles, scaffolding and safety equipments etc including carriage loading & unloading but excluding supply of ms clamp/ flat plate, bolts, nuts and washer.								ITEM RATE NOT TO BE QUOTED.
27.1	e) 100 x 14 mm	10.00	RM						

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28	Cost for supplying and fitting fixing of angle type rubber seal (Make : Universal Moulders & Engineer/Popular Rubber Works (Pvt) Ltd/SAB Industries/Unique Polymer Works/equivalent approved make conforming to IS : 11855 -2011/Latest Revision) for different types of gate as per direction of E.I.C. The cost includes cost of man power employed for dismantling & fitting fixing, cost of rubber seal, hire charges of tools & tackles, scaffolding and safety equipments etc including carriage loading & unloading but excluding supply of ms clamp/ flat plate, bolts, nuts and washer.								ITEM RATE NOT TO BE QUOTED.
28.1	a) size: (88mm+60mm+08mm) x 14mm(thick)	25.00	RM						
29	Cost for supplying and fitting fixing of bulb/musical node/J-f-type rubber seal (Make : Universal Moulders & Engineer/Popular Rubber Works (Pvt) Ltd/SAB Industries/Unique Polymer Works/equivalent approved make conforming to IS : 11855 -2011/Latest Revision) for different types of gate as per direction of E.I.C. The cost includes cost of man power employed for fitting fixing, cost of rubber seal, hire charges of tools & tackles, scaffolding and safety equipments etc including carriage loading & unloading but excluding supply of ms clamp/ flat plate, bolts, nuts and washer.								ITEM RATE NOT TO BE QUOTED.
29.1	b) solid bulb : size-40 dia 140 x 12 mm.	32.00	RM						
30	Supplying of M.S flat for clamping Rubber seal with hole as per direction of EIC	239	kg						ITEM RATE NOT TO BE QUOTED.
31	Supplying of M.S bolts with nut for clamping Rubber seal as per direction of EIC	36	kg						ITEM RATE NOT TO BE QUOTED.
32	Painting of embedded parts, all types of gates, stoplogs and barscreen/gratings etc on prepared surfaces with one coat of inorganic zinc silicate primer (airless spray preferred)70+/- 5 micron and two super coats with a total thickness of 300 microns (each 150+/- 5) of solventless coaltar epoxy paint each coat 150 microns ( total 300 microns) including cost of all materials, labour, scaffolding etc., complete with all leads and all lifts.	677.00	Sq.m						ITEM RATE NOT TO BE QUOTED.
33	Fabrication, supply, storing at site, installation & commissioning of trashrack/ bar screen/ grating conforming to relevant IS codes (IS:11388, IS:800, IS:2062) fabricated with structural steel sections such as ms flat, channels, angles etc. including cost of materials, machinery, labour, cutting, aligning, welding as per approved drawing including transportation charges as per direction.	69044.00	Kg						ITEM RATE NOT TO BE QUOTED.
34	Supply and fabrication of new stainless steel plate/flat (AISI - 304) of suitable size on seal beam / roller track/ slide track/ side seal seats/ top seal seat by welding (SS) as per direction of the Engineer-in-charge including cost of Materials, Machineries , Manpower, Cutting, Aligning, Welding, Finishing, Consumables, Carriage and all overheads with all leads and lifts complete as per specification.	307.00	kg						ITEM RATE NOT TO BE QUOTED.
	SITC of 11 KV, 1250 Amps 3 PANEL with 11 KV, 1250 Amps 25/26.2 KA VCB switchgear along with Panel top mounted P.T. as per enclosed specification. 1 no. Incomer feeder 2 nos. Outgoing feeder for 1000 KVA, 11 KV/433 V, 3 phase, 50 Hz Δ/λ, Dyn 11 outdoor ONAN type transformer. (Make- Siemens, Pascal, Schneider,ABB)								
	Each panel consists of following items:								
	RATING: 1250A								
	BUSBAR 1250A COPPER (25KA for 3sec) - 1no								
	A: MOVING PORTION:								
	A1: 11KV, 1250A, 25/26.2 KA for 3sec VCB - 1no								

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35	A2: VCB Enclosure + 1250A Copper connections - 1no	1	set						
	A3: 1250A PVC sleeved Copper Bus Bars -1no								
	B: CT AND PT DETAILS:								
	B1: 2 Core CT: CTR:200/1A+1A - 3nos								
	CORE 1: For metering, class-0.5, 15Va								
	CORE 2: For Protection, Class-5P10, 15VA								
	B2: 3 Nos 1Phase PTR:11KV/v3/110V/v3, Cl. 1 50VA (Panel top/bottom mounted PT) (Drawout type) - 1no								
	C: BREAKER PANEL INDICATION LAMPS:								
	C1: BREAKER On/OFF/Trip circuit Heathy/ Spring charge indication/ Breaker test position/ Breaker service position.- 6nos								
	C2: R-Ph./ Y-Ph./ B-Ph. -3nos								
	D: SWITCHES AND OTHER ACCESSORIES:								
	D1: DC ON/ OFF Switch- 1no								
	D2: AC ON/ OFF Switch-1no								
	D3: Auxiliary contactor (2NO + 2NC) - 1no								
	D4: Heater with heater switch & thermostat -2nos								
	D5: Cubicle illumination lamp-1								
	D6: 15A, 230V, 3 pin plug & socket and MCB -1no								
	D7: Local Remote Switch -1no								
	D8: T-N-C Switch -1no								
	D9: Mech. On-OFF push button -1no								
	D10: TTB -1no								
	D11: Buzzer- 1no								
	E: METERS & TRANSDUCERS:								
	E1: Ammeter with selector switch -1no								
	E2: Voltmeter with selector switch- 1no								
	E3: Digital MFM (Model: EM6400, CI-1.0 SCHNEIDER MAKE)- 1no								
	F: RELAYS								
	F1: Numerical relay communicable on MODBUS protocol MICOM P 127/equivalent with Power Pack Unit-1no								
	F2: Mastertrip lockout relay VAJH 13 (86)- 1no								
	F3: Electromechanical type DC fail relay VAA21 -1no								
F4: Electromechanical type Trip circuit Supervision Relay (VAX31)- 1no & Transformer Buchloz/winding temperature/Relay									
PT should be drawout type & Power pack unit must be provided for tripping circuit									
Cable entry box both side (Incomer & Outgoing) suitable for 3C X 240 sq. mm XLPE 11KV grade cable.									

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36	Supply,delivery, storing at site, installation, testing & Commissioning of 1000 KVA, 11 KV/433 V, 3 phase, 50 Hz Δ/λ, Dyn 11 outdoor ONAN type transformer in IP 55 enclosure with copper windings, OFF load tap changing arrangement in steps of + 1-2.5% & - 7.5%, having HTcable end boxes with cable gland plate suitable for terminating 11KV,3C x 240 sqmm XLPE/ ARMD, AL cables for primary side and1.1KV, 6 x 3½C x 300 sqmm. XLPE/ARMD, AL cables on the secondary side, three channel temperature scanner for continuous monitoring of the windings , with supply of all associated materials and accessories like oil conservator, silica gel breather,Bucholtz Relay, mounting channels bolts ,nuts washers, screw, clamps, painting, earthing etc.and confirming to IS- 1180 (Level-1) and as per specification as laid down in the contract complete in all respect as required at site including construction of required size CC pedestal above flood level. Make- Schneider/ KEC /CGL/ABB/Automatic Electrogear/Century/True Volt.	2	Set						
37	<p><b>LT PANEL AT PUMP HOUSE</b> Supply, delivery, storing at site, installation, testing &amp; commissioning of 415V (35MVA) TPN floor mounting free standing LTpanel made of min. 2mm thick sheet steel and stiffened by angle iron frame as necessary extensible on either side totally enclosed, dust and vermin proof, self supported, free standing unit with base channel, multi tier, compartmentalised cubicle, front access type construction with details of feeders as given below. LT panel shall be suitable for 500/415VAC 50HZ, 3-phase and neutral system.Panels shall be treated with seven tanks process before painting with two coats of epoxy paint over two coats of epoxy primer/powder coated paint all of approved shade complete with front operated incoming and outgoing switchgears, cablealleys, provision for cable entries from top and bottom, necessary meters, internal wiring with1.1KV, copper wire (2.5 sq.mm) protection HRC fuse etc terminal blocks, selector switches, inter connection with insulated(1.1KVgrade) colour coded copper conductor cable, gland plates, earth bus of copper, lifting bolts, level inscriptions, earth connections etc and supply of all necessary accessories all complete and mending good the damages as required.</p> <p>Make- Siemens/L&amp;T/ABB/Schnider</p> <p>Note:All works are to be done in accordance with I.E.rules and regulation and as per direction of Engineer-in-charge.GA drawing for each panel has to be get approved by the engineer-in-charge before manufacturing the same.</p> <p>(A) Incomer -2set each set comprising the following items</p> <p>(i) 1-Nos 1600A FP, 433V, 50 KA, Air Circuit Breaker (ACB)</p> <p>(ii) 1-set (3 Nos in each set) 15VA, 1250/5A, CL-1 for metering CTs</p> <p>(iii) 1-set cable termination arrangement suitable for 6 nos x 3½ C x 300 sq. mm., 1.1KV, XLPE /A, AL cable</p> <p>(iv) 1-set 0-1250A AC flush mounting digital ammeter with selector switch.</p> <p>(v) 1-set 0-500V flush mounted digital voltmeter with selector switch</p> <p>(vi) 1-set ON/OFF/TRIP/TRIP CIRCUIT HEALTHY lamps and push buttons</p> <p>(vii) 1-set R/Y/B phase indication lamps</p> <p>(viii) 1-set TRIP/NEUTRAL/CLOSE selector switch</p> <p>(ix) Earth bus-bar and all other accessories complete</p> <p>(x) Annunciator unit. 8W</p> <p>(xi) 1-set Multi Function Meter</p> <p>(B) Bus-Bars</p> <p>2-Set TPN, 500/415V, 1600A, 50Hz, 35 MVA continuous rated copper bus-bar with insulating sleeves</p> <p>(C) Bus-Coupler</p> <p>(i) 1-Nos 1600A FP, 433V, 50 KA, Air Circuit Breaker (ACB) with indication &amp; inter-locking.</p> <p>(D ) Outgoing</p>	1	Set						

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	<p>(i) 9 nos-400A TPN 500/415V, AC 50KA breaking capacity MCCB microprocessor based. Fully Automatic Star Delta Starter (FASD) for operation of 110KW Submersible pump motor having 3nos. 300A, 415V, TP AC 3 contactors and timer 0-30 sec CT operated thermal O/L relay having suitable setting range with single phase preventor MN-12-L or suitable rating, ON/OFF/TRIP lamps, START/STOP push buttons, 0-500A, CT operated digital ammeter with 500/5A class-1 CTS and selector switch, local/remote selector switch, temperature scanner (Masibus/Minilec make) including provision of Moisture sensor/oil, water leakage/ Bearing &amp; winding temperature, completely wired up to the terminals (for 8 nos Submersible pump &amp; 01 no spare) including supplying and installation capacitor bank of 80 KVAR or suitable rating to reach improve power factor near to 1, delta connected double dielectric heavy duty Metalised poly propylene - Heavy duty (MPP-H) power factor correction capacitor 415V AC, 3ph, 50Hz, as per IS:13340 &amp; IEC specification to be connected directly in parallel with the 110 KW motor terminals including supply and installation of Reactor/ Inductor coil with appropriate siz of Power contactor, time delay timer Auto manual selector switch, Indicating Lamps(ON-OFF)&amp; control fuses etc. against each module.</p> <p>(ii) 5 nos- 100A TPN 500/415V MCCB with breaking capacity of 50 KA including 0-100A CL-1 digital ammeter with 60/5A class-1 CTs and selector switch and ON/OFF/TRIP indication light complete ( 1 no for EOT crane, 1 nos for LDB, 1 nos for PDB, 2 nos spare). (iii) 1 nos- 250A TPN 500/415V MCCB with breaking capacity of 50 KA including 0-250A CL-1 digital ammeter with 250/5A class-1 CTs and selector switch and ON/OFF/TRIP indication light complete ( 1 no for office building, VCB room etc.). (iv) 1 nos- 160A TPN 500/415V MCCB with breaking capacity of 50 KA including 0-200A CL-1 digital ammeter with 200/5A class-1 CTs and selector switch and ON/OFF/TRIP indication light complete ( 1 no for street lights, indoor light of pump house etc.)</p> <p>(E) Earth bus-bar Continuous earth bus bar of 50 x 6mm G.I. flat running continuous through out the length of the switch board with earthing terminals.</p>								
38	<p>I/C and O/G PANEL AIR CIRCUIT BREAKER AT SUB-STATION Supply,delivery, storing at site,erection testing &amp; commissioning of indoor/outdoor as required, floor mounted metal clad totally enclosed horizontal cubicle fully compartmentalized,extensible on either side motor operated spring charged, electrically/manually operated fully draw-out type 433V Air Circuit Breaker(ACB) Board having rupturing capacity of 35MVA at 433V conforming to specification etc and detail shown in single line diagram and as described below Including supplying necessary mounting channels and all other mounting accessories complete.LT panel shall be suitable for 433V AC 50HZ,3 phase and neutral system. Make- Siemens/L&amp;T/ABB/Schneider Note:All works are to be done in accordance with I.E.rules and regulation and as per direction of Engineer-in-charge.GA drawing for each panel has to be get approved by the engineer-in-charge before manufacturing the same.</p>	2	set						
39	<p>(A) Incomer/ Outgoing (i) 1-Nos 1600A FP,500V, 50 KA, Air Circuit Breaker (ACB) (ii)1-set (3 Nos in each set) CT with CTR 1600/1A, 15VA,CL-1 for metering . (iii)2-set cable termination arrangement suitable for 6 nosx 3½ -C x 300 sqmm.1.1KV, XLPE /A, AL cable (iv)1-set 0-1600A AC flush mounting digital ammeter with selector switch. (v) 1-set 0-500V flush mounted digital voltmeter with selector switch (vi) 1-set ON/OFF/TRIP/TRIP CIRCUIT HEALTHY lamps and push buttons (vii) 1-set R/Y/B phase indication lamps (viii) 1-set TRIP/NEUTRAL/CLOSE selector switch (ix) Earth bus-bar and all other accessories complete (x) 1-set Multi Function Meter</p>								

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40	Supply, Installation , testing & commissioning of battery charger (make: Exide/ Life Line/Electroservice) with DCDB of 30 volt DC, considering of 15 to 16 nos dry maintenance free batteries (make:Exide/Amron) of 180 AH capacity , complete with metal racks & all other accessories housed in a common floor mounted enclosed & properly Ventilated sheet Cubicle ( IP-42) including preparation of Pedastal, Position of charger & batteries including necessary inter connection as supply, painting, earthing all complete as per specification.	1	set						
41	Supplying fitting fixing fabrication of MS ladder tray, hanger, masonry trench cover fabricated with MS and	380	Kg						
42	Supplying and fixing of 5.0 kg capacity fire extinguishers (Dry chemical type) to be fitted in wall with suitable bracket including cutting, chipping and mending good the damages.	12	Each						
43	Supplying and fixing 9 lts. Capacity MS fire bucket coloured red.	12	Each						
44	Supplying and fixing of shock treatment chart duly framed with glass on wall with necessary screws.	2	Each						
45	Supplying and fixing of 250 mm x 250 mm x 2 mm thick danger boards with screws.	8	Each						
46	Supplying and delivery high high voltage tested electrical rubber mat size (1mte x 2 mtr) and thickness 25 mm at site.	8	Each						
47	Supplying and fixing of First Aid Box with all items as required by rule on MS Bracket including mending good the damages.	2	set						
48	Supplying and laying of following sizes of 1.1KV grade XLPE insulated armored copper cable in excavated trenches, erected cable tray/ladder tray, pipes and masonry trench through under ground etc. including jointing and connector etc. as and where required as follows:								
48.1	7C X 2.5 Sqmm XLPE/A Cu Cable.	200	RM						
48.2	3C X 2.5 Sqmm XLPE copper cable	200	RM						
49	SUPPLYING OF FOLLOWING THREE CORE HT POWER CABLE WITH STRANDED COMPACT CIRCULAR ALUMINIUM CONDUCTOR, CONDUCTOR SCREEN WITH EXTRUDED SEMI CONDUCTING COMPOUND, XLPE INSULATED, INSULATION SCREENING WITH EXTRUDED SEMICONDUCTING COMPOUND IN COMBINATION WITH COPPER TAPE, CORES LAID UP, INNER SHEATH OF PVC, GALVANISED STEEL FLAT STRIP ARMoured, AND OVERALL PVC SHEATHED CABLE CONFORMING TO IS7098 (PART-2) 2011 WITH UP TO DATE AMENDMENTS. (Rate in Rs. Per Mtr ) 11 KV(E), 3 core 240sq.mm.	180	Meter					ITEM RATE NOT TO BE QUOTED.	
50	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 11 KV grade of following size direct in ground including excavation, sand cushioning, Brick protective covering and refilling the trench etc as required. Above 120 sq. mm and up to 400 sq. mm	120	Meter					ITEM RATE NOT TO BE QUOTED.	
51	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 11 KV grade of following size in the existing masonry open duct as required. Above 120 sq. mm and up to 400 sq. mm	60	Meter					ITEM RATE NOT TO BE QUOTED.	
52	Supplying and making indoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for following size of 3 core, XLPE aluminium conductor cable of 11 KV grade as required :3M / Raychem make 240 - 300 sq. mm.	10	Each					ITEM RATE NOT TO BE QUOTED.	
53	Supplying and making outdoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for following size of 3 core, XLPE aluminium conductor cable of 11 KV grade as required : 3M / Raychem make 240 - 300 sq. mm.	1	Each					ITEM RATE NOT TO BE QUOTED.	
54	SUPPLYING OF FOLLOWING XLPE INSULATED ALUMINUM CONDUCTOR ARMORED CABLES OF 1.1 KV GRADE AS PER IS7098 (PART1) 1988 WITH UPTO DATE AMENDMENTS. (Rate in Rs. Per Mtr)								



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54.1	3.5 core 300 sq.mm	2000	Per Mtr	ITEM RATE NOT TO BE QUOTED.					
54.2	4 core 70 sq.mm	220	Per Mtr						
54.3	4 core 35 sq.mm	120	Per Mtr						
54.4	4 core 25 sq.mm	40	Per Mtr						
54.5	4 core 16 sq.mm	800	Per Mtr						
54.6	4 core 10 sq.mm	50	Per Mtr						
54.7	2 core 10 sq.mm	200	Per Mtr						
55	Supplying & fixing medium gauge GI Pipe ( ISI-Medium) Protection with necessary fittings and jointing metarials as required for cable laying			ITEM RATE NOT TO BE QUOTED.					
55.1	40 mm dia	70	Per Mtr						
55.2	65 mm dia	15	Per Mtr						
56	Laying only Cable above 50 sqmm but not exceeding 400sqmm through existing RCC/ Hume/GI Pipe/open masonry trench for single, 2, 3, 3½ and 4 core	972	RM	ITEM RATE NOT TO BE QUOTED.					
57	Laying of three cables above 185 sqmm in an underground trench in single tier formation (horizontal) the trench size : 915 mm x 760 mm average depth with brick protection on the top of each cable with 8 nos. bricks per Mtr. and 4 nos. bricks per mtr. as separator between every two cables including filling the space between the bricks and cables and also the trench with shifted soil, levelling up and restoring surface duly rammed	340	RM	ITEM RATE NOT TO BE QUOTED.					
58	Laying of one No. cable upto 35 sqmm in underground trench 460 mm wide x 760 mm average depth, with brick protection on the top of the cable with 8 (eight) Nos. bricks per metre, including filling the space between the brick & cable and also the trench with shifted soil, leveling up and restoring surface duly rammed	650	RM	ITEM RATE NOT TO BE QUOTED.					
59	Laying of one No. cable above 35 sqmm and upto 185 sqmm in underground trench 460mm wide x 760mm average depth, with brick protection on the top of the cable with 8 (eight) Nos. bricks per Mtr. including filling the space between the bricks and cable and also the trenchwith shifted soil, leveling up and restoring surface duly rammed	100	RM	ITEM RATE NOT TO BE QUOTED.					
60	Laying of cable above 3½ core 50 sqmm and upto 3½ core 90 sqmm on wall/surface including S & F MS clams with earthing attachment in 2 x 10 SWG GI (Hot Dip) Wire, making hole etc. as necy., mending good damages and painting	120	RM	ITEM RATE NOT TO BE QUOTED.					
61	Laying of cable upto 2 core 25 sqmm on wall/surface incl. S & F MS saddles with earthing attachment in 10 SWG GI (Hot Dip) Wire, making holes etc. as necy. mending good damages and paintin	200	RM	ITEM RATE NOT TO BE QUOTED.					
62	Laying of cable upto 3/4 core 25 sqmm on wall/surface incl. S & F MS saddles with earthing attachment in 10 SWG GI (Hot Dip) Wire, making holes etc. as necy. mending good damages and painting	215	RM	ITEM RATE NOT TO BE QUOTED.					
63	Laying of cable from 3/3½ core 35 sqmm to 50 sqmm on wall/surface incl. S & F MS saddles with earthing attachment in 2 x 10 SWG GI (Hot Dip) Wire, making holes etc. as necy., mending good damages and painting	120	RM	ITEM RATE NOT TO BE QUOTED.					

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64	Supplying and fixing compression type gland complete with brass gland, brass ring & rubber ring for dust & moisture-proof entry of XLPE/PVC armoured cables as below :								
64.1	3.5 core 300 sq.mm	84	Each						
64.2	4 core 70 sq.mm	15	Each						
64.3	4 core 35 sq.mm	6	Each						
64.4	4 core 25 sq.mm	6	Each						
64.5	4 core 16 sq.mm	65	Each						
64.6	4 core 10 sq.mm	40	Each						
64.7	2 core 10 sq.mm	25	Each						
65	Finishing the end of following XLPE/PVC armoured cables by crimping method incl. supplying and fixing solderless socket(Dowels make), tapes, anticorrosive paste & jointing materials :								
65.1	3.5 core 300 sq.mm	84	Each						
65.2	4 core 70 sq.mm	15	Each						
65.3	4 core 35 sq.mm	6	Each						
65.4	4 core 25 sq.mm	6	Each						
65.5	4 core 16 sq.mm	65	Each						
65.6	4 core 10 sq.mm	40	Each						
65.7	2 core 10 sq.mm	25	Each						
66	Excavation of soil for installation of Earth Electrode and filling & ramming. For Soft Soil	96.8	Cum						
67	Earthing with 80mm dia GI pipe (TATA-Medium) x3.0 Mts. long and 1No. 65mm x8mm galvanized (HotDip) steel strip (4Mts. long), 20mm dia x 125mm long galvanized bolt, double nuts, double washers including finishing both ends by making holes etc. and S&F 80mm dia GI pipe (ISI-Medium) protection (3Mts. long) to be filled with bitumen partly under the ground level and partly above ground level to an average depth of 3.65 Mts.	20	Each						
68	Extra for providing masonry enclosure on the top of the earth electrode of overall size 86.36 cm x 86.36 cm x 46 cm deep (below Ground level) complete with cemented brick work(1:6) of 25 cm width duly plastered with cement mortar (inside) CI hinged inspection cover of size 36.56 cm x 35.56 cm with locking arrangement, GI reducer including drilling of 46 nos. 12 mm dia holes on the GI pipe	20	Each						
68.1	Extra for treatment of soil by using salt & charcoal or coke for plate electrode	20	Each						
69	Supplying & fixing earth busbar of galvanized (HotDip) MS flat 25 mmx6 mm on wall having clearance of 6mm from wall including providing drilled holes on the busbar complete with GI bolts, nuts, washers, spacing insulators etc. as required	50	M						
70	Supplying & fixing earth busbar of galvanized (HotDip) MS flat 50 mmx6 mm on wall having clearance of 6 mm from wall including providing drilled holes on the busbar complete with GI bolts, nuts, washers, spacing insulators etc. as required.	300	M						
71	Supplying & fixing earth busbar of galvanized (Hot Dip) MS flat 65 mm x 8 mm on wall having clearance of 6 mm from wall including providing drilled holes on the busbar complete with GI bolts, nuts, washers, spacing insulators etc. as required	400	M						
72	Connecting the equipments body to earth busbar incl. S & F 50 mm x 6 mm Galvanized (Hot Dip) MS flat on wall/floor with GI saddle as required and connection to equipments with incl. drilling holes, bolts, nuts, washers etc.	200	m						

ITEM RATE NOT TO BE QUOTED.

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73	Earthing with 50 mm dia GI pipe 3.64 mm thick x 3.04 Mts. long and 1 x 4 SWG GI (Hot Dip) wire (4 Mts. long), 13 mm dia x 80 mm long GI bolts, double nuts, double washers incl. S & F 15 mm dia GI pipe protection (1 Mts. long) to be filled with bitumen partly under the ground level and partly above ground level driven to an average depth of 3.65 Mts. below the ground level as below: By TATA-Medium GI pipe	35	Each					ITEM RATE NOT TO BE QUOTED.	
74	Connecting the equipments body to earth busbar including S & F 25 mm x 6 mm galvanised (Hot Dip) MS flat on wall/floor with GI saddles as required and connection to equipments incl. drilling holes, with bolts, nuts, washers etc.	170	m					ITEM RATE NOT TO BE QUOTED.	
75	Connecting the equipments to earth busbar including S & F GI (Hot Dip) wire of size as below on wall/floor with staples buried inside wall/floor as required and making connection to equipments with bolts, nuts, washers, cable lugs etc. as required and mending good damages (a) Solid GI wire 6 SWG	100	Per Mtr					ITEM RATE NOT TO BE QUOTED.	
76	Supplying and fixing 415V, TPN SFU with sheet steel enclosure on flat iron/angle iron frame on wall with nuts bolts etc incl. S&F 3nos.DIN type HRC fuse as per rating. 160 A, make-L & T. Angle iron frame	1	Each					ITEM RATE NOT TO BE QUOTED.	
77	Supplying & fixing sheet metal (16 SWG) Iron Clad Busbar chambers on angle iron frame on wall, incl.earthing attachment and painting as required – (As per Drawing no. 470 of PWD Specification Book – May 1991), 415 V, 200 A, 4 x 50x5 mm, 500x150mm	1.2	Per Mtr					ITEM RATE NOT TO BE QUOTED.	
78	Supply of 22.5 mm dia LED indicating lamps	3	Each					ITEM RATE NOT TO BE QUOTED.	
79	Supply of moving iron type analog AC ammeter (accuracy class 1.5), model-SMI-96 of following range (0 to 200A)	1	Each					ITEM RATE NOT TO BE QUOTED.	
80	Supply of 0 to 600V range moving iron type analog AC voltmeter (accuracy class 1.5), model-SMI-96	1	Each					ITEM RATE NOT TO BE QUOTED.	
81	Supply of indoor tape insulated ring type low tension current transformer of following rating							ITEM RATE NOT TO BE QUOTED.	
81.1	200/5A 5VA, CI 1.0	3	Each						
82.00	Supply of ammeter selector switch Current in Each phase with OFF, 4 Pos. 90° angle of throw (OFF-R-Y-B)	1	Each					ITEM RATE NOT TO BE QUOTED.	
83.00	voltmeter selector switch Voltage between phases with OFF, 4 Pos. 90° angle of throw (OFF-RY-YB-BR)	1	Each					ITEM RATE NOT TO BE QUOTED.	
84.00	Supplying and fixing Sheet steel Main Switches on angle iron frame on wall 415V TPN with fuse on L&N 100/125 A, make-Hevells	1	Each					ITEM RATE NOT TO BE QUOTED.	
85.00	Supplying and fixing Sheet steel Main Switches on angle iron frame on wall 415V TPN with fuse on L&N 60/63 A, make-Hevells	1	Each					ITEM RATE NOT TO BE QUOTED.	
86.00	Supplying and fixing Sheet steel Main Switches on flat iron frame on wall 30/ 32A, Standard,240 v.DP with fuse on L & N	2.00	Each					ITEM RATE NOT TO BE QUOTED.	
87.00	Supplying and fixing double door Horizontal TPN MCB Distribution board with IP-42/43 protection, concealed in wall after cutting the wall & mending good the damages to original finish incl. Inter connection with suitable size of copper wire and neutral link & provision for earthing attachment (Make-Legrand)							ITEM RATE NOT TO BE QUOTED.	
87.1	4 Way Enclosure (607715)	2	Each						
88.00	Supplying and fixing double-door SPN MCB Distribution Board with IP-42/43 protection, concealed in wall after cutting the wall & mending good the damages to original finish incl. Inter connection with suitable size of copper wire and neutral link & provision for earthing attachment. (Legrand Make)							ITEM RATE NOT TO BE QUOTED.	
88.1	2+8 way Enclosure (607711)								

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89	Supplying and fixing 240/415 V MCB Isolator ond in rail of existing DBs and necessary connection.								
89.1	63 A Legrand make FP	2	Each						ITEM RATE NOT TO BE QUOTED.
89.2	40A Legrand make DP	7	Each						ITEM RATE NOT TO BE QUOTED.
90	Supplying and fixing 240/415 V MCB of Breaking capacity 10kA & C characteristics on din rail of existing DBs and necessary connection								ITEM RATE NOT TO BE QUOTED.
90.1	6-32A SP Legrand make	80	Each						ITEM RATE NOT TO BE QUOTED.
91	Wiring in 1.1 KV grade single core stranded 'FR' PVC insulated & unsheathed copper wire (Brand approved by EIC) of following sizes in 25mm PVC casing-capping (Precision make) incl. necy. PVC clips, fittings etc. 2X56/0.3 (4 sqmm.) +1X36/0.3(1.5 sqmm)	60.00	RM						ITEM RATE NOT TO BE QUOTED.
92	Wiring in 1.1 KV grade single core stranded 'FR' PVC insulated & unsheathed copper wire (Brand approved by EIC) of following sizes in 25mm PVC casing-capping (Precision make) incl. necy. PVC clips, fittings etc. 2X36/0.3 (2.5 sqmm.) +1X22/0.3(1.5 sqmm)	400.00	RM						ITEM RATE NOT TO BE QUOTED.
93	Distribution wiring in 1.1 KV grade 2x22/0.3 (1.5 sqmm) single core stranded 'FR' PVC insulated & unsheathed copper wire (Brand approved by EIC) in suitable size PVC casing-capping (Precision make) with 1x22/0.3 (1.5 sqmm) single core stranded 'FR' PVC insulated & unsheathed copper wire for ECC, incl. necy. PVC clips, fittings etc. to light/fan/call bell point with piano key type switch (Anchor make) fixed on sheet steel fabricated switch board with Perspex/bakelite top cover on wall incl. necy. connections and making earthing attachment and mending good damages to building works. [PVC casing-capping and Switch board both on surface Average run 8 Mtr	150.00	Point						ITEM RATE NOT TO BE QUOTED.
94	Distribution Wiring in 1.1 KV grade 2x22/0.3 (1.5 sqmm) single core stranded 'FR' PVC insulated & unsheathed copper wire (Brand approved by EIC) in suitable size PVC casing-capping (Precision make) with 1x22/0.3 (1.5 sqmm) single core stranded 'FR' PVC insulated & unsheathed copper wire for ECC, incl. necy. PVC clips, fittings etc. to 5A 3 pin flush type plug socket with piano key type switch (Anchor make) fixed on sheet steel fabricated CRC MS switch board with bakelite/perspex (wall matching color) top cover of 3 mm thick flushed in wall by housing the board after cutting brick wall incl. necy. connection making earthing attachment, painting and mending good damages to building works [PVC casing-capping and plug box both on surface] On board	10.00	Point						ITEM RATE NOT TO BE QUOTED.
95	Supply & Fixing 240 V, 20A, plug socket with separate 20 A Piano key type switch (Brand approved by EIC) on sheet metal switch board embedded in wall incl. S & F 150x100x65mm MS (16SWG) switch board and bakelite/perspex top cover of 3mm thick by Brass screws after making housing for switch by cutting bakelite/perspex cover and making necessary connections as required.	4.00	Each						ITEM RATE NOT TO BE QUOTED.
96	Supply TMC501 Conventional industrial batten Philips LEDtube, model no : TMC 501 P 1xT-LED 22W P3241 with 1nos Mas LEDtube 1200mm 18W865 T8 I – 2100lm including necessary connection. (Phillips Make)	2.00	Each						ITEM RATE NOT TO BE QUOTED.
97	Fixing only single/twin florescent light fitting complete with all accessories Directly on wall/ceiling with HW block and suitable size MS fastener, Ceiling plate, nipples etc. as required,	2.00	Each						ITEM RATE NOT TO BE QUOTED.
98	Supply TMC501 Conventional industrial batten Philips LEDtube, model no : TMC 501 P 2xT-LED 22W P3242 with 2nos Mas LEDtube 1200mm 18W865 T8 I – 2100lm including necessary connection.	70.00	Each						ITEM RATE NOT TO BE QUOTED.

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99	Fixing only fluorescent light fitting suspended 25 cm bellow the ceiling with 2 No. 20 mm dia EI conduit (14 SWG) supports incl. S&F EI conduit, ball socket/socket type ceiling plate and connecting the length of PVC insulated wire and painting etc. as required by 2x24/0.20 mm (1.5sqmm) flexible copper wire of 1.10 mt. length.	70.00	Each						ITEM RATE NOT TO BE QUOTED.
100	Supplying of approved make high speed ceiling fan (ISI marked) of following sizes having double ball bearing complete with standard down rod, canopy, hanging shackle, Aluminium blades, without regulator, A.C. 230-250 volts (make Crompton ) 900mm/ 1050mm/ 1200mm	20.00	Each						ITEM RATE NOT TO BE QUOTED.
101	Fixing only ceiling fan complete with blades, canopy, fork, rubberbush etc. incl. S&F connecting wire for down rod upto 30 cm incl.painting the rod with approved paint and making necessaryconnection as required by 2x1.5 sqmm flexible copper wire.	20.00	Each						ITEM RATE NOT TO BE QUOTED.
102	Supply & Fixing Socket type fan regulator (Step type) (Brand approved by EIC) on existing sheet metal switch board with bakelite/perspex top cover by screw after making housing for regulator knob by cutting bakelite/perspex top cover incl. making necy. connections etc.	20.00	Each						ITEM RATE NOT TO BE QUOTED.
103	Supplying of different types of LED lamps (9W) Make : Philips, 9.0 Watt, Base B22/ E27, 825 Lm	5.00	Each						ITEM RATE NOT TO BE QUOTED.
104	S & F Lightning conductor Air-terminals made of 15 mm dia 1500 mm long GI pipe (ISI Medium) having five prongs of 4 SWG GI (Hot Dip) wire at top with 85 mm dia 6 mm thick GI base plate at bottom incl. necessary holes etc. duly grouted on the parapet etc. in CC mortar (4:2:1)	8	Each						ITEM RATE NOT TO BE QUOTED.
105	Cutting cornices/ steps etc. including cutting recess in buildings etc. & supply & fixing 15 mm bore (ISI-Medium) GI pipe protection as below and mending good damages to the building works: Length above 0.5 Mtr	8	Set						ITEM RATE NOT TO BE QUOTED.
106	Making soldered joints between conductors, conductors and air terminals for 4 SWG GI (Hot Dip) wire incl. supply of jointing materials and painting with 2 (two) coats of bituminous paint	8	Each						ITEM RATE NOT TO BE QUOTED.
107	Making soldered joints between conductors and down pipes/ other metallic objects for 14 SWG GI (Hot Dip) wire including supply of necessary 4 SWG GI (Hot Dip) wire, jointing materials and painting with 2 (two) coats of bituminous paint	24	Each						ITEM RATE NOT TO BE QUOTED.
108	Hiring charges for scaffolding arrangement including dismantling at the end of work and carriage, for LC installation, per storey of building per vertical run	8	Vertical Run						ITEM RATE NOT TO BE QUOTED.
109	Supply & fixing GI (Hot Dip) strips 20 mm x 3 mm thick for horizontal run on the Parapet/Roof/ Wall with GI Saddles 1100 mm apart incl. mending good the damages to building works	300	Mtr						ITEM RATE NOT TO BE QUOTED.
110	Supply & fixing of GI (Hot Dip) strips 20 mm x 3 mm thick for vertical run on wall with GI saddles spaced not exceeding 1000 mm apart incl. mending good damages to building work	180	Mtr						ITEM RATE NOT TO BE QUOTED.

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111	Supply & Fixing of Testing Joints by 20 mm x 3 mm thick GI (Hot Dip) strip 125 mm long grouted on wall having clearance of 6 mm from wall for making connection with thimbles at the end of 7/10 SWG GI (Hot Dip) stranded Wire and 4 SWG GI (Hot Dip) wire of vertical conductor and conductor from earth electrode complete with S & F thimbles, GI bolts, nuts, check-nuts, spring washers etc. as required	12	Each					ITEM RATE NOT TO BE QUOTED.	
112	Supplying and fixing 415V, TPN SFU with sheet steel enclosure on flat iron/angle iron frame on wall with nuts bolts etc incl. S&F 3nos. DIN type HRC fuse as per rating. 160 A, make-L & T. Angle iron frame	1	Each					ITEM RATE NOT TO BE QUOTED.	
113	Supplying and fixing 415V, TPN on load front operated Changeover switch with Sheet Steel enclosure on angle iron frame on wall with nuts bolts etc. 160A	1	Each					ITEM RATE NOT TO BE QUOTED.	
114	Supplying & fixing sheet metal (16 SWG) Iron Clad Busbar chambers on angle iron frame on wall, incl. earthing attachment and painting as required – (As per Drawing no. 470 of PWD Specification Book – May 1991) 4 bar, 415 V 200 A Dimension of Al. bars [85mm long] 415 v, 200A 4x50x5 mm. Dimension of Sheet Metal Box 500x150 mm	1.20	Rate / Mt. of complete chamber					ITEM RATE NOT TO BE QUOTED.	
115	Supply of 22.5 mm dia LED indicating lamps	3	Each					ITEM RATE NOT TO BE QUOTED.	
116	Supply of moving iron type analog AC ammeter (accuracy class 1.5), model-SMI-96 of following range (0 to 200A)	1	Each					ITEM RATE NOT TO BE QUOTED.	
117	Supply of 0 to 600V range moving iron type analog AC voltmeter (accuracy class 1.5), model-SMI-96	1	Each					ITEM RATE NOT TO BE QUOTED.	
118	Supply of indoor tape insulated ring type low tension current transformer of following rating							ITEM RATE NOT TO BE QUOTED.	
118.1	200/5A 5VA, CI 1.0	3	Each						
119.00	Supply of ammeter selector switch Current in Each phase with OFF, 4 Pos. 90° angle of throw (OFF-R-Y-B)	1	Each					ITEM RATE NOT TO BE QUOTED.	
120.00	voltmeter selector switch Voltage between phases with OFF, 4 Pos. 90° angle of throw (OFF-RY-YB-BR)	1	Each					ITEM RATE NOT TO BE QUOTED.	
121.00	Supply of 3-ph DOL Starter MN 16 DOL	3	Each					ITEM RATE NOT TO BE QUOTED.	
122.00	Supplying and fixing Sheet steel Main Switches on flat iron frame on wall 30/32 A, Havells, 415 v. TPN with fuse on L & N	3.00	Each					ITEM RATE NOT TO BE QUOTED.	
123.00	Supplying & fixing SS enclosure of suitable size for housing the following accessories as required with DIN rail etc. including supplying the following accessories a) 240VAC analog time switch for ON-OFF control of street light, b) 3 pole power contactor type ML 2, 40A current rating, Toggle switches etc.	1.00	Job					ITEM RATE NOT TO BE QUOTED.	
124	Supplying swaged and welded steel tubular pole of following specifications as per IS 2317: 1980)								
124.1	9m length, 108Kg, 410-SP-27 (make-calcutta pole)	14	Each					ITEM RATE NOT TO BE QUOTED.	
125	Supply of CI base plate for overhead MS pole	14	Each						
126	Supply of CI pole CAP for overhead MS pole	14	Each						

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127	Erection of Single Steel tubular pole of length as given below with/without sole plate & Cap etc. in CC foundation (Proportion and dimension indicated below), having 600x600x150 mm thick CC (4:2:1) base block below sole plate/pole with hard jhama metal including CC (6:3:1) muffing 0.30 mts. dia and 0.30 mts. above ground level including 3 mm thick neat cemented finish and GI earth bolt after making drilled holes etc. on pole & carriage of pole upto 1.6 Km from Store to work-site including filling up the excavated earth pit with shifted soil and ramming properly								
127.1	(a) Upto 9.0 mtr. Size 0.6x0.6x1.70 mts	14	Set						
128	Extra on items 1& 2 above, for providing CC (6:3:1) base block (around the pole) dimension 0.60x0.60x0.76 mt. above ground level, neatly cemented finish (3 mm thick), at the base pole (in lieu of CC muffing) incl. drilled hole in pole suitable for alkathene/polythene pipe entry, for street light wiring, without Loop Box	14	Item						
129	Supplying and Fixing GI water proof looping cable box having hinged GI Top Cover having 4 mm thick with rubber gasket lining, railway type mechanical locking arrangement, earthing terminal with lug etc. of the following sizes as indicated below, Comprising of one 250 V, 15 A Kit-Kat fuse unit, one NL on porcelain insulator etc. and housing the same in pole muffing incl. addition and alteration to the existing CC muffing (6:3:1) after dismantling the damaged looping cable box etc. where necy. incl. painting.(250x250x100mm)	14	Each						
130	Supplying & fixing medium gauge GI Pipe ( ISI-Medium) Protection with necessary fittings and jointing materials as required 40 mm dia	31.5	RM						
131	Painting of Steel Tubular Pole of lengths and no. of coats of paint, as given below with ready mixed paint/primer of approved make, and brand incl. preparation of surface by sand paper/emery Upto 9.0 mtr. long pole paper, cleaning etc. for receiving fresh coat of paint.								
131.1	(i) 1st coat of aluminium paint over 1 coat of RO priming	14	Per pole						
131.2	(ii) 2nd coat of aluminium paint over 1st coat	14	Per pole						
132	Supply and fixing of smart bright essential street light (70 Watt) complete with all accessories to be fixed /projected from the wall of the building or on pole incl. making holes/providing clamping arrangement & necy. GI reducer as required. S&F 40 mm GI pipe (ISI-Medium) quality 1.5 mts. average length having suitable bend S&F necy. length of 1.5 sqmm PVC insulated single core stranded annealed copper wire and making connections as required and mending good damages to wall incl. painting etc.								
132.1	Make : Crompton, 72 watt	28	Each						
133	Supply and fixing of LED Flood light (350 Watt) with IP66 protection. Available in MB/WB angles. 10KV SPD complete with all accessories to be fixed /projected from the wall of the building or on pole incl. making holes/providing clamping arrangement & necy. GI reducer as required including S&F necessary anchor/fastener & S&F necy. length of 1.5 sqmm PVC insulated single core stranded annealed copper wire and making connections as required and mending good damages to wall incl. painting etc. ( make:Crompton, Cat no- CFS-501-350-57-60D-HL2-GL-NGG )	4	Each						
134	Supplying and Fixing GI water proof looping cable box having hinged GI Top Cover having 4 mm thick with rubber gasket lining, railway type mechanical locking arrangement, earthing terminal with lug etc. of the following sizes as indicated below, Comprising of one 250 V, 15 A Kit-Kat fuse unit, one NL with necessary bars for provision of 3 ph. 4 wire cable connection on porcelain insulator etc. and housing the same on wall where necy. incl. painting. 250 x 250 x100 mm	20.00	Each						

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135	Supplying and fixing MCB SS enclosure with IP-20/30 protection, powder coated provision for two/four pole MCB, concealed in wall after cutting the wall & mending good the damages to original finish incl. painting, connection & provision for earthing attachment 2 Way	12.00	Each						ITEM RATE NOT TO BE QUOTED.
136	Supplying and fixing 240/415V MCB of Breaking capacity 10kA & C characteristics on din rail of existing DBs and necessary connection, DP 6-32 A make: Legrand	12.00	Each						ITEM RATE NOT TO BE QUOTED.
137	Supplying and fixing PVC Rigid Conduit 'FR' [Precision Make] on wall, ceiling with saddles and other accessories as required and mending good damages to building works 20 mm size	200.00	Mtr						ITEM RATE NOT TO BE QUOTED.
138	Supplying & laying of 4 Sq.mm 3 Core PVC 650 V/1100 V Grade insulated unarmoured, stranded Copper cable in pre-laid PVC polythene pipe. (make-KEI/Gloster)	200.00	Mtr						
139	Supplying and fixing of PARABOLA NEO (200 W) Industrial light Uniquely designed circular highbay with 150 lm/W efficacy and 10 kV SPD as standard making it a robust solution for various industrial application. Ingress protection of IP66 with additional safety chain, fixing on ceiling with anchor/fastener etc, and other accessories as required and mending good damages to building works (Cat. no.- CIP-325-200-57-60D-HL5-LM-NSG) make: Crompton	12.00	Each						
140	Supplying and fixing Sheet steel Main Switches on angle iron frame on wall 60/63 A, Havells, 415 v. TPN with fuse on L & N	1.00	Each						ITEM RATE NOT TO BE QUOTED.
141	Supplying and fixing double door Horizontal TPN MCB Distribution board with IP-42/43 protection, concealed in wall after cutting the wall & mending good the damages to original finish incl. Inter connection with suitable size of copper wire and neutral link & provision for earthing attachment (Make-Legrand)								ITEM RATE NOT TO BE QUOTED.
141.1	4 Way Enclosure (607715)	1	Each						
142	Supplying and fixing double-door SPN MCB Distribution Board with IP-42/43 protection, concealed in wall after cutting the wall & mending good the damages to original finish incl. Inter connection with suitable size of copper wire and neutral link & provision for earthing attachment. (Legrand Make)								ITEM RATE NOT TO BE QUOTED.
142.1	2+8 way Enclosure (607711)	1	Each						
143	Supplying and fixing 240/415 V MCB Isolator on din rail of existing DBs and necessary connection.								ITEM RATE NOT TO BE QUOTED.
143.1	63 A Legrand make FP	1	Each						
143.2	40A Legrand make DP	1	Each						
144	Supplying and fixing 240/415 V MCB of Breaking capacity 10kA & C characteristics on din rail of existing DBs and necessary connection								ITEM RATE NOT TO BE QUOTED.
144.1	6-32A SP Legrand make	20	Each						
145	Distribution wiring in 1.1 KV single core stranded 'FR' PVC insulated & unsheathed copper wire (Brand approved by EIC) in 20mm size PVC rigid conduit 'FR' (Precision make) incl. necy. fittings as required								ITEM RATE NOT TO BE QUOTED.
145.1	2x 36/0.3 (2.5 sqmm) + 1 x 22/0.3 (1.5 sqmm) ECC	400.00	RM						



Sl. No.	Description of work	Qty	Unit	Description of work proposed by the bidder (for budget quotes)	Quantity (for budget quotes)	Unit (for budget quotes)	Rate of GST	Rate (Rs., Incl of all taxes) (budget quotes)	Total Amount (Rs.) (budget quotes)
146	Distribution wiring in 2 x 22/0.3 (1.5 sqmm) single core stranded 'FR' PVC insulated & unsheathed copper wire (Brand approved by EIC) in 20mm size PVC rigid conduit 'FR' (Precision make), with 1x22/0.3 (1.5 sqmm) single core stranded 'FR' PVC insulated & unsheathed copper wire for ECC, to light/fan/call bell points with Piano Key type switch fixed on MS CRC sheet metal (16 SWG) switch board cum JB on wall complete with 2 no. suitable size "Ph & N" copper bar incl. bakelite/Perspex (wall matching color) top cover 3 mm thick and incl. 175mmx100mmx65mm inspection box, making earthing attachment, painting the MS box and mending good the damages to original finish. Average run 12 meter	22.00	point						ITEM RATE NOT TO BE QUOTED.
147	Distribution wiring in 1.1 KV grade 22/0.3 (1.5 sqmm) single core stranded 'FR' PVC insulated & unsheathed copper wire (Brand approved by EIC) in 20mm size PVC rigid conduit 'FR' (Precision make), with 1.1 KV grade 1 x 22/0.3 (1.5 sqmm) single core stranded 'FR' PVC insulated & unsheathed copper wire as ECC, to 5A 3 pin flush type plug socket & Piano Key type switch fixed on MS CRC sheet metal (16 SWG) switch board cum JB on wall incl. bakelite/Perspex (wall matching color) top cover 3 mm thick and incl. painting the MS box and mending good the damages to original finish on board	5.00	point						ITEM RATE NOT TO BE QUOTED.
148	Supply & Fixing 240 V, 20A, plug socket with separate 20 A Piano key type switch (Brand approved by EIC) on sheet metal switch board embedded in wall incl. S & F 150x100x65mm MS (16SWG) switch board and bakelite/perspex top cover of 3mm thick by Brass screws after making housing for switch by cutting bakelite/perspex cover and making necessary connections as required.	6.00	Each						ITEM RATE NOT TO BE QUOTED.
149	Supplying & fixing of wall mounting fan (heavy duty) with blades AC 230-250, sweep 600 mm (24"), 1 Phase make (crompton or any approved )	8.00	Each						
150	Supplying of approved make exhaust fan heavy duty with mounting frame, blades AC 230-250. 300mm sweep RPM 900 / 1400 (12")	8.00	Each						ITEM RATE NOT TO BE QUOTED.
151	Fixing only cabin fan on wall/ceiling by S&F rag bolts, nuts & washers (6 mm dia x 62 mm long) or as reqd. incl. S&F 24/0.20PVC insulated flexible copper wire 0.5 mt. length.	8.00	Each						ITEM RATE NOT TO BE QUOTED.
							<b>Total</b>		
	<b>Rupees in word...</b>								