

BID DOCUMENT

Survey, Geo-Technical investigation, Planning, Design, Construction and Commissioning of Fixed Type Jetty with Pipe carriageway for Raw Water Intake and 14 MLD Capacity Conventional Water Treatment Plant(WTP)with 5 years Operation & Maintenance after 3 months trial run for Intake, WTP and HT Sub- Station as per relevant BIS code / CPHEEO Manual consisting of all Civil, Mechanical and Electrical works and allied works including laying of Raw Water Rising Main(DI-K9)from intake to WTP along with specials and valves and carriage of pipes (to be supplied departmentally) from store to site with temporary road restoration for vehicular movement, Pipe Carrying bridge, Road crossing by Jack Pushing Technique works etc. all complete as per direction of Engineer-in-charge for proposed Water Supply Scheme of Panskura Municipality under AMRUT 2.0 Scheme.



**GOVERNMENT OF WEST BENGAL
OFFICE OF THE SUPERINTENDING ENGINEER
SOUTH CIRCLE
MUNICIPAL ENGINEERING DIRECTORATE
MUNICIPAL AFFAIRS DEPARTMENT**

Kausallya, Opposite Kausallya T.O.P., Kharagpur, Dist- PaschimMedinipore, Mail ID:sesouth.med@gmail.com

NOTICE INVITING e-QUOTATION

Memo No.MED/SE(S)/318/W-6/06 Pt-III

Dated-11/09/2025

Notice Inviting e-quotation No.-WBMAD/NIQ -10/SE(S)/2025-26

The Superintending Engineer, South Circle, Municipal Engineering Directorate, on behalf of the Governor of West Bengal invites sealed competitive Bid on Turnkey Basis(Two-part System) from reliable and resourceful Companies/Firms/Contractors having experience and acumen in Supplying & Laying works of Ductile Iron Pipes for water supply projects as noted below.

1.	Name of Work:	Survey, Geo-Technical investigation, Planning, Design, Construction and Commissioning of Fixed Type Jetty with Pipe carriageway for Raw Water Intake and 14 MLD Capacity Conventional Water Treatment Plant(WTP)with 5 years Operation & Maintenance after 3 months trial run for Intake, WTP and HT Sub- Station as per relevant BIS code / CPHEEO Manual consisting of all Civil, Mechanical and Electrical works and allied works including laying of Raw Water Rising Main(DI-K9)from intake to WTP along with specials and valves and carriage of pipes (to be supplied departmentally) from store to site with temporary road restoration for vehicular movement, Pipe Carrying bridge, Road crossing by Jack Pushing Technique works etc. all complete as per direction of Engineer-in-charge for proposed Water Supply Scheme of Panskura Municipality under AMRUT 2.0 Scheme.
2	Locations of work:	Intake Location: Mouza-Chatinda ,Block –KolaghatDist: PurbaMedinipore WTP location: Mouza-UttarMechogram , JL No-67,Kh no-01, Plot No-3154,3155,3156,3162,3162,3164 at ward no-02 under Panskura Municipality. 450 mm dia. (DI K9) Raw Water Rising Main Line: from Intake to WTP location Pipe carrying Bridge (i) Near Khanichak Bridge (22.451161,87.871838) , Min. Length -35 Mtr, Width-1.5 mtr, (ii) At Kola bazar more (22.445852,87.871215) , Min. Length -35 Mtr, Width-1.5 mtr and (iii) Near Laxmi Hotel (22.430753,87.819857) , Min. Length -35 Mtr , Width-1.5 mtr Trenchless Jack Pushing Technique At Kolabazar near cold store more on PWD road minimum 40 m length

3	Deleted	
4.	Eligibility to Participate in the Bid.	<p>i) Intending tenderers should produce credentials of a similar nature of completed work of the minimum value of 15.0 Crore as a single work in any Govt. / Board / Semi Govt. / Municipal Corporation / Statutory Authority /Govt. undertaking etc. organization during last 5 (five) years prior to the date of issue of the tender notice. In case of Joint Venture(JV), one partner in the Joint Venture should produce credentials of a similar nature of completed work valuing minimum 15.0 Crore as a single work in any Govt. / Board / Semi Govt. / Municipal Corporation / Statutory Authority /Govt. undertaking etc. organization during last 5 (five) years prior to the date of issue of the tender notice.</p> <p style="text-align: center;">OR</p> <p>ii) Intending tenderers should produce credentials of 2 (two) similar nature of completed works, each of minimum value of 11.0 Crore in any Govt. / Board / Semi Govt. / Municipal Corporation / Statutory Authority /Govt. undertaking etc. organization during 5(five) years prior to the date of issue of this Tender Notice. In case of Joint Venture(JV), either one partner shall have to produce credentials of 2 (two) similar nature of completed works, each of minimum value of 11.0 Crore in any Govt. / Board / Semi Govt. / Municipal Corporation / Statutory Authority /Govt. undertaking etc. organization during 5(five) years or any two partners must each shall have to produce credentials of 1 (one) similar nature of completed work, each of minimum value of 11.0 Crore in any Govt. / Board / Semi Govt. / Municipal Corporation / Statutory Authority /Govt. undertaking etc. organization during 5(five) years prior to the date of issue of this Tender Notice,</p> <p style="text-align: center;">OR</p> <p>iii) Intending tenderers should produce credentials of one single running work of similar nature which has been completed to the extent of 80% (eighty percent) or more and value of which is not less than the desired value as stated above (SI No.4(i)). In case of Joint Venture, credentials for running works will not be considered.</p> <p>Similar nature of works must include Construction of Intake Structure with Electro-mechanical works / Construction of WTP with Electro-mechanical works in any water supply related projects.</p> <p><i>N.B.- i)In case, the applicant is a JV, the required credentials criteria are to be fulfilled jointly, provided minimum 60% of the criteria is fulfilled by the Lead Member and minimum 25% of the criteria is fulfilled by the other Member.</i></p> <p><i>(ii)In case of running works, only those tenderers who will submit the certificate from Executive Engineer or equivalent competent authority will be eligible to participate in the tender. In the required certificate it should be clearly stated that the work is in progress satisfactorily and also that no penal action has been initiated against the agency i.e the tenderer.</i></p> <p><i>(iii)Credential certificate issued by the Executive Engineer or equivalent competent authority a State / Central Government, State / Central Government undertaking,</i></p>

Statutory / autonomous bodies constituted under the Central / State Statute, on the executed value of completed / running work will be taken as credential.

iv) Payment certificate will not be treated as Credential (Vide Ref No 04A/PW/O/10C-02/14 Dated 18.03.2015)

4.2: -PAN Card, Valid Professional Tax deposit certificate, GST registration Certificate (GSTIN), EPF registration, ESI registration, Income Tax Return Receipt for the Latest Assessment year - etc. are to be accompanied with the Technical Bid document.

4.3 -Valid Bank Solvency Certificate minimum 15 Crore from any Nationalized Bank/Scheduled Bank (Issue date of the certificate should be within the preceding 1 (one) year from the date of publication of the tender)

4.4 Annual Turn Over minimum 15 Crore in **any one year during last 5 years** in 3CB and 3CD Form. In case, the applicant is a JV, the required turnover criteria is to be fulfilled jointly, provided minimum 60% of the criteria is fulfilled by the Lead Member and minimum 25% of the criteria is fulfilled by the other Member. The Audited Report should contain the signature, name, address, contact no./email ID and membership no., UDIN no. of Chartered Accountant clearly.

4.5 In case of Proprietorship or Partnership Firms or Company the Tax Audited Report in 3CD Form for the period upto last five years. The Audited Report should contain the signature, name, address, contact no./email ID and membership no., UDIN no. of Chartered Accountant clearly. [Non Statutory Documents]

4.6 Registered Unemployed Engineers' Co-operative Societies/ Unemployed Labour Co.-Op. Societies are also required to furnish Certificate of Registration, Bye Laws, Tax Audit Report in 3CB and 3CD Form for the period upto last five years. The Audited Report should contain the signature, name, address, contact no./email ID and membership no., UDIN no. of Chartered Accountant clearly. [Non Statutory Documents]

4.7 Register partnership deed for partnership firm is to be submitted. The company shall furnish the Article of Association and Memorandum. Where an individual person holds a digital certificate in his own name duly issued to him against the company or the firm of which he happens to be a director or partner, such individual person shall while uploading any tender for and on behalf of such company or firm, invariably upload a copy of registered power of attorney showing clear authorization in his favour, by the rest of the directors of such company or the partners or such firm to upload such tender.

4.8 In case of the JV, The Lead member should have a stake of at least 51% and the partners of the Joint Venture shall have a stake of at least 10%. The JV members shall be jointly and severally liable under the contract.

On successful completion of the project, the Credential Certificate, if needed by the JV, shall be given according to the stake, mentioned in their JV agreement.

Note:

i. The bidder should have no adverse report, on any account, against their organization for any project worked during last 5 (five) years or working at present. This clause will lead for rejection of application, even after fulfillment of other eligibility criteria.

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6.	Earnest Money.	<p>2% of the Quoted Bid price in two parts, vise</p> <p>a. Rs.10.00 Lakh(Rupees Ten lakh)as an initial Earnest Money Deposit shall accompany with Bid Proposal and may be remitted by selecting from either of the following payments modes: -</p> <p>i) Net Banking (any of the banks listed in the ICICI Bank Payment gateway) in case of payment through ICICI Bank Payment Gateway. Bank Acknowledgement Slip to be uploaded during online bid submission;</p> <p>ii) RTGS/NEFT in case of offline payment through bank account in any Bank and also to be documented through e-filing.</p> <p>(As per GO No. 3975-F(Y) dt. 28.07.2016 of Finance Deptt., Govt. of West Bengal). Every such Transfer shall be done on or after the date of publish of NleB. Any Bid without such Transfer of EM (Except exemption as per G.O.) shall be treated as informal and shall be automatically cancelled. Online transfer of Earnest Money receipt (Scanned copy) shall be uploaded as Statutory document)</p> <p>b. Earnest Money Deposit i.e. 2% of bid amount beyond the amount as mentioned in 6.a. shall have to be deposited by the L1 bidder after acceptance of Bid Proposal as demand draft in favour of the Executive Engineer, East Midnapore Division, M.E.Dte Payable at Tamluk.</p> <p>Additional Performance security deposit @10% of the accepted amount is to be deposited in due course as per GoWB norms if the accepted amount is found to be @80% or less than the tentative departmental cost in terms of GO No.4608 f(y) Dt.18.07.2018</p> <p>The amount of earnest money will be converted into security deposit in case of the L1 bidder.</p> <p>In case of Joint Venture, the earnest money and / or security deposit including earnest money shall be in the name of the Joint Venture that submits the Bid.</p>								
7.	Cost priceof Bid documents	<p>The intending Bidders shall not have to pay the cost of tender documents for the purpose of participating in e-tendering vide Notification No. 199-CRC/2M-10/2012 dated 21/12/2012 of the Secretary, Public Works Department, Government of West Bengal. However, the successful bidder shall have to pay the cost of contract documents as per notification no-452-A/PW/O/10C-35/10 Dated:26.07.2011 of PWD Govt of West Bengal only per set at the time of formal agreement.</p>								
8.	Date and Time Schedule	<table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Particulars</th> <th>Date and Time</th> </tr> </thead> <tbody> <tr> <td>a)</td> <td>Date of uploading of NIB (Bid Documents(online) (Publishing date)</td> <td>10.09.2025 at 6.00P.M</td> </tr> </tbody> </table>	Sl. No.	Particulars	Date and Time	a)	Date of uploading of NIB (Bid Documents(online) (Publishing date)	10.09.2025 at 6.00P.M		
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		b)	Document download start date (online)	11.09.2025 at 6.00P.M
		c)	Date of Pre Bid Meeting (offline) with the intending Bidders in the office of the Superintending Engineer, South Circle, Municipal Engineering Directorate.	16.09.2025at 1.00 P.M
		d)	Both Technical and financial bid submission starting date(On line)	11.09.2025 at 6.00P.M
		e)	Last date of submission of queries (To be reached at SE (South Circle)	NA
		f)	Document download closing date (online)	08.10.2025 at 1.00 P.M
		g)	Both Technical and financial bid submission (on line) closing date	08.10.2025 at 1.00 P.M
		h)	Date & place of opening of Technical Proposals(online)	10.10.2025 at 1.00 P.M
		i)	Date of uploading of list of technically qualified bidders (online)	To be notified later.
		j)	Date of opening of financial bid (online)	To be notified later.
		k)	Also if necessary for further negotiation through offline for final rate.	To be notified later.

		<p>* All bidders are requested to raise objection(s), if any, regarding the decision of TIA with respect to acceptance/non-acceptance of technical bid within these hours through official e-mail of TIA only. Failing which the objection(s) may not be considered.</p> <p>N.B.-i) Maximum 2 (two) representatives of each prospective Bidders shall be allowed to participate in Pre-Bid Meeting on production of authorization letter from the Bidder. During the Pre-Bid Meeting, the Bidders may seek clarifications and offer suggestions for consideration.</p> <p>ii)The bidders are requested to submit pre-bid queries in writing (word/excel format), to reach the TIA not later than 48 hour before the scheduled date and time of pre-bid meeting from their official Reply will be given only to the written queries so submitted.</p> <p>iii) In the event of the specified date of Prebid meeting or opening of Technical/Financial Bids as mentioned above being declared a holiday by Govt. of West Bengal or the office of Govt. of West Bengal being closed on any account, the event of specified date will be extended to the next working day</p> <p>iv) All intending bidders are requested to remain present in the chamber of the Tender Inviting Authority during opening of the Financial Bid, to witness the tender opening procedure.</p>	
9	Time of completion	12 months from the date of issue of Work Order.	
10	Site inspection & general information	Intending Bidders are required to inspect the site of the Project with particular reference to location and infrastructure facilities. They are to make a careful study with regard to availability of materials and their sources and all relevant factors as might affect their rates and prices. They are also acquainted with relevant IS specifications with latest amendments, CPHEEO manuals, Clauses & Sub Clauses of the Bid documents and to have fully acquainted with all details of workfront, communications, underground utility services, seasonal weather and its variation, labours, water supply, existing & proposed site levels, position and diversion of transportation and barricading, if required, electricity and any other	

		<p>general information including topological condition & existing level and level pertaining to and needed for the work to be completed in time properly.</p> <p>Note- HFL/LWL/HTL (High Tide Level) should be collected by the bidder.</p>
11	Bid documents	<p>A full set of Bid documents consists of 2 Parts. These are -</p> <p>PART I :- Containing all documents in relation to the name of the firm applied for and credential possessed along with all documents as depicted in SI. No. 4 above and all corrigenda's of this NIT and forms for Declaration.</p> <p>PART II :- Containing the Following Document.</p> <p>BOQ</p>
12	Validity of Bid	<p>A Bid submitted shall remain valid for a period of 270 calendar days from the date set for opening of Bids. Any extension of this validity period if required will be subject to reciprocal concurrence of the Bidders & the TIA.</p>
13	Withdrawal of Bid	<p>A Bid once submitted shall not be withdrawn within the validity period. If any Bidder/Bidders withdraw his/their Bid(s) within the validity period then Earnest Money as deposited by him/them will be forfeited.</p>
14	Acceptance of Bid	<p>The "The Superintending Engineer, South Circle, M.E.Dte." will accept the Bid. He /She does not bind himself/herself to accept otherwise the lowest Bid and reserves to himself/herself the right to reject any or all of the Bids received without assigning any reason thereof.</p>
15	Intimation	<p>The successful Bidder will be notified in writing of the acceptance of his Bid. The Bidder then becomes the "Contractor" and he shall forthwith take steps to execute Formal Contract Agreement in appropriate FORM (W.B. form-2911 with the "The Superintending Engineer, South Circle, M.E.Dte." and fulfill all his obligations as required by the Contract.</p>
16	Escalation of Cost	<p>There will be no escalation in cost for materials or labour and the contract price mentioned in the contract stands valid till completion of the contract, and other obligation, if any.</p>
17	Name & address of Engineer-In-Charge (EIC) of the Work	<p>Executive Engineer, East Midnapore Division, Municipal Engineering Directorate, Department of UD & MA, Phone: 8918928723 E-mail ID – medmideast@yahoo.com.</p>
18	Execution of Work	<p>The Contractor is liable to execute the whole work as per direction and instruction of the Executive Engineer, East Midnapur Division of Municipal Engineering Directorate who is the Engineer in Charge of the work after due approval of "The Superintending Engineer, South Circle, M. E. Dte."</p>
19	Payment	<p>Payment will be made to the successful Bidder by the "The Executive Engineer, East Midnapore Division. M. E. Dte" periodically.</p>
20	Influence	<p>Any attempt to exercise undue influence in the matter of acceptance of Bid is strictly prohibited and any Bidder who resorts to this will render his Bid liable to rejection.</p>
<p>Following clauses are to be adhering to by the concerned Bidder during the process of Bidding.</p>		
21	<p>In case office faces sudden closure owing to reason beyond the scope and control of " The Superintending Engineer, South Circle, M.E.Dte.", any of last date/dates as schedule in SI. No 8 may be extended up-to/to next and following working day without issuing further and separate notice should the "The Superintending Engineer, South Circle, M.E.Dte ", feels it to be necessary and exigent.</p>	

22	Persons having authenticated and having registered Power of Attorney may be considered lawfully becoming to be acting on and for behalf of the Bidder.
23	Sufficient care has been taken to avoid variance in between the contents of the listed Documents in the Bid document. However, if there is any variance between the contents of different documents, the provision of documents appearing earlier in the list shall prevail over the same provided in the contents coming later.
24	Imposition of any duty/tax/rule etc. owing to change /application in legislations/enactment shall be considered as a part of the contract and to be adhering to by the Bidder/Contractor strictly.
25. a	Rates quoted by bidder shall be inclusive of statutory taxes and levies payable under respective statutes.
25. b	Bid Acceptance Authority is the "The Superintending Engineer, South Circle, M.E.Dte.
26	In case of any dispute arising from any clauses of similar nature between bid documents and Form No. 2911, the decision of the Superintending Engineer, Circle, M.E.Dte will be final and binding.
27	All usual deductions for taxes as applicable i.e. GST, IT, and Labour welfare cess etc. as applicable will be made from the bills from time to time as per prevailing Govt. orders and norms.
28	No conditional Bid shall be entertained.
29	In the event of e-Filing intending bidder may download the Bid document from the website http://wb.tender.gov.in directly by the help of Digital Signature Certificate & necessary cost of Bid document (if any) may be remitted through online payment Gateway & same may be documented along with earnest money Deposit through e-Filing, (scanned copy to be submitted) (Details of which has been narrated in "Instruction to Bidders"). Technical Bid & Financial Bid both will be submitted concurrently duly digitally signed in the Website http://etender.wb.nic.in . Bid document may be downloaded from website & submission of Technical Bid/Financial Bid as per Bid Schedule.
30	The requisite Earnest Money, as specified in this NIEB may be remitted by selecting from either of the following payments modes: - i) Net Banking (any of the banks listed in the ICICI Bank Payment gateway) in case of payment through ICICI Bank Payment Gateway; ii) RTGS/NEFT in case of offline payment through bank account in any Bank and also to be documented through e-filling. Every such payment shall be made on or after the date of publish of NIEB. Any Bid without payment of requisite Earnest Money (Except exemption as per G.O.) shall be treated as informal and shall be automatically cancelled.
31	The Bidder, at the Bidder's own responsibility and risk is encouraged to visit and examine the site of works and its Surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for the work as mentioned in the Notice inviting Bid, the cost of visiting the site shall be at the Bidder's own expense. Traffic management and execution shall be the responsibility of the Agency at his/her/their risk and cost.
32	Prospective applicants are advised to note carefully the minimum qualification criteria as Mentioned in 'Instructions to Bidders' before bidding.
33	During scrutiny, if it is come to the notice to Bid inviting authority that the credential or any other papers found incorrect/manufactured/fabricated, that Bidder will not be allowed to participate in the Bid and that application will be out rightly rejected without any prejudice.
34	Before issuance of the work order, the Bid inviting authority may verify the Credential & other documents with the original of the lowest bidder, if found necessary. After verification, if it is found that such documents submitted by the lowest bidder is either manufactured or false, in that case, L.O.A./ work order will not be issued in favour of the bidder under any circumstances.

35	If any discrepancy arises between two similar clauses on different notifications, the decision of "Superintending Engineer, South. Circle, M.E.Dte" is final & binding.
36	Contractor shall have to comply with the provisions of (a) the contract labour (Regulation Abolition) Act. 1970, (b) Apprentice Act. 1961 and (c) minimum wages Act.1948 of the notification thereof or any other laws relating thereto and the rules made and order issued there under from time to time.
37	Where an individual person holds a digital certificate in his own name duly issued to him against the company or the firm of which he happens to be a director or partner, such individual person shall, while uploading any Bid for and on behalf of such company or firm, invariably upload a copy of registered power of attorney showing clear authorization in his favour, by the rest of the directors of such company or the partners of such firm, to upload such Bid. The power of attorney shall have to be registered in accordance with the provisions of the Registration Act,1908. In case of Joint Venture, either all Members shall sign or only the Lead Member shall sign, in which case the power of attorney in favour of such Lead Member to sign on behalf of all members of the Joint Venture shall be attached.
38	Any legal matter will be settled within the jurisdiction of Hon'ble District Judges Court at Tamluk , Dist.- PurbaMedinipore, West Bengal.
39	Bidder would be at liberty to point out any ambiguities, contradictions, omissions etc. seeking clarifications thereof or interpretation of any of the conditions of the Bid documents before the Bid Inviting Authority in writing 48 hours prior to Pre-Bid Meeting, beyond such period no representation in that behalf will be entertained by the Bid Inviting Authority.
40	The successful Bidder will remain liable for following with West Bengal Contract Labour (Regulation & Abolition) Act 1970 and necessary certificates from appropriate authority to be submitted within 07 (seven) days from the date of issue of work order, otherwise the work order will be cancelled.
41	Successful Bidder will have to submit requirement of all materials, work programme and Working drawing for laying and sectional drawing as per IS Specification for each dia. of pipe <u>after awarding work order by competent authority.</u>
42	Deduction of tax, royalty ,Labour welfare Cess& GST As per prevailing Govt. orders/norms or as per notification during work.
43	No mobilization Advance and Secured Advance will be allowed. Agencies shall have to arrange required land for installation of Plant & Machineries, (specified for each awarded work, storing of materials, labour shed, laboratory etc. at their own cost and responsibility nearest to the work site)
44	Payment will be made phase wise against each item of work as per BOQ of the bid document. Security Deposit will be deducted from each and every running account bill @8% as per prevailing Govt. Orders/Norms.

45	<p>Defect Liability Period- Defect liability period Should be observed for 5 (Five) Years from the date of completion. (As per Notification No. 5784-PW/L&A/2M-175/2017 dt. 12.09.2017 of Principal Secretary, PWD).</p> <p>Release of Security Deposit:</p> <p>No amount shall be refunded to the contractor for first 3 (three) years from the actual date of completion of the work;</p> <p>30% (thirty percent) of the same shall be refunded to the contractor on expiry of 4 (four) years from the actual date of completion of the work;</p> <p>The balance 70% (seventy percent) of the same shall be refunded to the contractor on expiry of 5 (five) years from the actual date of completion of the work.</p>
46	<p>In case of item rate tender, the technically qualified bidder, whose total offered price considering sum of offered prices of all the items of works taken together, stands lowest, will be considered for acceptance. In no case lowest bidder of individual items of works will be considered for acceptance for the corresponding items of works.</p>
47	<p>Tender inviting Authority may ask to submit justification of rate offered by the bidder.</p>
48	<p>The employer (Tender accepting authority) reserves the right to accept or reject any quotation and to cancel the quotation process and reject all quotations at any time prior to the award of contract without thereby incurring any liability to the affected Tenderers or any obligation to inform the affected Tenderers of the ground for employer's (Tender accepting authority) action.</p>
49	<p>Technical Personnel-The prospective tenderer shall have in their full time engagement experienced technical personnel. (Authenticated documents in respect of qualification and engagement shall be furnished for Technical Evaluation)</p> <p>Civil Engineer (Minimum Diploma holders with min. 3 Yrs. of experience in construction field): 1 no.</p> <p>Note: 1) The bidder must be submitted the relevant document in proof of employment along with educational qualification & experience.</p> <p>2) Declaration as per annexed format from the end of the engineer also has to be submitted.</p>

Bid Evaluation Committee (BEC):

A Bid Evaluation Committee (BEC) has been constituted under the Superintending Engineer, South Circle, Municipal Engineering Directorate, Government of West Bengal.

The members of Bid Evaluation Committee:-

1. Superintending Engineer ,South Circle, MED- Chairman
2. Executive Engineer, EastMidnapore Division, MED- Member.
3. Executive Engineer, South Circle, MED - Member.
4. Divisional Accounts Officer / Divisional Accountant, EastMidnaporeDivision, MED - Member.

The Bid Evaluation Committee will do the technical and financial evaluations and make recommendation to the tender accepting authority.

The bidders will have to meet all the minimum criteria regarding:-

Financial Capacity

Technical Capability

Experience / Credential

The eligibility of a bidder will be ascertained on the basis of his digitally signed documents in support of the minimum criteria as mentioned in (a), (b), (c) above with the help of his DSC and the declaration executed through prescribed affidavit in non-judicial stamp paper of appropriate value duly notarized. If any document submitted by a bidder is either manufactured or false, in such case the eligibility of the bidder/ tenderer will be out rightly rejected at any stage without any prejudice and further penal action may be taken against him as per rule.

In case there is any objection regarding prequalifying an agency, that should be lodged to the Chairperson & Convenor of the Bid Evaluation Committee

General notes:

- (a) Bidders may participate either individually (the "Sole Firm") or as a Joint Venture of two firm under an existing agreement in the form of a Joint Venture (JV)
- (b) Bidder (In case of JV, any of the JV partner) must have a Registered Office or a functional office in the State of West Bengal. If any functional office is not already there at the time of bidding, successful bidder shall have to establish one within 30 days of award of contract. Payment shall be released only after submission of documentary evidence of having Functional Office, otherwise contract shall be terminated.

- (c) The Bidder should also upload Place of Registration, Principal Place of Business & Power of attorney of signatory of tender.
- (d) The annual turnover shall be based on audited balance sheets of last 5 (five) consecutive financial years.
- (e) The drawing and design to be submitted by the successful bidder in connection to the work for the components stated in the Bid.
- (f) Canvassing in connection with the e-tenders is strictly prohibited and the tenders submitted by bidder who take resort to canvassing will be liable to rejection.
- (g) Partnership Firms shall furnish the registered partnership deed and Companies shall furnish the Article of Association and Memorandum. [Non Statutory Documents]
- (h) In case of Proprietorship and Partnership Firms and Company, the Tax Audited Report to be furnished along with balance sheet and profit and loss account and all schedules forming the part of Balance Sheet and Profit & Loss Account in favour of applicant. No other name along with applicant name, in such enclosure will be entertained. [Non Statutory Documents]
- (i) Submission of Income Tax Acknowledgement Receipt for Current Assessment Year is mandatory.
- (j) Any legal matter will be settled within the jurisdiction of the Hon'ble District Judges' Court at Tamruk, Distt.-PurbaMedinipore, West Bengal.
- (k) The bidder would be at liberty to point out any ambiguities, contradictions, omissions etc. seeking clarifications thereof or interpretation of any of the conditions of the Tender documents before the Tender Inviting Authority in writing within the stipulated date and time as mentioned in this e-NIQ. Beyond such period no representation in this regard will be entertained by the Tender Inviting Authority. The Pre-Bid Meeting, if any, will be held at the Office of the Superintending Engineer, South Circle, M.EDte on Stipulated date &time.
- (l) Written clarification or amendments etc. as may be issued by the Tender inviting authority in pursuance to the presentation made by the Bidder shall be final and binding on the Bidder and shall form part of the Tender documents
- (m) Before issuance of the Acceptance / Work Order, the tender inviting authority may verify the credential & other documents of the lowest bidder if found necessary. After verification, if it is found that such documents submitted by the lowest tender is either manufactured or false in that case, work order will not be issued in favour of the lowest bidder under any circumstances.
- (n) In case of ascertaining authority at any stage of tender process or execution of work necessary registered irrevocable power of attorney is to be produced on demand.

- (o) In case of tie bid, L1 bidder will be selected following the prescribed procedure mentioned in the Memorandum No.-2320-F(Y), Dated-7.6.2022 of the Principal Secretary, Finance Department, Govt. of W.B.

Electrical Licence and LabourLicence:

Upon receipt of acceptance order, the successful bidder has also to obtain the labourlicence from the office of the Joint Labour Commissioner of the concerned District in which the location/site of the work falls, under the provision of W.B. Contract labour (Regulation & Abolition) rules, 1972 and Electrical Licence and Electrical Supervisory Licence has to be obtained by the bidder from the appropriate authority. Copies of the licenses are to be submitted to this office through the concerned Executive Engineer before execution of deed of contract.

Penalty for suppression / distortion of facts

If any bidder fails to produce the original hard copies of the documents or any other documents on demand of the Tender Inviting Authority within a specified time frame or if any deviation is detected in the hard copies from the uploaded soft copies or if there is any suppression, the bidder will be suspended from participating in the tenders on Tender platform for a period of 3(three) years. In addition, his User Id will be deactivated and Earnest Money Deposit will stand forfeited, besides, the tender inviting authority may take appropriate legal action against such defaulting bidder.

Award of Contract

The Tender Inviting Authority reserves the right to accept or reject any Bids and Cancel the Bidding processes and reject all Bids at any time prior to the award of Contract without thereby incurring any liability to the affected Bidders or any obligation to inform the affected Bidder or Bidders of the ground for Tender Inviting Authority's action. The Bidder whose Bid has been accepted will be notified by the Tender Inviting & Accepting authority through acceptance letter. The notification of award will constitute the formation of the Contract

.Security Deposit/Deduction.:

The entire deposited amount as EMD shall be converted to initial security deposit in case of successful bidder.

ii) Balance amount of security deposit (10% of the accepted value of the work or as per Govt Order amended time to time - EMD already deposited) will be deducted from each progressive bill of work. All duties, taxes, royalties, cess and also an amount equal to 1% of the contract amount will be deducted from the RA bill / final bill on account of "the building and other construction work (regulation of employment and condition of service) Act, 1996" and "The building and other construction work welfare cess Act, 1996" apart from other statutory deductions from bills/

payment due & GST will be deducted as per Govt norms. Royalty Certificate need to be produced from appropriate authority. Otherwise necessary deduction should be made from the bill.

Payment

Payment of RA as well as final bill will depend upon the availability of fund and no financial claim in case of any delay in payment will be entertained. Payment on supply without successful erection and commissioning will not be entertained. Materials which will be supplied should be supported by valid challans.

The bidder will notify the authority regarding the work being completed. The quantity and quality of executed work will be taken into account for the preparation of bill. The engineers shall field verify the work executed. Only the items which are successfully installed and commissioned will be taken in the preparation of bill.

All the applicable routine test, type test and other test reports shall be submitted along with the bill prayer.

PAYMENT TERM

Major Payment break-up of following sub-items of BOQ are as under :

A	Survey, Geo-Technical investigation, Planning, Design, Construction and Commissioning of Fixed Type Jetty head for facilitating erection of suction assembly consisting of all Civil, Mechanical and Electrical works, accommodating pumping machinery (20 hours operation) for pumping of Raw Water to inlet well at 14 MLD capacity WTP, working bay and also act as marine protection to the pump and other assemblies etc in tidal rivers supported on piles of appropriate size including construction of PUMP HOUSE for pumping machineries over intake jetty and installation of Raw water Pumps and allied works including Sub-station building, Pipe carriageway(min. 3m width), Land Development, Boundary wall with Gate, Masonry Drain, Bituminous approach Road, RCC Retaining Wall, Guard Room, River Bank Protection work with necessary testing, structural testing, equipment testing etc. all complete as per direction by Engineer-in-charge and 3 months trial run after successful commissioning.	18 % of Quoted Amount as per BOQ
B	Survey, Geo-Technical investigation, Planning, Design, Construction and Commissioning of a Conventional 14 MLD Capacity WATER TREATMENT PLANT consist of Inlet well, Parshall flume, Flash mixer, Chemical House, Clariflocculator Rapid Gravity Filters with under drainage system, connecting pipes and channels, , Clear water Reservoir with pump house for accommodating Clear Water Pump (21 hours operation), Back-wash water Tank, Sludge sump-cum-pump house, Sludge lagoon, Sub-station building etc as per BIS/CPHEEO Manual consisting of all Civil, Mechanical and Electrical works including consisting of HT Sub Station including supply and installation of Chlorination arrangements and allied works i.e. Land development, Internal road, storm water drains, administrative building (for accommodating office, laboratory, SCADA room, conference	59 % of Quoted Amount as per BOQ

	room etc.), staff quarter, boundary wall, guard room and , Approach road, Retaining Wall etc. necessary testing, structural testing equipment testing all complete as per direction by Engineer-in-charge and 3 months trial run after successful commissioning	
C	Laying of D.I. (K-9) and MS pipes with all kinds of Specials and valves from Intake to WTP site including earth work in excavation in any kind of soil having minimum depth to keep the top surface of pipe 1.10 m below of the existing ground level for under-ground installation and for Over-Ground installation in small ditches etc. supported with RCC pillars including fitting, fixing, jointing (all types of joints), specials, valves etc. as per requirement, in position, cutting, chamfering of pipes as required & construction of Valves Chamber, Thrust Blocks etc.as per requirement and necessary hydraulic pressure testing including Cleaning and disinfection thoroughly the inner surface of pipe line, specials and valves etc. and Submission of complete detailed drawing of Rising Main Intake to WTP after execution of work showing position of different types of valves, fittings, specials, with location and temporary Roads Restoration work for vehicular movement as per scope of the work as well as relevant IS code and direction of EIC all complete.	8% of Quoted Amount as per BOQ
D	Surveying, designing,drawing and construction of M.S Pipe Carrying Bridge with suitable foundation including supply of all materials & complete in all respect as direction of EIC and as per scope of work	3% of Quoted Amount as per BOQ
E	Survey, drawing ,Supplying and laying of M.S. Conduit 750mm dia. (internal) 10mm thick as casing pipe and 450mm dia (internal) 8mm thick M.S. carrier pipe with necessary specials across & Road crossing for Raw Water Rising Main by Jack Pushing Technique with necessary pit arrangement and providing all kinds safety measure and making connection with the proposed pipe line on both sides including necessary temporary road restoration and hydraulic testing as per relevant IS code all complete.	1% of Quoted Amount as per BOQ
F	5 (five) years Operation & Maintenance of Intake, WTP & HT Sub-Station after 3 months trial run.	11% of Quoted Amount as per BOQ
Note :All materials are to be supplied by the agency at his own cost except DI (K-9) Pipe & rubber gasket which will be supplied from departmental store, necessary charges for carrying of DI pipe will be borne by the agency at his own cost.		

Deduction of tax, royalty ,Labour welfare Cess& GST

All duties, taxes, royalties, labour welfare cess and also an amount equal to 1% of the contract amount will be deducted from the RA bill / final bill on account of “the building and other construction work (regulation of employment and condition of service) Act, 1996”

and “The building and other construction work welfare cess Act, 1996” apart from other statutory deductions from bills/ payment due & GST will be deducted as per Govt norms

Minimum Wages

Contractor shall have to comply with the provisions of (a) the contract labour (Regulation Abolition) Act. 1970(b) Apprentice Act. 1961 and (c) minimum wages Act. 1948 of the notification thereof or any other laws relating thereto and the rules made and order issued there under from time to time.

Cost of Tender Documents:

The intending Bidders shall not have to pay the cost of tender documents for the purpose of participating in e-tendering vide Notification No. 199-CRC/2M-10/2012 dated 21/12/2012 of the Secretary, Public Works Department, Government of West Bengal. However, the successful bidder shall have to pay the cost of contract documents as per notification no-452-A/PW/O/10C-35/10 Dated:26.07.2011 of PWD Govt of West Bengal only per set at the time of formal agreement.

Laboratory Test:

The successful bidder will have to establish field testing laboratory equipped with requisite instruments in conformity with relevant code of practice and technical staff according to the requirements of works to be executed. The executing agency will have to produce satisfactory test report of all the materials of the work as well as on samples collection jointly by him and concerned authority of the Engineer-in-Charge from all completed / ongoing items of works as per relevant codes of practice at his own cost from any Govt. approved / Govt. testing laboratory during execution of works. The successful bidder will have to bring all requisite plants and mechanical equipment and / or technical personnel and / or laboratory and field testing machineries and equipment for all the items of work as per BOQ and / or as per relevant IS / IRC Codes of practice and / or as per direction of the Engineer-in-Charge and / or as per relevant PWD Schedule of Rates at the time of execution of work at site even if upon technical evaluation he is declared as “qualified” without having all the requisite plants and mechanical equipment and / or technical personnel and / or laboratory and field testing machineries and equipment at the time of submission of bid.

No Mobilisation Advance:

No Mobilisation Advance and Secured Advance will be allowed. Agencies shall have to arrange required land for installation of Plant & Machineries, (specified for each awarded work, storing of materials, labour shed, laboratory etc. at their own cost and responsibility nearest to the work site.

Influence

Any attempt to exercise undue influence in the matter of acceptance of Tender is strictly prohibited and any bidder who resorts to this will render his bid liable to rejection.

- If any discrepancy arises between two similar clauses on different notifications,

the clause as stated in later notification will supersede former one in following sequence:

- (i) West Bengal Form No. 2911(ii)
- (ii) NleB
- (iii) Special terms & Conditions
- (iv) Technical bid
- (v) Financial bid

In case of inadvertent typographical mistake in the BOQ / Schedule of Works/ Price Schedule/rates /elsewhere, the same may be treated to be so corrected as to conform with the relevant schedule of rates and / or technically sanctioned estimate.

Bid Evaluation Committee (BEC):

A Bid Evaluation Committee (BEC) has been constituted under the Superintending Engineer (South Circle), Municipal Engineering Directorate, Government of West Bengal, who is the tender inviting authority for all works beyond the tender accepting power of the Executive Engineers.

The members of Bid Evaluation Committee would be:-

1. Superintending Engineer (South Circle)- Chairman
2. Executive Engineer(East Midnapore Division)- Member.
3. Executive Engineer, (South Circle)- - Member.
4. Divisional Accounts Officer / Divisional Accountant (East Midnapore Division) - Member.

The Bid Evaluation Committee will do the technical and financial evaluations of the bidders for different types of works and make recommendation to the tender accepting authority. The bidders will have to meet all the minimum criteria regarding:-

Financial Capacity

Technical Capability

Experience / Credential

The eligibility of a bidder will be ascertained on the basis of his digitally signed documents in support of the minimum criteria as mentioned in (a), (b), (c) above with the help of his DSC and the declaration executed through prescribed affidavit in non-judicial stamp paper of appropriate value duly notarized. If any document submitted by a bidder is either manufactured or false, in such case the eligibility of the bidder/

tenderer will be out rightly rejected at any stage without any prejudice and further penal action may be taken against him as per rule.

In case there is any objection regarding prequalifying an agency, that should be lodged to the Chairperson & Convenor of the Bid Evaluation Committee.

Defect Liability Period:-

For Civil work defect liability period should be observed for 5 (Five) Year from date of completion. (As per Notification No. 5784-PW/L&A/2M-175/2017 dt. 12.09.2017 of Principal Secretary, PWD).

Refund of Security Deposit:

In cases of Refunding and Releasing of 100% (one hundred percent) Security Deposit held with the Government, arising out from works contract, Security Deposit will be released after issuance of Completion Certificate.

For Civil work with 5 (five) years Defect Liability Period:

No amount shall be refunded to the contractor for first 3 (three) years from the actual date of completion of the work;

30% (thirty percent) of the same shall be refunded to the contractor on expiry of 4 (four) years from the actual date of completion of the work;

The balance 70% (seventy percent) of the same shall be refunded to the contractor on expiry of 5 (five) years from the actual date of completion of the work.

Note: All addendum and corrigendum, if published through <https://wbtenders.gov.in> in relation to this tender, will have to be considered as parts and parcel of this comprehensive tender document. Bidders have to follow all publications carefully and it will be the responsibility of the bidder to finalize their quoted Rate before the date of final submission.

Justification of offered rate-

Tender inviting Authority may ask to submit justification of rate offered by the bidder (if required).

Penalty for suppression / distortion of facts:

If any Tenderers fails to produce the original hard copies of the documents uploaded or any other documents on demand of the Tender Inviting Authority within a specified time frame or if any deviation is detected in the hard copies from the uploaded soft copies or if there is any suppression, the Tenderers will be

suspended from participating in the tenders on e-Tender platform for a period of 3 (Three) years. In addition, his/her/their user ID will be deactivated and Earnest Money Deposit will stand forfeited. Besides, The Superintending Engineer, South Circle , Municipal Engineering Directorate, may take appropriate legal action against such defaulting Tenderers. The authority may ask to show hard copies of all certificates, company details, partnership deeds etc. etc. as uploaded by the Tenderers and allied papers in connection with this tender as and when necessary for verification purpose as per convenience of the authority during processing of this tender.

Rejection of Tender

The employer (Tender accepting authority) reserves the right to accept or reject any Quotation and to cancel the quotation process and reject all quotations at any time prior to the award of contract without thereby incurring any liability to the affected Tenderers or any obligation to inform the affected Tenderers of the ground for employer's (Tender accepting authority) action

**Superintending Engineer
South Circle, M.E.Dte.**

CHAPTER-1
INSTRUCTION TO BIDDERS/BIDDERS
SECTION – A

1. General guidance for e-tendering

Instructions / Guidelines for Bidders for electronic submission of the tenders have been annexed for assisting them to participate in e-tendering.

2. Registration of Bidder

Any Bidder willing to take part in the process of e-tendering will have to be enrolled and registered with the Government e-procurement system, through logging on to <http://wbtenders.gov.in>. The Bidder is to click on the link for e-tendering site as given on the web portal.

3. Digital Signature certificate (DSC)

Each Bidder is required to obtain a class-II or Class-III Digital Signature Certificate (DSC) for submission of tenders, from the service provider of the National Information's Centre (NIC) or any other bonafide service

provider on payment of requisite amount. Details are available at the Web Site stated in Clause 2 of Guideline to Bidder. DSC is given as a USB e-Token.

4. The contractor can search and download NIB and Tender Documents electronically from computer once he logs on to the website mentioned in Clause 2 using the Digital Signature Certificate. This is the only mode of collection of Tender Documents.

5.Submission of Tenders.

General process of submission, Tenders are to be submitted through online to the website stated in Cl. 2 in two folders at a time for each work, one in Technical Proposal and the other is Financial Proposal before the prescribed date and time using the Digital Signature Certificate (DSC) the documents are to be uploaded virus scanned copy duly Digitally Signed. The documents will get encrypted (transformed into non readable formats).

A. Technical proposal

The Technical proposal should contain scanned copies of the following further two covers (folders).

A-1. Statutory Cover Containing

1. Prequalification Document

- i. Prequalification Application (Sec-B, Form – I)
- ii. Scanned Copy online Transaction of earnest money (EMD) as prescribed in the NleB against each of the serial of work.

2. NleB with Bid Documents (downloads and upload the same Digitally Signed)

3. Technical Document (To be filled, scanned & digitally signed)

- i. Financial Statement (Section – B, Form – II).
- ii. Affidavits(Ref. :- format for general affidavit shown in “Y” Part “B”.)
- iii. Bank Solvency Certificate.
- iv. Form III & IV of Section B.

A-2. Non statutory Cover Containing / My Documents

- i. GST Certificate (up to date).
- ii. Registration Certificate under Company Act. (if any).
- iii. Registered Deed of partnership Firm/ Article of Association and Memorandum, if applicable.
- iv. Power of Attorney (For Partnership Firm/ Private Limited Company, if any)
- v. Tax Audit Report along with Balance Sheet and Profit and Loss A/c for the period up to last five years(year just preceding the current Financial Year will be considered as year – I)
- vi. Clearance Certificate for the Current Year issued by the Assistant Registrar of Co-Op (S) (ARCS) bye laws are to be submitted by the Registered labour Co-Op(S) Engineers’ Co.-Opt.(S), if applicable.
- vii. Credential: Scanned copy of Original Credential Certificate as stated in NleB.

Intending Bidders should upload Non-Statutory documents as per following folders in My Document:

E-Bidding system of Government of West Bengal
Bidder Document Sub Category Master

Sl. No.	Category Name	Sub Category Name	Sub Category Description
A	CERTIFICATES	A1. CERTIFICATES	1. GST Certificate 2. E.S.I & EPF Registration Certificate.
B	COMPANY DETAILS	B1. COMPANY DETAILS	1. Proprietorship Firm (Trade License). 2. Registered Deed of partnership Firm 3. Registration Certificate under Company Act. (if any). Ltd. Company (Incorporation Certificate, Trade License) 4. Power of Attorney (For Partnership Firm / Private Limited Company, if any) 5. Society (Society Registration copy, Trade License)
C	CREDENTIAL	C1. CREDENTIAL1	Similar nature Work & Completion Certificates/certificate of running work along with work order, BOQ and payment certificate issued by competent authority (as per Sl. No. 3 of NleB)
D	EQUIPMENT	LABORTARYequipments& other MACHINERIES	1. List of Machineries and equipment necessary for field as well as laboratory test of all materials as per NleB
E	FINANCIAL INFO	E1. P/L & BALANCE SHEET	P/L & BALANCE SHEET (as per NleB)
		E2. PAYMENT CERTIFICATE 1	Payment Certificate in support of valid Credential only to be submitted
		E3. PAYMENT CERTIFICATE 2	
F	MANPOWER	TECHNICAL PERSONNEL	List of technical personnel employed under the organisation (or on contact basis) in details with name, qualification, experience and, address with contact number.
G	DECLARATION	DECLARATION 1	1. Bank Solvency Certificate (As per NleB)
		DECLARATION 2	2. Valid Document in support of annual turnover as per NleB.
		DECLARATION 3	3. Corrigendum and additional document (if any).

B. Bid Evaluation

i. Opening and evaluation of Bid :-No exemption from payment of EMD will be allowed.

ii. Opening of Technical proposal: - Technical proposals will be opened by the Bid Inviting Authority electronically from the website using his/ her Digital Signature Certificate.

iii. Cover (folder) of statutory documents (vide Cl. No. 5.A-1) should be opened first and if found in order, cover (Folder) for non-statutory documents (vide Cl. No.– 5.A-2) will be opened. If there is any deficiency in the statutory documents the Bid will summarily be rejected.

iv. Decrypted (transformed in to readable formats) documents of the non-statutory cover will be downloaded and handed over to the Bid Evaluation Committee. Scrutiny of technical proposal and recommendation thereafter and processing of comparative statement for acceptance etc. will be made by the Municipal Engineering Directorate, under the department of Municipal Affairs, Govt. of West Bengal. Comparative Statement may be forwarded to appropriate authority depending on the value of the work as applicable as per existing norms and guidelines under AMRUT programme.

v. Uploading of summary list of technically qualified bidders.

vi. Pursuant to scrutiny and decision of the screening committee the summary list of eligible Bidder and for which their proposal will be considered and uploaded in the web portals.

C. Financial proposal

As per Sl. 9 Part II (a) , Bid Price / Price Schedule. To be uploaded digitally signed by the Bidder.

6. Financial capacity of a Bidder will be judged on the basis of working capital and available bid capacity as mentioned in the N.I.T. to be derived from the information furnished in FORM-I and II (Section-B) i.e., Application (for Pre-qualification) and Financial Statement. If an applicant feels that his / their Working Capital beyond own resource may be insufficient, he/they may include with the application a letter of guarantee issued by a Nationalised/Scheduled Bank to supplement the applicant. This letter of guarantee should be addressed to the Tender Inviting / Accepting Authority and should guarantee duly specifying the name of the project that in case of contract is awarded to the Bidder, the Bidder will be provided with a revolving line of credit. Such revolving line of credit should be maintained until the works are taken over by the Authority.

The audited Balance sheet for the last five years, net worth bid capacity etc. are to be submitted which must demonstrate the soundness of Bidder's financial position, showing long term profitability including an estimated financial projection of the next two years.

7. Penalty for suppression / distortion of facts:

Submission of false document by Bidder is strictly prohibited and in case of such act by the Bidder the same may be referred to the appropriate authority for prosecution as per relevant IT Act with forfeiture of earnest money forthwith.

8. REJECTION OF BID

The Employer (tender accepting authority) reserves the right to accept or reject any Bid and to cancel the Bidding processes and reject all Bids at any time prior to the award of Contract without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the ground for Employer's (tender accepting authority) action.

The Bidder who's Bid has been accepted will be notified by the Tender Inviting and Accepting Authority through acceptance letter/ Letter of acceptance. The Letter of acceptance will constitute the formation of the Contract.

The Agreement in Printed Tender Form will incorporate all necessary documents e.g. N.I.B., all addenda-corrigendum, special terms and condition (Section –C), different filled-up forms (Section –B), Price Schedule and the same will be executed between the Tender Accepting Authority and the successful Bidder.

FORM —I
PRE-QUALIFICATION APPLICATION

To
The Superintending Engineer
South Circle, M.E.Dte.

Ref: Bid

For _____

Name of work _____

NieB No.:.....

Dear Sir,

Having examined the Statutory, Non statutory and NieB documents, I /we hereby submit all the necessary information and relevant documents for evaluation. The application is made by me / us on behalf of _____ In the capacity _____

dulyauthorized to submit the order.

The necessary evidence admissible by law in respect of authority assigned to us on behalf of the group of firms for Application and for completion of the contract documents is attached herewith.

We are interested in bidding for the work(s) given in Enclosure to this letter.

We understand that:

(a) Bid Inviting and Accepting Authority can amend the scope and value of the contract bid under this project.

(b) Bid Inviting and Accepting Authority reserves the right to reject any application without assigning any reason.

Encl:- e-Filling:-

1. Statutory Documents
2. Non Statutory Documents

Date: -

**Signature of applicant including title
and capacity in which application is made**

N.B :-THIS APPLICATION MUST BE MADE IN THE LETTER HEADED PAD OF THE FIRM CLEARLY MENTIONING THE ADDRESS, E-MAIL AND CONTACT NUMBER OFTHE FIRM.

AFFIDAVIT — "X"

(To *be* furnished in Non — Judicial Stamp paper of appropriate value duly notarized)

Work in progress				Work order issued but work not started		
Sl. No.	Name of the work with Tender No.	Tender Amount	% of work executed	Sl No.	Name of the work with Tender No.	Tender Amount

Signature, name and designation
of Authorized Signatory

For and on behalf of
(Name of the Applicant)

AFFIDAVIT — "Y"

(To be furnished in Non — Judicial Stamp paper of a appropriate value duly notarized)

1. I/We, the under-signed do certify that all the statements made in the attached documents are true and correct. In case of any information submitted is proved to be false, incorrect or concealed, the application may be rejected and no objection/claim will be raised by the under-signed.
2. The under-signed also hereby certifies that neither our firm _____ nor any of its constituent partners had been debarred to participate intender by any government organization/semi-government organization/government undertaking organization/autonomous bodies/statutory bodies/local bodies/local authorities/PSU, etc. during the last 5(five) years prior to the date of publication of this NIT.
3. Certified that I have access to or have available liquid assets (aggregate of working capital, cash-in-hand, uncommitted Bank Guarantees) and/or credit facilities not less than 10% of the estimated cost. In this respect, I have attached necessary documents with this application. The under-signed would authorize and request any Bank, person, Firm or Corporation to furnish pertinent information as deemed necessary and/or as requested by the Department to verify this statement.

If the applicant is a Joint Venture, insert the following: Certified that we have access to or have available liquid assets (aggregate of working capital, cash-in-hand, Bank Guarantees) and for and /or credit facilities (i) for all partners combined not less than ₹4.0 Crore, (ii) for each partner, not less than ₹1.25 Crore and (iii) for one partner, not less than ₹2.5 Crore. In this respect, we have attached necessary documents with this application

4. The under-signed understands and agrees that further qualifying information may be requested and agrees to furnish any such information at the request of the Department.
5. Certified that I/we have applied in the tender vide e-NIT noin the capacity of individual/ as a partner of a firm /& I have not applied severally for the same job.

If the applicant is a Joint Venture, insert the following: We have applied in the Tender as a Joint Venture with: [Insert a list with full name and the legal address of each member. and the Lead the indicate Member). We have attached a [insert: "of copy memorandum of understanding of the Joint Venture" signed by every participating member, which details the likely legal structure of and the confirmation of joint and several liability of the members of the said Joint Venture till completion of the work including the defect liability period.

6. The under-signed also hereby certifies that the Bid shall remain valid for a period not less than 270 (Two Hundred Seventy) days, after the dead line date for Bid submission.
7. I/We, the under-signed, declare that all the statements made in the attached documents in respect of mode of ownership of machineries are true and correct. I shall arrange facilities for different types of day to day testing as per MoRTH, IRC & IS guideline at the working site at my own cost relate to work.
8. Certified that required specified machineries for the works under this NIT will be installed at the working site within 15(fifteen) days from the date of issue of Work Order.
9. I / we do hereby certify that I shall bring all requisite technical personnel and /or plants/ testing machineries / equipments for all the items of works as per relevant IRC / IS codes of practice and as per BOO and as per direction of the Engineer-In-Charge at the time of execution of work at site even if upon Technical evaluation I am declared as "qualified" without having all the requisite technical personnel and /or plants/ testing machineries / equipments at the time of submission of tender.

11. I/We, the under-signed do certify that all the statements made in the attached documents are true and correct. If any declaration submitted is found / ascertain to be incorrect / fabricated / misrepresented / fraudulent etc. accordingly tender will be liable to be cancelled / terminated immediately & I / my firm / company shall also be liable to prosecuted under section 197, 199 & 200 of Indian Penal Code, 1860 along with section-71 & section-73 of Indian Information & Technology Act 2008 & any other applicable law for the time being in force in addition to forfeiture of Earnest Money / Security Deposit.

Date :

Signature, name and designation of Authorized Signatory

For and on behalf of

(Name of the Applicant with seal

[For a Joint Venture, either all members shall sign or only the Lead Member shall sign, in which case the power of attorney in favour of such Lead Member to sign on behalf of all members of the Joint Venture shall be attached]"

Declaration of the Bidder

(Affidavit to be affirmed on a Non Judicial Stamp Paper of appropriate value and enclosed with the Bid documents which is required to be submitted in time duly)

I,,son of, aged aboutyears
byoccupationdo hereby solemnly affirm and confirm as follow:

1. That, I am the of..... have duly authorized by and competent to affirm this affidavit on behalf of the said Bidder.
2. That, I have inspected the site of work covered under NIEB (NIEB No)circulated through Office memo bearing No.....dated.....and have made myself fully acquainted with the site conditions existing level/proposed level and local conditions in and around the siteof work. I have also carefully and meticulously gone through the Bid documents. Bid of the above named Bidder is offered and submitted upon due consideration of all factors and if the same is accepted, I on and for behalf of the aforesaid Bidder, being lawfully and duly authorized, promise to abide by all the covenants, conditions and stipulations of the Contractual documents and to carry out, complete the works to the satisfaction of the Bid accepting Authority of the Work and abide by all instructions as may given by the Engineer in Charge of the work time to time. I also hereby undertake to abide by the provisions of Law including the provisions of Contract Labour (Regulation & Abolition) Act, Apprentice Act 1961, West Bengal Sales Tax Act, VAT Act, Income Tax Act as would be applicable to the Contractor upon entering into formal Contract / agreement with the Bid Inviting/Accepting authority.
3. That I declare that, no relevant information as required to be furnished by the Bidder has been suppressed in the Bid documents.
4. That the statement above made by me is true to my knowledge.

Deponent

Solemnly affirmed by the said

Before me(1st class Judicial Magistrate/ Notary Public)

DECLARATION OF TECHNICAL PERSONNEL

I,..... S/o, D/o, W/o.....residing at do hereby declare that I am a Civil Engineer having qualification, DCE/BCE/MCE and working in the capacity of (Designation) in the organisation namely, address-..... since DD/MM/YYYY.

Copy of my passed certificate has been attached herewith.

Signature with date.....

Name.....

Address.....

Mobile No.....

Email.....

FORM- III

STRUCTURE AND ORGANISATION

A.1 Name of applicant :

A.2 Office Address :

Telephone No. and Cell Phone No. :

Fax No. :

E mail :

A.3 Attach an organization chart showing the structure of the company with names of Key personnel and technical staff with Bio-data. :

Note: Application covers Proprietary Firm, Partnership, Limited Company or Corporation.

**Signature of applicant including title
and capacity in which application is made**

FORM — IV

C. DEPLOYMENT OF MACHINERIES (in favour of owner / lessee): -

(Original document of own possession arranged through lease deed to be annexed)

(If engaged before Certificate from E.I.C. to be annexed in respect of anticipated dated of release of Machineries.)

Name of Machine/ Instrument	Make	Type	Capacity	Motor / Engine No	Machine No.	Possession Status		Date of release/Engaged
						Idle	Engaged	

For each item of equipment the application should attach copies of

- (i) Document showing proof of full payment,
- (ii) Receipt of Delivery,
- (iii) Road Challan from Factory to delivery spot, is to be furnished.

**Signature of applicant including title
and capacity in which application is made**

SECTION – C

Form - II

FINANCIAL STATEMENT

B.1 Name of Applicant :

B.2 Summary of assets and liabilities on the basis of the audited financial statement of the last five financial years.

(Attach copies of the audited financial statement of the last five financial years)

	Preceding 1st Year (Rs. In lakh)	Preceding 2nd Year (Rs. In lakh)	Preceding 3rd Year (Rs. In lakh)	Preceding 4th Year (Rs. In lakh)	Preceding 5th Year (Rs. In lakh)
a) Current Assets : (It should not include investment in any other firm)					
b) Current liabilities : (It should include bank over draft)					
c) Working capital : (a) – (b)					
d) Net worth : (Proprietors Capital or Partners Capital or Paid up Capital + Reserve and surplus)					
e) Bank loan/ Guarantee :					

Work in hand i.e. Work order issued	As on 31.03.2024	As on 31.03.2023	As on 31.03.2022	As on 31.03.2021	As on 31.3.2020

Signed by an authorized officer of the firm

Title of the officer

Name of the Firm with Seal

Date _____

Copy forwarded for information and with a request for wide publicity through the Notice Board to: -

1. The Chairperson ,Board of Administrator, PanskuraMunicipality,PurbaMedinipur.
2. The State Mission Director AMRUT, Subhanna, Saltlake.
3. The Chief Engineer, South Zone, M. E. Dte. BikashBhavan, Salt Lake, Kol. – 700 091.
4. The Addl. Chief Engineer (South), M. E. Dte. BikashBhavan, Salt Lake, Kol. – 700 091.
5. The District Magistrate, PurbaMedinipur.
6. The Executive Engineer, East Midnapore Division, M.E.Dte.
7. Notice Board of this office.
8. Office File.

**Superintending Engineer,
South Circle, M.E. Directorate**

TENTATIVE TECHNICAL SPECIFICATION

(This is indicative and not exhaustive)

2	Scope of Work	<p>Intake & Intake jetty :</p> <ul style="list-style-type: none">• Designing, drawing and construction of R.C.C intake Structure including pipe carrying Bridge of 50m (approx.) length & 3.00m wide with pump house building having good architectural view including machine foundation for pumps and motors will be constructed on the intake jetty structure on the river Rupnarayan as per Bid drawing. The height of the pumping station is to be designed in such a manner that the no obstruction will be allowed for repair maintenance of the vertical pump motor unit. E.O.T crane of approved capacities to handle pump and motor is to be provided by the Bidder in the pump house. In order to accommodate control panel room equipment/appliances will be housed at a level of pumps floor. The common delivery line with valves unit is to be placed opposite to the entry of the pump house as well as in front of the control panel for easy movement of the operator. The control panel room shall have to be covered by wooden glass frame room.• All Civil & Electro-mechanical Works for Construction of Raw Water Intake Setup on the river Rupnarayan.• Pumping Machines shall be designed for 20 hrs operation and size of the pumping station should be sufficient for facilitating erection of the suction assembly, accommodating pumping machinery to discharge 17.2 MLD capacity and other necessary arrangement.• Geo –Technical Investigation for intake should be done by making bore hole up to minimum depth of 45 Meter with minimum 2 Nos borehole with sample collection done by disturbed, undisturbed and standard penetration test after that performing laboratory test on disturbed or undisturbed sample as per standard procedure including tabulation sheet or proforma or as per direction of EIC for details investigation as per relevant IS Code. Soil Investigation report (six copies) shall have to be given with all relevant information like site plan, bore log, water table, collection test result with discussion , suggestion and recommendation in all respect. All these report shall have to be approved from IIT /JU/IIEST/ NIT / Govt Engineering College.• RCC Intake Well& Pumping station shall be located as per recommendation of feasibility study report.• Connecting RCC Jetty from river bank to Intake Well by RCC pipe carriage way at least 50 meter(approx.) length and width 3 meter supported by suitable pile foundation to accommodate all required provisions including Pipe Carriage way, Gangway, Cable tray etc. as per approved drawing .• Supplying, installation, commissioning of all Pumping Machineries for Pump House including Vertical Turbine (V.T.) Pumps, manifolds, other equipment, Compound illumination
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Complete execution of all Electro Mechanical Works of Pump House.

- Bank Protection works (100 meter) should be in the vicinity of intake structure with departmental approved drawing.
- Trial Run of the Comprehensive Project Setup for a period of 3 Months
- Operation & Maintenance of the Comprehensive Project Setup for a period of 60 Month after successful trial run

Intake Sub Station Building:

- Design &Construction of Intake Sub Station Building (500 KVA) (Plinth area not less than 200 sqm) along with all electro mechanical work including necessary allied work like land development, construction of retaining wall with departmental approved drawing.
- Geo -Technical Investigation: for intake substation should be done by making bore hole up to minimum depth of 30 Meter with minimum 1 Nos borehole with sample collection done by disturbed, undisturbed and standard penetration test after that performing laboratory test on disturbed or undisturbed sample as per standard procedure including tabulation sheet or proforma or as per direction of EIC for details investigation as per relevant IS Code. Soil Investigation report (six copies) shall have to be given with all relevant information like site plan, bore log, water table, collection test result with discussion, suggestion and recommendation in all respect.All these report shall have to be approved from IIT /JU/IIEST/ NIT / Govt Engineering College.
- Building Area: The intake substation building shall comprise mainly five basic sections as per design requirement in accordance to electricity rules.
- Supplier HT Breaker Room -No ventilation, no window, only shutter up to3.5-meter height.
- Consumer (11KV VCB Panel Room) - requisite exhaust fan forventilation, No Window, only shutter of 3.5-meter height.
- Transformer Room - requisite exhaust for ventilation, shutter of 3.5-meter height.
- L.T. Panel Room - requisite exhaust for ventilation ,shutter of 3.5 meter
- Operator/ Guard Room with toilet arrangement
- Boundary Wall: It is required to construct a boundary wall at least 100 meter length with 2 meter high (above EGL) along 3 ply barbed wire fencing with open able locked gates to isolate the Intake Sub Station Setup from surroundings. The boundary wall should be finished with decorative cement based paint. The offer also includes 5 M wide gate & security staff office cum sitting arrangement at the entrance.
- Land Development work(Approx. 700 sqm.) For Intake substation land development work should be consider as per site condition. It is essential to collect data regarding High Flood Level, High Tide Level, Low Water Level from appropriate authority. The

perspective bidder should collect these data in his own arrangement. The proposed ground level at HFL (High Flood Level). Proposed level of all approach roads should be 150mm above HFL as per drawing approved by EIC. So necessary land development cost should be included in rate.

- Approach road for likely bituminous in nature (i.e. about 50 meter length & 3 meter width) need to be constructed.
- Plantation work should be done along with preparation of bed for hedging with different plant like Furcaria, Rangoon Chinese, Duranata, ficusblakkietc (medium height) in the campus of substation as per direction of EIC . The inside footpath should be Cement concrete road and it should be finished with 25 mm thick tiles (Preferably Grey in colour) as per with departmental approved drawing .
- Supplying, installation, commissioning of all required Electrical Goods, Equipments, Machineries, devices, and appliances for Electrical Substation including transformers Panels, Compound illumination etc, and complete execution of all Electro Mechanical Works for Electrical Substation as per with departmental approved drawing specification.
- Masonry drain with approximately inner section about 110 meter length need to be constructed as per departmental design & drawing.
- Retaining wall about 80 meter length needs to be constructing, height of the wall should be determine as per requirement of site as per departmental design & drawing.

Raw water Pump (Electro- Mechanical Part):

- Provide, supply, and install the raw water pumps at proposed head works as per the detailed specifications enclosed herewith.
- Testing & commissioning.

• (A-4) Different levels of Intake Substation compound

- i) Proposed ground level: - The proposed ground level will be at per the HFL as shown in drawing and should be treated as ± 0.00 M level. Proposed level of all approach roads should be 150mm above HFL (High Flood Level).
- ii) Proposed Plinth Level: - The proposed plinth level of the area will be the 700 mm above HFL (High Flood Level) will be shown in drawing & demarcated at site as well as High Flood Level shall have to collected from the appropriate authority by the agency at his own cost.

Conventional type Surface Water Treatment Plant(WTP):

- Topographic survey of the plot with block contouring at 5 m X 5 m grid.
- Geo -Technical Investigation for WTP should be done by making

bore hole up to minimum depth of 30 Meter with minimum 3 Nos borehole with sample collection done by disturbed, undisturbed and standard penetration test after that performing laboratory test on disturbed or undisturbed sample as per standard procedure including tabulation sheet or proforma or as per direction of EIC for details investigation of following parameter.

- Liquid limit ,Plastic Limit, Grain Size Analysis by sieving ,Grain size analysis by Hydrometer method , determination of water content, determination of specific gravity, direct shear test , determination of unconfined compression strength , Tri axial shear strength as per relevant IS Code.
- Submission of report (six copies) given with all relevant information like site plan , bore log, water table, collection test result with discussion , suggestion and recommendation in all respect.
- All these report shall have to be approved from IIT /JU/IIEST/ NIT / Govt Engineering College.
- Contractor shall design, construct, including all supply & installation of electro-mechanical and instrumentation equipment a water treatment plant (WTP) of 14 MLD net output capacity as per the BOQ and as per the detailed specifications.The plant system to be design for net output 14 mld with a provision of 25% over loading and 25% under loading. It shall also include recirculation of waste from back wash water from the rapid sand filters including sludge treatment and disposal as per the specification. It shall also include design, supply and installation of all corresponding mechanical equipment. The contractor has to design process of water treatment, hydraulic sizing of various components of the treatment plant, Structural design of all components, design of mechanical equipment. Overall system are to be checked considering 25% over loading. All these designs and related drawings shall have to be prepared which are to be approved from IIT /JU/IIEST/ NIT / Govt Engineering College prior to submission of these documents.
- Contractor shall design, construct, including all supply & installation of electro-mechanical and instrumentation equipments a water treatment plant (WTP) of 14 MLD capacity including CWR of capacity at least 900 Cum along with Clear water pump house of atleast 200sqm area. Surface water treatment plant consisting of Inlet well, Parshall flume, Flash mixer, Chemical House, Clariflocculators (2nos.)
- All other ancillary structure will be provided as required.

Rapid Gravity Filters and Filter House

The filter house shall have adequate number filter bed as per guidelines of CPHEEO manuals.

Rapid Gravity Filters (Twin Bed) with under drainage system, connecting pipes and channels, Clear water Reservoir, Back-wash water Tank, Sludge sump-cum-pump house, Sludge lagoon etc. It shall also include design, supply and installation of all corresponding mechanical equipment

Sub Station Building For WTP:

- Soil investigation, Design and Construction of Water Sub Station Building (800 KVA) (Plinth area at least 200 sqm.) along with all electro mechanical work including necessary allied work like land development, construction of retaining wall with departmental approved drawing.
- Building Area: The WTP substation building height should be 5.0 meter. The total sub-station shall comprise mainly seven basic sections &The toilet area required for the sub-station. as per design requirement in accordance to electricity rules.
- Supplier HT Breaker Room (5.0 m x 5.0 m) –No ventilation, Nowindow, Only shutter up to3.5-meter height.
- Consumer (11KV VCB Panel Room) (5.0 m x 5.0 m) -2 exhaust fan for ventilation, No Window, louver at lower side, only shutter of 3.5-meter height.
- Transformer Room-2 nos. (5.0 m x5.0 m) -2 Nos exhaust for ventilation, shutter of 3.5-meter height.
- L.T. PDB Panel Room (10.0 m x5.0 m) -2 Nos exhaust for ventilation, shutter of 3.5 meter
- Operator/ Guard Room having dimension with provision should be made for toilet area.

Clear Water Reservoir

- Topographic survey of the plot with block contouring at 5 m X 5 m grid.
- The contractor has to design the RCC structure of the Clear Water Reservoir and the detailed RCC design and related drawing shall have to be prepared which are to be approved from IIT /JU/IIEST/ NIT / Govt Engineering College prior to submission of these documents.
- The necessary inlet, outlet, overflow and washout pipes with valves and made connection with Pipe Network.
- The Bid includes Surveying, designing, drawing and construction of clear water underground reservoir complete with inlet, overflow and scouring arrangement maintaining the levels.The full water depth should be at least 3.00 M including 0.6 m above FGL The foundation of pump house should have adequate strength to take tension for uplift due to subsoil water assumed at the HFL when the reservoir is empty and also for vertical loads, horizontal loads with surcharge in worst combination of load. The construction of pump house shall be completed earlier to facilitate the erection work of electrical/mechanical equipment.
- Design, drawing and construction of wet pit pump house building including machine foundation for motors, valves and electrical panel etc. in same floor as per Bid drawing. One E.O.T crane of 5 MT capacity to handle pump or motor that to be provided by the Bidder in the pump house.
- Design, drawing and construction of Approach/other connecting road, apron and Surface drains around the underground reservoir with pumping station & other units connecting the drainage system.

- The total civil work includes the construction of reservoir with pump house and pump sump and inlet connection to the reservoir from the clear water duct receiving filter water from filter beds. Inlet pipe (Two Nos.) has to be drawn from the clear water duct from filter house. Necessary pocket is to be left for delivery line from the pumps.
- The design of pump house has to be made on the basis of the Static load as prescribed and dynamic loading pattern thereof, taking into account of the vibration both horizontally and vertically that will be generated due to operation of each pump motor set.
- Site clearances and levelling of the area after development of site with carried earth up-to formation ground level, as proposed earlier.
- Adequate overflow arrangements should be provided to drain out excess water.
- The Bidder, whose Bid is accepted in the Course will have to furnish details of the design of the pump house in all levels, sump to connect the reservoir considering all the parameters as supplied by the pump manufacturer within the dimensions of the pumping station provided by them for housing the pumping machinery, electrical panel equipment/appliances.
- A tentative layout drawing showing the shape and different levels of the reservoir, pump house and other units of treatment plant is to be provided by the bidder. The Bidder has to quote his rate for construction of underground clear water reservoir with pumping station having 0.90 ML water capacity. Necessary Foundation of all units of treatment plants are to be provided on the basis of Soil Investigation Report. No folded structure is allowed while designing water-retaining Structure. While calculating the effective capacity of the CWR, to attain net volume of 0.90 ML capacity, the volume of water in pump sump and the capacity above free board will not be taken into account. The volume of R.C.C columns, baffle walls and all other obstruction will also be excluded.
- Hydraulic testing of components, 3 months trial run after successful commissioning
- necessary training of maintenance staff & thereafter (subsequently) 5 (five) years operation and maintenance of the Plant)

CLEAR WATER PUMPING STATION:

- The total capacity of the pumping station will be 660 cubic meter per hr. at a designed head to be provided by the bidder with simultaneous operation of pumps (Working & Stand By) Running hours of 21Hrs./day would yield to a supply of approx. 14MLD as per requirement. One pump will be kept stand by at any point of time. The pump delivery line with common delivery manifold should be equipped with actuator operated Butterfly valves, valve chamber, blank-flange if necessary (detail of which is given in Technical Specification). The minimum length of delivery manifold should be as per detail technical specification. All the design of the pipelines should be such that to ensure streamline flow to get

accurate flow measurement.

- The Bidder has to submit in due course the specific size and capacity of all machineries & equipment offered along with data related to static & dynamic loads in different operating conditions. The size of all the equipment should be so selected to match with the civil works.
- The vibration & noise should be within the acceptable limit as per I.S. or as per existing norms for all equipment.

The dimension and centerline of pedestals for supporting the Pumps as well as the valves should strictly be in line for both Civil & Electromechanical works.

- The center-to-center distance of the pumps, Clearance from wall for pumps should be as per I.S specifications.
- The installation of all electrical equipment should be strictly as per prevailing I.E. Rules.
- The minimum horizontal and vertical distance from the pump bell mouth to suction sump wall is to be maintained in such a level so that no vortex formation takes place in the entry of pump i.e. the flow should be maintained streamlined at the entry point of pump.
- The Bidder has to submit parallel operation curves for pumps & the same is to be matched with the system resistance curve of the delivery grid. Pump selection should be based upon that. Family curves for individual and multiple operations at all possible consequences depending upon the variation in % opening of the butterfly valve are to be submitted.
- The Bidder has to consider all sluice valves, butterfly valves, dismantling joints in individual delivery pipe lines as per detail technical specification.
- The Bidder must work out the natural frequency analysis for the structural work and the same should be verified with the RPM & critical speed of the rotating equipment to eliminate any chance of vibration.

The contractor has to design process of water treatment, hydraulic sizing of various components of the treatment plant, RCC design of these components, design of mechanical equipment. Hydraulic testing of components, 3 months trial run after successful commissioning and necessary training of maintenance staff. & thereafter (subsequently) 5 (five) years operation and maintenance of the Plant).

Land Development work AT WTP:

- It is essential to collect data regarding High Flood Level, High Tide

Level, Low Water Level from appropriate authority. The perspective bidder should collect these data in his own arrangement.

- The proposed ground level will be at HFL (High Flood Level). Proposed level of all approach roads should be 150mm above HFL. So necessary land development cost should include in rate.

Retaining wall AT WTP:

- The offer rate should include necessary cost of construction of retaining wall. It is approx 355 meter length needs to be constructing, height of the wall should be determine as per requirement of site as per departmental design & drawing.

Installation of Chlorination Arrangement AT WTP:

- The offer rate should include necessary cost of construction of Chlorination arrangement.

Administrative Building AT WTP:

- The offered rate should include necessary cost of construction of the following accommodation.
- Minimum Carpet area of Annex building 200 sqm each floor.
- Staff Quarter shall be two storied building and each floor area shall be 100 sq. m. The building consists of 2 (two) nos. Bed Rooms, 1(one) no. Drawing/Dining Room, 1(one) no. Kitchen, 2(two) nos. Toilets and 1(one) Balcony in each floor.
- Provision of SCADA room and System are to be provided SCADA compatible.
- Laboratory Room shall be provided in the Chemical House.
- Conference Room is situated in Ground floor of Annex Building in the name of "main entrance hall"
- Guard Room shall be single storied building of which room size 2.5 m x 2.5m minimum.
- One number 15 sqm. Stair case to be provided in Administrative Building./Annex Building
- Water for utility of ANNEX Building and CHEMICAL house etc. shall be taken from Filter Back Wash Tank.

Internal Road & Surface Drain at WTP:

- The offered rate should include necessary cost of construction of the internal road with paver block finishing & Surface drain should be of approved design & drawing.

Boundary Wall :

- The offer should include required boundary wall (2.1 M height from FGL)
- The offer also includes 5 M wide gate & security staff office cum sitting arrangement at the entrance.
- The boundary wall should be finished with two coats of acrylic exterior primer with acrylic exterior paint.

Electrical installation and instrumentation system at WTP –

- 1. Design, provide, supply, and install the electrical equipment and instrumentation equipment at proposed WTP and as per the detailed specifications
- 2. Testing & commissioning

Bituminous Approach Road to WTP –

- It is desired to construct approach road approx 100 m (From Main Road to WTP Site) in following specification.

Different levels of Water Treatment Plant compound

- Proposed ground level: - The proposed ground level will be at per the HFL as shown in drawing and should be treated as ± 0.00 M level. Proposed level of all approach roads should be 150mm above HFL (High Flood Level).
- Proposed Plinth Level: - The proposed plinth level of the area will be the 600 mm above HFL (High Flood Level) will shown in drawing & demarcated at site as well as it should be surveyed by the participant & finally fixed from the HFL .
- Proposed invert Level of over flow pipe at Clear Water Reservoir will be at least +0.50 M above HFL (High Flood Level).
- Hydraulic design of proposed Treatment Plant and clear water reservoir should be such that the tail water level of underground clear water reservoir will be of adequate gradient and vertical turbine Pumps to be installed in vertical configuration of clear water pumping station and must have positive suction head. Accordingly, hydraulic levels of all the other units of water treatment plant such as collecting well, flash mixer, Clarifloculator, Filter Beds, Clear water duct, inlet pipes of reservoir etc. are to be fixed to ascertain the positive suction head of vertical turbine pump.

Note- HFL/LWL/HTL (High Tide Level) should be collected by the bidder.

TREATMENT PROCEDURE TO BE ADOPTED

The different water treatment processes which will in general be taken up for treating the raw river water are:

- Inlet Well / channel with Parshall Flume, Flow meter, Alum dosing system cascade aerator
- Chemical House including storing, feeding and thorough mixing of

chemicals with raw water.

- Rapid Flash Mixer
- Clariflocculator
- Rapid sand gravity filtration.
- Back washing through Over Head Reservoir placed on the roof of the Filter Bed/Chemical House.
- Sludge drainage and disposal including sludge pond with drying bed, if required
- All Electro-Mechanical works related to water treatment process.
- Post, Pre-Chlorination by gaseous chlorine.
- Filter water conveying main to underground reservoir (CWR).
- Clear water pumping station with Pumps, motors & other electromechanical works.
- Clear water Under Ground Reservoir with pumping station.
- Inter Plant Piping and plant road facility within WTP compound.
- Plant Wastewater and solid waste disposal system.
- Laboratory Building with supply of necessary laboratory Equipment's
- HT substation
- Open Channel Flow measurement with recording system.

Raw water Rising Main

- Laying of D.I. (K-9) and MS pipes with all kinds of Specials and valves from Intake to WTP site including earth work in excavation in any kind of soil having minimum depth to keep the top surface of pipe 1.10 m below of the existing ground level for underground installation
- For Over-Ground installation in small ditches etc. supported with RCC pillars including fitting, fixing, jointing (all types of joints), specials, valves etc. as per requirement, in position, cutting, chamfering of pipes as required & construction of Valves Chamber, Thrust Blocks etc. as per requirement and necessary hydraulic pressure testing including Cleaning and disinfection thoroughly the inner surface of pipe line, specials and valves etc.
- Submission of complete detailed drawing of Rising Main Intake to WTP after execution of work showing position of different types of valves, fittings, specials, with location.
- Temporary Roads Restoration work for vehicular movement as per scope of the work as well as relevant IS code and direction of EIC all complete
- Approx. length of Raw water Rising Main to be laid 16250 m.
- DI (K-9) Pipe & rubber gasket will be supplied from departmental store, necessary charge for carrying of DI pipe should be borne by the agency. Rest of the materials are to be supplied by the agency

as per site requirement.

- Excavation should be made such a DI (K9) Pipe (450 mm dia.) with maintaining minimum clear cover 1.10 meter from top of the pipe. The width of the trench should be maintain by clear cover as per norms.
- Only DI (K9) Pipe will be supplied from the departmental stack yard. Whereas, M.S. Pipe (450 mm dia.) required length should be supplied by the agency and lay at site as per direction of the E.I.C.

Jack Pushing work: Road crossing 450 mm dia MS pipe for Raw Water Rising Main.

- Crossing of carrier Pipe (MS pipeline) along/across NH Road / SH Road by jack pushing as per below mentioned location including excavation, filling , construction of driving & reception pit, supply & fabrication of MS Carrier & MS Casing pipe of required dia. & thickness, necessary shoring complete in all respect. The whole process of permission including application for permission to the respective Authority through the EIC, preparation of drawing to be submitted to the Authority concerned for approval before such crossing at these location to be done by the entrusted Agency. Only the charges / demand for Restoration fees /License fee/NOC fees raised by NH/Competent Authority will be borne by the Municipal Authority.
- Preparation of Drawing & Design for driving & reception pit for Jack-push work under National Highway/State Highway at desired depth and other necessary paper correspondence as per requirement of the concerned Authority and getting the approval of the same by the competent authority for the proposed jack-push work.
- Construction of a driving & reception pit at desired depth for each and one valve chamber for jack-push work as per approved drawing of the concerned authority including excavation of earthwork and filling, reinforcement, Concreting (M 25), as per specification and direction of Engineer in Charge and all complete in all respect.
- Removing of rust with brushing and cleaning the external surface of MS carrier &MS casing Pipes and other as required applying one coat of approved primer over it and providing 2 coats of food grade epoxy , anti-corrosive, non-toxic paint to all pipes and specials into the inside& outside surface as per IS Specification & direction of Engineer in Charge.
- Fabrication of MS Specials viz. reducer, enlarger, tees, bends, puddles, bell mouth out of 8 mm thick MS barrel / MS spirally welded pipe including cutting of the barrel/spirally welded pipe to exact size & shape including supply of 8 mm plate from SAIL / TISCO/Jindal as per direction of Engineer in Charge.
- Supplying and laying of MS carrier & casing Pipes of required dia of SAIL/TATA/JINDAL make, mentioned in the above table and

other as required pipe including lowering, inserting and jointing the same MS conduit as per the level and slope as shown in the drawing and as per the direction of the Engineer in Charge and complete in all respect.

- Filling of steel pipes & D.I. Pipes and specials with water by contractor and testing hydraulically the same under a head of pressure as per specification including supply of water and necessary equipment such as blank flanges, gauges, pump etc. required for the testing including providing suitable end thrust block and dismantling and removal of the same after completion of the testing, fixing special type of end cap, blank flanges and removal of the same after completion of the testing, welding, jointing, gas cutting etc. as necessary including of jointing materials, disposal of water after testing etc. all complete as per specification and direction of the Engineer in Charge.
- Supply, fitting & fixing CI Sluice Valve &adequate dia. CI Air Valve at each jack push location as per requirement with necessary fittings and fixture along with construction of Valve chamber.
- Construction of sluice valve chamber as per drawing supplied by concerned division or standard drawing given by contractor and approved by E.I.C with brick work in cement mortar (6:1) over 15 cm. of PCC (6:3:1) with supply of approved quality (Heavy type) C.I surface box embedded in 100mm thick removable slab in (4:2:1).
- Submission of completed drawing of whole network including showing Pipe length &dia, location details of valve chamber, Jack pushing with as per direction of EIC in 5 (set).
- (DI -K9 MS Pipe with all specials & fittings and rubber gaskets, Sluice valve, Air Release valve, Mechanical Joints etc., whatever necessary, will be supplied by agency at his own cost)
- As per specification of design & drawing approved by competent authority.

The Pipe carrying Bridge work:

- Necessary soil test along with relevant hydraulic investigation and study of surface water flow characteristic of Canal for the purpose of design &execution should be done by the Bidder.
- During design consideration, It is to be ascertained by the bidder that the bottom of the truss bridge should be fixed 0.50 m above the H.F.L. or nearby existing bridge floor level whichever is higher.
- Soil test report should be duly signed from IIT / NIT /JU before submission to the Superintending Engineer, South Circle, MED for acceptance.
- The contractor has to design the Steel structure of desired span & width supported on RCC column/ pier with suitable foundation for all possible loads. The detailed design report and drawing has to be prepared as per relevant IS Codes and shall be got vetted from IIT / NIT / JU/IIEST before submission to the Superintending Engineer, South Circle, MED for approval.
- Width of the pipe carrying bridge minimum 1.5 mtr.to be

provided.

- Total 5 (Five) set of drawing & design report need to be submitted for approval before execution. Before execution the agency has to submit Mix design report of Concrete from Govt. approved laboratory, IIT / NIT / JU/NABL accredited laboratory.
- The contractor has to complete all the structural work in all respect including necessary finishing work i.e. plastering, coloring, painting etc. as per direction of the Engineer-in-Charge E.I.C.).
- For Construction of thrust block, pedestal drawing & design should be submitted by the bidder and get it approved by the E.I.C.
- All necessary test certificates, third party test report of supplied materials should be submitted as per direction of E.I.C.
- Vendor list for all materials need to be submitted for approval before execution.
- The necessary arrangement should be provided with MS ladder & MS railing for easy access of the maintenance team.
- The necessary testing in appropriate frequency/quantity of MS Plate/Pipe, Structural Members & Reinforcement Steel have to be done by the third Party agency such as RITES, National Test House /SGS/MECON/PDIL or other NABL accredited laboratory as per decision of the Superintending Engineer at contractor's own cost.

Sluice valve / air release valve: Supplying & delivery at working site ISI marked CIDF sluice valve / Cast iron kinetic double orifice type air release valve conforming to relevant IS code with latest amendment including stacking and inclusive of Departmental inspection, packing charges, all taxes and duties as applicable and payable.

- Construction of sluice valve chamber as per drawing supplied by concerned division or standard drawing given by contractor and approved by E.I.C with brick work in cement mortar (6:1) over 15 cm. of PCC (6:3:1) with supply of approved quality (Heavy type) C.I surface box embedded in 100mm thick removable slab in (4:2:1).
- Connection work from the existing DI pipes with proposed HDPE pipe as required including excavation, cutting of CI/DI pipes, back filling, chamfering etc. including supply of specials and rubber gasket all complete.
- Filling the entire pipe line with water, testing hydraulically as per I.S 3114-1965 (Article-6) as per direction of E.I.C. Hydraulically testing of different types of pipes in sections should be for a head of water not less than 1/2 (Half) the pressure recommended by I.S or corresponding pipe materials whether the gauge pressure will remain static for 30 minutes by filling water including supply of necessary equipment's such as generator sets, pumps gauges etc. All complete as per specification and instruction of E.I.C. [Water have to be arranged by the bidder himself and whole testing procedure will be accordance with as per IS : 3114 - 1965]. Hydraulic testing of MS pipe lines should be done under head of

water not less than 60 m (6 kg/cm²).

- Cleaning thoroughly the inner surface of pipe line including special & valves by flushing with water & subsequently disinfection of the same pipe line by flushing again with water containing bleaching powder resulting in residual chlorine not less than 10 mg / Ltr. after 24 hours of such filling including laboratory testing of water sample obtained from disinfected pipe line & disposal of water from the pipe line after completion of the work. The rate is including of cost of requisite water to be arranged by the Contractor.
- All necessary test certificates of supplied materials should be submitted as per direction of E.I.C.
- Vendor list for all supplied materials whatever necessary need to be submitted for approval before execution.

Operation & Maintenance of Intake ,WTP and HT Sub- Station for 5 years after 3 months trial run

- Up keeping and maintaining the buildings / structures (civil, structural, electrical, plumbing and firefighting) and the surrounding to ensure cleanliness & hygiene.
- List and quantity of consumable and chemicals for O&M to be submitted with detailed design for approval from competent authority. All these consumptions are within the scope of Agency during 5 yrs. O & M.
- Repair / retrofit / replace the malfunctioning units / equipment's / wires & cables so that the functioning and operation of the WTP.
- Maintain sufficient stock of spares parts of equipment's /Machineries at the WTP
- Provide and supply and ensure availability of the tools and tackles at the WTP
- Provide monthly progress reports to the Engineer-in-charge
- After the successful completion of the O & M period, jointly inspect the premises / equipment's with the Engineer-in-charge, attend to the observations made the Engineer-in-charge.
- Providing 1 no's of laptop with i-7 Intel Processor, 8 GB RAM and 800 GB SSD and 1 no's of laptopwith i-7 Intel Processor, 12 GB RAM and 1TB SSD with all windows software are license version and Printer cum Scanner 1 set.
- Desilting and cleaning the Raw Water Channel, Raw Water Sump, to Maintain 24X7 smoothly Water supply to Public
- If water Supply Interrupted due to negligence of contractor, Penalty will be decide and imposed by Municipality which will legally binding to contractor.
- Carryout O & M of the proposed executed pipelines for a period of 5 year from the date of successfully trial run of WTP.

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Detail Specification

Rising main (DI-K9) From Intake To WTP Location	
1	Carrying CI/DI/MS pipes with specials and valves and lowering placing in position and laying carefully inside the trenches in proper alignment and gradient etc. including earth work in excavation of adequate width as per specification having min. clear cover from top of pipe is 1.10mtr. below existing ground level in any kind of soil including mixed with boulder, road sub-grade and its flank, but excluding moorum and laterite and stone etc. without damaging the existing telephone/electric cable etc. (in case of damaged if any type of cable line during execution, necessary damaged charges as applicable by the respective authority will be borne by the agency in his own cost) preparing the bottom surface for continuous bedding of pipe line and laying pipes, fitting, fixing specials and valves with bailing out water if any including carriage of pipes, specials and valves from local deptt. store within 8KM and back filling the trenches with excavated earth in layers to original condition as per specification and direction of EIC. The surplus materials after execution of work are to be return to the deptt. store.
2	Filling the pipe line with water, testing hydraulically as per I.S 3114-1965 (Article-6) in section of a length not exceeding 500mtr. for head of pressure as per specification including supplying installing and fixing all equipments such as diesel pump set, blank flange, pressure gauge, valve, pressure pump and all other tools and plants including drilling topping and plugging of necessary holes to pipes, blocking ends providing temporary thrust block and subsequent blocking of holes and other jointing materials and dismantling and removal of the same including disposal of water etc. all complete as per specification and direction of EIC. The rate is inclusive of cost of requisite water to be arranged by the contractor (Recovery rate of water @ Rs.10.00/m ³ , if contractor used water from deptt. source).
3	Cleaning thoroughly the inner surface of pipe line including specials and valves by flushing with water and subsequently disinfection of the same pipe line by flushing again with water containing bleaching powder resulting in residual chlorine not less than 15mg/ltrs. after 24hrs. of such filling including laboratory testing of water samples obtain from the disinfested pipe line and disposal of water from the pipe line after completion of the work. The rates including of cost of requisite water to be arranged by the contractor) (The rate of water @Rs. 10/m ³ may be recovered, if the contractor used water from deptt. source).
4	Cutting of DI pipe to required length all complete as per direction of EIC.
5	Chamfering the spigot end of all type/class of DI pipe for proper using of push joint by means of grinder set at site for proper joint etc. all complete as per direction of EIC.
6	Making flange joint to DI/CI pipes, specials and valves where necessary with supply of required rubber insertion and nut bolts, washers etc. of approved quality and type all complete as per specification and direction of EIC (Nut and bolts shall be of TATA/GKW make).
7	Supply and fixing of 150 mm dia. Cast iron kinetic double orifice type air release valve having small orifice elastic ball resting on gun metal orifice nipple large orifice vulcanite ball seating on moduled seat ring, valve with built-in-Kinetic features, isolating sluice valve mounted in horizontal position and operated by a metre wheel gearing: inlet faced and drilled to IS 1538 Table 4 & 6. valve suitable for maximum working pressure of 10 kg/CM ² all complete as per direction of EIC.

8	Supply and fixing of 450mm dia Cast iron double flanged manually operated sluice valves generally conforming to IS 14846 : 2000, having four faces and spindle nut of gunmetal. inside screw non- rising type quality gunmetal /AISI 410 spindle: seat tested to 10kg/CM ² and body tested to 15kg/CM ² , flanges flat faced and drilled to 1.S.: 1538 : 1993. Painted black all over with asphalt base paint. Valves tested by closed end method all complete as per direction of EIC.
9	Construction of different dia Sluice valve /Air valve /Washout chamber in different sizes for village road where light traffic run and for main road where heavy traffic run as deptt.approved drawing with 25cm thick brick work (1:6) over cement concrete (4:2:1) over a single B/F soling over150mm.thick sand filling in foundation including earth work in excavation and disposal of excess earth from work site with RCC (1:1.5:3) cover slab 100mm / 150mm thick slab on top of chamber with 1% reinforcement in RCC cover slab with necessary opening for operation of valve all complete including cost of labour & materials as per Departmental Dwg. [Reinforcement type:- Other manufacturers not specified] all complete as per direction of EIC for 450 mm dia. pipe.
11	Construction of Thrust Block as per requirement all complete as per direction of EIC
12	Construction of Pedestal for over ground installation of pipe as per requirement all complete as per direction of EIC
14	Bituminous pucca road (approx. 450mm depth) cutting by using gaiti, chisel, hammer etc. and picking up excavated materials and remove the same within distance of 30mtr. at least all complete for fixing/crossing all dia of pipe line as per direction of EIC. (width cutting for trench as per IS 3114 : 2004 , P-1, Cl-3.2)
15	Dismantling all type of plain cement concrete works, stacking serviceable materials of site and removing rubbish as directed within a lead of 75mtr. for laying all dia pipe line in ground floor, upto 150mm thick.(width cutting for trench as per IS 7634 (Part 2) : 2012 , Table-3)
16	Removal of rubbish, earth etc. From the working site and disposal of the same beyond the compound, in conformity with the Municipal/ Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer-In-Charge.
17	Submission of complete detailed drawing of distribution system, rising main etc. after execution of work showing position of different types of valves, fittings/specials sluice valve chamber with location, node to node wise in the sanctioned drawing as completion drawing of the water supply scheme as per direction and satisfaction of EIC. The list of dia. wise fitting/specials, different pipes, valve used in the rising main should be shown in the completion drawing (not separate) with verified by SAE & AE in-charge of the scheme. The above drawing will be submitted in 5 copies.
18	Carriage of DI K-9 Pipes conforming to I.S-8329:2000 from store to site
19	a) Supply & Delivery (at Site) All Types of D.I Ductile Iron (D.I) specials
	b) Supply & Delivery (at Site) of M.S pipe Including Coating

LAND DEVELOPMENT FOR INTAKE SUB -STATION BUILDING and
WTP

	Following items are to be executed as per as per direction of Engineer in charge.
1.0	Surface Dressing of the ground in any kind of soil including removing vegetation, inequalities and disposal of the rubbish
2.0	Earth work in filling in compound, tank, low land, ditches etc. with good earth, in layers not exceeding 150 mm. including breaking clods and consolidating the same by ramming and dressing complete. (i) With carried earth arranged by the contractor
3.0	Preparation of beds for hedging and shrubbery by excavating 60cm deep and trenching the excavated base to a further depth of 30cm, refilling the excavated earth after breaking clods and mixing with sludge or manure in the ratio of 8:1 (8 parts of stacked volume of earth after reduction by 20%, one part of stacked volume of sludge or manure after reduction by 8%), flooding with water, filling with earth if necessary watering and finally fine dressing, levelling etc, including stacking and disposal of materials declared unserviceable and surplus earth by spreading and levelling as directed, complete. Planting hedge plants in two rows at 30cm apart
4.0	Supplying and Planting of different plant / trees (Supplying well grown plants bushy and healthy, minimum height as specified i.e. exposed height including all leads & lift, carriage, handling, manuring, applying pesticide and fertilizer etc)
	i) Furcaria veriegated 10-12 leaves in height 20-30cm in earthen pots of size 25cm
	ii) Rangon chineseese of size not less than 20cm
	iii) Rangon chineseese polythene pack
	iv) Rangon hi-breed healthy plant.
	v) Duranta healthy plant of big size
5.0	vi) Ficus blakii (F. Vivicon) well branched (Bushy) of height 120cm - 135 cm in earthen pot of size 30cm.
	a) Supplying & Laying 25 mm thick Tiles of any shade of approve quality as per relevant IS code, IS: 1237-2012 laid in pattern as directed for foothpath, ramp, staircase of public building over 25 mm thick (Avg) cement mortar (1:3) & Cement Slurry @4.4 kg/Sq.m at back side of Block (Cement for Mortar & Slurry to be supplied by department). in all respect i.e, with all labour and material. Note: Sub-grade CBR should not be less than 5.
	i) Grey
6.0	Cement concrete with graded stone ballast (40 mm size excluding shuttering)In ground floor1:3:6 proportion

Retaining wall

Following items are to be executed as per as per direction of Engineer in charge.	
1.0	Earth work in excavation of foundation trenches or drains. in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing. Spreading or stacking the spils within a lead of 75 m. as directed. The item includes necessary trimming the sides of trenches. leveling. dressing and ramming the bottom. bailing out water as required complete.
2.0	Earth work & filling in foundation trenches or plinth with good earth in layers not exceeding 150 mm. including watering and raming etc. layer by layer complete. With earth obtained from excavation of foundation.
3.0	Filling in foundation or plinth by silver sand in layers not exceeding 150 mm. as directed and consolidating same by through saturation with water ramming complete,including the cost of supply of sand-By fine sand
4.0	l) Cement concrete with graded stone ballast (40 mm size excluding shuttering) in ground floor & foundation. (a) 1:3:6 proportion (Pakur Variety)
5.0	Supplying and laying Polythene Sheet (150gm / Sq.M) over damp proof course or below flooring or roof terracing or in foundation or in foundation trenches.
6.0	Controlled cement concrete with well graded stone chips (20mm grade, Pakur/Chandil) excluding shuttering and reinforcement but including the cost for complete design of concrete mix as per IS-456 and relevant special publications, submission of job mix formula after preliminary mix design and after testing of concrete cubes & also taking of concrete cubes at every stage of casting at the site followed by testing as per direction of the E.I.C at the Govt./private Institution/Laboratories as dicided by the E.I.C. Consumption of cement will not be less than 400 Kg. per cubic meter of controlleld concrete but actual consumption will be determined on the basis of preliminary test and job mix formula in pile, pile cap, column, bracing, RCC heal beam bottom floor dome, conical wall (cantilever portion), bottom ring beam, shell wall walkway platform, top dome etc. including supply of all materials, casting vibrating with mechanical vibrators, curing etc. all complete as per drawing and specification.--Pakurvarity a) M 25 Grade
7.0	Hire and labour charges for shuttering with centering and necessary staging upto 4 m using approved stout props and thick hard wood planks of approved thickness with required bracing for concrete slabs , beams, m columns , lintels curved or straight including fitting , fixing and striking out after completion of works (upto roof of ground floor) (c) Steel shuttering or 9 to 12 mm thick approved quality ply board shuttering in any concrete work
8.0	Reinforcement for reinforced concrete work in the all sorts of structures including distribution bars, stirrups, binders etc. including supply of rods , initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction Tor steel/Mild Steel (SAIL/ TATA/RINL)
9.0	Providing weep holes in Brick masonry / Plain / Reinforced concrete abutment, wing wall / return wall with 100 mm dia AC pipe, extending through the full width of the structure with slope of 1V:20H towards drawing face. Complete as per drawing and Technical specifications.

River Bank Protection

	Following items are to be executed as per as per direction of Engineer in charge.
1	Cutting uprooting and clearing jungles including shrubs, water weeds,bushes, trees, plants, upto 30 cm. girth including removing all complete. For slope Portion
2	Earthwork in excavation in the canals / drainage channels / borrow pits / River bed / slope of bank as noted below as per designed section & throwing the spoils in layers of 25 cm. for making banks as per profile or to deposit the same in any other place within an initial lead of 30 metre and initial lift of 1.5 metre including breaking clods, rough dressing etc. complete as per direction of the Engineer-in-charge. (a) Ordinary soil / local soil / soil mixed with moorum or kankar / silt, dry or moist / slushy silt / sticky soil.
3	Supplying at site and laying in position UV stabilized needle punched, stapled fibre / continuous filament polypropylene non-woven geotextile of 300 gsm as filter, as per specification, including cost of preparing the bed, placing the geotextile as per profile with at least 15cm lapping, wherever required and anchorage at top, sewing / welding the overlapped portion, storage and transportation by all means including 3 rd party testing all complete as per direction of the Engineer-in charge. For slope Portion
4	Testing of Geo-textile materials including UV Test from well equipped laboratories like Jadavpur University, BITRA, CIPET etc.) (This item is applicable only for third party testing conducted by the Engineer-in-charge to assure the quality of the Geo-textile material)
5	Supply and Placing of Boulder pitching on top and slope by placing required boulders (each weighing 25 Kg. and above within lead of 100 metres and all lifts) including filling the interstices with fragments as required, preparing sub-grade by cutting or filling the earth on slope upto 7.5 cm. depth, watering and ramming where necessary complete as per direction of the Engineer-in-charge. a) Over Geo-textile filter. For slope Portion
6	Making sausage cage with 10 SWG galvanized iron wire of 125 mm. x 125 mm. mesh wire netting with proper lapping of minimum 150 mm. including sewing the joints with 10 SWG G I wire and supply of all materials and equipment including placing the sausage cage in position, filling the same with boulder or lump aggregates complete as per direction of the Engineer-in-charge but excluding the cost of boulder / lump aggregates and its carriage upto site. a) Size :- 1.00 m x 1.00 m x 1.00 m
7	Supply and Laying of boulder/ shingles in apron or within wire netting of sausage for slope pitching including carriage upto 30 metre and all lifts & dressing the exposed faces etc. complete as per direction of the Engineer-in-charge. Boulder for Apron
8	Supplying to site Nylon crate of size 1.00 m. x 1.00 m. x 1.00 m. having mesh size 175 mm. x 175 mm. with Nylon thread of 210 x 24 including all cost of carriage and taxes etc. complete. (Tensile strength not less than 250kg/sq.cm)
9	Dumping and placing in position properly filled in Nylon crates with filled in gunny / poly cement bags (minimum 25 nos. having capacity 50 kg) with local earth or sand, sewing and tying the crate with nylon wire within a lead of 150 m. and all lifts in river slope or bed by cutting trenches upto 50 cms depth, if necessary, or by boat including cost of hire charges of boat, boatmen and other necessary equipments and also including cost of bags, carriage and charge of filling bags with earth / sand as per direction of the Engineer – in – Charge.NB:- Volume of each earth/ sand filled bags should not be less than 0.028 m ³ .Size of Nylon crate is 1metre X 1metre X 1metre.

10

Cost of stone / laterite boulder at quarry site including Royalty(Royalty certificate in original from competent authority are to be submitted along with the bill, otherwise amount due towards Royalty of stone/laterite boulder will be deducted from the bills of works) .b) Pakur source (Each weighing 30/45 kg)

Jack Push	
Following items are to be executed as per as per direction of Engineer in charge.	
1	Construction for Driving Pit as per site requirement.
2	Construction for Reception Pit as per site requirement.
3	Pipe jacking from the driving pit to receiving pit including all labours. material tools and tackles, clearing of site etc. complete in all respect
4	Supply and Laying M.S. Casing pipe of 750 mm,. Dia. minimum 10 mm thick
5	Supply and Laying M.S. carrier pipe of 450 mm,. Dia. Minimum 8 mm thick
6	Cutting of C.I./D.I pipes for fitting with pipes and-or specials of similar or dissimilar materials at the time of laying without damaging any part of the required length including taking out of the broken pieces from the trench and restacking the same at the specified location as per direction of the Engineer-in-Charge
7	Chamfering the spigot end of all type/class of DI pipe for proper using of push joint by means of grinder set at site for proper joint etc. all complete as per direction of EIC.
8	Field welding of M.S. plate by means of electric arc welding as per relevant IS specification using standard electrodes including edge preparation and charges of deployment of electric generator set with fuel, lubricant, and all other tools and plants all complete as per specification and direction of Engineer-in-Charge. [Engineer-in-Charge shall approve the electrodes for arc welding before use]
9	Flange joint to C.I./D.I/MS. pipes and specials including supply of rubber gasket. nuts. bolts. washers etc. of best quality to make the joint watertight at required hydraulic pressure all complete as per specification & direction of the Engineer-in-Charge
10	Supply and fixing of M.S. Flange (slipper type) as per IS-6392 TABLE 17 Thickness - 20mm -22mm
11	Supply and fixing of Ductile Iron (D.I) Specials (viz. Bend. Tee. Taper. Tail piece etc), size conforming to I.S. Specification No. 9523/2000 with cement mortar lining (inside) and bituminous coating (outside).
12	Providing and placing fine sand to outer annular space between Casing pipe and carrier pipe MS pipe and specials with water by the contractor and testing hydraulically the same under a head of pressure as per specification including supply of water and necessary equipment such as blank flanged, pumps, gauges etc. required for the testing including providing suitable end thrust block and dismantling and removal of the same after completion of the testing, fixing special type of ends caps, blank flanges and removal of the same after completion of welding, jointing gas cutting etc. as necessary including of jointing materials, disposal of water after testing etc. all complete as per specification and direction of the Engineer-in-Charge after testing etc. all complete as per specification and direction of the Engineer-in-charge.

Boundary Wall with Gate

Following items are to be executed as per as per direction of Engineer in charge.	
1.0	Earth work in excavation of foundation trenches or drains. in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing. Spreading or stacking the spils within a lead of 75 m. as directed. The item includes necessary trimming the sides of trenches. leveling. dressing and ramming the bottom. bailing out water as required complete
2.0	Earth work & filling in foundation trenches or plinth with good earth in layers not exceeding 150 mm. including watering and raming etc. layer by layer as required complete.
3.0	Cement concrete with graded stone ballast [Pakur Variety](40 mm size excluding shuttering) In ground floor as required complete 1:3:6 proportion
4.0	Supplying and laying Polythene Sheet (150gm / Sq.M) over damp proof course or below flooring or roof terracing or in foundation or in foundation trenches as required complete.
5.0	Ordinary Cement concrete (mix 1:1.5:3) with graded stone chips Pakur Variety (20 mm nominal size) as per relevant IS codes.
6.0	Shuttering with centreing and necessary staging upto 4 m using approved stout props and thick hard wood planks of approved thckness with required bracing for concrete slabs , beams, m columns , lintels curved or straight including fitting , fixing and striking out after completion of works
7.0	Reinforcement for reinforced concrete work in the all sorts of structures including distribution bars, stirrups, binders etc. including supply of rods , initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge balck annealed wire at every intersection, all complete as per drawing and direction Tor steel
8.0	Brick work with 1st class bricks in cement mortar (1:6) In foundation and plinth and In superstructure, ground floor
9.0	125mm thick brick work with 1st class bricks in cement mortar(1:4) in different floors.
10.0	Plaster (to wall , floor, ceiling etc) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints or roughening of of concrete surface , including throating , nosing and drip course where necessary 15 mm thick plaster (Internal) 1:6
11.0	Applying Exterior grade Acrylic primer of approved quality and brand on plastered on concrete surface old or new surface to receive decorative textured(matt finish) or smooth finish acrylic exterior emulsion paint including scraping and preparing the surface throughly, complete as per manufacturer's specification and as per direction of the EIC. One Coat
11.0	Applying decorative cement based paint of approved quality after preparing the surface including scraping the same thoroughly (plastered or concrete surface) as per manufacturer's specification. (iii) Two coats.
12.0	Priming one coat on steel and metal surface with synthetic oil bound primer of approved quality including smoothening surfaces by sand papering etc.

13.0	Painting with best quality synthetic enamel paint of approved make and brand including smoothening surface by sand papering etc. including using of approved putty etc. on the surface, if necessary On steel or other metal surface : With super gloss (hi-gloss) - Two coats (with any shade except white)
14.0	(a) Supplying, fitting galvanised 3 ply 12 gauge / 4 points line of barbed wire in fencing (holes already made in the body of the post) or fixed by staples tightening and fixing the wires in taut condition with straining bolts including the cost of cutting and of lapping joints in the wire as necessary but excluding the cost of galvanised staples, straining bolt and binding wire where necessary.
15.0	M.S. or W.I. Ornamental grill of approved design joints continuously welded with M.S, W.I. Flats and bars of windows, railing etc. fitted and fixed with necessary screws and lugs including Locking and Handling Arrangement Grill weighing above 16 Kg./sq.mtr and above
16.0	Priming one coat on steel or other metal surface with synthetic oil bound primer of approved quality including smoothening surfaces by sand papering etc.
17.0	Painting with best quality synthetic enamel paint of approved make and brand including smoothening surface by sand papering etc. including using of approved putty etc. on the surface, if necessary : (b) On steel or other metal surface : With super gloss (hi-gloss) Two coats (with any shade except white)

Guard Room

Guard Room	
Following items are to be executed as per as per direction of Engineer in charge.	
1	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75 m. as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete.
2	(A) Filling in foundation or plinth by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand.
3	Single brick flat soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with powdered earth or local sand.
4	1) Cement concrete with graded stone ballast Pakur Variety (a) 1:3:6 proportion
5	Ordinary Cement concrete (mix 1:1.5:3) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement as per relevant IS codes.
6	Brick work with 1st class bricks in cement mortar (1:6) In foundation and plinth and Superstructure ground floor
7	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete.
8	Hire and labour charges for shuttering with centering and necessary staging upto 4mm, using approved scout props and thick hard wood planks of approved thickness with required bracings for concrete slabs, columns, lintels, beams etc. curved or straight, including fitting, fixing and striking out after completion of works
9	Reinforcement for reinforced concrete work in all sort of structures including distribution bars, stirrups, binders etc. including supply of rods, initial straightening and removal of loose rust (if necessary) cutting to requisite length, hooking and bending to correct shape, placking in proper position and binding with 16 gauge black annealed wire at every inter- section, complete as per drawing and direction.

10	25mm. thick damp proof course with cement concrete with stone chips (1:1.5:3) [with graded stone aggregate 10 mm nominal size] and admixture of water proofing compound as per manufacturer's specification followed by two coat of polymer based paint, (1st coat after 4 to 5 days of concrete laying and 2 nd coat just before brick masonry work) as directed (cost of water proofing compound & polymer based paint to be paid separately).(Chequering not required over concrete or painted surface).
11	125mm thick brick work with 1 st class bricks in cement mortar (4:1)
12	Artificial stone in floor, dado, staircase etc. with cement concrete (4:2:1) with stone chips, laid in panels as directed with topping made with ordinary / white cement (as necessary) and marble dust in proportion (2:1) including smooth finishing and rounding off corners and including application of cement slurry before flooring works, using cement @ 1.75 Kg /Sq.m. all complete including all materials and labour.
13	Supplying, fitting & fixing 1st quality Ceramic tiles in walls and floors to match with the existing work & 4 nos. of key stones (10mm) fixed with araldite at the back of each tile & finishing the joints with white cement mixed with colouring oxide if required to match the colour of tiles including roughening of concrete surface, if necessary or by synthetic adhesive & grout materials etc. With Sand Cement Mortar (1:4) 20 mm thick & 2 mm thick cement slurry at back side of tiles using cement @ 2.91 Kg/Sq.m & joint filling using white cement slurry @ 0.20kg/Sq.m.
14	Supplying, fitting & fixing 1st quality Ceramic tiles in walls and floors to match with the existing work & 4 nos. of key stones (10mm) fixed with araldite at the back of each tile & finishing the joints with white cement mixed with colouring oxide if required to match the colour of tiles including roughening of concrete surface, if necessary or by synthetic adhesive & grout materials etc. With Sand Cement Mortar (1:3) 15 mm thick & 2 mm thick cement slurry at back side of tiles using cement @ 2.91 Kg/Sq.m & joint filling using white cement slurry @ 0.20kg/Sq.m.
15	Neat cement punning about 1.5mm thick in wall, dado, window, sill, floor etc. NOTE:Cement 0.152 cu.m per100 sq.m.
16	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking outs joints or roughening of concrete surface by chamfering etc.including throating, nosing and drip course where necessary (Ground floor). Excluding cost of chipping over concrete surface] With 1:6 cement mortar, 15mm thick plaster. 20mm thick plaster.with 1:4 cement mortar,10mm thick plaster.
17	Wood work in door and window frame fitted and fixed in position complete including a protective coat of painting at the contact surface of the frame exluding cost of concrete, Iron Butt Hinges and M.S clamps. (The quantum should be correteduptothree decimals). (d) Sal : Local
18	Panel shutter for door and window as per design (Each panel consisting of single plank without joint)including fitting & fixing the same in position but excluding the cost of hinge and other fitting in Ground Floor(In case of non supply of single plank,penal rate of reduction of 20% will be made) 40 mm thick shutters with 19 mm thick pane of size 30 to 45 cm.

19	Supplying fitting and fixing in position approved P.V.C. door frame (Matt finish) made of extruded P.V.C. multichamber hollow section having dimensions 60mm x 50mm x 2mm (+/-0.2mm), horizontal section will be joined with vertical section by galvanised steel screws after inserting two number steel brackets as reinforcement making suitable space for placing hinges, one steel tube 40mm x 20mm x 1.20 mm will be inserted on one full vertical side of the frame (hinge side) as reinforcement, the frame will then be fixed in the opening with the help of P.V.C. expandable fastner/wooden gutties and galvanised steel screws all complete.
20	PVC Door Shutter-30 mm thick: Supplying fitting and fixing P.V.C. door shutter of approved quality & shade in position, the style & rail of the P.V.C. door shutter will be made of rigid P.V.C. multicavity hollow chamber of 59 mm x30 mm section with 2.0 mm (+/-0.2 mm) wall thickness. Horizontal & vertical section shall be fixed to each other by self tapping screws and 1 solid polymeric or M.S. galvanised tubular 'L' shaped bracket 100mm x 200mm in each corner of the shutter frame for placing hinges. Polymer based multicavity hollow section of 120 mm x30mm with 2.0 mm (+/- 0.2 mm) wall thickness will be fitted in the middle, reinforced by solid polymer bar of 200 mm long at both ends and screws from both sides as lock rail. The section frame will then be fitted in by PVC panels of size 100 mmx25 mm with wall thickness of 1.2 mm (+/- 0.2 mm) and 2 nos. of 6 mm dia bright rod will be inserted horizontally with both side check and nut system and stretches where fixing of hinges / hasp bolt / tower bolt / door ring are required to be strong enough to with stand wear and tear.
21	Supplying fitting approved type ventilator in position after cutting holes in walls, setting in cement mortar, mending damages to wall and plaster and two coats of paint of approved brand sand shade . R.C.C. ventilator of 20 mm thick - upto 0.10 sq.m. area
22	Supplying fitting, fixing- Openable steel windows as per IS sizes with side hung shutters and horizontal glazing bars with/without fixed type ventilators.
23	Supplying 1.5mm thick M.S. sheet fitted and fixed on one or both faces of M.S./ W.I. gate etc. with point welding at not more than 150mm apart complete in all respect as per design including cost of all labour and materials
24	(a) M.S. or W.I. Ornamental grill of approved design joints continuously welded with M.S, W.I. Flats and bars of windows, railing etc. fitted and fixed with necessary screws and lugs in ground floor.
25	White washing including cleaning and smoothening surface thoroughly. (c) Three coats (on new works only).
26	Applying decorative cement based paint of approved quality after preparing the surface including scraping the same thoroughly (plastered or concrete surface) as per manufacturer's specification. (i) Two coats.
27	(a) Priming one coat on timber or plastered surface with synthetic oil bound primer of approved quality including smoothening surfaces by sand papering etc.
28	(b) Priming one coat on steel or other metal surface with synthetic oil bound primer of approved quality including smoothening surfaces by sand papering etc.
29	(A) Painting with best quality synthetic enamel paint of approved make and brand including smoothening surface by sand papering etc. including using of approved putty etc. on the surface, if

	necessary :
30	Supplying, fitting and fixing M.S. clamps for door and window frame made of flat bent bar, end bifurcated with necessary screws etc. by cement concrete(1:2:4) as per direction.
31	Iron butt hinges of approved quality fitted and fixed with steel crews, with ISI mark.
32	(A) Iron door ring of approved quality fitted and fixed with nut and washer complete.
33	Anodised aluminium barrel / tower / socket bolt (full covered) of approved manufactured from extruded section conforming to I.S.-204/74 fitted and fixed with
34	i) Iron hasp bolt of approved quality fitted and fixed complete (oxidised) with 16mm dia rod with centre bolt and round
	(a) 200mm long.
35	Iron catch hook of approved quality fitted and fixed to shutter and chowkat.
36	Supplying , fitting and fixing hinge cleat in position excluding the cost hinge and other fittings.with 75mm iron Butt-hinge
37	125mm long wooden buffer block With Sal siliguri
38	Saucer drain up to 150 mm width and 75mm depth including cement plaster(3:1) and neat cement finishing. (cement=224.0 Kg/100 mtr)
39	Number plaque of building (plaque size up to 225 mm x 225 mm) made of sand cement plaster (1 : 2) on face of wall or plinth with 50 mm size letters P.W.D and the number of the structure formed thereon (in sunk type) including painting the letters and the number complete as per direction.
40	R.C. shelves (1:1.5:3)) either precast or cast in situ with stone chips and necessary reinforcement upto 1% (0.8 % main and 0.2% distribution bars), shuttering etc. and 6 mm. thick cement plaster (4:1) including neat cement finishing and cutting chase fitting and fixing in position, mending good damages necessary complete. In ground floor (b) 37.5 mm thick panels . SAIL/TATA/RINL
41	Band moulding (horizontal-verticle) rectangular section made with cement plaster 1:4 complete. i) Projection upto 25 mm a)Depth or Width 75 mm to 100 mm.
42	Renewing throating,nosing or drip course moulding with 15 mm thick cement plaster(1:4)complete.(cement 0.7 kg/mtr.) In ground floor.
43	Supplying,fitting and fixing Peet's valve fullway gunmetal standard pattern best quality of approved brand bearing I.S.I. marking with fittings . (tested to 21 kg/sq.cm.) (for water lines only).- 15 mm. dia.

44	Supplying, fitting and fixing Fan Hook for ceiling with 1 metre long 16mm dia rod complete including mending damages .
45	Supplying, fitting and fixing bevelled edged mirror 5.5 mm thick silver red as per I.S. 3438 / 1965 together with brass C.P. hinges. (i) 450 mm X 300 mm
46	Construction of septic tank of different capacities as per approved drawing with 1st class brick work in cement mortar (1:4) including two 560 mm dia. R.C.C. manhole cover (heavy type) of approved make supplied, fitted and fixed in the 100mm thick R.C.C (1:1.5:3) top slab with necessary fittings, 20mm thick cement plaster (4 : 1) with neat cement finish to the internal surfaces and 15 mm thick cement plaster (4 : 1) to outside wall upto 200 mm below G.L floor finished with 25 mm thick grey artificial stone over 100 mm thick R.C.C(1:1.5:3) bottom slab including supplying, fitting and fixing all necessary specials, fittings, S.W. tees, C.I. foot rest etc. including excavation earth in all sorts of soil, shoring, bailing out and pumping out water as necessary, ramming, dressing the bed and filling the sides of the tanks with earth, removing spoils, filling up the chamber with clear water, removing foreign materials from the chamber and including constructing attached inspection pit as per approved drawing and connecting all necessary pipes, joints etc. with internal plaster work and artificial stone flooring is to be done with admixture of water proofing compound @ 0.5% by weight of cement with all costs of labour and materials.
	i) For 10 users.
47	Supplying, fitting and fixing Orisa pattern water closet in white glazed vitreous China ware of approved make including trap as required all complete.
48	Supplying, fitting and fixing E.W.C. in white glazed vitreous chinaware of approved make complete in position with necessary bolts, nuts etc. With 'P' trap
49	Supplying, fitting and fixing 10 litre porcelain low-down cistern of approved make with either side or bottom inlet, side overflow, brackets complete with all internal PVC fittings. White
50	Supplying, fitting and fixing approved brand P.V.C. CONNECTOR white flexible, with both ends coupling with heavy 600mm long.
51	Construction of circular soak well 2.5 metre deep in all types of sandy soils with dry brick work upto 1.6 metre from the bottom having 150 mm intermediate cement brick work (1:4) band all round and cement brick work (1:4) upto 0.90 metre from top with 20mm thick cement plastering (1:4) to inside face upto the depth of cement brick work, 15mm thick cement plaster (1:4) on outer face from top of the well upto G.L. and 6 mm thick cement plaster (1:4) on top of the R.C.C. cover slab including filling bottom 1.00 metre of inside of the well with brick metal (50 mm to 63 mm size) including R.C.C. cover slab of 100 mm thick with cement concrete (1:1.5:3) with stone chips with necessary reinforcement and shuttering including one 560 mm dia. R.C.C. manhole cover (heavy type) of approved make supplied, fitted and fixed in the cover slab with necessary fittings, making necessary arrangements for pipe connections, excavation of well including shoring, dewatering and removing the excess earth from the premises as per direction complete in all respect with all costs of labour and materials. With 250 mm thick dry brick work and 250 mm thick cement brick work (1:6) and 1.00m inside dia.

52	Constructing inspection pit of inside measurement 600 mm x 600 mm x upto 600 mm (depth)with 250 mm thick 1st class brick work in cement mortar (1:4)on all sides ,bottom of the pit consisting of 100 mm thick cement concrete(1:3:6)with stone chips over a layer of jhama brick flat soling,15 mm thick (1:4)cement plaster to inside walls and outside walls upto GL and 20 mm thick (1:4)plaster to bottom of the pit,providing necessary invert with cement concrete (1:3:6)with stone chips as per direction,neat cement finishing to entire internal surfaces,top of the pit covered with 100 mm thick RCC slab (1:1.5:3)with stone chips and necessary reinforcements upto 1% and shuttering including 6 mm thick cement plaster(1:4) in all external surfaces of the slab and one 560 mm dia RCC manhole cover of approved make supplied,fitted and fixed in the slab with necessary fittings,necessary earth work in excavation in all sorts of soil,filling sides of the pit with earth and removing spoils after work complete in all respectswith pakur variety. (Sail/TATA/RINL)
53	Supplying, fitting and fixing white vitreous china best quality approved make wash basin with C.I. brackets on 75 mm X 75 mm wooden blocks, C.P. waste fittings of 32 mm dia., one approved quality brass C.P. pillar cock of 15 mm dia., C.P. chain with rubber plug of 30 mm dia., approved quality P.V.C. waste pipe with C.P. nut 32 mm dia., 900 mm long approved quality P.V.C. connection pipe with heavy brass C.P. nut including mending good all damages and painting the brackets with two coats of approved paint .550mm x 400 mm size
54	Supplying, fitting and fixing bib cock or stop cock. (ii) Chromium plated Concealed Stop Cock (Equivalent to Code No. 514(A) & Model - Tropical / Sumthing Special of ESSCO or similar brand).
55	Supplying, fitting and fixing bib cock or stop cock.
	a) (i) Chromium plated Bib Cock short body (Equivalent to Code No. 511 & Model - Tropical / Sumthing Special of ESSCO or similar brand).
56	Supplying, fitting and fixing PVC pipes of approved make of (medium duty) conforming to ASTM D - 1785 and threaded to match with GI Pipes as per IS : 1239 (Part - I). with all necessary accessories, specials viz. socket, bend, tee, union, cross, elbo, nipple, longscrew, reducing socket, reducing tee, short piece etc. fitted with holder bats clamps, including cutting pipes, making threads,fitting, fixing etc. complete in all respect including cost of all necessary fittings as required,jointing materials and two coats of painting with approved paint in any position .
	a) 25 mm dia.
	b) 15 mm dia.
57	Supplying P.V.C. water storage tank of approved quality with closed top with lid (Black) - Multilayer
	i) 500 ltr. Capacity.

Masonry Drain	
	Following items are to be executed as per as per direction of Engineer in charge.
1	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete.
2	Single Brick flat soling of picked jhama bricks including ramming and dressing bed to proper level, and filling joints with powered earth or local sand.
3	l) Cement concrete with graded stone ballast Pakur Variety (40 mm size excluding shuttering) (a) 1:3:6 proportion
4	Brick work with 1 st class bricks in cement mortar
5	Plaster (to wall, floor, ceiling etc)with sand & cement mortar includg rounding off or chamfering corners as directed a ramming out joints or roughening of concrete surface by chamfering etc. including threading noising and drip course where necessary 15 mm thick plaster (1:4)
6	Neat cement punning about 1.5mm thick in wall, dado, window, ceiling, floor, drain etc. 25 mm thick.
7	Supplying, fitting and fixing C.I. square jalli. 450 mm

Bituminous Approach Road

	Following items are to be executed as per as per direction of Engineer in charge.
1	Construction of Sub Base using Local Materials, spreading in uniform layers with Motor grader on prepared surface, including screening the metal as necessary, mixing by mix in place method with Rotavator at OMC, and compacting with vibratory roller to achieve the desired density, lighting, guarding and barricading including cost and carriage of all materials and making necessary earthen bundh of one metre wide on each side to protect the edges complete as per Clause 401 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)
	i) For Construction of Sub Base by compacting 1st class brick aggregates (40 mm down) and sand (in proportion of 60:40)
2	Water Bound Macadam Base course by Providing, laying, spreading and compacting stone aggregates of specific sizes to water bound macadam specification including spreading in uniform thickness, hand packing, rolling with vibratory roller 8-10 tonnes in stages to proper grade and camber, applying and brooming requisite type of screening / binding materials to fill up the interstices of coarse aggregate, watering including lighting, guarding, barricading and making necessary earthen bundh of one metre width on each side and preparing the bed by necessary cutting or filling, including cost of all materials and hire and labour charges of all men and machinery and compacting to the required density, as per Clause 404 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).

	(iii) Grading-I Aggregate (63 mm to 45 mm) Using Stone Screening Type B (11.2 mm) A. Mechanical Means.
	(iii) Grading-II Aggregate (53 mm to 22.4 mm) Using Stone Screening Type B (11.2 mm) A. Mechanical Means.
3	Bituminous Macadam using Mobile Hot Mix Plant (Light duty). Laying Bituminous Macadam of specified grade using Hot Mix Plant (HMP) and using approved aggregates conforming to specified grading and bitumen over prepared surface, including carrying the hot premixed materials by means of tipper truck, spreading, the mixed material at specified laying temperature over the prepared surface by means of a suitable paver finisher, tamping and finishing the mix to specified grade, line and camber, thorough rolling with suitable power rollers for break down, inter-mediate and finished rolling as per specification, hand packing and pinning to give an even surface including cost and carriage of stone materials & bitumen, and hire charges of HMP and all other machines and equipments, cost of fuels and lubricants and wages of operational staff, quality control as per IRC Specification all complete excluding cost of applying tack coat, as per specification for Road & Bridge Works of MoRT &H (5th. Revision) B. For Grading II (19 mm nominal size, 50-75 mm thick.)
4	Providing and applying tack coat using Cationic bituminous emulsion of approved grade conforming to IS : 8887-1978, over prepared surface including cleaning of surface with mechanical broom, moistening the surface, applying tack coat including cost and carriage of emulsion, hire charges of machineries and labour, cost of fuel and lubricants all complete as per specification and direction of the Engineer-in-charge.
	(a) On Granular surface @ 0.25-0.30 kg per 1 m ² :
	(b) On Bituminous surface @ 0.20-0.30 kg per 1 m ²
5	Open-Graded Premix Surfacing Providing, laying and rolling of Open - graded premix surfacing of 20 mm thickness composed of 13.2 mm (@ 0.018 m ³ per m ²) and 11.2 mm (@ 0.009 m ³ per m ²) size stone aggregates, including thoroughly cleaning of the surface, screening, cleaning and pre-heating stone chips and fully pre-coating the same either using viscosity grade paving bitumen or cut-back or emulsion, carrying the mixture by any suitable arrangements, laying the mixture uniformly over the surface, including line, grade and level to serve as wearing course on a previously prepared base, including mixing in Mobile Hot Mix Plant (Light Duty) and thoroughly rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades including the cost and carriage of stone chips and matrix, heating the matrix, preheating the aggregates to required temperature and including the hire charges of Mobile Hot Mix Plant (Light Duty) and other machinery, pay of operators, cost of fuel and lubricants etc. complete to be followed by seal coat of either Type A or Type B as per Technical Specification Clause 508 for Rural Roads of MORD.
6	Providing and laying Premixed Seal Coat (Type B) with approved quality sand/grit @ 0.6 m ³ / 100 m ² and bitumen binder on thoroughly cleaned black top surface coated with tack coat, including heating and mixing cleaned sand/grit (100 % passing through 2.36 mm sieve and retained on 180 micron sieve) uniformly with bitumen binder, laying and spreading the mix at an uniform rate using suitable means, brushing the surface, if necessary, to ensure uniformity, followed by rolling with power roller including the cost and carriage of binder and aggregates, cost of heating the binder and aggregates and all other incidental charges, cost of fuel and lubricants, including hire charges of machineries, tools & plants required for construction and quality control complete as per Clause 511 of Specifications for Road & Bridge Works of MoRT&H (5th Revision). By Manual Means With Hot Bitumen Binder (@ 6.80 kg / 10 sqm.)

Limit of Contract

The limit of contract starts from preparation of complete drawing of Intake, WTP, Rising Main , Valves etc., Jack push and Pipe Carrying Bridge including all other ancillary structure and after approval of same by competent authority proper execution according to specification and after completion of the job preparation of final drawing and submission of the same to competent authority. In between the above, all the works required for successful completion of the component are in the scope of the above work

DETAIL SCOPE OF WORKS -IN GENREAL

I. The participating agency has to carefully inspect the site with the attached drawing and collect all data for preparation of justified estimate and thereafter evaluation of unit rate against each item of BOQ. The participating agency also includes the cost of all such items in estimating the total cost which is required to complete the work complete in all respect.

II. The work is to be executed as per related IS Specification, Form No. 2911 and other specification laid down in the bid. The Sluice valve, Air Release valve, D.I. Fittings, Mechanical Joints etc., where necessary, will be supplied by agency and it should of have reputed make and should be approved by the EIC.

III. The contract comprises of laying of Clear Water Rising Main network (D.I.Pipes K9/MS) including all D.I./other Specials and laying, fitting, fixing, jointing and all other works incidental thereto as desired and set-forth in the specification. Bidders are advised to inspect the site before tendering, extra claims on the ground of insufficient data and absence of knowledge about conditions prevailing at site shall not be entertained.

IV. A tentative network drawing is attached with the bid document in .pdf format. The agency has to plan everything on the drawing i.e., where additional work of shoring, BFS, RCC column, sand filling, Sluice valve and chambers etc. are required. The whole planning thereof will be submitted by the successful bidder after awarding the contract. The working drawing (5 copies) prepared on the basis of the above will be approved by the Superintending Engineer, South Circle, MED, if found` correct. In that case any alternation /addition etc. done by the EIC and /or Superintending Engineer concerned will be final and the contractor will be bound to execute the work as per drawing approved by the SE concern.

V. The work has to be carried out on the basis of the approved drawing.

VI. After completion of the work, a completion drawing (5 copies) in suitable scale with position of pipes (diameter wise and its length), specials/fittings, valves etc. have to be submitted along with final bill. The final bill shall not be paid unless the said stipulation is complied with.

VII. Care has been taken to make the uploaded drawing as correct as possible, nevertheless these drawings must be checked thoroughly by the tenderers' who will be held responsible for satisfactory work of the pipe connection with all its details. Any discrepancy noticed should be pointed out before the work is commenced. Under all circumstances, the contractor will be held responsible for the satisfactory completion. In case of any discrepancy between the drawing and the schedule of tender, the decision of the Superintending Engineer will be final and binding.

VIII. The works are to be carried out strictly in accordance with approved drawing and specification supplemented by other detailed working drawings as the Engineer-in-Charge may sign, if necessary, from time to time. For any change, no extra claim will be entertained.

IX. The pipes are to be laid as far as practicable along road flanks with lowest hindrances to the vehicular traffic. The contractors are to obtain the information regarding the layout and precise position of the underground Electric Main, Telephone or other Cables. No responsibilities in this respect will be taken by the Directorate. The contractor will have to cut CC road orbituminous road of any thickness where suitable Road flank is not available and its cost is included in the relevant items of the work.

X. The trenches will have to be adequately protected against accidents continuously throughout day and night. Demonstrations of danger signals, red lamps and other signs as may be required at the vintage point and imperative upon the contractors in the interest of public safety.

XI. The contractors' will further shore up and support to the satisfaction of the Engineer-in-Charge, all Building Works, Electric Mains, Telephone or Other Cables, Surface Storm Water, Drains, Ditches, Culverts, Water Sources,

Water Mains and Other Pipes which may be or likely to be affected or endangered or disturbed by the works, being in the line thereof and continuous thereto.

XII. The contractors' will be liable for and make good at their own expenses within a reasonable period of time to be fixed by the Engineer-in-Charge, all damages which may be occasioned to one or combination of items in building, walls, water mains and other pipes by or in consequence of the execution of the works or accident whatsoever, in the event of default (in lapse with respect to the time limit) it shall be lawful for the undersigned to employ other agency to make good the damages at the risk at cost of the contractors' after a 24 hours written notice period has elapsed. The expenditure amount in above situation will be deducted from the bills of agency.

XIII. In case of trenches in front of any holding so as to block its passage of communication, the contractors' will have to make for temporary arrangements to remove the difficulties by provision of wooden planks or otherwise and removing the same after the trenches are filled up.

XIV. The tenderers will consider the conditions and adjust the extent of liabilities involved and quote their rate accordingly. Since no extra claims will be entertained separately on that account, inspection of sites prior to tendering, therefore, should be done by the tenderer.

XV. Decision of the Engineer-in-Charge in this respect is final. The excavation shall have to be done through any materials (e.g. — soil, premixed road surface, concrete to roads etc.) with shuttering and dewatering as may be required to protect the trenches and facilitate the works during execution. This also includes cutting and removing trunks and roots of trees.

XVI. Cutting the pipes to sizes lowering and placing them along trenches including laying, fitting and jointing with rubber gasket and / or solvent cement joint and/or D.T. joint as the case may be. Filling the trenches in layers of 15cm, each layer being adequately watered and consolidated. The filling has to be done after completion of the joints and after affecting the hydraulic test as per specification and at location where defects will be found during hydraulic tests. However, no trenches should be left open at the end of the day (at the time of closing of work).

XVII. After removal of the surplus excavated materials (except road metal) after the trenches have been rammed to the satisfaction of the Engineer-in-charge, if any, serviceable materials such as bricks and stones, ballast and chips, stone-setting, asphalt etc. are available from roads and other road flanks along which the pipes have been laid for restoration of the same, contractor will arrange for stacking these materials properly and separately as per direction of Engineer-in-Charge for which, no extra payment will be entertained in this situation.

XVIII. The contractors' rates for laying pipes will also include the cost of all the items of works mentioned with this Clause excepting that for which, a separate item has been provided in the schedule.

XIX. In general, the pipes have to be laid with minimum cushion of 1.1 metre from the existing ground level but if 1.1 metre cushion cannot be maintained anywhere the decision of the EIC is final & binding.

XX. The contractor will provide his own arrangement for every cost, charges or expenses which may be claimed or any person public or private or Government concerned, occurred to the property of life of any such concern or person (as the case may be) by or in consequence of the execution of the said work or in respect of any labour of work, entitled upon said work for which, no extra payment will be allowed.

XVII. EXCAVATION OF FOUNDATION, FILLING UP TRENCHES:

Foundation of trenches excavated as per drawing. The depth and width of trenches properly maintained during execution. The bed of trench is to be properly levelled and rammed. Any water accumulated in the trenches due to sewage or rain water to be dewatered at the cost of contractor. The laying rate includes for excavation in whatever soil and stone, hard or soft, that may be found and breaking through any underground structure surface metalling, pegging and trimming and

pumping, if necessary, for removal of water or muddy water, taking out mud keeping the top soil separately or unavailing of surplus materials, tapping and shoring excavated materials, matching temporary installment and maintenance of surface and every other expense in strict conformity with the specification.

The excavated areas around the foundation structure are to be filled up properly to the required levels with the earth obtained from excavation. The filling should be done properly consolidated with Iron Rammer and sprinkling water. The cost of filling up the trenches includes relevant items of work for which, no extra payment will be made.

XXIII. SUPPLY OF PIPES AND CARRIAGE Only DI (K9) pipe & rubber gasket will be supplied by the department from the store or yard free of cost. Agency has to bear the cost of carriage. All unutilized pipe, after completion of the work have to be returned to departmental store or yard by the agency at his own cost.

XXIII. TECHNICAL SPECIFICATION AND GENERAL CONDITIONS: As scope given in the NleT

XXIV. RECOVERY OF MATERIALS:

For loss or damage of materials, if any supplied by the department or non-returning of surplus materials, recovery (*in which case the decision of the Engineer-in-Charge shall be final*) will be made from the contractor at the highest of the following rates:-

50 per cent in excess of the highest of the following rates;

(i) Department stock rate or purchased rate at the time of recovery of value

(ii) Market rate at the time recovery of value.

The contractors' should carefully examine the materials supplied from Govt. Store regarding its quality and suitability. No complaint in this regard will be entertained once the materials have been supplied to and received by the Contractors.

XXV. DEPARTMENTAL MATERIALS AND COST:

Only DI (K9) pipe & rubber gasket will be supplied by the department free of cost.

XXVI. TIME OF COMPLETION:

The works for pipe line shall be completed in all respect by the contractors' within the time frame.

In the event of work being not completed within this stipulated period, the contractors' will be liable to pay a penalty as Clauses of WB Form No 2911 through which the tender will be accepted.

The contractor will show satisfactory cause for delay in starting work if the works are not started within 10(ten) days from the date of issue of work order. Otherwise, the contract will be terminated. The contractor will accordingly, prepare a time bound programme of execution with regard to all the items of work set-forth in a schedule and submit the same to the undersigned within 7(seven) days' from the date of work order.

For unsatisfactory progress of work, it will be the option of the undersigned/E.I.C. to withdraw the works out of the contractors' and to get the balance works done through any other agency at the risk and cost of the contractors'.

In case of recurrence of unsatisfactory progress, the undersigned/E.I.C. shall have the power to rescind the contract and to impose such penalties as have been specified in the WB Form No. 2911. The contractor may further be debarred from tendering for works under this Directorate.

Before starting the work, the contractor shall submit a target of progress schedule showing the different portions of work, he expects to complete against stages of time.

XXVIII. SITE ORDER BOOK:

The contractor will produce Site order book at site before commencement of the work duly numbering the page herein shall be recorded the orders, instructing comments, sketches etc. as may be issued at site by the undersigned / Engineer-in-Charge or his authorized representative from time to time. The contractor also will comply with such order, instruction, sketches etc. and will maintain the site order book till the contract is fulfilled and will be required to produce the same on demand by the Engineer-in-Charge.

The site order book shall be a bound register full scape size of fifty pages in triplicate duly marked two pages in each unit of three should have perforation beside, so as to be easily detachable.

The contractors' or authorized representative (to be categorical named by the contractors') must sign any such orders, instructions, comments and sketches issued as a token acceptance in all three pages of the Site Order Book.

XXIX. ACCIDENT OR INJURY TO WORKMEN:

The Employer shall not liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other; person in the employment of the Contractor or any sub-contractor, have and except any accident or injury resulting from any act or default of the employer, his agents, or servants. The Contractor shall indemnify and keep indemnified the Employer against all such damages and compensation, save and except as aforesaid and against all claims, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

4.0 SPECIFICATION OF DIFFERENT ITEM OF WORKS TO BE EXECUTED

a) Laying of D.I. pipes (K9) with specials & supplying, fitting & fixing of M.S. Pipes including earth work in excavation in of adequate width as per relevant IS Code having minimum depth to keep the top surface of pipe 1.10 M below of the existing ground level in any kind of soil mixed with boulder, metal crust, concrete pavement, road sub-grade and its flank etc., in position and carriage of materials from departmental store if any to work site, filling of the trenches with excavated materials, consolidating the same in layers, removing the surplus materials from site including all labour, tools and plants etc. Surplus materials out of excavation are to be cleared by the Agency within 20 Km. Radius of the Municipal boundary at his own cost.

b) Laying of **D.I** pipes & specials over brick or concrete pillar or wall upto height of 2m aboveground level aligning assembling etc. all complete including cost of all sal-ballah staging, bamboo scaffolding tools & plants specials for hoisting and positioning etc. all complete as per specification and direction of E.I.C.

c)Cutting D.I. (all types) by chisel/Hacksaw including rendering the surface smooth to make it suitable for rubber gasket/ rubber ring etc. complete as per direction of EIC. (for old line only).

d)Chamfering the spigot end of the D.I pipes for using in Tyton joints line or otherwise by means of electric grinder set at site as per direction of F.I.O

e) Cleaning thoroughly the inner surface of pipe line including special & valves by flushing with water & subsequently disinfection of the same pipe line by flushing again with water containing bleaching powder resulting in residual chlorine not less than 15 mg / Ltr. after 24 hours of such filling including laboratory testing of water sample obtained from disinfected pipe line & disposal of water from the pipe line after completion of the work. The rate is including of cost of requisite water to be arranged by the Contractor. If the agency uses water from departmental supply, recovery will be made as per norms.

f) Supplying & delivery at working site CIDF sluice valve conforming to IS 14846-2000 (ISI marked), with latest amendment, including stacking and inclusive of Departmental inspection, packing charges, all taxes and duties as applicable and payable, Flanged drilled as per IS 15381993 with latest amendment all complete along with installation of the same as per direction of EIC. All products must have BIS certification.

(Approved make: Kirloskar/IVC/L&T/VAG/Fluid Tech.)

Class PN 1.6 with cap. (Sluice Valve to be supplied by agency)

g) Making flange joint to D.I pipes and specials and valves including dewatering of trenches, tools & plants, labour etc. as per specification and instruction of E.I.C.

h) Hydraulically testing of different types of pipes in sections for a head of water not less than 1/2 (Half) the pressure recommended by I.S. or corresponding pipe materials whether the gauge pressure will remain static for 30 minutes by filling water including supply of necessary equipment's such as generator sets, pumps gauges etc. All complete as per specification and instruction of E.I.C. [Water have to be arranged by the bidder himself and whole testing procedure will be accordance with as per IS : 3114 -1965. If the agency uses water from departmental supply recovery will be made as per norms.]

i) Hire and labour charges for 75 mm dia bamboo railing on Jhau / Eucalyptus or other approved timber / bamboo posts 1.4 m above GL and 0.6 m below GL including tying strongly with coir ropes and boring holes for posts in any soil/ concrete surface / Bituminous surface packing the sides etc. including cost of restoration to the damages of the ground to its original condition as per direction of EIC after removing barricade. 75 mm dia bamboo railing and 100 mm dia bamboo posts @1.4 mtr apart. railing with 3 rows.

j) Dismantling all type of masonry including cement concrete, stacking serviceable materials at site and removing rubbish as directed within a lead of 75m in ground floor including roof.

k) Cutting sub -grade of road (concrete bituminous carpeting & consolidated Ballast/brick soling & other sub-grade materials by means of chisels/Hammer other equipments(for trenches & laying of pipe line.)

l) Emergency horizontal road crossing by **Auger-boring** including boring charge, pipe laying and jointing, making barricades, lighting arrangement etc. all complete as per direction of E.I.C. for 100 mm dia to 500 mm dia pipes (including PWD Road). Horizontal road crossing **by Jack pushing method** including boring charge, pipe laying and jointing, making barricades, lighting arrangement etc. all complete as per direction of E.I.C. for 100 mm dia to 500 mm dia pipes (Including National Highways and Railways crossing).

m) Construction of sluice valve chamber as per drawing supplied by concerned division.

n) Installation of CI Bolted collar as per IS 13382-1992 with latest amendment or end cap up to date including all taxes & other incidental charges what so ever, carriage, loading unloading & stacking at working site.

o) Hire and labour charges for shuttering with centring and necessary staging upto 4 mtr. using approved stout props for and thick hardwood planks of approved thickness with required bracing for concrete slabs , beams and columns ,lintels curved or straight including fitting , fixing and striking out after completion of works (upto roof of g.f), as per drawing, specification & direction of E.I.C.

p) Ordinary cement concrete (mix 1:1.5:3) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement if any in ground floor as per relevant IS Codes.

a) Pakur variety. In ground floor

q) Reinforcement (As per approved brand approved by the EIC) conforming to relevant IS code for all reinforced concrete work in all sorts of structures including distribution bars, stirrups, binders etc. including supplying of rods, initial straightening and removal of rust (if necessary), cutting to requisite length, hooking & bending to correct shape (if necessary) placing in proper position & binding with 16 gauge black annealed wire at every intersection etc. complete as per drawing & specification including cost of wire.

r) Single Brick Flat Soling of Picket Jhama bricks including ramming & dressing bed to proper level & filling joints with powder earth or local sand.

s) Temporary Restoration works of all roads to be done and as per direction and satisfaction of E.I.C.

**Superintending Engineer
south Circle, M.**

SECTION – B

CONDITIONS & REQUIREMENTS FOR BIDDING

1. Submission of eBid document will not be allowed beyond the schedule time indicated in the eBidding.
2. Each Bidder shall upload his offer in envelopes (statutory and non statutory)& .xls sheet after digitally signed super scribing the name of the work, name & address of the bidder, NIB No and date of submission of the eBid.
3. Each page of the eBid documents, drawing etc. has to be digitally signed / initialed by the authorized signatory.
4. No eBid proposal will be entertained without the earnest money being submitted as indicated in the eNIB. No interest will be allowed for the said earnest money and the Bid issuing authority will hold the same till finalization of the eBid.
5. Any conditional eBid will be liable for rejection.
6. e-Bids will be opened in presence of the Bidder or their authorized representatives who opt to be present.
7. The Bid inviting Authority reserves the right to reserve or amend the eBid documents prior to the date notified for submission of the eBid or also to extend the time mentioned in the eNIB under intimation to the Bidders.
8. e-Bid once offered cannot be withdrawn within a period of 120 calendar days from the date set for opening of e-Bids. Any extension of this validity period if required will be subject to concurrence of the Bidders.
9. Bidders would be at liberty to point out any ambiguities, contradictions, omissions, etc. seeking clarifications thereof or interpretation of any of the conditions of the eBid documents before the Bid Inviting Authority by uploading his/her doubt within a period of seven days or at pre Bid Meeting from the date of publishing of Bid documents. Any questions or clarifications regarding Bid Document which is required to be discussed in Pre Bid meeting should be send by the bidder in advance before Pre Bid meeting in the office of the Superintending Engineer (South Circle), Kharagpur, M.E.Dte

10. Written clarification or amendments etc. as may be issued by the Bid Inviting Authority in pursuance to the representation made by the intending Bidders under Clause 10 above shall be final and binding on the Bidders and shall form a part of the eBid documents. Bid Inviting Authority however, reserves the right to have pre Bid conference with the intending Bidders if deemed necessary.
11. Intending Bidders are required to inspect the site of the Project with particular reference to location and infrastructure facilities. They are to make a careful study with regard to availability of materials and their sources and all relevant factors as might affect their rates and prices.
12. If expenses incurred for site inspection and all activities in the preparation and uploading of the eBid shall be borne by the Bidders.
13. Extra claim or any concession on the ground of insufficient data or information and absence of knowledge of conditions prevailing at the site or situation arising during the execution of the work shall not be entertained.
14. eBid, which have been considered valid on the result of general examination (Prequalification stage) at the time of opening, shall be subjected to subsequent detail scrutiny. Notwithstanding the general examination carried out earlier, the Bid Inviting authority reserves the right of rejection of any eBid, which may be found to be defective during the detail scrutiny.
15. Bidders before uploading the eBid documents shall have to ensure that “Declaration by the Bidder” in the pro-forma set out in the eBid documents is to be filed separately with the eBid documents in the form of Affidavit to be affirmed by the same person signing the Bid documents.
16. The Bid inviting authority reserves the right to accept or reject any or all of the eBid received or to split up the work in groups or to relax any clause without assigning any reason thereof.
17. This set of Bid documents consists of:

Main Bid Documents consists of PART I & PART II(Technical) & financial.xls sheet

The Superintending Engineer,

South Circle

SECTION - C

General Conditions of Contract

1.0. DEFINITIONS AND INTERPRETATION

- (1) In the Contract, as hereinafter defined, the following words and expressions shall have to be meanings hereby assigned to them, except where the context otherwise requires:
- (a) "Approved" means approved in writing, including subsequent written confirmation of previous verbal approval and "approval" means approval in writing, including as aforesaid. However in spite of approval from Competent Authority, contractor is solely responsible for design-cum-execution of the whole project as it is a turnkey job. The contractor takes full responsibility for the construction and commissioning of the plant. This also includes the delivering of the plant in full working order to the owner. The constructor assumes responsibility from beginning to the end. After approval from the competent Authority, if any rectification, addition, alteration, reinstallation of any equipment of any nature is necessary as per site condition or as per requirement of the plant, the contractor is liable to do all needful at his own cost including supplying, delivery of all equipments. In that case, the contractor has to seek fresh approval from the competent authority treating the previous approval as cancelled and null and void. In all case "Approval" has to be treated as provisional approval only.
- (b) Authority means the Superintending Engineer (South Circle), M.E.Dte.
- (c) "Bank" means the "State Bank of India" or any other Nationalized Bank.
- (d) "Calendar day" means a period of twenty four hours extending from midnight to midnight.
- (e) "Cash" includes cheque, bank drafts and any other payment voucher authorizing payment from any bank or treasury;
- (f) "Contractor" means the person or persons, firm or Corporation who have entered into the contract for the performance of the work;
- (g) "Contract price" means the sum as stated in the Bid submitted by the contractor subject to such additions thereto or deductions therefore as may be made under the provisions of; the contract documents and accepted by the Employer.
- (h) "Constructional Plant" means all appliances or things of whatsoever nature required in or about the execution or maintenance of the works but do not include materials or other things intended to form or forming part of the permanent works.
- (i) "District" or Panskura Municipal Area means the area described as such in Schedule-I of The Act;

- (j) "Drawings" means the drawings referred to in the Bid documents and any modification of such drawings approved in writing by the Superintending Engineer, Central Circle or his representatives of Municipal Engineering Directorate from time to time or approved in writing by the Superintending Engineer, Central Circle, M.E.Dte., Govt. of W.B.
- (k) "Employer" means **"the Superintending Engineer, South Circle, M.E. Directorate, Govt. of W.B** on behalf of Governor of WB.
- (l) "Engineer in Charge" means the Executive Engineer, East Midnapur Division of Municipal Engineering Directorate.
- (m) "Engineer's Representatives" means any Assistant Engineer or Assistant of the Engineer or any Technical Personnel of works appointed from time to time by the Employer or the Engineer to perform the duties set forth in Clause 2 hereof, whose authority shall be notified in writing to the Contractor by the Engineer-in Charge.
- (n) "Ground Level" means the level of the referred point of the exposed surface of the ground, road or pavement free from extraneous materials;
- (o) "Holidays" means a public holiday for the purpose of Section 25 of the Negotiable Instruments Act, 1881 or such other day on which the office of the Authority remains closed for the day;
- (p) "Local Authority" not only means a Municipal Corporation or Municipality or other authority legally entitled to the control or manage local funds but also includes the West Bengal State Electricity Board.
- (q) "Month" means English calendar month;
- (r) "Permanent Work" means the permanent works including equipment to be supplied, executed, erected and maintained in accordance with the Contract;
- (s) "Road" shall include a street, avenue, lane, by-lane or any other access routes over which a person authorized by a Local Authority has a right of way;
- (t) "Rupees" (or Rs. in abbreviation) shall mean Rupees in Indian Currency.
- (u) "Site" means the land and other placed on, under in or through which the Permanent. Works or Temporary Works are to be executed and any other lands and places provided or arranged by the employer for working space or any other purpose as may be specifically designated in the Contract as forming part of the Site,

- (v) "Specification" means the specification referred to in the Bid and any modification thereof or addition thereto as may from time to time be furnished or approved in writing by the Superintending Engineer, Central Circle, M.E.Dte., and Govt. of W.B.
- (w) "Store" means such storage areas including depot, godown, stockyard, dumping yard etc. maintained by the Authority) or where supply of any material for the construction or any work has been undertaken by any authorized agent, by such agent within the District.
- (x) "Temporary Works" means all temporary works of every kind required in or about the execution or maintenance of the Permanent Works.
- (y) "Bid Date" means the date fixed for receipt of Bids as per Notice Inviting Bids or as extended by subsequent notification(s).
- (z) "Bidder" means the person, or persons, Firm, Company or Corporation submitting a Bid for the work contemplated either directly or through a duly authorized representative;
- (aa) "The Act" West Bengal Municipal Act, 1975.
- (bb) "Time" expressed by hours of the clock shall be according to the Indian Standard Time.
- (cc) "Water main" means any pipe or conduit of cast iron, steel or of any other material intended to convey or distribute water;
- (dd) "Works" shall include both Permanent Works and Temporary Works.
- (ee) "Work" means all of the work of the project called for or shown in the Bid documents including preparation, construction improvement and clean up.
- (ff) "IRWR" means intermediate Raw Water Reservoir in between intake and water treatment plant (WTP).
- (2) Singular and Plural: Works importing the singular only also include the plural and vice versa where the context demands.
- (3) Headings or Notes: The headings and marginal notes in these Conditions of Contract shall be deemed to be part thereof or be taken into consideration in the interpretation or construction thereof or of the Contract.
- (4) Cost: The work "cost" shall be deemed to include overhead costs whether on or off the Site.

2.0. ENGINEER IN CHARGE AND HIS REPRESENTATIVES

- (1) Duties and Powers of Engineer in Charge and his Representative - The Engineer shall carry out such duties in issuing decisions, certificates and orders as are specified in the Contract. Fixation and acceptance of rates for altered or substituted items of work or for additional items of work or their deletion shall however always rest with the same authority (by designation) as had accepted the original Bid.

- (2) Representative(s) shall be responsible to the EIC and his/their duties are to watch and supervise the Works and to test and examine any materials to be used or workmanship employed in connection with the works. He shall have no authority to relieve the Contractor of any of his duties or obligations under the Contract, not, except as expressly provided hereunder or elsewhere in the Contract, to order any work involving delay or any extra payment by the Employer, nor to make any variation of or in the Works.
 - (a) Failure of the Engineer's Representative to disapprove any work of materials shall not prejudice the power of the Executive Engineer thereafter to disapprove such work or materials and to order the pulling down, removal of breaking up thereof.

 - (b) If the Contractor shall be dissatisfied by reason of any decision of the Engineer's Representative he shall be entitled to refer the matter to the Executive Engineer, who shall thereupon confirm, reverse or vary such decision.

ASSIGNMENT AND SUB LETTING

3.0. ASSIGNMENT

The Contractor shall not assign the Contract or any part thereof, or any benefit or interest therein or there under, otherwise than a change in the Contractor's bankers of any money due or to become due under this contract, without the prior written consent of the EIC.

4.0. SUBLETTING

The Contractor shall not sublet the whole of the Works. Except where otherwise provided by the Contract, the Contractor shall not sublet any part of the Works without the prior written consent of the Superintending Engineer, which shall not be unreasonably withhold and such consent, if given, shall not relieve the Contractor from any liability or obligation under the Contract and he shall be responsible for the acts, defaults and neglects of the said sub-contractor including his agents, servants or workmen as fully as if they were the acts, defaults or neglects of the Contractor, his agents, servants or workmen, provided always that the provision' of labour on a piece-work basis shall not be deemed to be a subletting under this clause.

5.0. CONTRACT DOCUMENTS

- (1a) Language: The Contract documents shall be drawn up in the English language. All correspondence, orders, notices etc. shall also be in English.
- (1b) Law: The law of India and of the State of West Bengal shall apply to the Contract and the Contract is to be construed accordingly.
- (2) Documents Mutually Explanatory: The several documents forming the contract are to be taken as mutually explanatory of one another but in case of ambiguities or discrepancies the same shall be explained and adjusted by the Superintending Engineer, in terms of the provisions in Clause B-2.3 of the Conditions and Requirements for Bidding (omitted portion) who shall thereafter issue to the Contractor instructions thereon. Provided always that if, in the opinion of the Engineer, compliance with any such instructions shall involve the Contractor in any cost, which by reason of such ambiguity or discrepancy could not reasonably have been foreseen by the Contractor, the Engineer shall certify and the Superintending Engineer shall pay such additional sum as may be reasonable to cover such costs.

6.0 DRAWINGS

- (1) Custody of drawing: All the approved Drawings shall remain in the safe custody of the Executive Engineer, but one copy thereof shall be furnished to the Contractor free of charge. The Contractor shall provide and make at his own expenses any further copies required by him. At the Completion of the Contract, the Contractor shall return to the Executive Engineer, East Midnapur Division, M.E.Dte. Govt. of W.B all drawings as provided under the Contract.
- (2) One copy of approved drawing to be kept on site. One copy of the Drawings furnished by the Contractor as aforesaid, shall be kept by the Contractor on the site and the same shall at all reasonable times be available for inspection and use by the Engineer and his/municipal Representatives and by any other persons authorized by the Engineer in writing.
- (3) Disruption of progress: The Contractor shall give written notice to EIC whenever planning or progress of the works is likely to be delayed or disrupted unless any further approval of drawing or order, including a direction instruction or approval is issued by the S.E. South Circle, M.E.Dte., on recommendation of Executive Engineer within a reasonable time. The notice shall include details of the drawing or order required, and of why and by whom it is required and of any delay or disruption likely to be suffered if it is further delayed.
- (4) The contractors should submit required design calculations along with drawing. If required by S.E (South) / E.I.C the design shall be submitted in latest version of civil, Mechanical, & Electrical software's with their hard copies and soft copies (in CD).

7.0. FURTHER DRAWINGS

The EIC shall have full power and authority to supply to or demand from the Contractor, from time to time, during the progress of the Works, such further drawings as shall be necessary for the purpose of the proper and adequate execution and

maintenance of the Works. The Contractor shall carry out and be bound by the same. Adequacy as determined by the EIC shall be final and binding on the Contractor.

8.0. GENERAL OBLIGATION

Contractor's General Responsibilities - The Contractor shall, subject to the provision of the Contract, and with due care and diligence, execute and maintain the Works and supply all labour, including the supervision thereof, materials, equipment, Constructional Plant and machinery, tools and all other things whether of a temporary or permanent nature, required for such execution and maintenance, so far as necessary for providing the same is specified in or is reasonably to be inferred from the Contract. The Contractor shall take full responsibility for the adequacy, stability and safety of all Site operations and methods of construction, erection etc.

9.0. CONTRACT AGREEMENT

The Contractor shall, when called upon to do so, enter into and execute a Contract Agreement, to be prepared and completed in the form annexed with such modification as may be necessary.

10.0. GUARANTEE

The contractor shall stand guarantee for successful operation of the plant for 60 (sixty) months from the date of successful commissioning of the pump and shall within the O&M period, after 3 months trial run remove/rectify/ make good any such deficiency forthwith at his own cost. During the guarantee period (after the trial run period) the firm's representative shall visit the site once in a month and advise in writing the Superintending Engineer about the condition, state of health, and operation & maintenance procedure of the equipment.

The successful Bidder shall also give the following guarantee in respect of the equipment supplied by him.

- i) All equipment shall be free from any defects due to faulty design of the components, materials and/or workmanship
- ii) The equipment shall operate satisfactory. The performance and efficiency shall not be less than guaranteed values.
- iii) Formal acceptance of the work or equipment covered under the contract will not be made by the EIC until all the work done by the contractor has satisfactorily passed all tests required and run for a reasonable period to his satisfaction.

If during testing of work, including equipment prior of formal acceptance, the same or the material thereof must satisfy in respect of meeting the specification guaranteed or otherwise the Contractor shall replace all such equipment etc. in a condition which will meet the guaranteed performance and be up to the specification, in both material and workmanship.

Any such work shall be carried out by the contractor at his own expense, if such work shall, in the opinion of the Engineer-in-Charge, be necessary due to the use of materials or workmanship not in accordance with the contract and/or to the neglect or failure on the part of the contractor to comply with any obligation expressed or implied on the contractor's part under the contract. If the contractor shall fail to do any such work as per aforesaid requirement of the Engineer-in-Charge, the EIC shall be entitled to have such work carried out by its own workman, or by others hired for the purpose, and if such work is in the opinion of the Engineer-in-Charge for which the contractor should have carried out at the contractor's own cost, the department shall be entitled to recover from the contractor the supervision cost deemed fit together with the cost increased for the purpose and may deduct the same from any money due to or that may become due to the Contractor.

10.1 START-UP GURANTEES

Until such time as the equipment or material installed and erected under the contact is finally accepted by the Dept.in keeping with the terms and condition of this contract and associated specifications the responsibility for proper storage, testing, maintenance and efficient of the same shall be that of the contractor. Prior to start-up contractor shall be required to service of the equipment and during start-up render such assistance as may be necessary or request for by the Employer.

When the equipment has not been manufactured by the bidder, Back to Back Guarantee shall be provided and the manufacturer recommendations for installation of the same shall be strictly adhered to and any defects developing due to faulty installation transportation and / or erection during start-up or during a period of one year from the date of commissioning shall be rectified, remedied or made good by the contractor through manufacturer, if considered by the Dept. ,at his own cost. When the equipment has manufactured by the bidder himself, rectification within similar period is compulsory.

11.0. INSPECTION OF SITE

The EIC shall have made available to the Bidder with the Bid documents such data like its location, distance from fixed point including the layout drawing and location of the primary grid point,level drawing data the source of filling the reservoir and the Bid shall be deemed to have been based on such data. But the Bidder shall be responsible for his own interpretation thereof. The Bidder may also undertake investigations at his own cost on such levels or any other levels prior to submission of his offer.

The Bidder shall also be deemed to have inspected and examined the site and its surroundings and information available in connection therewith and to have satisfied himself, so far as is practicable, before submitting his Bid; as to the form and nature thereof, including the sub-surface conditions,topography together in the level, the hydrological and climatic conditions, the extent and nature of work and materials necessary for the completion of the Works, the means of access to the Site and the accommodation he may require and, in general 'shall be deemed to have obtained all necessary information, subject as above mentioned, as to risks, contingencies and all other circumstances which may influence or affect his Bid

12.0. SUFFICIENCY OF BID AND ADVERSE PHYSICAL CONDITIONS, ARTIFICIAL OBSTRUCTIONS

The Bidder shall be deemed to have satisfied himself before Bidding as to the correctness and sufficiency of his Bid for the Works and of the rates and prices quoted in the Schedule of prices, which Bid rates and prices shall, except in so far as it is otherwise provided in the Contract, cover all his obligations under the Contract and all matters and things necessary for the proper execution and maintenance of the Works. If, however, during the execution of its Works the Contractor shall encounter physical conditions, other than Climatic conditions on the Site, or artificial obstructions, which conditions or obstructions could, in his opinion, not have been reasonably foreseen by an experienced contractor, the Contractor shall forthwith give written notice thereof to the Engineer and if, in the opinion of the Engineer, such conditions or artificial obstructions could not have been reasonably foreseen by an experienced contractor, then the Engineer shall certify and the EIC shall pay the additional cost to which the Contractor shall have been put by reason of such conditions, including the proper and reasonable cost.

- a) Of complying with any instruction which the Engineer may issue to the Contractor in connection therewith, and
- b) Of any proper and reasonable measures approved by the EIC on recommendation of Engineer in charge which the Contractor may take in the absence of specific instructions from the EIC as a result of such conditions or obstructions encountered.

13.0. WORK TO BE TO THE SATISFACTION OF ENGINEER IN CHARGE

Save in so far as it is not legally or physically impossible, the Contractor shall execute and maintain the Works in strict accordance with the Contract to the satisfaction of the EIC and shall comply with and adhere strictly to the EIC's instructions and directions on any matter whether mentioned in the Contract or not touching or concerning the Works.

14.0. WORK PROGRAM

- (1) Program to be furnished: Within thirty (30) calendar days, the Contractor shall, after the acceptance of his Bid, submit to the EIC for his approval a program showing the order of procedure in which he proposes to carry out the Works. The Contractor shall, whenever required by the EIC, also provide in writing for his information, general description of the arrangements and methods, which the Contractor proposes to adopt for the execution of the Works.
- (2) If at any time it should appear to the EIC that the actual progress of the Works does not conform to the approved program referred in sub-clause (1) of this Clause, the Contractor shall produce, at the request of the EIC, a revised program showing the modifications to the approved program necessary to ensure completion of the Works within the time for completion as defined in Clause 42 hereof.
- (3) The submission to and approval by the EIC of such program or the furnishing of such particulars shall not relieve the Contractor of any of his duties or responsibilities under the Contract.

15.0. CONTRACTOR'S SUPERINTENDENCE

The Contractor shall give or provide all necessary superintendence during the execution of the Works and as long thereafter as the EIC may consider necessary for the proper fulfilling of the Contractor's obligations under the Contract. The Contractor or a competent

and authorized agent or representative approved of in writing by the EIC, which approval may at any time be withdrawn, is to be constantly on the Works and shall give his whole time to the Superintendence of the same. If such approval be withdrawn by the EIC, the Contractor shall, as soon as is practicable, having regard to the requirement of replacing him as hereinafter mentioned after receiving written notice of such withdraw, remove the agent from the works and shall not thereafter employ him again on the Works in any capacity and shall replace him by another agent approved by the EIC. Such authorized agent or representative shall receive, on behalf of the Contractor, direction and instruction from the EIC or, subject to the limitations of Clause 2 hereof the Engineer's Representative. The agent or representative of the Contractor must be able to speak and communicate in English/Bengali. In the absence of the Contractor's designated agent or representative for a particular operation on any site of the works the Contractor's supervisory staff or sub-agent or leading hands shall be instructed to receive and carry out any instruction or direction issued or given by the EIC

16.0. EMPLOYEES

- (1) Contractor's Employees - The Contractor shall provide and employ on the Site in connection with the execution and maintenance of the Works
 - a) Such technical assistants as are skilled and experienced in their respective calling and such sub-agents, foreman and leading hands as are competent to give proper supervision to the work they are required to supervise, and
 - b) Such skilled, semi-skilled and unskilled labor as is necessary for the proper and timely execution and maintenance of the Works.
 - c) Employees covered under (a) and (b) may have to be provided with identity cards as specified by the EIC.
- (2) The Engineer shall be at liberty to object to and require the Contractor to remove forthwith from the Work any person employed by the Contractor in or about the execution or maintenance of the Works who, in the opinion of the EIC, misconducts himself, or is incompetent or negligent in the proper performance of his duties, or whose employment is otherwise considered by the EIC to be undesirable and such person shall not be again employed upon the Works without the written permission of the EIC. Any person so removed from the Works shall be replaced as soon as possible by a competent substitute approved by the EIC.

17.0. SETTING-OUT

The Contractor shall be responsible for the true and proper setting-out of the Works in relation to original points, lines and levels of reference given by the Engineer in writing and for the correctness, subject as above mentioned, of the position levels, dimensions and alignment of all parts of the Works and for the provision of all necessary instruments, appliances and labor in connection therewith. If, at any time during the progress of the Works, any error shall appear or arise in the position, levels, dimensions or alignment of any part of the Works, the Contractor, on his part, required to do so by the Engineer or the Engineer's Representative, shall at his own cost, rectify such error to the satisfaction of the Engineer or the Engineer's Representative, unless such error is based on incorrect data supplied in writing by the Engineer, in which case the expense of rectifying the same shall be borne by the Employer. The checking of any setting-out or of any line or level by the Engineer or the Engineer's Representative shall not in any way relieve the Contractor of his responsibility for the correctness thereof and the Contractor shall carefully protect and reserve all bench-marks, sight rails, pegs and other things used in setting out the Works.

18.0. WATCHING AND LIGHTING

The contractor shall in connection with the works provide and maintain at his own cost all lights, guards, fencing, as and when/where necessary or as required by the EIC or the Engineer's Representative, for the protection of the works, contractor's employees, employees supervisor or for any other reason deemed fit by the Engineer.

19.0. WORKS & RISKS

- 19.(1) Care of Works: From the commencement of the Works until the date stated in the Certificate of Completion for the whole of the Works, pursuant to Clause 47 hereof, the Contractor shall take full responsibility for the care thereof. Provided that if the EIC shall issue a Certificate of Completion in respect of any part of the Permanent Works, the Contractor shall cease to be liable for the care of that part of the Permanent Works (O&M not counted) from the date stated in the Certificate of Completion in respect of that part and the responsibility for the care of that part shall pass to the EIC provided further that the Contractor shall take full responsibility for the care of any outstanding work which he shall have undertaken to finish during the period to Maintenance until such outstanding work is completed. In case any damage, loss or injury shall happen to the Works, or to any part thereof, from any cause whatsoever, save and except the expected risks as defined in sub-clause (2) of this Clause, while the Contractor shall be responsible for the care thereof the Contractor shall, at his Own cost, repair and make good the same, so that at completion the permanent Works shall be in good order and condition and in conformity in every respect with the requirements of the Contract and the EIC instructions. In the event of any such damage, loss or injury happening from any of the excepted risks, the Contractor shall, if and to the extent required by the EIC and subject always to the provisions of Clause 62 hereof, repair and make good the same as aforesaid at the cost of the Employer. The Contractor shall also be liable for any damage to the Works occasioned by him in the Course of any operations carried out by him for the purpose of completing any outstanding works or complying with his obligations under Clause 48 or 49 hereof.
- (2) Expected Risks: The 'expected risks" are war, hostilities, invasion, act of foreign enemies, rebellion, revolution insurrection or military or usurped power, civil war or unless solely restricted to employees of the Contractor or of his sub-contractors and arising from the conduct of his workers, riot commotion or use or occupation by the EIC of any part of the Permanent Works, or a cause solely due to the Engineer's design of the Works, or ionizing radiations or contamination by radio-activity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosive, or other hazardous properties of any explosive, nuclear assembly or nuclear component thereof, pressure waves cause by aircraft or other aerial devices traveling at sonic or supersonic speeds, or any such operation of the force of nature as an experienced contractor could not foresee, or reasonably make provision for or insure against all of which are herein collectively recurred to as "the expected risks."

20.0. INSURANCE OF WORKS, ETC.

Without limiting his obligations and responsibilities under Clause 19 hereof the Contractor shall insure in the names of the Employer and the Contractor against all loss or damage from whatever cause arising, other than the expected risks, for which he is responsible under the terms of the Contract and in such manner that the Employer and Contractor are covered for the period stipulated in Clause 19(1) hereof and are also covered during the Period of Guarantee for loss or damage arising from a cause, occurring prior to the commencement of the Period of Guarantee, and for any loss or damage occasioned by the Contractor in the course of any operations carried out by him for the purpose of complying with his obligations under Clause 48 or 49 hereof.

- a) The Works for the time being executed to the estimated current contract value thereof together with the materials for incorporation in the Works at the replacement value.

- b) The Constructional Plant and other things brought on the Site by the Contractor to the replacement value of such Constructional Plant and other things. These shall include materials belonging to the EIC but issued to or intended to be issued to the Contractor for use in the Works. Such insurance shall be effected with an insurer and in terms approved by the Employer, which approval shall not be unreasonably withheld, and the Contractor shall whenever required, produce to the EIC or the Engineer's Representative the policy or policies of insurance and the receipts for payment of the current premiums.

21.0. DAMAGES

- (1) Damage to persons and property: The Contractor shall, except if and so far as the Contract provides otherwise, indemnify the EIC against all losses and claims in respect of injuries or damage to any person or material or physical damage to any property whatsoever which may arise out of or in consequence of the execution, operation and maintenance of the Works and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto except any compensation or damages for or with respect to :
 - a) The permanent use or occupation of land by the Works or any part thereof.

 - b) The right of the EIC to execute the Works or any part thereof on over under, in or through any land.

 - c) Injuries or damage to persons or property which are the unavoidable result of the execution, operation or maintenance of the Works in accordance with the Contract.

 - d) Injuries or damages to persons or property resulting from any act or neglect of the Employer, his agents, servants or other contractors, not being employed by the Contractor, or for or in respect of any claims, proceedings, damages, costs, charges and expenses in respect thereof or in relation thereto or where the injury or damage was contributed to by the Contractor, his servants or agents such part of the compensation as may be just and equitable having regard to the extent of the responsibility of the EIC, his servant or agents or other contractors for the damage or injury.

- (2) Indemnity of EIC: The Contractor shall indemnify the EIC against all claims, proceedings, damages, costs charges and expenses in respect of the matters referred to the provision to sub-clause (1) of this Clause.

22.0. INSURANCE

- (1) Third Party Insurance: Before commencing the execution of the Works the Contractor, but without limiting his obligations and responsibilities under Clause 21 hereof, shall insure against his liability for any material or physical damage, loss or injury which may occur to any property, including that of the EIC, or to any person, including any employee of the EIC, by or arising out to the execution of the Works or in the carrying out of the Contract, otherwise than due to the matters referred to in the proviso to Clause 21 (1) hereof

- (2) Minimum Amount of third party insurance - Such insurance shall be effected with an insurer and in terms approved by the EIC, which approval shall not be unreasonably withheld, and for a least the amount stated in the Appendix to the Bid. The Contractor shall, whenever required, produce to the EIC or the Engineer's Representative the policy or policies or insurance and the receipts for payment of the current premium. However, the Bidder should insure for an amount commensurate with the risk involved subject to the minimum amount prescribed elsewhere in the Bid.
- (3) Provision to indemnify Employer - The terms shall include a provision whereby, in the event of any claim in respect of which the Contractor would be entitled to receive liability under the policy being brought or made against the Superintending Engineer, the insurer will indemnify the Employer against such claims and any costs, charges and expenses in respect thereof.

23.0. ACCIDENT, INJURIES

- (1) Accident or injury to Workmen: The EIC shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other person in the employment of the Contractor or any subcontractor, save and except an accident or injury resulting from any act or default of the EIC, his agents, or servants. The Contractor shall indemnify and keep indemnified the EIC against all such damages and compensation, save and except as aforesaid, and against all claims, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.
- (2) Insurance Against Accident, etc., to workmen: The Contractor shall insure against such liability with an insurer approved by the EIC, which approval shall not be unreasonably withheld, and shall continue such insurance during the whole of the time that any person is employed by him on the works and shall, when required, produce to the EIC or the Engineer's Representative such policy of insurance and the receipts for payment of the current premium. Provided always that, in respect of any person employed by any sub-contractor, the Contractor's obligation to insure as aforesaid under this sub-clause shall be satisfied if the sub-contractor shall have insured against the liability in respect of such persons in such manner that the EIC is indemnified under the policy, but the Contractor shall require such sub-contractor to produce to the EIC when required, such policy of insurance and the receipt for the payment of the current premium.
- (3) Notification to insurer: It shall be the duty of the Contractor to notify the insurers under any of the insurance referred to in Clause 20, 22 and 23 hereof any matter or count which by the terms of such insurance are required to be notified and the Contractor shall indemnify and keep indemnified the EIC against all losses, claims, demands, proceedings, costs, charges and expenses whatsoever arising out of or resulting from any default by the Contractor in complying with the requirements of this sub-clause whether as a result of the avoidance of such insurance or otherwise.
- (4) All Insurances at Contractor's cost - The insurances referred to in Clause 21, 22 & 23 hereof shall be entirely at the cost and expenses of the Contractor and be included within his rates.

24.0. REMEDY ON CONTRACTOR'S FAILURE TO INSURE

If the Contractor shall fail to effect and keep in force the insurance referred to in Clause 20, 22 and 23 hereof, or any other insurance which he may be required to effect under the terms of the Contract, then and in any such case the EIC may effect and keep in force

any such insurance and pay such premium or premiums including fines as may be necessary for that purpose and from time to time and deduct double the amount so paid by the employer as aforesaid from any moneys due or which may become due to the Contractor or recover the same as a debt due from the Contractor.

25. (1) Giving of Notices and Payment of Fees: The Contractor shall give all notices and pay all fees required to be given or paid by any National or State Statute, ordinance, or other law, or any rules regulation, or bye-law of any local or other duly constituted authority in relation to the execution of the Works and by the rules and regulations of all public bodies and companies whose property or rights are affected or may be affected in any way by the Works.
- (2) Compliance with Statutes, Regulations, etc. - The Contractor shall conform in all respects with the provisions of any such Statute, Ordinance or Law as aforesaid and the Rules, regulations or bye-laws or any local or other duly constituted authority which may be applicable to the Works and with such rules and regulations of public bodies and companies as aforesaid and shall keep the EIC indemnified against all penalties, fines and liability of every kind for breach of any such Statute, ordinance of Law, regulation of bye law.

26.0. FOSSILS, TREASURE TROVE ETC.

All fossils, Any treasure trove, coins articles of value or object with antiquity and structures and other remains or things of geological or archaeological interest discovered on the site of the Works shall as between the Employer and the Contractor be deemed to be the absolute property of the Employer and shall be handed over to the owner.

27.0. PATENT RIGHTS AND ROYALTIES

The Contractor shall save harmless and indemnify the EIC from and against all claims and proceedings for or on account of infringement of any patent, rights, design Trade mark or name or other protected right in respect of any Constructional Plant, machine works, or material used for or in connection with the Works or any of them and from and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect thereof in relation thereto. Except where otherwise specified, the Contractor shall pay all tonnage and other royalties, rent and other payments or compensations, if any, for getting stone, sand, gravel, clay or other materials or equipment required for the works or any of them.

28.0. INTERFERENCE WITH TRAFFIC AND ADJOINING PROPERTIES

All operations necessary for the execution of the Works shall, so far as compliance with the requirements of the Contract permits, be carried on so as not to interfere unnecessarily or improperly with the convenience of the existing plant workers, member of the public, or the access to use and occupation of public or private roads, railways and footpaths to or of properties whether in the possession of the EIC or of any other person or local authority.

29.0. TRAFFIC

- (1) Extraordinary Traffic: The Contractor shall use every reasonable means to prevent any of the highways, railways or bridges communicating with or on the routes to the Site from being damaged or injured by any traffic of the Contractor or any of this sub-contractors and, shall select routes, choose and use vehicles and restrict and distribute loads so that any such extraordinary traffic as will inevitably arise from the moving of plant and material from and to the Site shall be limited, as far as reasonably possible, and so that no unnecessary damage or injury may be occasioned to such highways, railways and bridges.
- (2) Special Loads: Should it be found necessary for the Contractor to move one or more loads of Constructional plant, machinery or pre-constructed units or parts of units of work over part of a highway, railway or bridge, the moving whereof is likely to damage any highway, railway or bridge unless special protection or strengthening is carried out, then the Contractor shall before moving the load on to such highway, railway or bridge give notice to the EIC or Engineer's Representative or the local authority of the weight and other particulars of the load to be moved and his proposals for protecting or strengthening the said highway, railway or bridge. The Contractor at his own cost and expenses shall carry out such proposals, including any modifications thereto that the Engineer or the local authority may require.
- (3) Settlement of Extraordinary Traffic Claims: If during the Carrying out of the Works damage or injury to railways, railway or bridge occurs due to moving of one or more loads of Constructional Plant machinery or pre-constructed units or parts of units of work, the Employer shall conduct the necessary investigation for the purpose of determining the Contractor's liability. If the damage is due to failure on the part of the Contractor to observe and perform his obligations under sub-clause (1) and (2) of this Clause then the restoration / repair of the damaged portion of road or structure certified by the Engineer or local authority to be due to such failure shall be undertaken by or be chargeable against the Contractor.
- (4) Water-borne Traffic: Where the nature of the Works is such as to require the use by the Contractor of water-borne transport the foregoing provisions of this Clause shall be construed as though "highway" included a lock, dock, sea wall or other structure related to a waterway and "vehicle" included craft, and shall have effect accordingly.

30.0. RESTRICTION

- (a) Restriction of Movements: The work shall have to be executed within the protected area of existing water works. The existing rules and regulation related to ingress and egress of labor and material shall have to be followed strictly in consultation with and as per direction of the EIC or the local authority as the case may be. No labor, Supervisor or Engineer of the contractor shall enter inside the treatment plant, pump house or any other existing installations without prior permission of concerned officers EIC.
- (b) Opportunities for other contractors: The Contractor shall in accordance with the requirements of the EIC, afford all reasonable opportunities for carrying out their work to any other contractors employed by the Employer and their workmen and to the workmen of the employer and of any other duly constituted authorities who may be employed in the execution on or near the Site of any work not included in the Contract or of any contract which the Employer may enter into in connection with or ancillary to the Works. If, however, the Contractor shall, on the written request of the EIC or the Engineer's Representative, make available to any such other contractor, or to the Employer or any such authority, any roads or ways for the maintenance of which the Contractor is responsible, or permit the use by any such of the Contractor's scaffolding or other plant on the Site, or provide any other service of whatsoever nature, the Employer shall pay to the Contractor in respect of such use or service such sum or sums if at all as shall, in the opinion of the Engineer, be reasonable.

31.0. CONTRACTOR TO KEEP SITE CLEAR

During the progress of the Works the Contractor shall keep the site reasonable free from all necessary obstruction and shall store or dispose of any Constructional Plant and surplus materials and clear away and remove from the Site any wreckage, rubbish or Temporary Works no longer required.

32.0. CLEARANCE OF SITE ON COMPLETION

On the completion of the Works the Contractor shall clear away and remove from the site all Constructional Plant, surplus materials, rubbish and Temporary Works of every kind, and leave the whole of the Site and Works clean and in a workmanlike condition to the satisfaction of the Executive Engineer.

33.0. LABOUR

- (1) Engagement of labor: The Contractor shall make his own arrangements for the engagement of all labour, local or otherwise, and save in so far as the Contract otherwise provides, for the transport, housing, feeding and payment thereof.
- (2) Supply of water: The Contractor shall, so far as is reasonably practicable having regard to local conditions, provide on the Site, to the satisfaction of the EIC representative, an adequate supply of drinking and other water for the use of the Contractor's staff and work people.
- (3) Alcoholic Liquor or Drugs: The Contractor or his workmen shall not consume or sale or gift or be under the influence of any drug/narcotics or Alcoholic liquor within the vicinity of the Construction site.
- (4) Arms and Ammunition: The Contractor shall not give, barter or otherwise dispose of to any person or persons, any arms or ammunition of any kind or permit or suffer the same as aforesaid.
- (5) Festivals and Religious Customs: The Contractor shall in all dealing with labour in his employment have due regard to all recognized festivals days of rest and religious or other customs.
- (6) Epidemic: In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the Government, or the local medical or sanitary authorities for the purpose of dealing with and overcoming the same.
- (7) Disorderly Conduct etc.: The contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his employees or workers and for the preservation of peace and protection of persons and property in the neighborhood of the Works against the same.

- (8) Compliance with Laws, regulation etc. relating to labour: In respect of the engagement, employment, transport, payment, feeding, housing and working conditions of labour and all matters connected there with the Contractor shall at all times during the continuance of the Contract, comply in all respects with and carry out all obligations imposed on him by the provisions and requirements of the following statutes.
- (a) The Apprentices Act 1961 (Act 52 of 1961) and Rules and Regulations issued there under from time to time.
- (b) The Contract Labour Regulation and abolition Act 1970 (Act 37 of 1970) and Rules made there under (West Bengal Contract Labour Regulation and Abolition Rules 1972) from time to time.
- (c) The Payment of Wages Act 1936, the Minimum Wages Act 1948, the Employees Liability Act 1938, the Industrial Disputes Act 1947, the Maternity Benefits Act 1961, the Employees State Insurance Act 1948 including modifications thereto the Rules and Regulations framed there under from time to time.
- (d) Other existing National or State Statute, Ordinance or other Law or any Regulation or Bye-law of any local or other duly constituted authority which may be applicable, including any such Law, Regulation or Order that may be passed or ordered from time to time and come into force during the tenure of the Contract.
- (9) Employees Provident Fund: The Contractor shall comply with the provisions of the relevant Employees Provident Fund Act or Rules in force in the State along with the provisions of all rules and Regulations made there under from time to time, and shall in particular be responsible for the payment of all contributions as laid down under the Act/Rules.
- (10) Trade union rights: The Contractor shall recognize the freedom of all workmen employed by him in and for performance of the Contract to be members of registered Trade Unions and shall not in any manner prevent or discourage any such workman from becoming a member of a registered Trade Union or discriminate against any workmen who is a member of a registered Trade Union.
- (11) Local Labor: As far as possible local labor shall be engaged as unskilled labour.
- (12) Fair Wages - The Contractor shall in respect of all workmen employed by him in and for the performance of the Contract pay rates of wages and observe the conditions of employment not less favorable than those provided under the relevant labor law as applicable to the State.
- (13) Medical Attendance: The Contractor shall provide, to the satisfaction of the Government or Local Authorities Concerned, adequate medical attendance for his employees and labour.
- (14) Report or Accident: The Contractor shall, within twenty four (24) hours of the occurrence of any accident at or about the site or in connection with the execution of the Work, report such an accident to the Engineer. The Contractor shall also report such accident to the competent authority whenever law requires such a report.

- (15) Report required by Labor Commissioner: The Contractor shall submit, at the request of the Labor Commissioner or of the Assistant Commissioner of the State such returns as may be called for from time to time in respect of labor employed by the Contractor and by his subcontractors in the execution of the Contract. If so required, the Contractor shall furnish the names and address of all subcontractors to the Labor Commissioner. Statutory provisions in these regards are to be also complied with.
- (16) The Contractor shall be responsible for observance by his subcontractor of all the foregoing provision of sub-clause (1) to (15) of this Clause 33.

34.0. RETURNS OF LABOR ETC.

The Contractor shall, if required by the EIC, deliver to the EIC, or at his office a return in detail in such form and at such intervals as the EIC may prescribe showing the supervisory staff and the number of the several classes of labor from time to time employed by the Contractor on the Site and such information respecting Constructional Plant as the Executive Engineer his Representative may require.

35.0. MATERIALS AND WORKMANSHIP

- (1) All materials and workmanship shall be of the respective kinds described in the Contract and in accordance with the Engineer's instructions and shall be subjected from time to time to such tests as the Engineer may direct at the place of manufacture or fabrication, or on the Site or at such other place or places as may be specified in the Contract, or at all or any of such places. The Contractor shall provide such assistance, instruments, machines, labor and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used and shall supply samples or materials before incorporation in the Works for testing as may be selected and required by the EIC, be it at site or at the manufacturer/Vendors premises or elsewhere.
- (2) Cost of samples: The Contractor at the cost and expense of him shall furnish all samples of materials as may be required by the EIC.
- (3) Cost of Tests: The cost of making any test shall be borne by the Contractor if such test is clearly intended by or provided for in the Contract and in the cases only of a test under load or of a test to ascertain whether the design of any furnished or partially finished work in appropriate for the purpose which it was intended to fulfill, is particularized in the Contract in sufficient detail to enable the Contractor to price or allow for the same in his Bid.
- (4) Cost of Tests not provided for, etc.: If the EIC orders any test, which is either;
- a) Not so intended by or provided for, or
 - b) (In the cases above mentioned) is not so particularized, or
 - c) Though so intended or provided for is ordered by the Engineer to be carried out by an independent person or organization at any place other than the Site or the place of manufacture or fabrication of the materials tested, then the cost of such test

shall be borne by the Contractor, if the tests shows the workmanship or materials not to be in accordance with the provisions of the Contract or the Engineer's instruction, but otherwise the cost shall be borne by the Employer.

36.0. INSPECTION OF OPERATIONS

The Engineer and any person authorized by him shall at all times have access to the Works and to all workshops stores and places where work is being prepared or from where material manufactured articles or machinery are being obtained for the Works and the Contractor shall afford every facility for and every assistance in or in obtaining the right to such access.

37.0. EXAMINATION

- (1) Examination of work before covering up: No work shall be covered up or put out of view without the approval of the Engineer or the Engineer's Representative and the Contractor shall afford full opportunity for the EIC or the Engineer's Representative to examine and measure any work which is about to be covered up or put out of view and to examine foundations before permanent work is placed thereon. The Contractor shall give due notice to the Engineer's Representative where any such work or foundations is or are ready or about to be ready for examinations and the Engineer's Representative shall, without unreasonable delay, unless he considers it unnecessary and advises the Contractor accordingly attend for the purpose of examining and measuring such work or of examine such foundations

- (2) Uncovering and making openings: The Contractor shall uncover any part or parts of the Works or make opening in or through the same as the Engineer may from time to time direct and shall reinstate and make good such part or parts to the satisfaction of the Engineer. If any such part or parts have been recovered up or put out of view after compliance with the requirement of sub-clause (1) of this Clause and are found to be executed in accordance with the Contract, the expenses of uncovering, making openings in or through, reinstating and making good the same shall be, borne by the Employer, but in any other case all costs shall be borne by the Contractor.

38.0. REMOVAL

- (1) Removal of improper work and materials: The EIC shall during the progress of the works have power to order in writing from time to time.
 - a) The removal from the Site, within such time or time as may be specified in the order, of any materials, which in the opinion of the Engineer, are not in accordance with the Contract.
 - b) The substitution of improper, substandard and unsuitable materials, and
 - c) The removal and proper re-execution, notwithstanding any previous test thereof or interim payment therefore, of any work which in respect of materials or workmanship is not in the opinion of the Engineer, in accordance with the Contract

- (2) Default of Contractor in Compliance: In case of default on the part of the Contractor in carrying out such order, the Employer shall be entitled to employ and pay other persons to carry out the same and all expenses consequent thereon or incidental thereto shall be recoverable from the Contractor by the Employer, or may be deducted by the Employer from any sum due or which may become due to the Contractor.

39.0. SUSPENSION

- (1) Suspension of work: The Contractor shall, on the written order of the Engineer, suspend the progress of the works or any part thereof for such time or times and in such manner as the Engineer may consider necessary and shall during such suspension properly protect and secure the work, so far as is necessary in the opinion of the Engineer. The extra cost incurred by the Contractor in giving effect to the Engineer's instruction under this Clause shall be borne and paid by the Employer unless such suspension is
- a) Otherwise provided for in the Contract, or
 - b) Necessary by reason of some default on the part of the Contractor, or
 - c) Necessary by reason of climatic conditions on the Site, or
 - d) Necessary for the proper execution of the work or for the safety of workmen or Works of any part thereof in so far as such necessity does not arise from any act or default by the Engineer or the Employer or from any of the expected risks defined in Clause 19 hereof provided that the Contractor shall not be entitled to recover any such extra cost unless he gives written notice of his intention to claim to the Employer within twenty-eight days of the Engineer's order. The EIC shall settle and determine such extra payment and/or extension of time under Clause 43 hereof to be made to the Contractor in respect of such claim as shall in the opinion of the Employer be fair and reasonable.
- (2) Suspension lasting more than 90 days: If the progress of the Works or any part thereof is suspended on the written order of the EIC and if permission to resume Work is not given by the EIC within a period of ninety days from the date of suspension then, unless such suspension is within paragraph (a), (b), (c) or (d) of sub-clause (1) of this Clause, the Contractor may serve a written notice on the Employer requiring permission within twenty eight days from the receipt thereof to proceed with the Works, or that part thereof in regard in which progress is suspended and, if such permission is not granted within that time, the Contractor by a further written notice so served may, but is not bound to, elect or treat the suspension where it affects part only of the Works as an omission of such part under Clause 50 hereof, or where it affects the whole Works, as an abandonment of the Contract by the Employer.

40.0. COMMENCEMENT TIME AND DELAYS

Commencement of works: The Contractor shall commence the Works on Site within the period named in the Appendix to the Bid after the receipt by him of a written order to this effect from the Engineer and shall proceed with the same with due expedition and without delay, except as may be expressly sanctioned or ordered by the Engineer, or be wholly beyond the Contractors' Control.

The successful contractor shall within four weeks from the date of issue of Letter of Intent furnish one or more drawing stating and showing the following:

- 1.0 Dimensioned area requirement of the pumping station and sump showing the details of
- 1.1 Cut-outs at the operating platform.
- 1.2 Layout of motors, pumps, valves and other electrical units like MCC, Capacitors etc. at different flow level.
- 2.0 Vertical space requirement showing the levels of -
 - 2.1 Plummer Block supporting systems
 - 2.2 Centerline of Pump
 - 2.3 Foundation level of pumps & valves
 - 2.4 Centerline and sizes of pump delivery pipes, bends etc.
 - 2.5 Top of the Pump casing
 - 2.6 H.O.T. Crane rail.
- 3.0 Forces and Moments developed at different locations.
 - 3.1 Static and Dynamic loads of pumps, motors, valves, etc. (showing dead loads separately) & load of various electrical equipment and machinery.
 - 3.2 Moments and stresses developed at different locations.
 - 3.3 Vibrations at different locations expected.
- 4.0 Foundation details showing bolt sizes and extent of embedding of the foundation bolts.

- 5.0 RSJ sizes, locations and fixing arrangements for motor support, RSJ/girder requirement for fixing HOT crane as clamp-on chain pulley blocks for attending of valves etc. at the pump floor level stating the maximum load that is required to be lifted.
- 6.0 Layout of cable trenches, cable trays showing the locations and levels together without position of hooks at the underside of the operating platform stating the maximum load required to be withstood.
- 7.0 Any other data that the Bid considers relevant for construction of civil structure.
8. Any other reasonable data that may be asked for.

41.0. POSSESSION

- (1) Possession of site: Save in so far as the contract may prescribe, the extent of portions of the Site of which the Contractor is to be given possession from time to time and the order in which such portions shall be made available to him and subject to any requirement in the Contract as to the order in which the Works shall be executed, the Employer will, with the Engineer's written order to commence the Works, give to the Contractor possession of so much of the Site as may be required to enable the Contractor to commence and proceed with the execution of the Works in accordance with the Programmed referred to in Clause 14 hereof, if any, and otherwise in accordance with such reasonable proposals, of the Contractor as he shall, by written notice to the Engineer, make and will, from time to time as the Works proceed, give to the Contractor possession of such further portions of the Site as may be required to enable the Contractor to proceed with the execution of the Works with due dispatch in accordance with the said Programmed or proposals, as the case may be. If the Contractor suffers delays or incurs cost for failure on the part of the Employer to give possession in accordance with the terms of this Clause, the Employer shall grant an extension of time for the completion of the Works and certify such sum as, in his opinion, shall be fair to cover the cost incurred, which sum shall be paid by the Employer.
- (2) Way leaves etc.: The Contractor shall bear all costs and charges for special or temporary way leaves required by him in connection with access to the Site. The Contractor shall also provide at his own cost any additional accommodation outside the site required by him for the purpose of the works.

42.0. TIME

- (1) Time of Completion and progress of Works: The progress of the work shall conform to the approved Work Programmed in terms of Clauses 14 hereof, and subject to any requirement in the contract as to the completion of any section of the Works before completion of the whole, the whole of the Works shall be completed, in accordance with the provisions of Clause 47 hereof, within the time stated in the Contract calculated from last days of the period named in the Appendix to the Bid as that within which the Works are to be commenced, or such extended time as may be allowed under Clause 43 hereof.
- (2) Failure in keeping to stages of work Programmed: If the Contractor does not keep to the approved program and continues at any stage to fall behind his schedule by as much as twenty percent (20%) of the said approved work programmed, within thirty (30) days from receipt by him of a written notice from the Engineer, or if in the opinion of the Engineer the delay will

substantially affect operation activities or execution of a major work item and it is ascertained by the Engineer that the Contractor cannot remedy the occasion within the stipulated time, the Executive Engineer on recommendation of Engineer shall have full authority to undertake measures to recover from such adverse condition in terms of the provisions of Clause 62 thereof.

43.0. EXTENSION OF TIME FOR COMPLETION

Should the amount of extra or additional work of any kind or any cause of delay referred to in these Conditions, or other special circumstances of any kind whatsoever which may occur, other than through a default of the Contractor, be such as fairly to entitle the Contractor to an extension of time for the completion of the works, the EIC on recommendation of Engineer shall determine the period of such extension and shall notify the Employer and the Contractor accordingly. Provided that the Engineer is not bound to take into account any extra or additional work or other special circumstances

unless the Contractor has within twenty-eight days after such work has been commenced, or such circumstances have arisen or as soon as is practicable, submitted to the Engineer full and detailed particulars of any extension of time to which he may consider himself entitled in order that such submission may be investigated at the time.

44.0. NO NIGHT OR SUNDAY WORK

Subject to any provision to the contrary contained in the Contract, none of the Permanent Works shall, save as hereinafter provided, be carried on during the night or on Sundays, if locally recognized as days of rest, or other locally recognized equivalent without the permission in writing of the Engineer, except when the works is unavoidable or absolutely necessary for the saving of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Engineer, provided always that the provisions of the Clause shall not be applicable in the case of any work which it is customary to carry out by rotary of shifts

45.0. RATE OF PROGRESS AND NIGHT WORK WHEN PERMITTED

If for any reason, which does not entitle the Contractor to an extension of time, the rate of progress of the Works or any section is at any time, in the opinion of the Engineer, too slow to ensure completion by the prescribed time or extended time for completion, the EIC on recommendation of the Engineer shall so notify the Contractor in writing and the Contractor shall thereupon take such steps as are necessary and the Engineer may approve to expedite progress as to complete the Works or such section by the prescribed time or extended time. The Contractor shall not be entitled to any additional payment for taking such steps. If as a result of any notice given by the EIC under this Clause, the Contractor shall seek the EIC permission to do any work at night or on Sundays, If locally recognized as days of rest, or their locally recognized equivalent, such permission shall not be unreasonable refused. When work at night has to be carried out, the Contractor shall, at his own cost and expense, make adequate arrangements for lighting and provide necessary facilities for safety etc. and comply with all stipulations as may have been imposed by the EIC in granting permission for night work.

46.0. DAMAGES FOR DELAY

- (1) Liquidated Damages for Delay: If the Contractor shall fail to achieve completion of the Works within the time prescribed by Clause 42 hereof, then the Contractor shall pay to the Employer the sum stated in the Contract as liquidated damages for such default and not as a penalty for every day or part of a day which shall elapse between the time prescribed by Clause 42 hereof and the date of certified completion of the Works, the Employer may without prejudice to any other method of recovery, deduct the amount of such damages from any money in his hands, due or which may become due to the Contractor. The payment or deduction of such damages shall not relieve the Contractor from his obligation to complete the Works, or from any other of his obligations and liabilities under the Contract.
- (2) Reduction of liquidated Damages: If, before the completion of the whole of the Works any part or section of the Works has been certified by the Engineer as completed, pursuant to Clause 47 hereof, and occupied or used by the Employer, the liquidated damages for delay shall, for any period of delay after such certificate and in the absence of alternative provision in the contract be reduced in the proportion which the value of the part or section so certified bears to the value of the whole of the Works.
- (3) Extent of Liquidated Damages: The liquidated damages referred to in sub-clause (1) for delay of each day or part thereof, shall be at the rate of one percent (1 %) or such smaller amount as the Employer may decide, or the total value of the Contract Price excluding the value of such part or section of the works as may have been covered by certificate of completion in terms of the provisions of sub-clause (2) above, Provided however that in no case shall the total amount of liquidated damages exceed ten percent (10%) of the total Contract Price for whole Works.
- (4) Liquidated Damage as Reasonable Compensation: The 'Liquidated damage' referred to in sub-clause (1) to (3) above, shall be considered as reasonable compensation to be applied to the use of the Employer without reference to the actual loss or damage sustained and whether or not any damage shall have been sustained.
- (5) No bonus for early completion: The Contractor shall not be entitled to payment of any bonus for early completion of the Works.

47.0. CERTIFICATION OF COMPLETION OF WORK

- (1) Erection: Erection of Mechanical and electrical equipment shall be construed to have been completed where equipment in question is placed in position undergoes all necessary tests such as those for alignment, verticality, leak proof, insulation etc. as may be specified elsewhere in the Bid documents and put to operation.
- (2) Completion: Completion is a stage when the equipment and the structure as a whole is certified by the Employer. The date shall only be indicative for the purpose of reckoning the period of Maintenance Period and shall not be co-related with the release of any payment provided that non-continuous or sporadic functioning shall not be deemed as commissioning and also provided that non-commissioning of minor works, the decision on determination of major or minor works resting with the employer, shall not multiply the act of completion for the aforesaid purpose.

An item shall be considered as minor work where its non-completion may not in the opinion of the employer, stand in the way of commencement of plant operation.

- (3) Trial Run:-The Trial Run period shall be for three months including 72 hours with load operation of 8 hours at a stretch operation of all equipment as per specification and to the satisfaction of Engineer-in-Charge.

48.0. MAINTENANCE

- (1) Maintenance Period: Maintenance period shall be for a period of one year counted from the date of certified commissioning i.e. after successful trial runs of 3 months. The Contractor shall provide spare parts at his cost required during the maintenance period.
- (2) Cost of Execution of work of repair, etc.:— The repair work shall be carried out by the Contractor at his own expense if the necessity thereof shall, in the opinion of the Engineer, be due to the use of materials or workmanship not in accordance with the Contract, or to neglect or failure on the part of the Contractor to comply with any obligation, expressed or implied, on the Contractor's part under the Contract. If, in the opinion of the Engineer, such necessity shall be due to any other cause, the value of such work shall be ascertained and paid for as if it was an additional work.
- (3) Remedy on contractor's failure to carry out work required: If the Contractor shall fail to do any such work as aforesaid requirement by the Engineer, the Employer shall be entitled to employ and pay other persons to carry out the same, which in the opinion of the Employer, the Contractor was liable to do at his own expense under the Contract. In the said event, all expenses consequent thereon or incidental thereto shall be recoverable from the Contractor by the Employer, or may be deducted by the Employer from any sum due or which may become due to the Contractor.

49.0. CONTRACTOR TO SEARCH

The Contractor shall, if required by the EIC in writing, search under the directions of the Engineer, for the cause of any defect, imperfection or fault appearing during the progress of the Works or in the period of Maintenance. Unless such defect, imperfection or fault shall be one for which the contractor is liable under the contract, the cost of the work carried out by the contractor in searching as aforesaid shall be borne by the Employer. If such defect, imperfection or fault shall be one for which the contractor is liable as aforesaid, the cost of the work carried out in searching as aforesaid shall be borne by the contractor and he shall in such case repair, rectify and make good such defect, imperfection or fault at his Own expense in accordance with the provisions of Clause 48 hereof to the satisfaction of the Engineer.

50.0. ALTERATIONS, ADDITIONS AND OMISSIONS

- (1) Variations: The Employer may make any variation of the form, quality or quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion, be desirable, he shall have power to order the Contractor to do and the Contractor shall do any of the following:
- a) Increase or decrease the quantity of any work included in the contract.
 - b) Omit any such work.
 - c) Change the character or quality or kind of any such work.

- d) Change the levels, lines position and dimensions of any part of the Works and
 - e) Execute additional work of any kind necessary for the satisfactory completion of the works or for deriving satisfaction of the Employer. It is expressly provided that no such variation shall, in any way vitiate or invalidate the Contract.
- (2) Orders for variations to be in writing: The Contractor shall make no such variations without an order in writing from the Employer. Provided that no order in writing shall be required for insignificant increase or decrease in the quantity of any work where such increase or decrease is not the result of an order given under this Clause, but is the result of the quantities exceeding or being less than those stated in the Schedule of prices. Provided also that if for any reason the Employer shall consider it desirable to give any such order verbally, the Contractor shall comply with such order and any confirmation in writing of such verbal order given by the Employer whether before or after the carrying out of the order, shall be deemed to be an order in writing within the meaning of this Clause. Provided further that in the event of non-receipt of written confirmation from the Employer, the Contractor shall, within eleven days, confirm the same from his end in writing to the Employer, and If such confirmation is not contradicted in writing within fourteen days by the employer, it shall be deemed to be an order in writing by the Employer.

51.0. VALUATION

- (1) Valuation of variations: All extra or additional work done or work omitted or substituted by order of the Employer shall be considered within the contract.

52.0. PLANT TEMPORARY WORKS AND MATERIALS

1. Plant, etc. exclusive use for the works: All Constructional Plant, Temporary Works and materials provided by the Contractor shall, when brought to the Site be deemed to be exclusively intended for the execution of the Works and the Contractor shall not remove the same or any part thereof, except for the purpose of moving it from one part of the Site to another, without the consent, in writing, of the Engineer which shall not be unreasonably withheld.
2. Removal of plant, etc.: Upon completion of the Works the Contractor shall remove from the Site all the said Constructional Plant and Temporary Works remaining thereon and any unused material provided by the Contractor to the satisfaction in the Engineer.
3. Employer not liable for damage to plant, etc.: The employer shall not at any time be liable for the loss of or damage to any of or damage to any of the said Constructional Plant, Temporary Works or materials same as mentioned in Clause 19 and 62 hereof.
4. Octroi, Sales tax, VAT, Cess and other imposts. The Contractor shall pay Octroi, Sales Tax, VAT, Cess, Work Contract Tax and all other taxes, duties and charges as may be applicable from time to time in respect of materials purchased by him or plants and equipment brought to Site. No separate payment shall be made for all these and they shall be deemed to have been covered within the Contractor's rates for the finished items of work.

5. Temporary Works: At least fourteen (14) days in advance of taking up any temporary works, the contractor shall submit to the Engineer for approval complete drawings of all temporary works he may require for the execution of the Works. He shall, so required by the Engineer, submit his calculations relating to the strength of the temporary works proposed. Modifications that the Engineer may require shall be made by the Contractor at the latter's cost and expenses. At the discretion of the Engineer, a higher stress up to a maximum of twenty five percent (25%) in excess of the stress normally allowed for permanent structures may be permitted in the design of temporary works.

Notwithstanding the approval by the Engineer of any of the temporary works, the contractor shall remain wholly responsible for their adequacy, safety, proper maintenance and of all obligations in regard to such works specified or implied in the Contract, until the removal of such works.

53.0. APPROVAL OF MATERIAL, ETC. NOT IMPLIED

The operation of Clause 52 hereof shall not be deemed to imply any approval by the Engineer of the materials or other matters referred to therein shall not interfere with rejection of any such materials at any time by the Engineer.

54.0. MEASUREMENT

For measurement, the metric system will be used.

55.0. WORKS TO BE MEASURED

The engineer shall, except as otherwise stated, ascertain and determine by measurement the value in terms of the Contract of work done in accordance with the Contract. He shall, when he requires any part or parts of the works to be measured, give notice to the Contractor's authorized agent or representative, who shall forthwith attend or send a qualified agent to assist the Engineer or the Engineer's Representative in making such measurement, and shall furnish all particulars required by either of them. Should the Contractor not attend, or neglect or omit to send his agent on two consecutive occasions, then in the third occasion the measurement shall be made unilaterally by the Engineer, which shall be taken to be the correct measurement of the work. For the purpose of measurement such permanent work as is to be measured by records and drawings at suitable intervals of such work and the Contractor, as and when called upon to do so in writing shall, within fourteen days, attend to examine and agree upon such records and drawings, with the Engineer or Engineer's Representative and shall sign the same when so agreed. If the Contractor does not so attend to examine and agree upon such records and drawings on two consecutive occasions they shall be taken to be correct. If, after examination of such records and drawings, the Contractor does not agree with the same or does not sign the same as agreed, they shall nevertheless be taken to be correct, unless the Contractor shall, within fourteen days of such examination, lodge with the for decision by the Engineer, a notice in writing giving details of the respects in which such records and drawings are claimed by him to be incorrect together with reasons thereof.

56.0. METHOD OF MEASUREMENT

The Works shall be measured but, notwithstanding any general or local custom, except where otherwise specifically described or prescribed in the Contract.

57.0. PAYMENT

- 1a) Periodic Payment to the Contractor from works done and measured in terms of the provisions of Clause 55, shall normally be made in compliance with prevalent norms and guideline.
- b) The valuation of the Engineer for the purpose of making periodic payments to the contractor through on account bills shall be considered as estimates only and the Engineer reserves the authority to make amendments or modifications thereto through any subsequent bill/bills.
- c) Payment may be made on percentage basis as per accepted break up schedule of payment
- 2) a) Earnest Money, Security Deposit and other retention money

Description	Amount	State where amount payable/pledged to the Authority	Refund/Release
Earnest money	2% of quoted amount	As per eNIB	To the unsuccessful Bidder after award of contract (to the successful Bidder) without any interest. Earnest Money of the successful Bidder shall be covered into Security Deposit.
Security Deposit	8%	To be deducted from the Running Account Bills	After completion of successful O&M period of five year (without interest)
Cess for labor Welfare	1 % of Construction cost	To be deducted from the Running Account Bills in Cash	Deducted and send to Govt. of West Bengal, Labor Welfare Department.

- b) All payments to the Contractor shall be subject to deduction of Sales Tax/Work Contract Tax, Income Tax and any other Tax as may be prevalent at the time of payment. For each such deduction the Contractor will be furnished a Certificate to enable him to make requisite adjustment in his returns related to Income Tax/Sale Tax/Works Contract Tax or any other Tax as may be deducted. Contractors, while quoting, are to take into account all taxes, duties etc. as applicable and prevalent on the date of opening. If any other taxes or duties of statutory nature are imposed during the post-Bidding period, the said amount shall be reimbursed on production of documentary proof of payment. Similarly for reduction or withdrawal, a corresponding deduction shall be made. In both cases, the decision of the Employer shall be final as to the extent thereof.
- c) All payments to the Contractor shall be subject to all accounting and auditing provisions, procedures, rules, regulation, decrees, law etc. legislated, enacted or in force in India and as applicable to the State of West Bengal during the period of the Contract.

5. Final Claims: Not later than sixty calendar days after the issue of the Completion Certificate, the Contractor shall submit to the Engineer a Statement of final account with supporting documents showing in details the value of the work done in accordance with the Contract together with all further sums which the Contractor considers to be due to him under the Contract. Within thirty calendar days after receipt of the final account and of all information reasonably required for its verifications, the Engineer shall issue Final Certificate.
6. Certificate of final acceptance: The Contractor's obligations and responsibilities under the contract will be considered satisfied and the completed permanent Works accepted when the EIC has issued the Certificate of Final Acceptance to the Contractor.

58.0. APPROVAL ONLY BY MAINTENANCE CERTIFICATE

No Certificate other than the Maintenance Certificate referred to in Clause 59 hereof shall be deemed to constitute final approval of the Works.

59.0. MAINTENANCE CERTIFICATE

- (1) The Maintenance Certificate stating that the Works have been completed and maintained to the satisfaction of the Engineer, shall be issued by him within twenty eight days after the expiration of the period of Maintenance, or if different periods of maintenance shall become applicable to different sections or parts of the Works, the expiration of the latest such period, or as Soon thereafter as any works ordered during such period, pursuant to Clauses 4) and 48 hereof (shall have been completed to the Satisfaction of the Engineer).

With regard to defects that may arise during the Period of Maintenance, the Contractor shall be responsible to carry out restoration/rectification of damages as are attributable to defects in works carried out under this Contract. The decision of the Employer in the regard shall be final and binding on the contractors.

- 2) Cessation of Employer's liability: The Employer shall not be liable to the Contractor for any matters or thing arising out of or in connection with the Contractor for any matters or thing arising out of or in connection with the Contract or the execution of the Works, unless the Contractor shall have made a claim in writing in respect thereof before the delivery of the Maintenance Certificate under this Clause.
- 3) Unfulfilled obligations: Notwithstanding the issue of the Maintenance Certificate the Contractor and, subject to the sub-clause (2) of the Clause, the Contractor shall remain liable for the fulfillment of any obligation incurred under the provisions of the Contract prior to the issue of the Maintenance Certificate which remains imperforated at the time such Certificate is issued and for the purpose of determine the nature and extent of any such obligation, the Contract shall be deemed to remain in force between the parties hereto,

60.0. REMEDIES AND POWERS

- 1) Default of contractor: If the Contractor shall become bankrupt, or have a receiving order made against him, or shall present his petition in bankruptcy, or shall made an arrangement with or assignment in favour of his creditors, or shall age to carry out the Contract under a committee of inspection of his creditors or, being a corporation, shall go into liquidation (other than a voluntary liquidation for the purpose of amalgamation or reconstruction), or if the Contractor shall assign the Contract, without the consent in writing of the Employer first obtained, or shall have an execution levied on his goods, or if the Engineer shall certify in goods, or if the Engineer shall certify in writing to the Employer that in his opinion the Contractor :
 - a) Has abandoned the Contract, or
 - b) Without reasonable excuse has failed to commence the Works or has suspended the progress of the Works for twenty eight days after receiving from the Engineer written notice to proceed, or
 - c) Has failed to remove materials from the Site or to pull down and replace work for twenty eight days after receiving from the Engineer written notice that the said materials or work had been condemned and/or rejected by the Engineer under these conditions, or
 - d) Despite previous warnings by the Engineer, in writing, is not executing the Works in accordance with the Contract, or is persistently or flagrantly neglecting to carry out his obligation under the Contract, or
 - e) Has, to the detriment of good workmanship, or in defiance of the Engineer's instructions to the contrary, sublet any part of the Contract.

Then the Employer may, after giving fourteen day notice in writing to the Contractor, enter upon the Site and the Works and expel the Contractor therefore without thereby avoiding the Contract, or releasing the Contractor from any of his obligations or liabilities under the Contract, or affecting the rights and powers conferred on the Employer or the Engineer by the Contract, and may himself complete the Works or may employ any other contractor or agency to complete the Works. The Employer or such other contractor may use for such completion so much of the Constructional Plant, Temporary Works and materials, which have been deemed to be reserved exclusively for the execution of the Works, under the provisions of the Contract, as he or they may think proper and the Employer may, at any time, sell any of the said Constructional Plant, Temporary Works used and unused materials and apply the proceeds of sale in or towards the satisfaction of any sums due or which may become due to him from the Contractor under the Contract.

- 2) Valuation at date of forfeiture: The Engineer shall, as soon as may be practicable after any such entry and expulsion by the Employer, fix and determine expert, or by or after reference to the parties, or after such investigation or enquiries as he may think fit to make or institute and shall certify what amount, if any, had at the time of such entry and expulsion been reasonably earned by or would reasonably accrue to the Contractor in respect of work then actually done by him under the Contract and the value of any of the said unused or partially used materials, and Constructional Plant and any Temporary Works.
- 3) Payment after forfeiture: If the Employer shall enter and expel the Contractor any money on account of the Contract until the expiration of the Period of Maintenance and thereafter until the costs of execution and maintenance, damages for delay in completion, if any and all other expenses incurred by the Employer have been ascertained and the amount thereof certified by the Engineer. The Contractor shall then be entitled to receive only such sums or sums, if any, as the Engineer may certify would have been payable to him upon due completion by him after deducting the said amount. If such amount shall exceed the sum which would have been payable to the Contractor on due completion by him, then the Contractor shall, upon

demand, pay to the Employer the amount of such excess and it shall be deemed a debt due by the Contractor to the Employer and shall be recoverable accordingly.

61.0. URGENT REPAIRS

If, by reason of any accident, or failure, or other event occurring to in or in connection with the Works, or any part thereof, either during the execution of the Works, or during the period of Maintenance, any remedial or other work or repair shall, in the opinion of the Engineer or the Engineer's Representative, be urgently necessary for the safety of the Works and the Contractor in unable or unwilling at once to do such work or repair, the Employer may employ and pay other persons to carry out such work or repair as the Engineer or the Engineer's Representative may consider necessary. If the work or repair so done by the Employer is work which in the opinion of the Engineer, the Contractor was liable to do at his own expense under the Contract, all expenses properly incurred by the Employer in so doing shall be recoverable from the Contractor by the Employer, or may be deducted by the Employer from any sums due or which may become due to the Contractor. The Engineer or the Engineer's Representative, as the case may be, shall, as soon after the occurrence of any such emergency as may be reasonably practicable, notify the Contractor thereof in writing.

62.0. SPECIAL RISKS

Notwithstanding anything in the Contract contained:

- 1) No liability for war, etc., Risks- The Contractor shall be under no liability whatsoever whether by way of identity or otherwise for or in respect of destruction of or damage to the Works, same to work condemned under the provision of Clause 38 hereof prior to the occurrence of any special risk hereinafter mentioned, or to property whether of the Employer or third parties, or for or in respect of injury or loss of life which is the consequence of any special risk as hereinafter defined The employer shall indemnify and save harmless to Contractor against and from the same and against and from the same and against and from all claims, proceedings, damages, costs, charges and expenses whatsoever arising there out or in connection therewith.
- 2) Damage to works, etc., by special risks - If the Works or any materials on or near or in transit to the Site, or any other property of the Contractor used or intended to be used for the purposes of the Works, shall sustain destruction of damage by reason or any of the said special risks the Contractor shall be entitled to payment for:
 - a) Any permanent work and for any materials so destroyed or damaged and so far as may be required by the Engineer, or as may be necessary for the completion of the Works, or the basis of cost plus such profit as the Engineer may certify to be reasonable;
 - b) Replacing or making good any such destruction or damage to the Works;
 - c) Replacing or making good such materials or other property of the Contractor used or intended to be used for the purposes of the Works.

- 3) Projectile missile etc.: Destruction, damage, injury or loss of life caused by the explosion or impact whenever and wherever occurring of any mine, bomb, shell, grenade, or other projectile, missile, ammunition, or explosive of war, shall be deemed to be a consequence of the said special risks.
- 4) Increase cost arising from special risks: The Employer shall repay to the Contractor any increased cost of or incidental to the execution of the Works, other than such as may be attributable to the cost of reconstructing work condemned under the provisions of Clause 38 hereof, prior to the occurrence of any special risk, which is howsoever attributable to or consequent on or the result of or in any way whatsoever connected with the said special risks, subject however to the provisions in this Clause hereinafter contained in regard to outbreak of war, but the Contractor shall as soon as any such increase of cost shall come to his knowledge forthwith notify the Superintending Engineer thereof in writing.
- 5) Special Risks: The special risks are war, (whether war be declared or not), invasion, act of foreign enemies, the nuclear and pressure waves risk described in Clause 19(2) hereof, or in so far as it relates to the country in which the works are being or are to be executed or maintained, rebellion, revolution, insurrection, military or usurped power, civil war, or unless solely restricted to the employees of the Contractor or of his Sub-Contractor and arising from the conduct of the Works, riot, commotion or disorder.
- 6) Outbreak of war: If, during the currency of the Contract, there shall be an outbreak of war, whether war is declared or not, in any part of the world which, whether financially or otherwise, materially affects the execution of the works, the Contractor shall, unless and until the Contract is terminated under the provisions of this Clause, continue to use his best endeavors to complete the execution of the Works. Provided always that the Employer shall be entitled at any time after such outbreak of war to terminate the Contract by giving written notice to the Contractor and upon such notice being given, this Contract shall, except as to the rights of the parties under this Clause and to the operation of Clause 64 hereof, terminate but without prejudice to the rights of either party in respect of any antecedent breach thereof
- 7) Removal of plant of termination: If the Contract shall be terminated under the provisions of the last preceding sub-clause, the Contractor shall, with all reasonable dispatch, remove from the Site all constructional Plant and shall give similar facilities to his Sub-Contractors to do so.
- 8) Payment if Contract terminated: If the Contract shall be terminated as aforesaid, the Contractor shall be paid by the Employer, in so far as such amounts or items shall not have already been covered by payments on account made to the Contractor, for all work executed prior to the date of termination at the rates and prices provided in the Contract and in addition
 - a) The amounts payable in respect of any preliminary items, so far as the work carried out or performed, and a proper proportion as certified by the Engineer of any such items, the work or service comprised in which has been partially carried out or performed.
 - b) The cost of materials or goods reasonably ordered for the Works which shall have been delivered to the Contractor or of which the Contractor is legally liable to accept delivery such materials or goods becoming the property of the Employer upon such payments being made by him.

- c) A sum to be certified by the Engineer, being the amount of any expenditure reasonably incurred by the Contractor in the expectation of completing the whole of the Works in so far as such expenditure shall not have been covered by the payments in this sub-clause before mentioned.
- d) Any additional sum payable under the provisions of sub-clause (1), (2) and (4) of this Clause.

Provided always that against any payments due from the Employer under this sub-clause, the Employer shall be entitled to be credited with any outstanding balances due from the contractor for advances in respect of Constructional Plant and materials and any other sums which at the date of termination were recoverable by the Employer from the Contractor under the terms of the Contract and provided that if the termination be made in exercise of Clause C-60(1), no payment shall be released under ClauseC-62(8) (a) to (d).

63.0. FRUSTRATION

Payment in event of Frustration: A war, or other circumstances outside the control of both parties, arises after the Contract is made so that either party is prevented from fulfilling his contractual obligations, or under the law governing the Contract, the parties are released from further performance, then the sum payable by the Employer to the Contractor in respect of the work executed shall be the same as would have been payable under Clause 62 hereof if the Contract had been terminated under the provisions of Clause 62 thereof.

64.0. SETTLEMENT OF DISPUTES

Settlement of Disputes: If any dispute or difference of any kind whatsoever shall arise between the Employer and the Contractor or the Engineer and the Contractor in connection with, or arising out of the Contract, of the execution of the Works, whether during the progress of the Works or after their completion and whether before or after the termination, abandonment or breach of the Contract, it shall be settled in the court of law having jurisdiction provided that such a recourse shall not be resorted to without exhausting all other reasonable avenues of redresser.

65. NOTICES

- (1) Contractor's local office and service of notices to contractor: The Contractor shall have a local office at or near the Site of Work; full address thereof shall be intimated by the Contractor or his authorized Agent to the Employer as well as to the Engineer. All Certificates notice or written orders to be given by the Employer or by the Engineer to the Contractor under the terms of the Contract shall be deemed to have been served by sending by post to or delivering the same to the Contractor's local office.

- (2) Service of notice to employer: All Notice to be given to the employer under the terms of the Contract shall be served by sending by Registered post or delivering the same to the address given below:

- (3) Change in Address of the Employer, the Engineer or the Contractor may change a nominated address to another address by prior written notice to the other two and in that event shall resume receiving of communication 28 days after delivery of such notice.

66. PRICE ADJUSTMENT

- (1) The prices to be paid to the contractor for the whole work shall remain firm during the stipulated Contract period or extension thereof and no price adjustment shall be allowed.

- (2) The statutory changes in price in the form of Taxes, duties etc. shall however be taken into account. For this purpose the taxes and duties prevailing on the last date of submission of the technical bid (or revised price bid, if applicable) shall be taken as the base. Such taxes and duties for different bought out items shall be specified by the contractor, falling which the assessment of the Employer shall be final and binding. Changes in price of Petrol, Diesel Lubricants, and Electricity etc. shall not be considered.

67.0. MISCELLANEOUS

Dangerous materials: Explosive, chemicals, combustible articles and items and similar materials intended for the Works shall be conveyed, stored and used by the Contractor and his sub-contractors In accordance with all laws, decrees, instruments, orders and regulations imposed by the Government or any of its instrumentalists. Observance of all safety provisions shall be the obligation of the Contractor and nothing herein shall release him from full responsibility for damage or injury to persons or properties resulting from his use of these dangerous materials.

68.0. CONTRACT CONFIDENTIAL

Except with the prior written approval of the Employer and to subject the such conditions as may be prescribed, the Contractor and/or any member of his organization shall not in any case communicate to any person or entity and information connected with the performance of the Services or in carrying out the Works not make public any information for the purpose of publication or advertisement. The Contractor shall treat all matters related to the Contract as private and confidential.

69.0. CONTRACTOR TO PROVIDE FACILITIES

The Contractor shall provide such labour, materials and other facilities that the Engineer or his Representative may require to assist them in carrying out normal tests and checks on materials and workmanship and in measurement of works.

70.0. INTERFERENCE WITH EXISTING FACILITIES

The Contractor shall carry out the works in such a way as to the minimum extent of interference to the use of existing facilities of any kind.

71.0. ACTS OF INFLUENCE

Neither the Contractor nor any of his Agents, Representatives, Employees or members of his organization shall commit any act which may influence the judgment or decision of the Employer or the Engineer or any their agents, representatives, employees or members of their respective organization. Any breach of this provision shall constitute a breach of Contract on the part of the Contractor and apart from penal measures against the Contractor according to the law the Employer shall have the Authority to take action for the Contractor's default in terms of the provisions of Clause 60 hereof.

72.0. INDIVIDUALS NOT PERSONALLY RESPONSIBLE

No personal liability shall be imposed on the members or the Employer or on the Engineer or their duly authorized representatives, agents or employees for acts performed or discharged in the exercise of their authorized duties or responsibilities or in carrying out their obligations by virtue of the provisions or scope of work contained in the Contract, if being understood that they are acting solely as agents and representatives of the Employer in good faith.

73.0. CONTRACT EMBODIES WHOLE ARRANGEMENT

The Contract becomes effective immediately on Issue of the letter of acceptance to the successful Bidder.

The Contract (with annexure if any) as subsequently executed embodies the whole arrangement between the parties entering into the Contract All previous correspondence, negotiations, representation, explanations statements, promises or guarantees (whether oral or written) as are not included with the Contract as executed, shall normally be excluded in the interpretation of the Contract.

74.0. COMPLETION DRAWING

Completion drawing including detailed construction drawing shall have to be submitted in original with 6 (six) copies of prints of each. The original drawings shall be drawn on thick polyester film approved by the Engineer-in-Charge. Scale and size of drawings shall also be as specified by the Engineer-in-Charge. Soft copy of drawing copied in CD/DVD should be submitted in addition. No extra payment will be made for it.

The Completion drawings are to be got approved by the Employer and shall have to be submitted before the issue of certificate of final acceptance as in Clause C-57 (6).

All drawings, specification and copies of drawings are the property of the owner. They are not to be used on other work, and with the exception of the signed contract set, are to be returned to the owner on request at the completion of the work.

75. TENDERER SHALL VISIT THE SITE

Intending tenderer shall visit the site and make him thoroughly acquainted with the local site condition, nature and requirements of the works, facilities of transport condition effective labour and materials, access, delivery, loading, unloading and storage for materials and removal of unsuitable materials. The tenderer shall provide in their tender for cost of procurement, carriage, freight and other charges as also for any special difficulties and including incorporation any or all inconveniences, police restriction for transport etc for proper execution of work as indicated in the drawing. The successful tenderer will not be entitled to any claim of compensation for difficulties faced or for losses incurred on account of any condition which existed before the commencement of the work or which in the opinion of the owner might be deemed to have reasonably been inferred to be so existing before commencement of work.

76. GOVERNMENT AND LOCAL RULES/LAW OF STATE

The contractor shall conform to the provisions of all local Bye-laws and Acts relating to the work and to the work and to the Regulations etc of the Government and Local Authorities and of any company with whose system the structure is proposed to be connected. The contractor shall give all notices required by said Act, Rules, Regulations and Bye-laws etc and pay all fees payable to such authority/authorities for execution of the work involved. The cost, if any, shall be deemed to have been included in his quoted rates, taking into account all liabilities for licences, fees for footpath encroachment and restorations etc and shall indemnify the owner against such liabilities and shall defend all actions arising from such claims or liabilities.

77. OFFICE ACCOMMODATION FOR THE SITE ENGINEER

The contractor shall provide, erect, and maintain at his cost a separate simple office accommodation for the site Engineer of the owner at site. This accommodation shall be well lighted and ventilated and provided with windows, door with a lock. The Site Engineer's office with toilet facilities (one W.C one urinal) the accommodation shall be demolished when directed.

78. DISMISSAL OF WORKMEN

The contractor shall on the request of the owner immediately dismiss from works any person employed thereon by him, who may in the opinion of the owner be unsuitable or incompetent or who may misconduct himself. Such discharges shall not be the basis of any claim for compensation or damages against the owner or their officer or employee.

79. IDLE LABOUR

Whatever the reasons may be, no claim for idle labour, additional establishment cost of hire and labour charges of tools and plants would be entertained under any circumstances.

80. FIRST AID

- a) At every work place, there shall be maintained in readily accessible place first aid appliance including an adequate supply of sterilised dressings and sterilised cotton wool. The appliance shall be kept in good order and in large work place they shall be placed under the charge of a responsible person who shall be readily available during working hours.
- b) At large work places, where hospital facilities are not available within easy distance of the works, first aid posts shall be established and be run by a trained compounder.
- c) Where large work places are remote from regular hospitals, an in-door ward shall be provided with one bed for every 250 employees.
- d) Where large work place are situated in cities, towns in their suburbs and no beds, are considered necessary owing to the proximity of city or town hospitals, suitable transport shall be provided to facilitate removal of urgent cases to the hospitals. At other work places, Some conveyance facilities, such as a car, shall be kept readily available to take injured person or persons suddenly taken ill to the nearest hospital.

Superintending Engineer
South.. Circle, M.E.Dte

2.0 DRAWINGS

1) **Custody of drawing:** All the approved Drawings shall remain in the safe custody of the Executive Engineer, East Midnapore Division, MED, one copy of original approved drawing and design to be submitted to Panskura Municipality. The Contactor shall provide and make at his own expenses any further copies required by him. At the Completion of the Contract, the Contractor shall return to the Executive Engineer, East Midnapore Division, and M.E.Dte. All drawings as provided under the Contract.

2) **Copy of drawing:-** One copy of drawings to be kept on site. One copy of the Drawings furnished by the Contractor as aforesaid, shall be kept by the Contractor on the site and the same shall at all reasonable times be available for inspection and use by the Engineer and his/municipal Representatives and by any other persons authorized by the Engineer in writing.

3) **Disruption of progress:** The Contractor shall give written notice to Executive Engineer, East Midnapore Division, MED whenever planning or progress of the works is likely to be delayed or disrupted order, including a direction instruction or approval is issued by the Superintending Engineer, South Circle, MED on recommendation of Executive Engineer within a reasonable time. The notice shall include details of the drawing or order required, and of why and by whom it is required and of any delay or disruption likely to be suffered if it is further delayed.

3.0 FURTHER DRAWINGS

The Executive Engineer, East Midnapore Division, MED shall have full power and authority to supply to or demand from the Contractor, from time to time, during the progress of the Works, such further drawings as shall be necessary for the purpose of the proper and adequate execution and maintenance of the Works. The Contractor shall carry out and be bound by the same. Adequacy as determined by the Executive Engineer, East Midnapore Division, MED shall be final and binding on the Contractor.

4.0 CONTRACT AGREEMENT

The Contractor shall, when called upon to do so, enter into and execute a Contract Agreement, to be prepared and completed in the form no. 2911 along with all other documents mentioned earlier with such modification as may be necessary.

4.1 Security Deposit:*The entire amount of such 10% (ten percent) of Security Deposit (Initial 2% EM + additional 8%) will be refunded without any interest only after expiry of Defect Liability Period as per PWD order No. 5784-PW/L&A/2M-175/2017 Dated: 12.09.2017, wherein, Construction of new building / new bridge / new culvert, the Defect Liability Period of the work shall be five years from the date of completion of the work;*

For work with five years Defect Liability Period:

- i) No security deposit shall be refunded to the contractor for 1st 3 years from the date of completion of the work;*
- ii) 30% of the security deposit shall be refunded to the contractor on expiry of four years from the actual date of completion of the work;*

iii) The balance 70% of the security deposit shall be refunded to the contractor on expiry of five years from the actual date of completion of the work.

5.0 INSPECTION OF SITE

The Executive Engineer, M.E. Dte. or his authorized person shall have made available to the Bidder with the Bid documents such data like its location, distance from fixed point including the layout drawing and location of the primary grid point, level drawing data, the source of filling the reservoir and the Bid shall be deemed to have been based on such data. But the Bidder shall be responsible for his own interpretation thereof. The Bidder may also undertake investigations at his own cost on such levels or any other levels prior to submission of his offer.

The Bidder shall also be deemed to have inspected and examined the site and its surroundings and information available in connection therewith and to have satisfied himself, so far as is practicable, before submitting his Bid; as to the form and nature thereof, including the sub-surface conditions, topographical level of proposed site, the hydrological and climatic conditions, the extent and nature of work and materials necessary for the completion of the Works, the means of access to the Site and the accommodation he may require and, in general 'shall be deemed to have obtained all necessary information, subject as above mentioned, as to risks, contingencies and all other circumstances which may influence or affect his Bid.

6.0 WORK TO BE TO THE SATISFACTION OF ENGINEER IN CHARGE

Save in so far as it is not legally or physically impossible, the Contractor shall execute and maintain the Works in strict accordance with the Contract to the satisfaction of the Executive Engineer, East Midnapore Division, MED and shall comply with and adhere strictly to the Superintending Engineer, South Circle, MED's instructions and directions on any matter whether mentioned in the Contract or not touching or concerning the Works.

7.0 WORK PROGRAM

(1) Program to be furnished: Within thirty (30) calendar days, the Contractor shall, after the acceptance of his Bid, submit to the Executive Engineer, East Midnapore Division, MED for his approval a program showing the order of procedure in which he proposes to carry out the Works. The Contractor shall, whenever required by the Executive Engineer, East Midnapore Division, MED, also provide in writing for his information, general description of the arrangements and methods, which the Contractor proposes to adopt for the execution of the Works.

(2) If at any time it should appear to the Executive Engineer, East Midnapore Division, MED that the actual progress of the Works does not conform to the approved program referred in sub-clause (1) of this Clause, the Contractor shall produce, at the request of the Executive Engineer, East Midnapore Division, MED, a revised program showing the modifications to the approved program

necessary to ensure completion of the Works within the time for completion as defined in Clause 42 hereof.

(3) The submission to and approval by the Executive Engineer, East Midnapore Division, MED of such program or the furnishing of such particulars shall not relieve the Contractor of any of his duties or responsibilities under the Contract.

8.0 CONTRACTOR'S SUPERINTENDENCE

The Contractor shall give or provide all necessary superintendence during the execution of the Works and as long thereafter as the Superintending Engineer, South Circle, MED may consider necessary for the proper fulfilling of the Contractor's obligations under the Contract. The Contractor or a competent and authorized agent or representative approved of in writing by the Superintending Engineer, South Circle, MED, which approval may at any time be withdrawn, is to be constantly on the Works and shall give his whole time to the Superintendence of the same. If such approval be withdrawn by the Superintending Engineer, South Circle, MED, the Contractor shall, as soon as is practicable, having regard to the requirement of replacing him as hereinafter mentioned after receiving written notice of such withdraw, remove the agent from the works and shall not thereafter employ him again on the Works in any capacity and shall replace him by another agent approved by the Executive Engineer, East Midnapore Division, MED.

Such authorized agent or representative shall receive, on behalf of the Contractor, direction and instruction from the Executive Engineer, East Midnapore Division, MED or, subject to the limitations of Clause 2 hereof the Engineer's Representative. The agent or representative of the Contractor must be able to speak and communicate in English / Bengali. In the absence of the Contractor's designated agent or representative for a particular operation on any site of the works the Contractor's supervisory staff or sub-agent or leading hands shall be instructed to receive and carry out any instruction or direction issued or given by the Executive Engineer, East Midnapore Division, MED or the EIC.

9.0 MATERIALS AND WORKMANSHIP

1) All materials and workmanship shall be of the respective kinds described in the Contract and in accordance with the Engineer's instructions and shall be subjected from time to time to such tests as the Engineer may direct at the place of manufacture or fabrication, or on the Site or at such other place or places as may be specified in the Contract, or at all or any of such places. The Contractor shall provide such assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used and shall supply samples or materials before incorporation in the Works for testing as may be selected and required by the Executive Engineer, East Midnapore Division, MED, be it at site or at the manufacturer/Vendors premises or elsewhere.

2) COST OF SAMPLES: The Contractor at the cost and expense of him shall furnish all samples of materials as may be required by the Executive Engineer, East Midnapore Division, MED.

3) COST OF TESTS: The cost of making any test shall be borne by the Contractor if such test is clearly intended by or provided for in the Contract and in the cases only of a test under load or of a test to ascertain whether the design of any furnished or partially finished work is appropriate for the purpose which it was intended to fulfill, is particularized in the Contract in sufficient detail to enable the Contractor to price or allow for the same in his Bid.

4) COST OF TESTS NOT PROVIDED FOR, ETC.: If the Executive Engineer, East Midnapore Division, MED orders any test, which is either;

a) Not so intended by or provided for, or

b) (In the cases above mentioned) is not so particularized, or

c) Though so intended or provided for is ordered by the Engineer to be carried out by an independent person or organization at any place other than the Site or the place of manufacture or fabrication of the materials tested, then the cost of such test shall be borne by the Contractor, if the tests show the workmanship or materials not to be in accordance with the provisions of the Contract or the Engineer's instruction.

10.0 INSPECTION OF OPERATIONS

The Engineer and any person authorized by him shall at all times have access to the Works and to all workshops stores and places where work is being prepared or from where material manufactured articles or machinery are being obtained for the Works and the Contractor shall afford every facility for and every assistance in or in obtaining the right to such access.

11.0 EXAMINATION

1) Examination of work before covering up: No work shall be covered up or put out of view without the approval of the Engineer or the Engineer's Representative and the Contractor shall afford full opportunity for the Executive Engineer, East Midnapore Division, MED or the Engineer's Representative to examine and measure any work which is about to be covered up or put out of view and to examine foundations before permanent work is placed thereon. The Contractor shall give due notice to the Engineer's Representative where any such work or foundations is or are ready or about to be ready for examinations and the Engineer's Representative shall, without unreasonable delay, unless he considers it unnecessary and advises the Contractor accordingly attend for the purpose of examining and measuring such work or of examining such foundations

2) Uncovering and making openings: The Contractor shall uncover any part or parts of the Works or make opening in or through the same as the Engineer may from time to time direct and shall reinstate and make good such part or parts to the satisfaction of the Engineer if any such part or parts have been covered up or put out of view after compliance with the requirement of sub-clause (1) of this Clause and are found to be executed in accordance with the Contract, the expenses of

uncovering, making openings in or through, reinstating and making good the same shall be, borne by the Employer, but in any other case all costs shall be borne by the Contractor.

12.0 CERTIFICATION OF COMPLETION OF WORK

1) Erection: Erection of Mechanical and electrical equipment shall be construed to have been completed where equipment in question is placed in position undergoes all necessary tests such as those for alignment, verticality, leak proof mess, insulation etc. as may be specified elsewhere in the Bid documents and put to operation.

2) Completion: Completion is a stage when the equipment and the structure as a whole are certified by the Employer. The date shall only be indicative for the purpose of reckoning the period of Maintenance Period and shall not be co-related with the release of any payment provided that non-continuous or sporadic functioning shall not be deemed as commissioning and also provided that non-commissioning of minor works, the decision on determination of major or minor works resting with the employer, shall not multiply the act of completion for the aforesaid purpose.

An item shall be considered as minor work where its non-completion may not in the opinion of the employer, stand in the way of commencement of plant operation.

13.0 MAINTENANCE

1) Defect Liability Period: 5(five) years.

2) Cost of Execution of work of repair, etc.: The repair work shall be carried out by the Contractor at his own expense if the necessity thereof shall, in the opinion of the Engineer, be due to the use of materials or workmanship not in accordance with the Contract, or to neglect or failure on the part of the Contractor to comply with any obligation, expressed or implied, on the Contractor's part under the Contract. If, in the opinion of the Engineer, such necessity shall be due to any other cause, the value of such work shall be ascertained and paid for as if it was an additional work.

3) Remedy on contractor's failure to carry out work required: If the Contractor shall fail to do any such work as aforesaid requirement by the Engineer, the Employer shall be entitled to employ and pay other persons to carry out the same, which in the opinion of the Employer, the Contractor was liable to do at his own expense under the Contract. In the said event, all expenses consequent thereon or incidental thereto shall be recoverable from the Contractor by the Employer, or may be deducted by the Employer from any sum due or which may become due to the Contractor.

14.0 CONTRACTOR TO SEARCH

The Contractor shall, if required by the Executive Engineer, East Midnapore Division, MED in writing, search under the directions of the Engineer, for the cause of any defect, imperfection or fault appearing during the progress of the Works or in the period of Maintenance. Unless such defect, imperfection or fault shall be one for which the contractor is liable under the contract, the cost of the

work carried out by the contractor in searching as aforesaid shall be borne by the Employer. If such defect, imperfection or fault shall be one for which the contractor is liable as aforesaid, the cost of the work carried out in searching as aforesaid shall be borne by the contractor and he shall in such case repair, rectify and make good such defect, imperfection or fault at his Own expense in accordance with the provisions of Clause 48 hereof to the satisfaction of the Engineer.

15.0 ALTERATIONS, ADDITIONS AND OMISSIONS

1) Variations: The Employer may make any variation of the form, quality or quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion, be desirable, he shall have power to order the Contractor to do and the Contractor shall do any of the following:

- a) Increase or decrease the quantity of any work included in the contract.
- b) Omit any such work.
- c) Change the character or quality or kind of any such work.
- d) Change the levels, lines position and dimensions of any part of the Works and
- e) Execute additional work of any kind necessary for the satisfactory completion of the works or for deriving satisfaction of the Employer. It is expressly provided that no such variation shall, in any way vitiate or invalidate the Contract, but the value, if any, of all such variations shall be taken into account in ascertaining the amount of the Contract Price.

2) Orders for variations to be in writing: The Contractor shall make no such variations without an order in writing from the Employer. Provided that no order in writing shall be required for insignificant increase or decrease in the quantity of any work where such increase or decrease is not the result of an order given under this Clause, but is the result of the quantities exceeding or being less than those stated in the Schedule of prices. Provided also that if for any reason the Employer shall consider it desirable to give any such order verbally, the Contractor shall comply with such order and any confirmation in writing of such verbal order given by the Employer whether before or after the carrying out of the order, shall be deemed to be an order in writing within the meaning of this Clause. Provided further that in the event of non-receipt of written confirmation from the Employer, the Contractor shall, within eleven working days, confirm the same from his end in writing to the Employer, and If such confirmation is not contradicted in writing within fourteen working days by the employer, it shall be deemed to be an order in writing by the Employer.

16.0 MEASUREMENT :For measurement, the metric system should be used.

17.0 WORKS TO BE MEASURED

The engineer shall, except as otherwise stated, ascertain and determine by measurement the value in terms of the Contract of work done in accordance with the Contract. He shall, when he requires any part or parts of the works to be measured, give notice to the Contractor's authorized agent or representative, who shall forthwith attend or send a qualified agent to assist the Engineer or

the Engineer's Representative in making such measurement, and shall furnish all particulars required by either of them. Should the Contractor not attend, or neglect or omit to send his agent on two consecutive occasions, then in the third occasion the measurement shall be made unilaterally by the Engineer, which shall be taken to be the correct measurement of the work. For the purpose of measurement such permanent work as is to be measured by records and drawings at suitable intervals of such work and the Contractor, as and when called upon to do so in writing shall, within fourteen days, attend to examine and agree upon such records and drawings, with the Engineer or Engineer's Representative and shall sign the same when so agreed. If the Contractor does not so attend to examine and agree upon such records and drawings on two consecutive occasions they shall be taken to be correct. If, after examination of such records and drawings, the Contractor does not agree with the same or does not sign the same as agreed, they shall nevertheless be taken to be correct, unless the Contractor shall, within fourteen days of such examination, lodge with the for decision by the Engineer, a notice in writing giving details of the respects in which such records and drawings are claimed by him to be incorrect together with reasons thereof.

18.0 METHOD OF MEASUREMENT

The Works shall be measured but, notwithstanding any general or local custom, except where otherwise specifically described or prescribed in the Contract.

19.0 COMPLETION DRAWING

Completion drawing including detailed construction drawing shall have to be submitted in original with 5 (five) copies of prints of each. The original drawings shall be drawn on thick polyester film approved by the Engineer-in-Charge. Scale and size of drawings shall also be as specified by the Engineer-in-Charge. Soft copy of drawing copied in CD/DVD should be submitted in addition. No extra payment will be made for it. The Completion drawings are to be got approved by the Employer and shall have to be submitted before the issue of certificate of final acceptance.

Superintending Engineer, South Circle
Municipal Engineering Directorate

SECTION — D

1.0 GENERAL

1.1 General Materials

1.1.1 All materials used in the permanent works shall be of the best quality of the kind and to the approval of the Engineer-in-Charge. Any material not covered by these Specifications, shall comply with the relevant latest Indian Standard Specifications (Referred to as IS as revised or modified up-to the date one month prior to Tender date). British or American Standard Specifications shall be referred to in case any particular specification is not available in any of the aforesaid Specifications. For materials not specified in the aforesaid, direction of the Engineer-in-Charge shall be followed. All disputes shall be referred to the Employer, whose decision shall be final and binding.

1.1.2 Samples of materials to be supplied and used, by the Contractor in the works shall be to the prior approval of the Engineer-in-Charge. For this purpose the Contractor shall furnish in advance representative samples in quantities and in the manner as directed by the Engineer-in-Charge for his approval. Materials brought to the Site, which in the option of the Engineer-in-Charge do not conform to the approved sample, shall, if so directed by him, be removed by the Contractor from the Site and replaced by the materials of approved quality.

1.1.3 In spite of approval of the Engineer-in-Charge of any materials brought to the site, he may subsequently reject the same if in his opinion the materials has since deteriorated due to long or defective storage or for any reason whatsoever and is thereby considered unfit for use in the permanent works. Any material thus rejected shall be immediately removed from the Site at Contractor's cost and expense.

1.1.4 All materials brought to the Site shall be properly stored and guarded in the manner as directed by the Engineer-in-Charge and to his satisfaction.

1.1.5 The Engineer on written request of EIC may carry out test of materials as he may decide. The Contractor shall, at his cost and expenses, for this purpose supply requisite materials and render such assistance to the Engineer-in-Charge as he may require.

1.2 **Workmanship**

All works are to be carried out in proper workman like manner. Items of works not covered by these Specifications or by other tender documents shall be carried out as per best practice according to the direction of the Engineer-in-Charge and to his satisfaction. The relevant IS Specifications or in case of necessity British or American Standard Specifications shall be taken as guide for the purpose.

1.3 **Works Included**

The rates for all items, unless specifically stated otherwise in the Contract, must cover the cost of all materials, labour, tools, machinery, plant, pumps, explosives, scaffolding, staging strong props, bamboos, ropes, templates, pages and all appliances and operations whatsoever necessary for efficient execution of work.

1.4 Ground Conditions

The Contractor is to visit the site and ascertain local conditions, traffic restrictions and obstructions in the area and allow for extra expenses likely to be incurred due to any limitations whatsoever.

1.5 Setting Out and Leveling

The Contractor is to set and level the works, and will be responsible for the accuracy for the same. He is to provide all instruments and proper qualified staff required for checking the Contractor's work.

1.6 Safety

The Contractor shall take, adequate precaution to provide complete safety for prevention of accidents on the site.

1.7 Keeping Works Free from Water

The Contractor shall provide and maintain at his own cost, electrically or other power driven pumps and other plant and equipment to keep site excavated foundation pits and trenches free from surface as well as subsoil/leakage water from any other source thereof and continue to do

so to the complete satisfaction of the Engineer-in-Charge till the site is handed over. Method of dewatering shall need approval of the Engineer-in-Charge but no payment whatsoever is allowed on this count.

1.8 Rubbish

1.8.1 The Contractor shall clear all rubbish, vegetation, roots, soda etc., and dump them in the area indicated to the satisfaction of Engineer-in-Charge. No separate rate shall be allowed for the above work.

1.8.2 After the work is completed, the Contractor shall clear the area surrounding the buildings, all hutments and excess stores and remnants of building materials such brick bats, metal, sand, timber, steel etc.

1.9 Bench Marks and Ground water Gauges

The Contractor shall protect surveyor's benchmarks and ground water gauges, zero line marks and base line marks and base line marks from damage of movement during work.

1.10 Inspection

The Contractor shall inspect the Site of works and ascertain site condition and the nature of soil to be excavated.

1.11 Contractor's Staff

The Contractor must provide at all times efficient staff of trustworthy, skillful and experienced assistance capable of carrying out the work in accordance with the drawings and specification and to correct levels. The cost this establishment should be included in his rates.

1.12 Method of Measurement

Unless otherwise specified, the method of measurement for building works shall be as per IS: 1200.

1.13 Specifications Referred to

1.13.1 The specification contained herein is not exhaustive and for such items of works which may arise and which are not covered by these specifications, the provisions in the relevant Indian Standard (Latest Edition) shall apply.

1.13.2 A list of some Indian Standards is given herein.

1.13.3 Wherever reference to the Indian Standard mentioned below or otherwise appears in the specification, it shall be taken as reference to the latest version of the Standard.

IS Code No	Description
IS: 1200	Method of measurement of building and Civil Engineering works.
IS: 1542	Sand for plaster.
IS: 383	Aggregates-Coarse and fine, from natural source for Concrete.
IS: 515	Aggregates for use in Mass Concrete, natural and manufactured.
IS: 456	Code of Practice for Plain and Reinforced Concrete for General Building construction.
IS: 3370	Code of Practice for Concrete Structures for the Storage of Liquids.
IS: 12269	Specification for 53 Grade Ordinary Portland cements.
IS: 1786	Specification for High Strength for Differed steel bar & wires for concrete reinforcement.
IS: 1077	Common Burnt Clay Building Bricks.
IS: 1235	Flooring Tiles, Cement Concrete, Floor Finish
IS: 1443	Cement Concrete, Flooring Tiles, Laying and finishing.
IS: 1661	Cement and Cement Lime Pointing Plaster finishes on walls and Ceilings.
IS: 226	Structural Steel (Revised) Iron Work
IS: 800	Code of Practice for use of Structural Steel in General Building Construction.
IS: 1199	Workability of Concrete

2.0 EARTH WORK IN EXCAVATION & FILLINGS

2.1 General

Applicable provisions of Conditions of contract shall govern work under this section.

2.2 Excavation for Foundation, Trenches, Pit etc.

The excavation work shall be carried out in all kinds of Soil including Sand in workman like manner without endangering the safety of the nearby Structures or works without causing any hindrance to other activities in the area. The existence of old buildings, boundary walls, hutment, sewer lines, water lines, if any very close to the area of excavation should be given careful consideration while designing carrying out the excavation work. The excavation shall be done in such method as would technically be appropriate and befitting the site conditions subject to the approval of the Engineer-in-Charge. All foundation trenches shall be excavated to the full width and depths shown on the approved drawing or to such ordered to the Contractor.

The Contractor shall not undertake any earthwork without having obtained prior approval from the Engineer-in-Charge to the methods he proposes to employ in order to execute the work in the most efficient manner. He shall not modify such methods without the approval of the Engineer-in-Charge. This approval, however, shall not in any way make the Engineer-in-Charge responsible for any consequent loss or damage.

2.2.2 Should any excavation be taken down the specified levels, the Contractor shall fill in such excavation at his own cost with concrete as specified for foundations, well rammed in position until it is brought up to the specified level.

2.2.3 The Contractor shall notify when the excavation is completed and no concrete or masonry shall be laid until the soil for each individual footing, rafts etc. is approved.

2.2.4 The Contractor shall keep the site clear of water at all times. To this end he shall provide arrangements for bailing and pumping or any special arrangements as required within his quoted prices.

- 2.2.5 All foundation pits shall be refilled to the finished ground level (formation level) with approved materials, which shall be suitably consolidated in layers to the satisfaction of the Engineer-in-Charge.
- 2.2.6 Nothing extra will be paid for bailing out water collecting in excavation due to rains, ordinary springs, leakage from any other sources etc., or any other reason.
- 2.2.7 For the work of excavation the Tenderer shall included in his quotation the shoring, sheeting, bracing and sheet piling (if required). The quotation shall also include the cost of compaction of foundation sub-base, removal and storage of excavated materials and back filling.

2.3 Shoring

Timber shoring whenever required shall be closed boarded with minimum 50mm thick good and seasoned timber planks of sufficient length driven side-by-side to the required depth. The gaps between adjacent timber planks shall such would not allow any flow of soil particles, if necessary, the sides of the planks shall be planed smooth to ensure this. Sufficient number of bracing struts, walling etc. are to be provided to make the shoring rigid and non-yielding by earth pressure. Where necessary, sheet piling shall be done to ensure safety to the adjoining structures, if it is found that it is not feasible to protect the structure by timber shoring only. The Tenderer is strongly advised to inspect the site before tendering and apprise himself of the requirement of any Sheet piling in addition to the timber shoring before submitting his Quotation accordingly.

2.4 Back Filling

The space around the foundations in trenches or sites shall be cleared of all trash and loose debris and filled with approved excavated earth, all clods being broken up to the finished G.I. Filling shall be done in 200mm layers, each layer to be property moistened and well rammed. Excavated materials which is surplus or which is consolidated unsuitable for back filling is to be disposed of in spoil dumps as directed by the Engineer-in-Charge. No extra payment will be made for this.

3.0 CONCRETE

3.1 General

3.1.1 Applicable provisions of Conditions of Concrete shall govern work under this section.

3.1.2 All concrete work, plain or reinforced shall be carried out strictly in accordance with this specification and any working drawing or instructions given from time to time to the Contractor.

3.1.3 The Contractor's states shall allow for wastages in all materials as well as for all tests of materials and concrete.

3.1.4 No concrete shall be cast in the absence of the Engineer-in-Charge or any other person duly authorized by him. The Contractor's Engineer shall personally check that both the form work and reinforcement have been correctly placed and fixed, and shall satisfy himself that all work preparatory to the casting is completely ready, before informing the Engineer-in-Charge for final inspection and approval and for which purpose at least 24 hours notice shall be given by the Contractor.

3.1.5 The Indian Standards wherever referred to herein shall be the latest addition of such standards.

3.2 Cement

Cement shall conform for IS: 12269; 1987 Cement tests shall have to be carried out at Contractor's expense as and when directed. Cement, which has or practically set, shall not be used under any circumstances. The important structures should be constructed with the grade of cement not below 43 (Grade-43). No extra payment will be made for using Grade-53 cement or more grade available in departmental store. In case of brand of cement contractor have to choose one brand from given brands by E.I.C in writing prior of starting work & the decision given by E.I.C regarding brand of cement is final and binding.

3.3 Aggregates

The fine and coarse aggregates shall conform to all provisions and test methods of IS: 383 and/or IS: 515. Samples of aggregates, proposed to be used in the work shall be submitted free of charge in sufficient quantities to the Engineer-in-Charge with sieve analysis and other physical and chemical analysis data for his approval. He will preserve approved samples for future reference. This approval will not in any way relieve the Contractor of his responsibility of producing of specified qualities.

3.3.1 Coarse Aggregates

Coarse aggregates for use all reinforced and other plain cement concrete works shall be crushed black granite trap stone obtained from approved source and shall consist of uncoated, hard, strong dense and durable pieces of crushed stone, and be free from undesirable matters, viz. Disintegrated stones soft, friable, thin, elongated or laminated pieces, dirt, salt, alkali, vegetable matter or other deleterious substances. The aggregates shall be thoroughly washed with water and cleaned before use to the satisfaction of the Engineer-in-Charge at no extra cost of the Employer.

The maximum size of coarse aggregates shall be as follows unless specified otherwise elsewhere.

Reinforced Concrete : 20 mm

Plain Concrete : 20 mm

Thin R. C. C. Members

With very narrow space : 12 mm.

Mat/Lean Concrete : 20/40 mm.

(The actual size to be agreed by the Engineer-in-Charge)

Grading of coarse aggregates for a particular size shall generally conform to relevant I.S Codes and shall be such as to produce a dense concrete of the specified proportions and or strength and consistency that will work readily in position without segregation.

3.3.2 Fine Aggregates

Sand shall be clear River sand brought from approved source and consist of siliceous material, having hard, strong, durable uncoated particles, free from undesirable matters viz. dust lumps, soft or flaky particles or other deleterious substances. The amount of undesirable shall not exceed the percentage limits by weights as specified in relevant IS Codes. Washing of aggregates by approved means shall be carried out, if desired by the Engineer-in-Charge, at no extra cost to the Employer.

Coarse and fine sand shall be well graded within the limits by weight as specified in relevant IS Code. Fineness Modulus shall not vary by more than plus or minus 0.20 from that of the approved sample. Fineness Modulus for sand should not be less than 2.5.

3.4 Reinforcement

3.4.1 The Contractor shall prepare and furnish to the Engineer-in-Charge, Bar Bending Schedules in considerations of the approved drawings for all R.C. C. works for review and checking by the Engineer-in-Charge well before taking up the work.

3.4.2 The High Yield strength differed bar (HYSD) shall conform to IS: 1786-1990.

All steel for reinforcement shall be free from loose, oil, grease, paint or other harmful matters immediately before placing the concrete.

3.4.3 The Reinforcement shall be bent to the shapes shown on the approved drawings prior to placing and all bars must be bent cold. The Steel shall be placed in such a way that it is rigidly held in position while concrete is being cast. The correct clearance from the form shall be maintained by either pre-cast mortar blocks or by metal supporting chairs to be supplied by the Contractor free of charge.

The intersection of roads crossing one another shall be bound together with soft pliable with No. 16 to 18 SWG at every intersection so that reinforcement will not be displaced in the process of depositing concrete. The loops of binding wire should be tightened by pliers and welding of reinforcement for lapping & binding should be done if desired by E.I.C. No extra payment will be made for this purpose.

3.4.4 The work of reinforcement shall also be inclusive of stirrups distribution bars, binders, initial straightening and removing of loose rust, if necessary, cutting to requisite length, hooking and bending to correct shape, placing in proper position including supplying and binding with block annealed wire as stated in clause 3.4.3 above.

3.4.5 In case of brand of Steel contractor have to choose one brand from given brands by E.I.C in writing prior of starting work & the decision given by E.I.C regarding brand of steel is final and binding.

3.5 Water

The Water shall be clean and free from Alkali oil or injurious amounts of deleterious materials. As far as possible, the water is of such quality that it is potable. If any chemical analysis of water is necessary and ordered, the same shall be carried out at an approved laboratory at the Contractor's cost and expenses.

3.6 Concrete Proportioning

3.6.1 The concrete proportions shall be as indicated on the approved drawings and shall conform to IS: 456 & IS: 3370. The quality and character of concrete shall be governed by IS: 383. It should be sampled and analyzed as per IS: 1199. The concrete should stand the test specified in IS: 516.

3.6.2 The minimum cover of main reinforcement shall be as per relevant IS: Codes. Cover to any reinforcement of R.C.C. piles shall be minimum 65 mm in case in-situ and 50 mm in case of pre-cast piles. Suitable spacer blocks shall be provided at intervals not exceeding 1.2 m. throughout the length of the pile.

3.6.3 The workability shall be measured by slump. Slump for different grades of concrete shall not exceed following unless specifically permitted by the Engineer-in-Charge.

i) For M 15 concrete - 3.75 cm.

ii) For M 20 concrete - 2.50 cm.

iii) For M 25 concrete – 2.00 cm

3.6.4 All concrete works shall be thoroughly compacted and fully worked around the reinforcement, around embedded fixtures and into comers of the form work.

The Concrete shall be thoroughly and shall be efficiently vibrated during laying. The use of mechanical vibrators shall comply with IS: 2608, IS: 2506 and IS: 456. Whenever vibration has to be applied externally, the design of formwork and deposition of vibration shall receive special consideration to ensure efficient compaction and to avoid surface blemishes.

3.6.5 Test for Water Tightness of Structures / Pipes

For liquid retaining structures including inlet chambers etc. shall be deemed to be satisfactory water tight as per relevant clause of IS: 3370. The Contractor at his own expenses, if necessary, shall undertake approved corrective measures.

As regards the pipelines, the tests shall be performed for the Hydrostatic Pressure of 10 Kg./Sq. cm in case of S.W.D., D.I. Pipes and 2 Kg./Sq. cm. for P. S. C. respectively. The tests shall be carried out as per relevant IS Codes and pipes shall be considered satisfactory if the tests results satisfy the requirements of the relevant clauses of the Codes. The Contractor shall give all these Hydraulic Tests by making his own arrangements for water supply and filling and disposing the water after the tests. The Contractor shall rectify the defects noticed and carry out the tests again and repeat the testing operation till successful result is obtained and accepted by the Engineer. The rates Quoted for the work shall be considered as inclusive of cost of all Labour, materials and equipment required to give successful tests for Water tightness.

3.7 Workmanship

3.7.1 All Concreting work shall be carried out according to the IS: 456, IS: 3370, and other related codes. It should, however, be noted that for every 15 M3 of concrete placed or for every one day's volume of concrete whichever is lower, a minimum of 3 (three) Cubes shall be kept for test purpose, and tested at the Contractor's cost and expenses at a Laboratory as approved by the Authority. The number of test cubes may, however, be altered at discretion of the Engineer-in-Charge. It is compulsory to test 3 (three) cubes in each case.

3.7.2 Structural Concrete

Design mix Concrete shall be on all concrete works except in case of Mud-mat concrete lean concrete where nominal mix concrete will be allowed.

Design mix Concrete will be used in Reinforced Concrete Structures and shall be in Grade of M25 for works other than water retaining structure & for water retaining structure (RCC) Grade will be M30 as per IS 456.

The mix shall be designed to produce the grade of concrete having required workability and a Characteristic Strength not less than appropriate values given in IS: 456 - 2000. For mix design, procedure given in Indian Standard recommendation or any other standard procedure shall be adopted. As long as the quality of materials does not change a mix design done earlier may be considered adequate for later work. Batching mixing, sampling and Strength Test of concrete shall be carried out in compliance with the relevant clause of IS: 456-2000 and all other relevant Indian Standards recommended therein.

The mix design by the Contractor shall be used for works only after obtaining written approval of the Engineer-in-Charge. Mix design shall be entirely the responsibility of the Contractor and any approval by the Engineer-in-Charge shall not relieve him of his responsibility in respect thereof.

The Contractor shall prepare all the Calculations, Tabulations, Graphs etc. pertaining to Mix Design Test result and supply copies of such Calculations, tabulations, Graphs etc. required by the Engineer-in-Charge.

On proportioning concrete, the quantity of both cement and aggregate shall be determined by weight, where the weight of cement is determined on the basis of weight per bag a reasonable number of bags be weighed periodically to check the net weight or should be either weighed or measured by volume in calibrated tanks, All measuring equipments shall be maintained in a clean serviceable condition and shall periodically checked for accuracy.

The grading of coarse and fine aggregates shall be checked frequently and frequency of testing shall be determined by the Engineer-in-Charge. Where weight batching is not possible or practicable, the quantities of coarse and fine aggregates may be determined by volume but cement in any case shall be weighed by weight only. If fine aggregate and volume batching is adopted, allowance shall be made for bulking. The bulking shall be determined in accordance with IS: 2386 (Part-III).

The Water-Cement Ratio shall be maintained to its correct value. Surface moisture content of aggregate shall be determined as per IS: 2386 (Part-III) and the amount of water to be added shall be adjusted accordingly to maintain the correct Water-cement ratio.

During the progress of work in order to ensure correct strength of concrete proper control should be exercised by the Contractor as specified in Specifications mentioned in the Clause 3.7.1 above. Test strength of every sample shall be determined in accordance with the recommendations of IS: 456-2000. If one out of ten consecutive test cubes shows a deficiency in strength up-to a maximum limit of 10%, the concrete will be deemed satisfactory. If two of the test cubes out of ten shows a deficiency in strength up to a limit of 10%, the concrete shall be deemed to be less satisfactory and a reduction of 1 % will be made on the cost of such concrete. If three out of ten test cubes show deficiency in strength up to a limit of 10%, a reduction of 5% will be made on the cost of such concrete. If more than three test cubes show a deficiency in strength up-to a limit of 10% a reduction of 10% will be made on the cost of such concrete. If more than five show a deficiency in strength up-to a limit of 10%, the concrete shall be rejected. Such rejected concrete work shall have to be dismantled and replaced to the satisfaction of the Engineer-in-Charge by the Contractor free of cost to the Employer. No payment for the dismantled concrete, the relevant formwork and reinforcement, embedded fixtures etc. wasted in the dismantled portion, shall be made. In the course of dismantling, if any, damage is done to the embedded items or adjacent structures, the same shall also be made good free of charge by the Contractor to the satisfaction of the Engineer-in-Charge.

If the deficiency in strength of one-test cubes exceeds the 10% limit, a reduction of 5% will be made on the cost of such concrete. If the deficiency in strength to two out of ten test cubes exceeds the 10% limit, a reduction of 10% will be made on the cost of such concrete. If the deficiency in strength of three out of ten test cubes exceeds the 10% limit, a deduction of 20% on the cost of such concrete will be made.

All deduction will be made with respect to current P.W.D. schedule of rates according to the direction of E.I.C.

With permission of the Engineer-in-Charge for any above mentioned grades of concrete, if the quantity of water has to be increased in special cases, cement shall also be increased proportionally to keep the ratio of water to cement same as adopted in trial mix design for each grade of concrete. No extra payment for additional cement will be made.

3.8 Pre-cast Concrete

Pre-cast Concrete items shall conform to relevant IS Specifications. Pre-cast items shall be suitably marked with the date of casting identification marks and shall show the right way up as may be required. The arrangements to be made by the Contractor for Site manufacture and handling of pre-cast items shall be done to the approval of the Engineer-In-Charge. Each pre-cast unit shall be cast in one operation and no construction joints shall be permitted. No damaged or defective units shall be built into the works and units shall be so stored that they are not over' stressed.

Pre-cast units shall be provided in places as shown in the approved drawings. The pre-cast units shall be cast at site strictly following the Specifications of Pre-cast Concrete work. Proper care shall be taken to ensure that the units are obtained from the moulds without any damage. Before erecting in position the units shall be cured adequately by keeping units immersed in water.

3.9 Form Work

3.9.1 The Form Work shall conform to IS: 456. Whenever necessary, shuttering must be provided.

The work shall also include providing all necessary staging, centering, formwork and moulds for placing concrete. Shuttering may be of approved dressed timber true to line, not less than 37 mm. thick. Surface to be in contact with concrete are to be planed smooth. Alternatively, sufficiently rigid plywood shuttering or steel shuttering may be used. In every case, joints of the shuttering are to be such as to prevent the loss of

liquid from the concrete. In timber shuttering the joints shall, therefore, be either tongued or grooved or the joints must be perfectly close and lined with draft paper polythene films or other types of approved materials. In case of plywood or steel shuttering also the joints are to be similarly lined. All shuttering and framing must be adequately stayed and braced to the satisfaction of the Engineer-in-Charge for properly supporting the concrete, during concreting and the period of hardening. It shall be so constructed that it may be removed without shock or vibration to the concrete. No through bolts are allowed for holding the shuttering in water retaining structure.

3.9.2 Cleaning, Treatment and Removal of Forms

All forms shall be thoroughly cleaned of old concrete, wood shavings, saw dust, dirt and dust sticking to them before they are fixed in position. All rubbish loose concrete chippings, shavings, saw dust etc. shall be scrupulously removed from the interior of the forms before the concrete is poured. Formwork shall not be used/reused, if declared unit or unserviceable by the Engineer-in-Charge.

If directed by the Engineer-in-Charge, compressed air jet/or water jet shall be kept handy along with wire brushes, brooms etc. for the purpose of cleaning.

Before shuttering is placed in position, the form surface in contact with the concrete shall be treated with approved non-staining oil or composition. Care shall be taken that the oil or composition does not come in contact with reinforcing steel or existing concrete surface. They shall not be allowed to accumulate at the bottom of the shuttering.

Forms shall be struck in accordance with the relevant clause of IS: 456 or as directed by the Engineer-in-Charge. The Contractor shall record on the drawings or in other approved manner, the date in which the concrete is placed in each part of the work and the date on which the form work is removed there from and have this recorded checked and countersigned by the Engineer-in-Charge.

The Contractor shall be responsible for the safe removal of the formwork, but the Engineer-in-Charge may delay the time of removal if he considers it necessary. Any work showing signs of damage through premature removal of formwork or loading shall be entirely reconstructed without any extra cost to the Employer.

3.10 Protection and Curing of Concrete

Newly placed concrete shall be protected by approved means; from rain, sun and wind and extreme temperature. Concrete placed below the ground level shall be protected from failing earth during and after placing. Concrete placed in ground containing

deleterious substance shall be kept free from contact with such ground or, with water draining from such ground during placing of concrete and for a period of at least 3 (three) days or as otherwise directed by the Engineer-in-Charge, the ground water around newly poured concrete shall be kept to an approved level by pumping or other approved means of drainage at the cost of the Contractor. Adequate steps shall be taken to prevent flotation or flooding. Steps, as approved by the Engineer-in-Charge, shall be taken to protect immature concrete from damage by debris, excessive loading, vibration, abrasion, mixing with earth or other deleterious materials, etc. that may impair the strength and durability of the concrete.

As soon as the concrete has hardened sufficiently for the surface to be marked it should be covered with Hessian, canvas, or similar materials and kept continuously wet for at least 7 (seven) days after final setting. This period may be extended at the discretion of the Engineer-in-Charge, up-to 14 (fourteen) days. Concrete slabs and floors shall be cured by flooding with water of minimum 25 mm depth for the period mentioned above.

Approved curing compounds may be used in lieu of moist curing with the permission of the Engineer-in-Charge. Such compound shall be applied to all exposed surface of the concrete as soon as possible after the concrete has set. No extra payment is allowed on such count.

3.11 Concrete Finish

The Concrete surface on removal of form work shall be such that no finish is necessary, If, however, the surfaces is not satisfactory the Contractor shall, if so instructed, remove unwanted, projecting parts by chipping and smoothing the surface with cement rendering at his own expenses. The shutter marks shall invariably be removed by rubbing with carborandum stone. The Contractor shall therefore take all precaution for avoiding the shutter marks.

3.12 Construction Joints

These shall be in according with IS: 3370.

3.13 Expansion Joints as per IS Code relating to liquid retaining structure

Expansion joints shall be provided at position as directed and the spacing shall not exceed the limits specified in IS: 456. These shall comply strictly with the details shown on approved construction drawings. Reinforcement shall not extend across any expansion Joint and the break between the two sections must be complete.

3.14 Details of typical expansion joints and construction joints should comply with the suggestive arrangements shown in IS: 3370 (Part-I), Clause 8.1 (a)(2), Figure 2 (for expansion Joints) and Clause 8.1(a) Figure 1, Clause 8.1 (b) Figure 4 (for construction joints).

3.15 PVC Water Stops as per IS Code relating to liquid retaining structure

The materials shall be durable and tough and as per approval of the Engineer-in-Charge. The minimum thickness of PVC sealing strips shall be 6 mm. and the minimum width 225-mm actual shape and size shall be as per drawings. The materials should be of good quality polyvinyl chloride highly resistant to learning abrasion and corrosion as well as to chemicals likely to come in contact with during use. The physical properties will generally be as follows:

Specific Gravity	1.3 to 1.35
Shore Hardness	60 A to 80 A
Tensile Strength	100 to 150 Kg./Cm ²
Minimum Safe Continuous Temperature	750C
Ultimate Elongation	Not less than 275%
Water Absorption	Not more than 5% by weight in a 7 day test.

3.16 Rubber Water Stops as per IS Code relating to liquid retaining structure

The materials must be very durable and tough and as per approval of the Engineer-in-Charge. The ribs shall be sufficient to ensure proper bonding with concrete. The width shall be minimum 225 mm and thickness minimum 6 mm. The rubber water stop must be used in long lengths to avoid splicing as far as practicable. Ends shall have at least 200 Cu M overlaps and vulcanised. The materials shall be natural rubber and be resistant to corrosion tear and also to attacks from acid, alkalis and chemicals normally encountered in service. The physical properties will generally be as follows

Specific Gravity	1.1 to 1.15
Shore hardness	65 A to 75 A
Tensile Strength	250 to 300 Kg/ Cm ²
Maximum safe continuous temperature	750C
Ultimate elongation	Not less than 350%
Water Absorption	Not more than 350% by weight in a 7 day test.

3.17 Contractor's Supervision

The Contractor shall provide constant and strict supervision of all the items of construction during progress of work, including the proportioning and mixing of the concrete and bending and placing of reinforcement. Any important operation such as concreting or stripping of form work adequate notice shall be given be.

The cement and sand shall be thoroughly mixed dry in specified proportions. Water shall then be added just sufficient to make a stiff and workable paste. The mortar shall be used within half an hour of mixing.

- 4.1 The Contractor shall build all brickwork uniformly no one portion being raised more than 1 meter above another at a time. The joints shall not exceed 12 fore executions. in thickness and should extend the full thickness of the brickwork. All joints shall be properly raked and the surface washed down.
- 4.2 All the bricks shall be kept fully immersed in water at least for a minimum period of six hours till they are completely soaked and only thoroughly soaked bricks shall be used in the work.
- 4.3 The Contractor shall keep wet all brickwork for at least 10 (ten) days after laying. The surface of unfinished work shall be cleaned and thoroughly wetted before joining new work to it.

5.0 PLASTERING, PAINTING AND SURFACE TREATMENT

5.1 Cement Plaster

5.1.1 The plastering work shall be governed by IS: 1661. Unless otherwise specified cement plaster shall be composed of 1 part of cement and 6 parts of sand. For ceiling plaster, the composition shall be 1 part of cement and 4 parts of sand. The thickness of plaster at ceiling and concrete surface shall be 10 mm. The thickness of plaster to the fair faces of brickwork shall be 20 mm. The thickness mentioned shall be minimum thickness. The Contractor shall allow in his rate for any rubbing out due to inequalities of brickwork.

5.1.2 The rate shall also include for forming of any molding drip course etc., and for extra thickness due to corbelling of brick work in parapet or at any other place. If required, all internal angles shall be rounded off as per drawing or as directed by the Engineer-in-Charge without any extra charges.

5.1.3 Cement and sand shall be measured and mixed dry thoroughly to a uniform color on a platform specially constructed for the purpose. Care should be taken to see that no foreign matters get mixed with the mixture. Only enough water shall be mixed to make the mixture workable. The mix shall then be turned over and again to a uniform color and texture number more cement mortar shall be mixed at a time than cannot be used within thirty (30) minutes of mixing.

5.1.4 Surface to be plastered are to be brushed clean, wetted for 24 hours before the plaster is put in and the joints of the brick work raked out 12 mm. deep minimum. The concrete faces to be plastered shall be chipped, roughened and soaked with water for achieving required bond with the plaster without any extra cost.

5.1.5 The surface of the plaster shall be finished absolutely in one plane. The Contractor

shall rub down any unevenness with carborandum stones at his cost and expenses. Care shall be taken to see that no mark remains at the junction of plastering done at different times. If necessary, the junctions shall be rubbed with carborandum stones to eliminate such undesirable marks. The Contractor may be required to use normal sprinkling of thin cement slurry on the surface for satisfactory finishing of the plastering work for which no extra payment shall be made.

5.1.6 Plaster shall be protected and cured by keeping it thoroughly wet with sprinkling of water for 10 (ten) days continuously.

- 5.1.7 The cost of plastering work shall also include the cost of necessary scaffolding, staging etc. as would be required for the work.

6.0 SURFACE FINISHING

6.1 General

The cost of all the items of work under this section should include the cost of necessary scaffolding, staging, preparing sub base, removing stains from the floor, skirting, wood work, glass etc. caused through execution of the work.

6.2 White Washing

6.2.1 White washing shall be done with 5(five) parts of stone lime and 1 (one) part of shell lime with necessary gum (about 2 Kg per M³ of lime) using a small quantity of blue as per direction of Engineer-in-Charge. The lime shall be brought to the site unslaked and shall be slaked at site with an excess of water and allowed to remain under water for (two) days. To the mixture fresh water may be added to bring the consistency to that of a thin cream. When thoroughly mixed, the mix is to be strained through coarse cloth. The surface of the wall is to be brushed thoroughly cleaned before the white washing is applied. Each coat of white wash has to be laid on with brushes. Each coat of WhiteWash means one continuous strike of brush with the prepared wash from top downwards. Another similar strike bottom upward over first strike followed by another similar strike from right to left and another from left to right over the right application of brush before it dries. Each coat must be perfectly uniform when finished and free from brush mark etc.

6.2.2 Three coats of white wash will mean a minimum of 3 (three) coats to produce an opaque white surface to the entire satisfaction of the Engineer-in-Charge. If the surface is blotchy or otherwise unsatisfactory, number of coats shall be applied till the desired effect is produced to the satisfaction of the Engineer-in-Charge without any additional cost.

6.3 Snowcem or Similar Decorative Cement Finish

6.3.1 Where specified, external surface shall be finished with two coats of 'Snowcem' or similar decorative cement finish of approved color, shade and manufacture. The surface to be finished is to be previously cleaned down to remove loose dust or dirt by use of stiff wire brush. All inequalities are to be rubbed down and defects rectified. The surface is to be wetted well with water and the surface water is to be allowed to run off. The 'Snowcem' or equivalent is to be mixed strictly as per manufacturer's specification. The mixed

'Snowcem' or equivalent to be applied to the surface with a brush of a good quality. The first coat should be well brushed into the surface to form a good bond. Second coat should be applied carefully to give a good finished appearance may be applied by brushing or spraying. Each 'Snowcem' or equivalent application shall be wetted at the end of the day with a fine water spray.

6.4 Painting to Steel Works

6.4.1 Any shop coat of paint shall not be considered as a coat of paint for the purpose of specification.

6.4.2 Ready mixed synthetic enamel paint of 'Jenson & Nicholson' 'British Paints', 'Shalimar Paints or similar other approved make and approved color and shade shall only be used. The primer shall be red oxide zinc chromate primer (IS: 2074) or any other anticorrosive primer as approved and directed by the Engineer-in-Charge. The Contractor shall furnish the details of paints to the Engineer-in-Charge for approval of paints before commencement of painting work.

6.4.3 The surface to be painted shall be properly cleaned, de-rusted, all loose scales removed and smoothed with emery papers. Then a coat of anticorrosive priming shall be evenly applied. After this has dried up, two successive coats of best quality ready mixed synthetic enamel paint shall be given to the entire satisfaction of the Engineer-in-Charge. Brushes of approved size and make shall only be used for application of paint and use of cloth is definitely prohibited.

7.0 DAMP PROOFING WORK

7.1 Unless otherwise specified, damp proof course shall be 25-mm thick cement concrete (1:2:4) with stone chips graded 10 mm to 3 mm with 3% Cico or similar approved water proofing compound conforming of IS: 2645 by weight of cement. The proportioning, laying etc., shall be done in conformity with specification for cement concrete work. The damp proof course shall be used for all brick walls of the building.

8.0 ROOF WATER PROOFING TREATMENT

8.1 Both flat and curved roofs, whether accessible or inaccessible, shall provided with polyurethane based water proofing paint.

Specification for Roof Water Proof Treatment with Polyurethane based Water Proof Paint

8.2 Preparation of Surface

The top surface of the roof shall be chipped off where necessary and all loose particles, dust impurities, are to be removed by rubbing the entire roof surface with wire brush and by application of High Pressure Compressed Heated Air to have a complete dust free and moisture free surface.

The roof surface, receiving polyurethane based Water Proofing paint, shall be provided with cement punning having smooth finish. A cross slope of 1 in 300 shall be provided in the roof of Building to allow proper drainage of rainwater.

8.3 Specification of Materials

The polyurethane based paint is essentially an elastic and water proof film having a good adhesion to concrete; water and abrasion resistant properties and shall have long term weather proof characteristics. The paint / film material shall be of two components which is to be mixed and processed as per manufacturer's specification. The mixture shall be homogeneous before applications, as it has tendency to settle.

The polyurethane based water proofing system shall be manufactured by reputed manufacturers of proven recorded and shall be approved by the Central Building Research Institute (CBRI)/ National Chemical Laboratory (NCL)/ The Council of Scientific and Industrial Research/New Delhi (CSRI)/ National Test House, Kolkata or similar such Government/ Public Sector Undertakings.

The materials are to be inspected/ approved by the Engineer-in-Charge as per procedure to be mutually agreed upon the agency and in charge of the work.

- 8.4 Since the product has a very short self-life, the materials are to be used in the work shall not be older than four (4) months from the date of manufacture (i.e. the date of bottling).

Necessary Test Certificate of CBRI/NCL/CSIR/National House etc. are to be furnished by the contractor or the Department, for the materials procured for the water proofing work.

8.5 Application

The two components of polyurethane based water proofing system should be mixed as per manufacturer's specification before application. The tack coat should be applied by brushing or roller to the entire surface in normal temperature and 406 hours setting time should be allowed before application of the second coat. The record and final coat of polyurethane based mixed waterproofing sealing over the priming coat to be applied at normal temperature and curing time between 36 to 48 hours should be allowed.

The application to be made by technically trained and approved applicators duly certified by the manufacturers.

8.6 Guarantee Period

The entire waterproofing job shall be covered with a written guarantee of leak proof performance for a minimum period of 10 (ten) years.

8.7 Defects Liability Period

The percent (10%) of the cost of all works shall be retained by the Department for one (1) year from the date of commissioning. Any defect observed during the Defect Liability Period shall be rectified by the Contractor without any extra cost to the Department.

9.0 FLOORING

9.1 Patent Stone Floorings shall be 25mm. thick in M20 grade concrete with 10mm. to 6mm. stone chips laid in rectangular panel with diagonal length not exceeding 3.00M and finished smooth with neat cement punning 1.5mm thick. After finishing, the surface shall be left undisturbed for two hours and then with wet bags and after 24 hours cured by flooding with water and kept wet for at least 7 (seven) days. Required Camber or Slope should be provided in floor draining wash water, if necessary.

9.2 Cast-in-Situ Mosaic in floor shall be 25mm.thick (finished) laid in panels as directed with necessary underlay of cement concrete (1:2:4) with stone chips with 12mm. thick terrazzo topping finished to 9 mm. after final grinding with 0 to 10 mm. size Mosaic chips highly polished etc. - complete as per specification of IS; 2114-1962. Cast-in-situ Mosaic in Skirting and Dedo shall be 12mm. thick. The Mosaic work shall be of approved color and to the entire satisfaction of the Engineer-in-Charge.

- 9.3 The Marble flooring containing marble Slab/tile of 12 to 15 mm thickness in all room floor, lobby, stair, landing & treads, working space etc. over 20 mm (avg.) thick base of Cement mortar (1:2) laid with white cement slurry @ 4.4 kg/Sq.M before placing marble & jointed with white cement slurry @ 2.0 kg/Sq.M with necessary pigments including grinding and Granite polishing as per direction of Engineering -in -Charge With Makrana plain pink / Adranga Pink / GarbhGulabi / Udaypur pink / Udaypur Green / Black Bhaslana and Area of each Slab/tile exceeding 0.3 Sq.M but not exceeding 0.6 Sq.M.
- 9.4 Kota stone flooring containing 12 mm to 15 mm thick kota stone slab in wall, dado, walk way in 15 mm thick [avg] cement mortar (1:3) including making suitable arrangement to hold the stone properly by brass / copper hooks including pointing in cement mortar (1:2) (1 cement : 2 marble dust) with admixture of pigments matching the stone shade, including grinding and polishing all complete as per direction of Engineer-in-charge including cost of materials, labour, scaffolding, staging, curing complete. [Using cement slurry for bedding @4.4 kg/Sq.M and for jointing @1.8 kg/Sq.M]
- 9.5 In machine/pump room the 'Ferro site' or 'Ironite' Flooring shall be 50 mm. Thick to be laid in two layers. First a layer of 25mm. thick patent stone flooring shall be laid in M20 grade concrete and allowed to dry. Then the second layer of 25mm.thick flooring of M20 grade concrete with 10mm.to 6mm. stone chips using at least 1Kg./Sq.m. of floor hardening compound of approved quality and make shall be laid and cured. The flooring shall be laid in rectangular panel with diagonal length not exceeding 3.0 meters.

10.0 IRON MONGERY

- 10.1 The rain Water pipe of the materials and of size as specified shall be of approved manufacture end jointed as follow:
- 10.1.1 For heavy cast iron pipes with gasket and lead properly caulked.
- 10.1.2 Where required these are to be run in chase left out in walls, columns, slabs and to be encased in cement concrete 1:2:4 (1 Cement, 2Sand 4 washed Stone Chips 19mm. down) with metal wrapping or with M.S: loops placed at approximately 325mm center to center or as directed by the Engineer-in-Charge. All pipes encased in walls, columns or under floors must be heavy cast iron with lead caulked joints. For exposed lengths of pipes, these are to be neatly secured clear from the finished wall face with nails and bobbing in the case of cast iron pipes, nails or screwed to hard wood tapping pugs embedded in wall.

10.1.3 All cast iron rain water pipes shall be painted two coats inside with approved anticorrosive paint. The exposed cast iron pipes shall be painted outside with two coats of ready mixed Synthetic Enamel Paints of approved makes, shade and color over a coat of priming of approved make.

10.1.4 The mouth of rain water pipes shall be fixed with C.I grating and the pipe jammed in position in 1:2:4 cement concrete with stone chips and neat finish on the surface.

10.1.5 The work shall include all supply, fitting and fixture of materials cutting, making chases, encasing, painting, jointing, etc. complete in all respect. The work shall include supplying, fitting, fixing, and jointing of all the specials required for the completed work.

10.1.6 Rain water Spouts shall be of C.I pipes cut to exact length as per approved drawing or direction of the Engineer-in-Charge and laid in position in 1:2:4 cement concrete with stone chips, adjoining roof being finished in neat cement. The interior faces shall be painted two coats with anticorrosive paint and the faces shall be painted with two coats of ready mixed Synthetic Enamel paint of approved make, shade and color over a coat of priming of approved make.

10.2 Metal Casement

10.2.1 Unless specified otherwise, all doors, windows and ventilation in general should be of mild steel casement with sections as per IS: 1038. They shall be of approved make. The Contractor will submit the name and address of the manufacturer whose metal casements he intends to use for approval of the Engineer-in-Charge. The workmanship shall be of high quality and shall be up to the entire satisfaction of the Engineer-in-Charge.

10.2.2 All the steel doors and windows sashes shall be given a shop coat of Red Oxide Zinc Chromate Primer IS: 2070 after these are thoroughly cleaned off dust, dirt, scales etc., and passed after inspection by the Engineer-in-Charge.

10.2.3 Windows are to be prepared for puffy glazing from the outside and for opening outwards unless otherwise mentioned. All steel sashes shall have holes drilled at suitable places for inserting glazing clips which shall also be supplied by the Contractor All glazing shall be fixed to the shutters or frames in addition to glazing clips with quality putty of Shalimar or equivalent make. Glass must not be placed directly against the metal. A thin layer of putty must be evenly spread over the glazing rebate and the glass pressed firmly against it.

- 10.2.4 Ventilators shall be constructed from solid rolled universal casement section being double weathered at all points to ensure water tightness and bedded in mastic and screwed to the sashes.
- 10.2.5 The fitting shall be of heavy pattern bronze oxidized brass and of approved quality, side hung casement will have two point locking handle and casement fasteners. The hung windows shall have 200mm. long adjustable casement stay, arrange to lock the windows from inside horizontally at the center, hung windows shall have spring catch designed for hand cord or pole operation as approved by the Engineer-in-Charge. The fittings to be fitted either by screwing to the window sections or to steel bracket welded to the window section as approved by the Engineer-in-Charge.
- 10.2.6 Galvanized weather bars shall be provided to sills of all windows.
- 10.2.7 Metal casement is on no account to build in at the time the walls are constructed. Holes to accommodate the fixing lugs are to be left or cut and the casement fixed after all rough masonry plaster works have been finished. The lugs of the casement shall be jammed in 1:2:4 cement concrete with stone chips after holding the casement in proper position, line or level.
- 10.2.8 Glazing for windows and ventilators shall weight not less than 8.0 Kg/Sq m for doors, 6mm. thick wire net reinforced glazing shall be used as approved by the Engineer-in-Charge. The glasses shall be cut to size accurately to suit all openings to glaze with slight margin of about 1.50mm. on all sides or as directed. These shall be securely fixed in position in the manner described earlier. On completion of the building, the Contractor shall clean all the glass and leave the same perfectly in a tidy condition.
- 10.2.9 The cost of marginal doors, windows and ventilations shall include supplying fixing, fitting, glazing cleaning, necessary scaffolding, staging etc. and shall be for the complete work in all respects to the satisfaction of the Engineer-in-Charge.
- 10.2.10 The Contractor shall without any extra charge, submit three sets of shop drawings from the manufacture showing full details of each type of doors, windows and ventilators including section, position of all fittings and fixtures for the approval of the Engineer-in-Charge before manufacture and finally six sets of approved final drawings with notes on the method of fixing.
- 10.2.11 Where specified, mosquito fly proof brass wire screen of approved gauge and mesh shall be used in combination with windows. The screen shall be fixed to the inside of the frames and the windows to be opened outside and be fitted with 'Folo operator' for opening to any position and closing. Additional intermediate members be fixed to the frames to receive the fly screen so that the clear span of the screen does not exceed 300 m or as approved by the Engineer-in-Charge.

10.2.12 All windows shall be provided with grills of approved design made of 25 mm x 6 mm M.S. Flats and the other clean openings not exceeding 100 mm. (Grill weighing above 16kg per sqm).

10.2.13 The work for metal casements shall also include the cost of painting with 2 coats of ready mixed synthetic enamel paint of approved make, quality color and shade over a coat of approved anticorrosive primer.

10.3 Collapsible Gate

The M.S. collapsible gates will be obtained from manufacturer as approved by the Engineer-in-Charge. These shall be of mild bar type, out of 20 mm. channels and shall be top hung with roller bearing and shall have locking arrangement. Collapsible gates under 2.700 m height shall be with 4 sets of lattices. Guide tracks shall be to the entire satisfaction of the Engineer-in-Charge. The gates shall be fixed in position, de-rusted, discaled and painted with 2 coats of approved ready mixed paint over a coat of approved anticorrosive primer.

10.4 Rolling Shutter

10.4.1 The M.S. roller shutter shall be obtained from manufacturer as approved by the Engineer-in-Charge. The roller shutter shall be of 18 G x 75 mm galvanized mild steel lath of convex corrugation complete with one piece construction. These shall be fitted with pressed side guides and pressed bottom rail, brackets, door suspension shafts, top rolling springs (of strong English Continental Spring Steel Wire) with a four lever concealed lock as also separate locking arrangements for padlocks, pulling hooks, handles and top cover. The roller shutters shall be fixed in position with all accessories and the workmanship shall be to the entire satisfaction of the Engineer-in-Charge. This shall be finished with two coats of approved ready mixed paint over a coat of approved anti corrosive primer.

11.0 STRUCTURAL STEEL WORK

11.1 All Structural Steel to be used for gantry beam etc. shall be of tested quality conforming to IS: 226 and IS: 2062 latest addition.

Finished steel shall be free from cracks, lamination and other visible defects. Section shall be adequately protected from rusting and scaling. Rivets and bolts, nuts and washers shall be of mild steel and comply with requirements of relevant IS Codes. Steel

used for rails shall have tensile strength of about 50-60 Kg/Sq. mm. and yield point at 26 Kg/Sq. mm. The electrodes for welding shall conform to IS: 814. All steel work shall be fabricated and erected as per IS: 800 and IS: 806. Welding shall be carried out as per IS: 814, IS: 815, IS: 816 and IS: 823, all of the latest editions.

11.2 All steel work, after preparation of surface, shall be given a coat of red oxide zinc chromate primer (IS: 2074) and finished with two coats of Synthetic enamel paint. Surface to be painted shall be thoroughly cleaned of mill scale, oil grease, rust etc. over coating and finishing paints shall be of well-known make (vise Jenson & Nicholson/ Berger Paints/ Shalimar Paints). The Contractor shall furnish details of Paints to the Engineer-in-Charge for approval of paints before commencement of painting work.

11.3 Steel work shall be hoisted and erected in position in a safe and proper manner.

No riveting or permanent bolting shall be done until proper alignment has been made. For grouting, cement and clean fine sand shall be used in a proportion of 1:2 and properly mixed with water. All trapped pockets shall be fully vented for full penetration of grout. All grouting shall be cured for a minimum period of seven days.

12.0 CABLE TRENCHES

12.1 The cable trenches should normally be of dimension 760mm x 460 mm (D x W) with insert plates made of M.S. of dimension 100 mm x 75 mm x 12 mm (W x D x Th) are to be provided on the wall side of the cable trench 600 mm apart all along with cable tray.

12.2 The Cable Trenches shall be covered with pre-cast concrete slabs of dimension 650 x 600 adequate thickness to withstand a load of 500 Kg/m² are to be provided as covers of trench all along. For easy access of cable from room to room, the design of the tie beam and level of the rooms may be adjusted to avoid bend in the cable.

12.3 The cable trenches shall be absolutely free from any obstructions as to allow the cables to be lowered in the trenches from top only during laying. The space inside the trenches throughout the entire lengths shall in no case be encroached by any beam or columns.

13.0 POCKETS & HOLDING DOWN BOLTS

Provision has also to be kept for pockets and holding down bolts as per requirement of the electrical and mechanical equipments at no extra cost. The exact details of such pockets and holding down bolts will be supplied to the Contractor as per specifications of the suppliers of the equipment after award of the contract. It is contemplated that M.S. hangers shall be provided from the underside of slab/beam of the operating floor, and is to be executed in a separate

contract. However, for the above arrangement suitable pockets and holding down bolts are to be left.

14.0 CHEQUERED PLATES ETC.

These shall be manufactured from structural steel conforming to IS: 226. They shall be of the specified size, thickness and pattern as per relevant drawings or as directed by the Engineer-in-Charge. Cover plates will generally be of chequered plates with or without stiffeners as detailed in the drawings. For convenience, the Contractor shall prepare detailed floor plans of the layout of cover plates for floors and platforms so as to include all openings, cuts etc. and so as to match the patterns of adjacent cover plates/gratings. Where necessary, the floor will have to be made leak proof by properly welding cover plates. If necessary, packing shall be welded to the bottom of cover plates to raise the cover plates on sides, so as to provide necessary slopes as shown in the drawings or as directed by the Engineer-in-Charge in the floors and platforms to drain away any liquid falling on the floors and platform. Necessary gutters at the ends of platforms shall be provided for sloping floors and platforms as shown in the approved drawings or as directed by the Engineer-in-Charge. Krebs of flats shall be provided where necessary, around openings and cuts in order to prevent liquids falling to lower floors or platforms.

15.0 HAND RAILING

Double rows of 30 mm diameter G.I. tubular hand railing fixed in G.I. stanchions shall be provided on the edge of walkways and platforms as specified. The stanchions shall be fixed with mild steel rag bolts with chromium plated cap nuts. The stanchions shall not be less than 1000 mm. high and placed at a distance not exceeding 2500 mm. The hand railing shall be fixed true to exact line and level. G.I. stanchions and hand railing layout shall be of architectural design with pleasing appearance.

16.0 SANITARY INSTALLATIONS

16.1 The Urinals shall be of flat back, front lipped having a size of 46.5 cm. x 36.5 x 26.5 cm. or nearest available size. The Indian type W.C. shall be of minimum 58 cm. Complete with footrest in one piece.

16.2 All Sanitary works shall be of "Parry, "Neycer", or any other equivalent make. They shall be of approved quality conforming to relevant IS Codes and shall bear ISI Certification marks. All G.I. pipes shall be of ITC or equivalent make heavy quality conforming to relevant IS Code. Wheel valves and stop cocks shall be of gun metal and of "Leader" or "Annapurna" or equivalent make as approved by the Engineer-in-Charge and shall conform to relevant IS Codes.

16.3 Two urinals, one Indian W.C., one European W.C. (Commode) have to be provided in the toilet block.

17.0 MANHOLE COVERS

Heavy-duty plastic fiber reinforced concrete manhole covers shall be of heavy duty type conforming to IS: 1726.

18.0 TIMBER DOOR

The timber door shall be of 1st Class CP Teak Wood for both frame (100 mm x 100 mm) and shutters (49 mm thick). All such doors shall be fully paneled. All timber shall be of best' quality, well seasoned and/or well treated for prevention and protection against decay etc. It shall be uniform in substance, straight in fibers, free from large or dead knots, sap, flaws, sub cracks, shakes, or blemishes of any kind. Any insect damage or spoils across the grain shall not be permissible. The color of the timber shall be uniform throughout, firm and shining with a silky luster when placed and shall not emit dull sound when struck. The doors shall be made as per approved drawings and as directed by the Engineer-in-Charge and the timber shall be sawn in direction of the grains and shall be straight and square. The door fittings shall be highly polished as per direction of the Engineer-in-Charge.

19.0 M.S. PIPELINES

M.S. Pipe lines in required lengths and should be spirally welded from reputed manufacturers and M.S. specials will be fabricated from the said MSSW pipe or from M.S. Plates cut to exact size and shape, bent true to curvature and welded using standard electrodes after necessary edge preparations. Both the inside and outside surfaces of the MSSW pipes and specials shall thereafter be thoroughly cleaned after de-rusting and brushing. The outside surface shall then be wrapped and coated with a protective coal tar based insulating tape of 4 mm. average thickness as approved over one coat of approved primer leaving 150 mm. on either end of pipes unwrapped. The inside-surfaces will be provided with 3 (three) coats of non-toxic paint over one coat of primer.

The pipes and specials will be lowered in trenches for laying only after testing the same with spark test by holiday detector so as to ensure that the pipes and special are free of holidays. The pipes thus lowered will then be interconnected by welding and the portions of 150 mm. width left unwrapped on either side of pipes will then be wrapped with said insulating tape.

The thickness of SWMS pipes and specials of 900 mm diameter shall be 12 mm.

20.0 P.S.C. PIPELINES / N.P.-2 CLASS PIPELINE

P.S.C./N.P.-2 Class Pipes will be laid on suitably designed 1:3:6 concrete bedding of 150 mm thickness. The pipes will join by rubber rings. Bends and specials will be of mild steel. The P.S.C./N.P.-2 Class pipes will be joined with M.S. special and machined ends will be wrapped and coated with an approved protective coal tar based insulating tape of 4 mm. average thickness over one coat of approved primer. The inside surface will be provided with 3 (three) coats of non-toxic paint over one coat of primer.

21.0 HAND OPERATED OVERHEAD CRANE

Provisions have to be made for a 10.0 M.T. capacity Hand Operated Traveling Crane (H.O.T.) suitable for operation with a lift up to motor floor level and cross travel of 12 M for handling pump, motor and other accessories. They shall be of reputed make as per vendor list and as approved by Engineer-in-Charge. Suitable type of crane rails, girders and all other accessories as necessary for installation and operation of the crane are to be designed and provided by the contractor within the Lump Sum pipe quoted. The two travels and two hoists i.e. long cross & main Auxiliary etc. must be mechanical operation. The buffers must be spring-loaded operation. Suitable vertical clearance is to be provided over the rail level to the bottom of the roof beam.

22.0 SLUICE GATE/PEN STOCK GATE

Cast iron single faced Thimble mounted Sluice Gate/Pen Stock Gate will be designed as per IS: 13349-1992.

23.0 C.I. SLUICE VALVE

C.I. Sluice Valve conforming to IS: 2906-1869 suitable for water works purposes and as per requirements of the Clear Water Reservoir / Clear Water Pump Sump. The class of Sluice valves shall be class-I with maximum working pressure as per relevant IS standard.

24.0 C.I. COWL VENTILATOR

150 mm diameter Specially designed C.I. Cowl Ventilator shall be provided in the outer peripheral walls in between the underside of the reservoir roof and Top Water Level (T.W.L.) of the reservoir, in order to prevent breakage of the Cowl Ventilator, the same shall be encased with cement concrete of grade M 15 with nominal reinforcement as typically shown in the tender scheme drawing.

25.0 ARRANGEMENTS OR PLASTIC FIBRE REINFORCED CONCRETE MANHOLE COVER M.S. LADDER ETC.

25.1 Manhole Cover

Heavy duty plastic fiber reinforced concrete manhole covers with frame should conform to relevant IS Code. The clear opening for access to the M.S. Ladder for going inside the reservoir shall be 600 mm. and the overall dimension of the heavy Duty Manhole Cover shall be specified by the Tenderer conforming to relevant IS Code. The manhole cover with frame shall be of 'Double Seal Type'. Location of manhole covers and frames are specified in the tender scheme drawing and the Bidders are to include the cost thereof in their offer.

25.2 M.S. Ladder

M.S. Ladder for going inside of the reservoir has been typically shown in the tender scheme drawing. The width of the ladder shall be 750 mm. with G.L. hand railing with M.S. angle posts. The steps of the ladder shall be provided with M.S. chequered plates with minimum 6 mm. in thickness. The rise and treads of the steps work of the ladder shall be provided with suitable anti-corrosive paints over two coats of primer as per manufacturer's specifications to be approved by the Department. There shall be 4 (four) numbers M.S. ladder in the locations shown in the Tender drawings.

25.3 Rung Ladder

Where over specified, shall be formed out of 20 mm diameter M.S. Rods. The rods forming Rung Ladder shall be properly bonded inside the R.C.C. walls. The spacing of Rung Ladder shall not exceed 300 mm. and the size of the rung formed shall be 300 mm wide x 150 mm deep. The rods are to be painted with anti-corrosive paint with suitable primer as per manufacturer's specification to be approved by the Department.

26.0 LIGHTENING ARRESTOR AND AVIATION LIGHT

Required sets of Lightning Arrestor and Aviation lighting arrangement shall be provided by the Tenderer at the highest point or such places or of the Pump House Building conforming to the I.E. Rules specifications as per standard practice.

The job includes supplying, fixing and commissioning of sufficient no. of lightening arrestors which includes air-terminals, separate earth electrodes, grid earthing and individual earthing with approved size of air-terminals, earth electrodes, earthing strips as per IE rules/IS codes. Detail Calculations to be vetted by the department in the final design.

27.0 MOTOR FLOOR AND CONTROL ROOM

There must not be any column in the motor floor for easy movement of the H.OT Crane. Similarly in the Control room cum office room, these must not be any columns in the room. The motor floor should have suitable openings at appropriate location as per requirement of the pump manufacturer for lowering and taking up of pumps, motors, valves, entry of cable etc. The motor floor shall be suitably designed to take care of the vibration generated from the motor pump assembly while in operation.

28.0 WRAPPING COATING

This work is to be completed in all S.W.M.S. pipe at ground level with 4 mm. thick coal tar based tape. Necessary 'Holiday Test' to be done to ensure perfection. This job is to be done before commencement of work of respective stretch.

29.0 MS PIPE

Pipes to be supplied under this contract shall conform to IS:35892001, (latest version) and IS:5504 (Latest version) Indian Standard for Electric Resistance welded or seamless or spirally welded steel pipes for water, gas and sewage (subject to specific requirements given below). In case supplier proposes to supply pipes to the standards superior to the above standards no weightage will be given while evaluating the bid and for payment.

30.0 MS SPECIALS

Scope

The scope or special specification shall cover the following works under the contract. Fabrication MS plates for specials for road crossing works, expansion joints and testing, etc. at the contractor's factory and testing the pipes.

Drawings

Working drawings shall have to be prepared by the contractor taking into consideration the sizes and lengths of the MS plates, flats, etc.

31.0 MS SPECIALS LAYING

General

All specials like distance pieces, straps, tapers, saddles, branches, tees etc. shall be generally fabricated in the factory. Only small kinks or bends or saddles may be fabricated on site, care being taken to see that the length of the fabricated fitting is at least equal to the diameter of the pipe to which it is being fixed. Such fabrication of specials on site shall be done only on approval of the Engineer and as his direction. As specified earlier, only kinks or bends shall be fabricated on site by cutting the pipe faces and then welding shall be carried out as specified hereinafter and shall be paid separately. All specials shall necessarily be in steel and shall be laid in the same manner specified in 'MS pipe laying'.

Straps

Whenever the pipe laying work proceeds from two ends and if gap between two faces is less than 30 cms., this gap shall be bridged by providing a strap. Strap shall also be provided during fixing of expansion joints as has been specified earlier. Such strap shall be fabricated on site by cutting a piece from the pipe. This piece shall be split longitudinal and stepped over the gap. A minimum gap of 8 cm shall be kept on both the pipes to be connected and strap shall be welded with required number of fillet welds from inside and outside. The gap between the ends of straps shall be welded longitudinally butt welded.

Distance pieces

Distance piece shall be provided with the gap between the pipe faces to be jointed is more than 30 cms measured in the evening. Distance pieces shall be cut from the pipe pieces on site or can be cut in factory. These will be measured and paid for laying as specials

Tapers and bends etc.

These shall be fabricated in the factory and shall be welded on site as per requirements. Laying of tapers shall be paid for laying as specials for the diameter in the larger size. Bends shall be measured along the mean length and paid for in the respective items of Bill of Quantities.

Mode of measurement

The MS specials including all above described will be paid on weight basis in Kg. Unit on

32.0 WELDING

General

Before aligning, assembling and welding the pipe faces shall be cleared by scraping with wire brushes or by any other method approved by the Engineer. Welding of pipes in field shall conform to ISS:816-1969 (code of practice for use of metal arc welding for general construction in Mild Steel). In case of variance, specifications hereunder shall have precedence.

Welder shall be qualified, experienced and approved by the Engineer-inCharge to do the welding at the locations welding shall not be allowed to be done by helpers. Contractor shall remove such of the welders from the job, whose work is not found to be satisfactory. The Engineer may ask them to do test welding before approving their employment on the job.

The contractor shall keep record of the welding for each circumferential joint. It shall contain the name of the Welder, Operator and Date of Completion of such run of internal and external welding.

Electrodes

Welding electrodes to be used for welding in this contract shall conform the Indian Standard Specifications ISS:814-1971 (Specification for covered electrodes for metal arc welding of Mild Steel)

The contractor shall use standard electrodes depending on the thickness of the plates to be welded and the type of joint. The contractor shall also use standard current and A.C. voltage required for the machine as per manufacture directions.

Types of welded joints

The circumferential joints of the pipes shall be butt welded with required number of runs externally and internally.

All fillet welds shall have a throat thickness not less than 0.7 times the thickness of the pipe to be welded.

33.0 GAS CUTTING

General

Gas cutting of MS Pipes may require to be adopted on site for fabrication of bends on site or for preparing distance pieces, straps etc. and for cutting holes in pieces for manholes, branches scour valves, Air Valves and other appurtenances and temporary manholes for cleaning welding etc..

After gas cutting the edges shall be made smooth and even so as to remove all the equalities ends of the pipe shall have „V“ edge from inside.

34.0 BITUMINOUS MACADAM

This work shall consist of construction in a single course having-50 mm thickness or in multiple courses of compacted crushed aggregates premixed with a bituminous binder on a previously

prepared base to the requirements of these Specifications. Bituminous macadam is more open graded than the dense graded bituminous materials.

The materials required are coarse aggregates, fine aggregates and bitumen properties and proportions of which shall be as per relevant specification of MoRTH.

The base on which bituminous macadam is to be laid shall be prepared, shaped and compacted to the required profile in accordance with Clauses 501.8 and 902.3 as appropriate, and a prime coat, shall be applied in accordance with Clause 502 where specified, or as directed by the Engineer-in-charge. The surface shall be thoroughly swept clean by a mechanical broom, and the dust removed by compressed air. In locations where mechanical broom cannot get access, other approved methods shall be used as directed by the Engineer in- charge.

A tack coat in accordance with Clause 503 shall be applied as required under the Contract or as directed by the Engineer-in-charge.

Preparation and transportation of the Mix shall be according to the provisions of Clauses 501.3 and 501.4 of MoRTH. Spreading shall be according to the provisions of Clause 501.5.3 of MoRTH.

Compaction shall be carried out in accordance with the provisions of Clauses 501.6 and 501.7.

Rolling shall be continued until the specified density is achieved, or where no density is specified, until there is no further movement under the roller. The required frequency of testing is as per Clause 903.

The surface finish of the completed construction shall conform to the requirements of Clause 902. For control of the quality of materials and the works carried out, the relevant provisions of Section 900 shall apply.

The bituminous macadam shall be covered with either the next pavement course or wearing course, as the case may be, within a maximum of forty-eight hours. If there is to be any delay, by the Contractor the course shall be covered by a seal coat to the requirement of Clause 512 before opening to any traffic. The seal coat in such cases shall be considered incidental to the work and shall not be paid for separately

35.0 PRIME COAT

Where the material on which the dense bituminous macadam is to be laid is other than a bitumen bound layer, a prime coat shall be applied, as specified, in accordance with the provisions of Clause 502 MoRTH, or as directed by the Engineer-in-charge

36.0 GRANULAR SUB BASE

This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the requirements of these Specifications. The material shall be laid in one or more

layers as sub-base or lower sub-base and upper sub—base (termed as sub- base hereinafter) as necessary according to lines, grades and cross-sections shown on the drawings or as directed by the Engineer-in-charge

Material properties shall be tested in accordance to BS 812 (Part 111) The water absorption value of the coarse aggregate shall be determined as per IS:2386 (Part3); if this value is greater than 2 per cent, the soundness test shall be carried out on the material delivered to site as per IS : 383. For Grading II and III materials, the CBR shall be determined at the density and moisture content likely to be developed in equilibrium conditions which shall be taken as being the density relating to a uniform air voids content of 5 percent

37.0 LABORATORY EQUIPMENT

The laboratory shall be suitably accommodated on the ground floor of chemical house. The contractor shall provide the laboratory equipment to the latest and upto-date design and shall as per CPHEEO manual.

ELECTROMECHANICAL EQUIPMENT DETAILS SPECIFICATION

Technical Specification of Major Electro-Mechanical Equipments for PANSKURA INTAKE

This is indicative not exhaustive, will be finalized in detail engineering.

1.0. VERTICAL TURBINE (VT) PUMP

1.0 Vertical Wet Pit Pumps

- 1.1 The pump shall be of vertical wet pit type with mixed flow impeller. Pump shall be placed vertically submerged in the wet pit and mounted on intake jetty pumping station. The pump shall be self-service water lubricated type. Self-lubricated type guide bearings are to be provided at suitable positions of the shafts and shall not be more than 1.5M (approximately) apart. Since the service water may carry minor solid particles, the guide bearings shall have suitable passages within them to expel / pass these minor solid particles by self-working pressure, and the same will not stick inside the bearings deteriorating them. The specific gravity of River Water shall be considered as 1.05 M (Max.).
- 1.2 The pump battery shall contain suitable no pump sets out of which each pump shall deliver 100 % of the demand and also the system shall have minimum 50% stand-by Pumps.
- 1.3 Pump shall be vertically driven with shaft directly & flexibly coupled with adequate rating, V1, SCIM. The pump rotational speed shall not be more than 1500 rpm (syn.).
- 1.4 The pump shall be of non-pull out type. The individual pump discharge lines shall run over the main operating floor and shall be connected with the common delivery manifold. The pump discharge head/motor stool /sole plate shall be rigidly grouted on the Pump floor. The foundation plan and foundation pockets required to be kept with the civil construction, and the successful bidder on receipt of the orders shall furnish the pump-motor foundation plan authenticated by the OEM. The said foundation will take care and counter the horizontal back thrust as may be generated during start/stop of the same (at shutoff condition may be considered).
- 1.5 The pump impellers shall be securely held on the pump shaft as per provision of the pump manufacturer's design so as to prevent sliding of the impeller along the shaft during operation.

1.6 The pump shall be of having a fairly steep H-Q curve. The tenderer shall furnish the evaluated specific speed of the pump at the specific trim at duty point. The pump H-Q characteristics curves shall be stable all throughout. There shall be a margin of at least 25% in between the run-out flow and the duty point flow.

1.7 The pump efficiency shall be reasonably high. The head-discharge-efficiency-KW absorbed-NPSHR shall be guaranteed without any tolerances at the duty point working at river water level condition mentioned in the Obligatory Data.

The tenderer shall have to confirm the maximum power absorbed by the pump on the entire range starting from the shut-off to run-out without any positive tolerance

1.8 The suspension length of the pump assembly shall be such that it can safely work at the lowest low-level condition considering worst of (i) the NPSHR of the offered pump at the maximum water discharge condition on the entire operating range & (ii) minimum submergence requirement. It shall have one suitable basket type strainer preventing entry of foreign particle and of any solid in the pump.

1.9 The vertical column pipe assembly shall be of suitable dia fabricated from adequately mm thick MS plate, flanged type, and anti-corrosive epoxy painted both inside and outside. The column piping shall be of individual length not more than 1.5 M each for effective and easy handling.

1.10 **Cassian pipe: Suitable** diameter (Not less than 160% of column pipe diameter) stainless steel (SS316) perforated Cassian pipe rigidly held from the jetty deck, secured at intermediated points by fastening it with the jetty pier liner, shall be provided with each pump assembly. The cassian pipes will run for the entire suspension lengths of the pump assembly running up to the basket strainer tip. Pump manufacturer will design the perforation details in such a way that no eddy, wake is formed to hamper the pump hydraulics. The ID of the cassian pipes shall be such that the same shall not hamper easy installation, easy withdrawal of the pump assembly, smooth running of the same keeping the cassian pipes in position.

1.11 The total suspension length including the bottom basket strainer if any, shall be fixed by the tenderer considering the minimum submergence requirement working at the lowest low level, the required bottom clearance at the indicated level etc. The total suspension length, as has been considered in the offer backed by technical justification shall be placed with the technical offer.

1.12 The pump assembly shall be provided with suitable anti-friction roller thrust bearing, non-reverse ratchet assembly, bowl bearing, suction bell bearing, shafts sleeves including sleeve at gland packing point, seal ring / wearing ring, provision for

impeller adjustment nut, double throat air-valve at column vent point and other important features as provided by the manufacturer. Suitable motor stool, motor sole plate with facility of pulling out the column and bowl assembly through it, anchoring bolts, nuts, washers, fixing bolts all complete are to be provided.

- 1.13 The pump rotating assembly shall be statically and dynamically accurately balanced. The impeller balancing shall be within the grade G- 6.4 as per IS: 11723. No hole or any piece being welded / bolted on the pump impeller for balancing shall be allowed. The shaft should be ground all over and perfectly aligned. Special care should be taken that the entire pump assembly do not experience vibration beyond the permissible limit as per IS:11724, of such class roto-dynamic unit while in operating even in worst operating condition at any combination.
- 1.14 The pump motor shall be considered as a single unit and the vibration limit should be within the limit specified in above IS.
- 1.15 The noise level shall be within the permissible limit of IS: 12065. The thrust bearing shall be designed in such a manner to be worked safely on any working condition even at the respective shut off.
- 1.16 The pump shall also withstand the condition of any back flow on it.
- 1.17 The static and dynamic loading of the pump motor assembly with other allied components shall be clearly indicated.
- 1.18 The pump shall be capable of continuous operation. The pump shaft, line shaft shall be accurately sized. Replaceable sleeves are to be provided at desired point. The Stuffing box shall be self sealed design provided with packing ring and preferably with Split type gland.
- 1.19 The impeller of the offered pump shall not be either on the lowest trim or the highest trim of the same pump family offered.
- 1.20 The wetted portion of the pump shall have a proper finish. The pump shall have a minimum efficiency of 80% at duty point. Pumps offered with lesser efficiency at duty point shall not be accepted.

- 1.21 The pump shaft shall be accurately machined and ground all over. The portion of the pump that will come under the contact with pumped liquid shall be protected by replaceable sleeves.

Suitable pump casing wearing ring and/or impeller neck ring as per the manufacturer's design shall be provided. Each pump shaft shall be adequately supported, both at driving and non-driving ends, on anti-friction type ball/roller bearings capable to withstand the worst thrust loading for the pump operation from shut-off to run-out.

- 1.22 The pump shall be suitable for valve open starting and also to take care of the condition of back water flow in it, if any. Grease injection nipples and grease collector at each bearing points shall be provided.

- 1.23 The overall noise level of the pump-motor unit shall be within the stipulations of the relevant BIS limit all round measured from a distance of 1.5 M.

- 1.24 The identical parts of the pumps shall be inter- changeable type.

- 1.25 The supply of the pump shall be completed by the pump manufacturer with the following components and accessories: -

Suitable motor stool, pump motor sole plate with facility of pulling out the column and bowl assembly through it, anchoring bolts, nuts, washers, fixing bolts all complete are to be provided. Sole Plate of the total pump-motor assembly, motor stool with all foundation bolts, nuts, washers, wedges, leveling shims and other erection materials as required. It may be noted that there shall be no other thrust encountering device on the pump discharge pipe branch and the common delivery header excepting the pump foundation bolts. The pump foundation bolts shall be adequate enough to withstand all the thrust that may occur during pump operation including start/stop. Additionally one MSDF short-piece with adequate stiffeners shall be provided just after the pump delivery flange and the same shall be anchored with pump / intermediate floor to minimize the back – thrust.

Suitable flexible coupling with bolts, nuts, pins, keys etc. for coupling the drive and driven unit.

Air-vent cock, priming cock suitably placed.

Self sealed packing box provided with packing rings, lantern rings, split type glands, gland cooling water connection with cock, valves etc., all service pipes, valves, fittings, drain plug, lifting lugs etc. as required for safe operation of pumps.

Any other accessories & component considered by the manufacturer for safe, efficient operation of pumps

1.26 The pump shall be capable for continuous operation at any stated level condition.

1.27 The material of construction of the pump is given below. If the tenderer feels that the MOC other than what have been stated will give better service and performance, he may offer the pumps with the MOC as per his choice, backed by technical justifications, but the same shall only be made as an alternative offer.

- | | | |
|--------------------------------------|---|---|
| a) Pump casing | : | CI as per IS 210 Grade FG 260 |
| b) Impeller | : | SS, CF8M |
| c) Pump Shaft & Intermediate shaft | : | SS 410 |
| d) Sleeves | : | SS 410 hardened |
| e) Shaft Pins, Keys | : | SS 410 |
| f) Shaft Coupling | : | SS 410 |
| g) Bearing (Except thrust bearing) | : | Self-lubricated type without less nitrile rubber in SS shell (straight grooves preferred) |

- h) Wearing ring / seal ring : Material having at least 50 BHN hardness difference to the nearest component
- i) Impeller Nut : CI IS 210 GR. FG 260
- i) All hardware used in total pump Assembly (nuts/bolts/fasteners etc.) : SS-410
- k) Column pipes : MS, fabricated from adequately thick steel plate with anti-corrosive epoxy painted both inside and outside after proper surface finish

1.29 All materials, casting used for manufacture of the pumps with allied components & accessories shall be of best tested quality and the contractor has to submit the test certificate for the MOC at the time of shop test as well as with the supplies.

Ultrasonic test to the shafts are to be conducted and test certificate to be furnished.

The dynamic balancing of the rotating unit with coupling, key etc. is to be conducted and test certificate is to be submitted on shop test.

Dye-penetration test to the impeller are to be conducted and the test certificate are to be furnished with the supply.

Hydrostatic tests at a pressure not less than 1.5 times of the shut-off pressure for duration of 30 minutes are to be performed and test certificates to be furnished.

The pump performance test of all the pumps for head, efficiency, power consumed etc. versus discharge shall be conducted as per IS: 9137 in presence of the departmental representatives and in full load, full speed with the job motor and preferably with full column setting.

The duration of the performance test at shop shall be not less than 8 hours continuous operation and the temperature monitoring of both pump and motor shall be conducted.

The tenderer should indicate the maximum column setting, they can accommodate in their factory test bed.

The NPSHR test as per IS: 9137 for at least one pump as per by the manufacturer choice of the department at various discharge conditions including duty point shall be conducted by the manufacturer and test report shall be submitted. The duration of the performance tests of all pumps shall be not less than 2 / 3 hours each, during which the temperature, noise, vibration shall be monitored and tested.

The minimum submergence test as per IS: 9137 shall be conducted to at least one pump as per choice of the department at various discharge conditions including at duty point during the joint shop test of the pumps.

Vibration analysis to all pump motor sets are to be made in all load conditions both during the shop-testing as well as at site after the pump sets have been fully commissioned.

After the performance tests, one pump as per choice of the department shall be stripped off and the internal components shall be checked

Apart from the stated shop tests all field tests including noise, temperature rise, and vibration analysis shall be conducted by the contractor.

1.30 The tenderer shall fill-up the guaranteed performance figure / data given in the separate section and submit with the technical offer

1.31 Hydraulic test at shop

1.31.1 All pressure parts shall be subject to hydraulic testing at a pressure of 150% of shut off head or 200% of rated head (effective head) whichever is higher, for a period not less than 30 minutes.

1.31.2 Performance test are to be conducted to cover the entire range of operation of the pumps. These shall be carried out to a span of at least 125% of rated capacity up to pump shut off condition. A minimum of five combinations of head and capacity are to be achieved during testing to establish the performance curves including the design capacity points and the two extremities of the Range of operation specified. For range of operation, stipulation in relevant Clause may be followed.

1.31.3 Tests shall be conducted with actual drive motors / shop motors at full load and full speed.

1.31.4 Reports and test certificates of the above tests shall be submitted to the Engineer-in-charge for approval of the employer.

1.31.5 All rotating components of the pumps shall be subjected to dynamic balancing tests, & to be specified in Data Sheets.

1.36 Performance test at shop

1.36.1 Each pump shall have to be tested to determine the performance curves of the pumps. These tests are to be conducted, in presence of Employer or his representative, as per the requirements of the Hydraulic Institute Standard/ASME Power Test Code PTE 8.2/BS-599/I.S.S., latest edition/ relevant universally accepted codes.

1.36.2 The Contractor shall conduct necessary arrangements for establishing such test with adequate size of sump, to establish the suitability of suction conditions , flow correcting devices for measurement of flow.

1.36.3 The Employer or his authorized representative shall be given full access to all tests. Prior to performance tests, the Contractor shall intimate the Owner allowing adequate time so that if the Employer so desires, his representatives can witness the test.

1.37 **PERFORMANCE GUARANTEE, TOLERANCE AND PENALTIES**

1.37.1 **Performance Guarantee and Tolerance**

The Bidder shall guarantee the effective head at the specified designed capacity and also the corresponding pump efficiency, pump input power. Unless otherwise mentioned, the Bidder shall specify the allowable tolerance considered by him on the guaranteed performance on other operating points, which shall not be more than those specified in IS9137.

1.38 **Rectification of Deficient Performance**

The tenderer shall indicate the guaranteed efficiency of the pumps offered by him. While carrying out shop performance tests, the permissible limits of errors in measurement shall be in conformity with Class-B of BS:599 without any penalty whatsoever. Apart from that a negative tolerance of maximum (–) 3% on quoted efficiency shall be acceptable only with penalty. Variation more than (–) 3% will render the pump liable for rejection.

If the shop performance tests indicate any failure of the pump to achieve the guaranteed efficiency, the Contractor will be given a time, to be decided by the Owner, to make up the deficiency at his cost by incorporating necessary modification, alteration and replacement.

1.39 **CLEANING, PROTECTION AND PAINTING**

1.39.1 **Cleaning before shipment**

Surface of all parts shall be cleaned to remove scale, dirt, oil, water, grease and other foreign objects prior to final assembly of the equipment. All openings shall be covered to guard against damage and entry of foreign objects.

1.39.2 **Painting**

All surfaces shall thoroughly be cleaned in a manner approved by the manufacturer for necessary paint (Epoxy) coating to be applied on the surface. In case of any prevalent Standard/Codes on selection and application of painting/coating, the same shall be strictly adhered to.

The colour code for finished painting on the external surface shall be subject to Employer's approval. Necessary finish paintings including touch up paints, if not applied at shop, shall be done by the Contractor from sealed containers for site application.

1.39.3 **Packing for shipment**

All parts shall be properly boxed, crated or otherwise protected for transportation to suit the mode of transportation. Exposed finished surfaces shall be thoroughly greased before transportation.

1.40 **TESTS AND INSPECTION**

1.40.1 The manufacturers shall conduct all tests required to ensure that the equipment furnished shall conform the requirements of this specification and in compliance with requirements of applicable Codes and Standards. The particulars of the proposed tests and the procedures for the tests shall be submitted to the Employer for approval before conducting the tests. The pump is to be tested on the test bed of manufacturers' works in presence of the EIC representatives. All relevant cost of such inspection by two representatives of EIC has to be borne by the manufacturer / contractor.

1.50 **SPARE PARTS**

1.50.1 The tenderer is to supply spare parts as per list enclosed vide list of spare parts as per tender specification.

1.50.2 The spare parts as mentioned are to be supplied within the completion period of the contract alongwith the main equipment.

1.50.3 Cost of spare parts as above are to be mentioned separately.

1.50.4 Replacement of spare parts during contract period would be borne by the Tenderer at their own cost.

List of spare parts

- i) Rotating Unit: 01nos
- ii) TNC switch: 02nos
- iii) Tr. Feeder relay: 02nos
- iv) Bearing: 02 sets
- v) Indicating lamp "25" nos.
- vi) Contractor: 03 nos.

1.60 **DRAWINGS, CURVES & INFORMATION REQUIRED**

1.60.1 Characteristic curves of pumps showing effective head, pump input power, efficiency, submergence/NPSH, against capacity ranging from shut off condition to at least 125% of rated capacity along with a tentative General Arrangement Drawing showing relevant details shall be submitted with the offer.

1.60.2 The successful bidder shall furnish the following drawings/data for Employer's approval after award of the contract.

1.60.3 All data furnished during bidding stage shall be treated as final and binding on the Contractor if, however, any, minor change is essential during detail design stage for any improvement in the system, such changes shall be carried out only after obtaining approval of the Employer.

1.60.4 The G.D2 values of the impeller of the pump and Rotor of the motor at 1500 R.P.M. (syn.) are to be furnished.

1.51 **INSTRUCTION MANUALS**

- a) The instruction manual shall present the following basic categories of information in a comprehensive manner prepared for use by operating and/or maintenance personnel :
 - i) Instruction of Erection
 - ii) Instruction for pre-commissioning check up, operation, abnormal conditions, maintenance and repair.
 - iii) Write up on Controls and interlocks provided, if any
 - iv) Recommended inspection points and periods of inspections.
 - v) Schedule of preventive maintenance.
 - vi) Ordering information for all replacement parts.
 - vii) Recommendation for type of lubricants, lubricating points, frequency of lubrication and lubricant changing schedule.
 - viii) Trouble Shooting Procedure.
- b) The information shall be organized in a logical and orderly sequence. A general description of the equipment including significant technical characteristics shall be included to familiarize operating and maintenance personnel with the equipment.
- c) Necessary drawings and/or other illustrations shall be included or copies of appropriate final drawings shall be bound in the manual. Test, adjustment and calibration information as appropriate shall be included and shall be identified to the specific equipment. Safety and other warning notices and installations, maintenance and operating cautions shall be emphasized.
- d) A parts list shall be included showing part nomenclature, manufacture's part number and/or other information necessary for accurate identification and ordering of replacement parts.
- e) Instruction manual shall be securely bound in durable folder.
- f) If a standard manual is furnished covering more than the specific equipment purchased, the applicable model (or other identification) number, parts number and other information for the specific equipment purchased shall be clearly identified and highlighted. Sectional drawing to suitable scale and characteristic curves for the particular equipment supplied must be included in the Instruction manual.

13.00.00 **PROPOSAL DATA**

13.01.00 To complete the proposal, the Tenderer must fill up the following DATA SHEET / CHECK LIST furnished hereinafter.

DATA SHEET / CHECK LIST OF THE PUMPS BEING OFFERED

(FOLLOWING DATA SHEET ARE TO BE FILLED UP SEPARATELY FOR EACH CATEGORY OF PUMPS IF THERE BE ANY)

1.00.00	GENERAL		
1.01.00	Manufacturer	:	
1.02.00	Model No.	:	
1.03.00	Type of Pump	:	
1.04.00	Non Pullout	:	Yes/No
1.05.00	Impeller Type	:	Closed/Semi open/Open
1.06.00	No. of Pumps offered	:	
1.07.00	Efficiency of Pump at duty condition for solo operation	:	
1.08.00	Efficiency of Pump at duty condition in parallel operation :	:	
2.00.00	PERFORMANCES		
2.01.01	Guaranteed capacity - M ³ /hr without tolerance in single operation & parallel operation	:	
2.01.02	Guaranteed head - MWC at rated discharge discharge, without tolerance in single operation parallel operation.	:	
2.01.03	Input to the Pump (KW) at duty condition in single operation & parallel operation without tolerance	:	
2.01.04	Pump input power at worst operating condition on the range of operation (without positive tolerance)	:	
2.01.05	Pump input power at shut off	:	
2.01.06	Range of operation of Pump	:	
2.01.07	Recommended Motor KW	:	

2.02.08	Pump rated speed (RPM)	:
2.01.09	Pump specific speed for duty condition	:
2.01.10	Pump shut off head for duty condition	:
2.01.11	Minimum submergence required in MWC at worst flow condition	:
2.02.01	PUMP NPSHR	
2.02.02	-do- at highest water level condition	:
2.02.03	-do- at lowest water level condition	:
2.02.04	-do- in the operating range, without positive tolerance	:
2.02.05	Pump duty : continuous/intermittent	:
3.00.00	FLEXIBLE JOINTS AND SHAFT	
3.00.01	Flexible Coupling	
3.00.02	Type	:
3.00.03	Make	:
3.00.04	Factor of Safety adopted	:
3.00.05	Degree of Flexibility	:
3.00.06	Extent of Play allowed	:
3.00.07	Shaft diameter	:
3.00.08	Material	:
3.00.09	Factor of Safety adopted	:
4.00.00	THRUST BEARING	
4.00.01	Type	:
4.00.02	Whether separate thrust bearing for pump motor provided or not	:
4.00.03	Method of lubrication	
4.00.04	Whether the thrust bearing is capable for worst loading of both phases	:
4.00.05	Axial thrust at duty point (kg) approx	:
4.00.06	Whether thrust bearing temperature detector provided	:
5.00.01	Are the pumps suitable for parallel operation	:

- 5.00.02 Whether non-Reserve Ratchet is provided in pump or not :
- 5.00.03 Type of lubrication for pump :
- 5.00.04 Whether pre lubrication arrangement provided
- 6.00.00 **EXPECTED LIVES UNDER NORMAL OPERATION AND MAINTENANCE**
- 6.00.01 Impellers :
- 6.00.02 Pump Bowl Casing :
- 6.00.03 Shaft :
- 6.00.04 Thrust Bearing :
- 6.00.05 Whether pump performance curve (H-Q, Q-P, Q-n, Q-NPSHR) authenticated by the pump manufacturer provided with the offer along with :
system resistance curve
- 6.00.06 Whether the copy of the pump family curve, authenticated by the pump manufacturer provided with the offer :
- 6.00.07 Whether the Pump H-Q curve superimposed on the system head curve submitted with the offer :
- 7.00.00 **GENERAL**
- 7.00.01 Are companion flanges, air release valves, sole plate, arrangement for thrust encountering devices provided :
- 7.00.02 Whether lifting lugs, eye bolts etc. provided :
- 7.00.03 load data
- 7.00.04 Weight of total pump assembly (empty) :
- 7.00.05 Weight of total water column :
- 7.00.06 Total Static Load :
- 7.00.07 Total dynamic Load :
- 7.00.08 Maximum horizontal back thrust at maximum water level condition :

2.0 MOTORS

2.01.00 SCOPE

- 2.01.01 This specification covers the general requirements of the drive motors.
- 2.01.02 Motor shall be furnished in accordance with both this general specification and the accompanying driven equipment specification.
- 2.01.03 In case of any discrepancy, the driven equipment specification shall govern.

2.02.00 STANDARDS

All motors shall conform to the latest applicable IS/BS/DIN Publications.

2.03.00 TECHNICAL SPECIFICATION FOR DRIVE MOTORS

- 2.03.01 The drive electrical motors shall be of squirrel cage induction type vertical axis to suit the size of the pump and shall be able to drive the pump. The rating of the motor shall be minimum 110KW & 1500 RPM (Syn.), 415V \pm 10%, 3 Phase, 50 Hz \pm 5%,
- 2.03.02 The motor shall be designed for Star / Delta starting arrangements. The motor starting current shall be guided by IS 12615.
- 2.03.03 All the motors shall be rated for continuous duty operation (duty: S1) IE2. However, due to the operational schedule of the pumping station, the pump motor unit may demand for 8/10 start and stop in a day with a minimum time gap of 20 minutes for one stop after prolong operation and restart the same. The motor shall also be capable of one immediate hot restart and three equi spaced starts per hour.
- 2.03.04 The motor KW rating shall have at least 20% margin over the maximum pump input at duty point or 10% margin over the maximum pump input in the worst case of operation whichever is higher. The overload capacity of the such selected motor rating shall be 10% continuous by allowing temperature rise upto Class-F limits. If the tenderer feel that the above rated motor is not satisfying stated loading, they may offer their rating of motor.
- 2.03.05 The motor characteristics shall match the requirements of the driven equipment.
- 2.03.06 The motor should deliver rated output and accelerate the full speed with 85% of the rated voltage at motor terminal. The accelerating time of the motor should not be more than 3 sec.
- 2.03.07 With 85% rated voltage at motor terminal, the motor shall be capable of working satisfactorily at full load at least 5 minutes without injurious heating or stalling. For 3% voltage imbalance in power supply, the motor shall not be de-rated by more than 10%.
- 2.03.08 The locked rotor withstand time under hot condition at 110% rated voltage shall be more than motor starting time by at least 2.5 sec. Hot thermal withstand curve shall have a margin of at least 10% over the full load current of the motor to permit relay setting using motor rated capacity.
- 2.03.09 The motor shall be TEFC type having protection group of IP 55. Motor shall be suitable for rotation in both the direction.

2.03.10 The insulation of the stator winding of the motor shall be of Class-F but the heat exchanging arrangement shall be such that the temperature rise is limited to that of Class-B as IS:325 over the ambient temperature. The ambient temperature may be considered as 45°C and the relative humidity may vary from 80% to 100%.

2.03.11 The rotor of the motor should be sturdy in construction so as to ensure trouble free operation as indicated in relevant clause without any rotor bar fracture inside or outside the rotor slots or rotor bar end brazing failure or development of cracks in the brazed joint of the rotor bar with shorting ring. The rotor bar of the rotor shall be 99.99% electrolyte grade Cu and shall be well machined, insulated tightly placed and evenly press fitted inside the rotor slots, the later being broached to have smooth finish. The rotor shall be slotted end ring design. The rotor bars in the form of temple bars shall be used. Proper brazing materials shall be used.

The rotor shall be dynamically balanced with all the fans and with key in the shaft extension.

The rotor must carry a guarantee of at least 20,000 starts as per the operations schedule mentioned in relevant clause without any rotor bar failure or any other type of rotor failure.

2.03.12 The motor shall be provided with anti-friction bearing, grease lubricated both at driving and non-driving ends.

The bearings shall be provided with seals to prevent leakage of lubricant or entrance of foreign matter like dirt, water etc. into the bearing area.

Grease lubricated bearings shall be pre-lubricated and shall have provision for on-service positive lubrication with drains and grease collectors to guard against over lubrication.

The type and number of bearing the lubricant details (limited to normally available types of IOC or, any standard make). Quantity and frequency of bearing lubrication should be clearly indicated in the offer as well as to be displayed in the rating plate of the motor.

2.03.13 The motor should be smooth in operation and the noise level should not exceed 85 db at 1.5M from the motor. The vibration level of the pump and motor should be within the specified the limit of IS:11724 and must be within 75 microns.

The motor should have adequate number of terminal boxes for main power cable, control cable & signal cable. The motor main terminal box shall be

rotatable in steps of 90°. The main terminal box should be suitable for 2 nos. 3 core, 1.1 KV grade, 185 sq.mm. Aluminium conductor, armoured, XLPE Cable. The terminal boxes shall be with removable cover with access to connection. No compound shall be used in the terminal box for easy handling. The motor terminal boxes shall be furnished with suitable cable lugs and double compression brass glands

to match with the cable size. The terminals shall be clearly identified by phase markings and termination indication corresponding to direction of rotation.

The maximum system fault current for a duration of 1.0 sec. shall be considered.

The motor shall be equipped with built-in anti-condensation space heater of adequate rating suitable for operation at 240V AC supply. Separate terminal box for the space heater connection are to be provided.

The frame of each motor shall be provided with two separate and distinct grounding pads suitable for accommodation of grounding conductors of suitable size GI flat. The main cable terminal boxes shall have separate grounding pads.

- 2.03.14 The rating plate of the motor should contain, the minimum information as indicated in the relevant IS. Apart from the same, the information as indicated in relevant clause as well as the temperature rise in °C under rated condition, method of measurement, degree of protection shall be furnished.
- 2.03.15 The successful tenderer should furnish the motor load-efficiency curve, torque-speed curve load-power factor curve, thermal withstand curve (hot and cold), current-speed curve and current-time curve.
- 2.03.16 The dimensional drawing of the offered motor, terminal box drawings, load data, GD2 value of the drive unit and the driven unit shall be furnished to the EIC for approval.
- 2.03.17 Apart from the standard accessories provided by the motor manufacturer and those accessories mentioned in preceding paras, one local lock switch is to be provided with each motor having proper connection with the motor connecting switchgear so that the motor breaker can not be closed when the lock switch is in operation. The motor shall also be provided with suitable lifting lugs eye bolts having adequate provision for lifting installation.
- 2.03.18 The motor shall be provided with RTD's and BTD's for alarm and trip (for rating 75 KW and above). The leads shall be brought out to a separate terminal box.
- 2.03.19 The routine tests as per IS:325 shall be conducted to each motor. Temperature rise test are to be conducted on at least one motor of each rating. The motor vibration tests shall be conducted mounting the motor on the shop motor stool. All the above tests are to be conducted at the manufacturer's shop in presence of the departmental representatives. Apart from the shop testing, normal field testing are to be carried out during installation, pre-commissioning and commissioning. All necessary arrangements for the tests are to be made by the contractor.
- 2.03.20 Motors upto 5 KW shall be of DOL starting and beyond 5 KW shall be Star-Delta Starting

CHECK LIST OF THE MOTORS BEING OFFERED

- 1.01.00 Manufacturer of the Motor
- 1.02.00 Rates output in KW
- 1.03.00 No of Poles
- 1.04.00 Speed
- 1.05.00 Nos. offered
- 1.06.00 Type of duty & duty designation (as per IS 325)
- 1.07.00 Whether the motor is capable for operation after one hot restart and/or three equispace hourly restarts.
- 1.08.00 Supply conditions
 - 1.08.01 Rated voltage (Volts)
 - 1.08.02 Allowable variation in voltage (%)
 - 1.08.03 Frequency (Hz)
 - 1.08.04 Allowable variation in frequency considered
- 1.09.00 No. of phase
- 1.10.00 Stator connection
- 1.11.00 Currents
 - 1.11.01 Full load current
 - 1.11.02 No load current
 - 1.11.03 Starting current % of full load current
- 1.12.00 Efficiency at 100% & 75% load
- 1.13.00 Power factor at 100% & 75% load
- 1.14.02 No load power factor
- 1.15.00 Method of starting
- 1.16.00 Starting torque (% of full load torque)

- 1.17.00 Maximum torque (% of full load torque)
- 1.18.00 Acceleration time (sec.) from dead stop to full load speed
- 1.19.00 With 100% terminal voltage
- 1.20.00 With 85% terminal voltage
- 1.21.00 Safe stall time - cold/hot
- 1.22.00 Class of insulation
- 1.23.00 Ref Ambient (temperature EC)
- 1.24.00 Temperature rise in (EC) by resistance method & class which limited
- 1.25.00 Type of enclosure
- 1.26.00 Degree of protection
- 1.27.00 Installation
- 1.28.00 Shaft orientation & mounting
- 1.29.00 Space heaters - No proposed
 - 1.29.01 Number
 - 1.29.02 Rating (Watts)
 - 1.29.03 Voltage, Phase, Frequency
- 1.30.00 Whether separate terminal box provided for
- 1.31.00 Bearings
 - 1.31.01 Driving end
 - 1.32.02 Non-driving end
 - 1.32.03 Anticipated life (hours)
- 1.33.00 Recommended lubricant
- 1.34.00 Whether separate lubricant nipple provided
- 1.35.00 Interval of lubrication (hours)

- 1.36.00 Whether winding temperature detectors & bearing temperature detector provided
(Rating 75 KW &above)
- 1.37.00 Whether separate terminal box for BTDs & RTD's provided
- 1.38.00 Approx. weight of the motor (kgs)
- 1.39.00 Dynamic load (kgs)
 - 1.39.01 Normal running condition
 - 1.39.02 Starting condition
 - 1.39.03 Short current condition
- 1.40.00 GD2 value of motor (kg M²)
- 1.41.00 GD2 value of load to motor shaft (kg M²)
- 1.42.00 Painting
- 1.43.00 Earth terminal & lifting lug provided (Y/N)
- 1.44.00 Technical leaflets/literatures provided or not

2.00.00 TESTS

- 2.01.00 Upon completion, each motor shall be subjected to standard routine tests as per I.S. In addition, type test (Temperature rise) of at least 1 no. motors as per choice of the customer, shall be performed. Further any special tests called for in the driven equipment specification shall be performed. The manufacturer/tenderer has to bear all expenses for such testing to witness the tests for max. two representatives of EIC to the manufacturer's premises.
- 2.02.00 3 (Three) copies of routine test certificates and type test certificate shall be submitted for approval prior to the despatch of the motors from the manufactures factory.

3.00.00 SPARES

Spare parts are to be supplied as specified separately. Recommended spares for five (5) years operation shall be quoted along with the bid clearly identifying the part nos. with recommended quantities.

i) DE & NDE Bearing :1 set.

4.00.00 DRAWINGS, DATA & MANUALS

Drawings, data & manuals for the motors shall be submitted as indicated below:

- 4.01.00 Along with the bid:

Individual motor data as per Check List

4.02.00 After Award of the Contract for Approval:

- a) Dimensional General Arrangement Drawing
- b) Foundation Plan & Loading
- c) Cable end box details
- d) Load Vs Efficiency & power factor, Current Vs Time / Speed curves
- e) Thermal withstand curves hot & cold
- f) Speed torque characteristics at 80% & 100% voltage
- g) Complete motor data

VALVES AND SPECIALS

11.01.01 Delivery side of pumps

The delivery side of each pump shall be provided with 1 no. Electrical Actuator operated butterfly valve and 1 no. non-return valve, 1 no. Dismantling joint & short pieces wherever required. The diameter of the valves and joints shall select based on velocity of 2.0 m/sec(approx.) with nearest sizes as per IS.

11.01.02 Non-Return Valve

The non-return valve as mentioned here in before shall be manufactured conforming to IS: 5312 (Part-I) / equivalent international standard. The valves will be used for handling Raw water and to maintain unidirectional flow. The valve shall be maintenance free, leak proof and shall have low life cycle cost. The PN rating of valves shall be PN 1.6.

The non-return valve shall be single door, Ductile Iron, double flanged, conventional non-slam design. The body, door, cover shall be of ductile iron (Gr. GGG 40). The seat and body shall withstand fluid pressure of 16kg / cm² and 24 kg / cm² respectively. The body seat, door face rings, bearing block, disc shaft, hinge pin, plug and fasteners shall be of SS 316. The bearings shall be suitable for maximum thrust imposed by the shaft during testing and in service.

The end connection shall be drilled flanged type as per IS or BS or equivalent standard. The non-return valve shall have features for quick closing (up to 85%) and slow closing from 85 to 100%. It shall have by pass valve with cock. The valve shall be marked to indicate the direction of flow.

The design and construction of the non-return valve shall be non-slam type and the disc shall be so balanced that the it will not bump against the valve body while the pump is in operation.

The surface protection of the valve shall be done by either epoxy powder coating or epoxy painting (min. paint thickness - 250 micron) for both inside and outside.

All bolts and nuts for flange connection(s) of entire pipe line (delivery & common manifold) where applicable shall be of carbon steel having tensile strength 300 N/ mm².

The valves are subject to satisfactory hydrostatic test at manufacture's works and in presence of the department's representative for acceptance.

The MOC of other accessories to complete the individual delivery piping like Y or T bends, flanged end short piece, flanged end enlarger/ reducer or any other components required to complete the job in all respect shall be MS as per IS 226.

11.02.01 **Butterfly Valve**

The butterfly valves shall be DIDF, PN 1.6, conforming to IS 13095 of 1996 / BS 5155. The seat pressure shall be 16 kg/cm² and body pressure shall be 24 kg/cm². The valve shall operate smoothly & steadily in both direction, free from flow induced vibrations. The butterfly valve shall be double flanged, double eccentric design. The body, disc materials shall be of ductile iron (Gr. GGG 40). It should provide tight shut off closures & shall be suitable for frequent operation as well as from throttled duty conditions. The valve disk should rotate 90° from full open to full close. The valve disk shall be solid streamlined slab design, and to have minimum head loss. The seat ring shall be of stainless steel (SS) with micro finished nickel / Monel overlay. The seating shall preferably be integral. The disc seal shall be of elastomeric EPDM. The EPDM seal on the disc must be of easy replaceable type with the facility of replacement at site. The shaft bearings shall be medium free, steel backed PTFE / bronze and suitable for maximum axial thrust imposed by the shaft during testing and in service. The fasteners shall be of SS 304. The valve shall have suitable and adequate capacity of gear box actuator with hand wheel and indicating pointer. The gear box actuator unit shall be of so sealed type with necessary attachments such that external water do not enter the gear box housing to spoil the mechanism. The gear box shall be directly coupled to electrical actuators. The electrical actuators shall be complete with motor starter with reversing control gear, mechanical indication showing the amount of valve opening and shall have the following components.

- a) 415V ± 12.5% 3 phase, 50 Hz, AC motor.
- b) Reduction gearing arrangement.
- c) Torque & limit switch mechanism.
- d) Valve position indicator.
- e) Arrangements for pick up signals for displaying the % opening of the valves in the suitable meters to be placed on control desk.
- f) The hand wheel with clutch mechanism for manual operation. The manual operation shall be automatically declutched when actuator motors in operation.
- g) Motors shall be of outdoor construction, IP68 protection group.

The motors and gearing arrangement shall be of adequate to open and close the valve under full unbalance pressure and to overcome the seating torque.

The torque switch should function as a full proof design by tripping the motor in case of over torque condition

11.02.02 ELECTRICAL ACTUATOR

1. The actuator motor for the BFV shall be suitable for use on $415 \pm 10\%$ Volts, 3 phase, 50 HZ power supply and shall have high torque and low inertia squirrel cage motor having minimum class F insulated, 15 minutes rated and shall be with temperature sensing protection by a thermostat / thermistor directly embedded in all phases of the stator winding.
2. The actuator motor shall be provided with complete environmental protection during prolonged period of inactivity to prevent condensation and must have IP 68 degree of protection for continuous submergence.
3. The actuator motor must have high starting torque and it shall be suitable for 60 Starts / hour. The actuator gear box assembly shall be of the totally enclosed oil bath lubricated type and shall be suitable for operation at any angle.
4. The actuator assembly shall have a mechanically independent hand wheel drive for emergency manual operation of the valve by declutching the actuator motor drive by integral lever or otherwise. The drive shall be restored to power drive mechanism automatically on starting of the actuator motor.
5. The actuator assembly shall be provided with following limit switches
 - i. torque limit switches for 'open' and 'close'
 - ii. Position limit switches

All switches shall have contact ratings of 10 amps at 250 volts AC inductive.

6. The actuator assembly shall have integral reversing contactor starter, local control facilities and terminals for remote control and indication circuit at remote end. The starter shall be both mechanically and electrically interlocked and shall have adequately rated contactors to suit the actuator motor rating. The motor shall positively be protected from any earth leakage and single phasing. All electrical shall be mounted on a readily accessible printed circuit board to facilitate withdrawal of starter assembly without any electrical disconnection. Local control shall comprise of one pad lockable three position L/R selector switch and push button switches for open, close and stop. All external wire connections shall be within the scope of the contractor.

- 7 The actuator assembly shall have facilities to indicate the position of the valve in remote control desk (percentage opening of the valve). The actuator assembly shall have one mechanical dial indicator to indicate the position of the valve. In addition, end of travel indication shall be illuminated with red indicating valve open and green indicating valve closed. The valves and actuators are subject to satisfactory shop test at manufacture's works and PG test at site in presence of the department's representative for acceptance.

The electrical actuators shall have the following components.

- a) 415V \pm 12.5% 3 phase, 50 Hz, AC motor.
- b) Reduction gearing arrangement.
- c) Torque & limit switch mechanism.
- d) Valve position indicator.
- e) Arrangements for pick up signals for displaying the % opening of the valves in the suitable meters to be placed on control desk.
- f) Remote operation facility with selector switch and local control console.
- g) The hand wheel with clutch mechanism for manual operation. The manual operation shall be automatically declutched when actuator motors in operation.
- h) Motors shall be of outdoor construction, IP 68 protection group suitable for continuous submergence.

The motors and gearing arrangement shall be of adequate to open and close the valve under full unbalance pressure and to overcome the seating torque. The torque switch should function as a full proof design by tripping the motor in case of over torque condition.

11.04 **M.S. DISMANTLING JOINT ASSEMBLY AT INDIVIDUAL DELIVERY LINE AND MANIFOLD**

One M. S. dismantling joint of suitable diameter is to be fixed in each of the individual delivery and one no along with the Flow meter & BFV on the water delivery main for the ease of dismantling and fitting of Flow meter during maintenance and to relieve the pipe line stresses. The expansion range for each of the dismantling joint shall be minimum 40 mm. The M. S. dismantling joint

shall be complete with long stud (SS 304) holding arrangements with split flange matching with the site requirement. The hydrostatic test pressure of the DJ shall be 24 kg/cm². One leak proof concrete chamber if required as per site condition is to be constructed. The Dimension of the Chamber would however depend on the final alignment and level of the site condition

11.05 **PUMP DELIVERY SIDE PIPING AND COMMON DELIVERY MANIFOLD**

The pump individual delivery side piping, valves and joints and Common Delivery Manifold shall be shall selected based on velocity of 2.0 m/sec(approx.) and 1.55 m/sec(Approx.) respectively with nearest sizes as per IS.

The pipes shall be made up of M.S. 12 mm thick plates for individual delivery line and Common Delivery manifold, painted both inside and outside by anticorrosive epoxy paints. The pipes shall be of welded joints and shall consist of necessary companion flanges so as to connect the piping with the DJ, NRV, BFV's of the individual pump delivery branch. The pump individual delivery side piping shall be connected to be common delivery manifold as per the layout. Necessary gaskets of suitable thickness shall have to be provided to all flange joints complete with all necessary nuts, bolts, washers etc. The length shall be ascertained from the layout and from the dimensions of the valves/specials.

The common delivery manifold shall of such diameter as per the Technical offer. The manifold shall be fabricated from 12mm thick MS plates. The common manifold shall have blank flange / Dish end on one side with adequate stiffening (as applicable) and the other side would be extended from the centre line of the last pump to install one each Dismantling Joint, Butterfly valve, Air Release Valve and further as required to install one Full bore Electromagnetic flow meter. The length of the manifold must be extended at least one meter on one side after the interconnections with the delivery pipe lines from the pumps at the one extreme end and in the other end it will be extended up to the specified length.

The common delivery manifold shall be provided with one no. 80 mm dia air release valve (double throat) with **isolating Gate valve** suitably placed. The pipe where ever laid underground shall be painted with anticorrosive paints at the inside and outside shall be wrapped and coated with anti corrosive tape of not less than 4mm thick so as to prevent the pipes from corrosion.

(Necessary surface finish for proper painting and wrapping coating shall be made by the contractor and careful laying shall be done so as to prevent damages during laying).

11.06 **Tamper proof Kinetic air release valve**

Air valve for clean, cold potable water up to 50°C

PN 10 / 16

DN 80 – 200

Double chamber valve with twin float (Rubber / Vulcanite coated timber core / SS 304) - automatic operation with water.

Two-orifice venting system with 3 functions (supply and release of air as well as automatic venting during operation) Flange connection dimensions to IS 1538 Table 4 & 6

Body and Cover made of CAST IRON IS 210 Gr. FG 260

Seal made of EPDM

Corrosion protection:

Inside and outside with liquid epoxy coating; thickness >250 µm, colour: RAL 5005 blue

Accessories:

Must have a metal seated gate valves (description as above for Sluice Valves upto 800 mm) of same diameter for isolation purpose, complete with gasket and fasteners (steel galvanized)

19.00 Pressure Gauge (Dial Type):

The individual discharge line and common delivery manifold shall be provided with pressure gauge (6" dial) of bourdon type.

The bourdon tube shall be of SS 316. The gauge shall have cast aluminium weather proof case and casing shall be black stove enameled. The accuracy shall be of $\pm 1\%$. The full-scale range shall be from 0 -16 Kg / Sq.cm. The pressure gauge shall have 3-way cock and fitting.

2.0 HTPDB

3.1. The HT PDB shall be multi panel switch board suitable for indoor installation and shall operate at 11 KV $\pm 10\%$, 3 ϕ , 50 Hz $\pm 5\%$ AC earthed system. The Switchboard shall comprise of the following

- I) Incomer panel – 1 no
- II) Outgoing transformer feeder panel – 2 nos.

3.2. The switch gear shall be indoor, metal clad, floor mounted, horizontal isolation and horizontal draw out type and shall be suitable for trouble free and continuous operation at 11 KV $\pm 10\%$, 3 phases, 3 wire, 50 Hz $\pm 5\%$, grounded system. The switch gear will be located in a hot, humid and tropical atmosphere.

Design and construction shall be such so as to allow extension at either ends. The base channel frame of the switch gear along with all hardware shall be within the scope of the contract.

The switch gear enclosure shall conform to the degree of protection IP-4X. The minimum thickness of sheet used shall be 2 mm except the gland plate where the sheet thickness shall be 3 mm.

The switch gear assembly shall comprise a continuous dead front, line up of free standing, vertical cubicles. Each cubical shall have front hinged door with latches and a removable back cover. All covers and doors shall be provided with neoprene gaskets.

Circuit breakers, instrument transformer, bus bars, cable chamber etc. shall be housed in separate compartments.

- 3.3 The Switch gear shall be fully wired at the factory to ensure proper functioning of indications, control, protection, transfer and inter-locking scheme.

Fuse & links shall be provided to permit individual circuit isolation without disturbing other circuits. All spare contacts of relays, switches and other devices shall be wired up-to terminal blocks.

Wiring shall be done with flexible, 1.1KV grade PVC insulated switchboard wires with stranded copper conductors of 2.5 sq. mm for control and current circuits and 1.5 sq. mm for voltage circuits.

Each wire shall be identified with both ends with permanent marker bearing wire number as per contractor's wiring diagram.

Wire termination shall be made with crimping type connectors with insulating sleeves.

Not more than two wires shall be connected to any terminal. At least 25% spare terminal shall be furnished in the terminal block.

- 3.4 Switch gear shall be designed for cable entry from bottom. Sufficient space shall be provided for ease of termination and connection.

Power cables shall be XLPE insulated, armoured, overall PVC sheathed with stranded aluminum conductors.

Control cables shall be XLPE insulated, armoured, overall PVC sheathed with 2.5 sq. mm stranded copper conductors.

All provisions and accessories shall be furnished for termination and connection of cables, including removable gland plates (3 mm thick), cable supports, crimping type tinned copper / aluminum lugs, brass compression glands with washers and terminal blocks.

- 3.5 The main buses and connections shall be of high conductivity electrolyte grade copper, sized for specific current rating with maximum temperature rise limited to 90°C.

Bus-bars and connection shall be fully insulated for working voltage with adequate phase / ground clearance. Insulating sleeves for bus bars and cast resin shrouds for joints shall be provided.

All buses and connections shall be supported and braced to withstand stress due to maximum short circuit current and also to take care of any thermal expansion.

Bus-bars shall be color coded for easy identification and the bus-bar chamber shall be provided with inter panel barrier with epoxy cast seal-off bushings through which the buses will pass through so as to prevent fire from one panel to other.

- 3.6 A copper ground bus, rated to carry maximum fault current for 3 secs., shall extend for full length of the switchgear. The ground bus shall be provided with two bolt drilling with GI bolts, nuts and washers at each end to receive GI flat of adequate sizes to withstand earth fault current.

CT & VT secondary neutrals shall be earthed through removable links so that earth of the one circuit may be removed without disturbing the others.

Each stationery unit shall be directly connected to the ground bus.

- 3.7 The circuit breaker shall be vacuum type triple pole 800 Amps, 25 KA for 3 secs., horizontal draw out, horizontal isolation having Service / Test / Isolated position with positive indication for each position. The V.C.B. shall have 220 V AC motorized spring charged trip free mechanism and mounted on a carriage complete with self contained manually operated fully interlocked, raising and lowering mechanism with integral earthing /earthing truck. The operating mechanism shall normally be operated from remote electrical control but arrangement should also be made for local electrical control. Mechanical device shall also be provided on the breaker for manually tripping and closing. Each set of the circuit breaker shall have the following features:

- a) 1 set mechanical ON & OFF indicator.
- b) 1 rear entry cable box with glands suitable for 11 KV grade XLPE cable.
- c) 1 set of indicating lamp ON / OFF / TRIP / SPRING CHARGED / TRIP CIRCUITHEALTHY / Service & Test Position Indications for each breaker & in addition DC FAIL / R-Y-B Phase Indications (for Incomer only).
- d) 3 double core current transformers of suitable ratio and accuracy class 5P10 & 1.0 shall be provided for protection & metering
- e) Shunt trip coil and closing coil rated for 110 V DC.
- f) 1 space heater with ON & OFF switch
- g) 15A / 15A 3 Pin Plug Socket
- h) In – panel lighting with control switch
- i) Space heater for each Switchgear panel
- j) 240 V AC Alarm Bell & Buzzar for non – trip fault & trip with provision for alarm cancellation (common)
- k) Auxiliary switches with required contact.
- l) 1 suitable label

In addition, 1 no resin cast and draw out type PT shall be provided suitable for 3 phase, 3 wire 5 limb 50 Hz system with a ratio of 11 KV / 110 / $\sqrt{3}$ / 110 / $\sqrt{3}$ volts,

100 VA, class 1.0 / 3 P. Symmetrical breaking capacity of the circuit breaker shall be 25 KA and making capacity shall be 62KA. The short time rating of the circuit breaker shall be 25 KA for 3 secs.

The circuit breaker shall be capable of carrying rated current at 45°C ambient temperature without derating.

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3.8 The feeder details of the Multi panel HT PDB shall be as under:

A) Incoming feeder Panel: 1 No. (800 A)

- i) 96 sq mm (0 – 12 KV) Voltmeter with Selector Switch - 1 Set
- ii) 96 sq mm Ammeter suitably dual scaled with Selector Switch - 1 Set
- iii) Local/ Remote selector switch - 1 No.
- iv) TNC Breaker Control switch - 1 No.
- v) Double core Dual Ratio Cast Resin CT of appropriate ratio and 5A Secondary, Class 5 P10 & 1.0, 10VA burden - 1 Set
(3 Nos.)
- vi) Microprocessor based draw out directional combined IDMTL over current & earth fault relay type P127 or equivalent - 1 No.
- viii) Trip Circuit Supervision Relay type VAX 31 or equivalent - 1 No.
- ix) Master Trip Relay type VAJH 13 or equivalent - 1 No.
- x) Multifunction meter (For Amp. Voltage, frequency, power factor etc.) type ELITE 445 or equivalent - 1 No.

xi)	Power Factor Meter	-	1 No.
xii)	KW Meter	-	1 No
xiii)	12 Channel alarm annunciator & Indicating Lamps		1 Set
B)	Out going feeder panels for transformers : 2 Nos. (800 A) Each Transformer feeder panel shall be equipped with the following:		
i)	96 sq mm Ammeter suitably scaled with Selector Switch	-	1 Set
ii)	Local / Remote selector switch	-	1 No.
iii)	TNC Breaker Control switch	-	1 No.
iv)	Double core Cast Resin CT of appropriate ratio and 5A Secondary, Class 5 P10 & 1.0, 10VA burden	-	1 Set (3 Nos.)
v)	Microprocessor based draw out type non directional combined IDMTL over current relay with high set instantaneous element and instantaneous earth fault element type P122 or equivalent	-	1 No.
vi)	Master trip relay type VAJH-13	-	1 No.
vii)	Trip Circuit Supervision Relay type VAX 31 or equivalent	-	1 No.
viii)	Auxiliary relay type VAA -33 or equivalent	-	3 Nos.

ix) 12 Channel alarm annunciator & Indicating Lamps - 1 Set

C) Common for all above feeders:

i) Anti – pumping relay

3.9. Following power supplies shall be arranged to switch-gear.

AC Supply: 220V AC from MCC cum PDB to the switch-gear panels

DC Supply: 110V DC supply in each panel by duplicate feeders shall be made available from the station battery bank / Battery Charger / DCDB stated elsewhere. Hooking up with the station switchgear and other equipments is within the scope of the contractor and shall be done through cables.

3.10. All equipment, accessories and wiring shall have fungus protection.

Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent the entrance of insects.

All surfaces shall be sand blasted, pickled and grounded as required to produce a smooth, clean surface free of scale, grease and rust.

After cleaning, the surfaces shall be given a phosphate coating followed by two coats of high quality primer and stove after each coat.

The switch gear shall be finished in RAL 7032 with two coats of epoxy paints

3.11 Notwithstanding whatever mentioned elsewhere in the document, following tests shall include but not necessarily limited to the following:

- (a) Operation under simulated service condition to ensure accuracy of wiring, correctness of control scheme and proper functioning of the equipment.
- (b) All wiring and current carrying part shall be given appropriate high voltage test.
- (c) Primary current and voltage shall be applied to all instrument transformers.
- (d) Routine test shall be carried out on all equipment such as circuit breakers, instruments, transformers, relays and meters.

All tests shall be performed in presence of owner's representative.

Certified copies of all the tests carried out at the manufacturer's premises shall be furnished in three copies.

4.0 TRANSFORMER

There will be total two (2) number of transformers, each having a capacity of 500 KVA.

The voltage rating of the Transformer shall be 11 KV / 433 V

Normally the specification of all the transformers are, 11 / 0.433 KV with neutral brought out, 3 ph, 50 c/s, Dyn 11 vector group, shall be supplied and installed by the contractor. Each of the transformers should be equipped with:

- i) Conservator with drain valves and oil gauge.
- ii) Silica gel breather
- iii) Bidirectional rollers
- iv) PRV with contact.
- v) Oil filter valve
- vi) Transformer tank drain valve, one upper and one lower.

- vii) Earthing terminals – 2 nos.
- viii) Air relieve plugs
- ix) Rating and diagram plate
- x) Bucholz's relay with Alarm and Trip
- xi) OTI with Alarm and Trip contacts
- xii) WTI with Alarm and Trip contacts
- xiii) MOG with contact
- xiv) Marshalling box with contacts of Bucholz, OTI, WTI, MOG & PRV duly wired up to the terminal block

Transformers will be wound with 99.99% electrolytic grade copper wires / flat and the H.T. sides of the transformer will be fitted with OFF circuit tap changing device with a range of +5% to -10% in step of 2½%.

Primary side (H.T.) terminal box shall be suitable for terminating one no. 11 KV grade, 300 sq. mm, Al. conductor 3 core XLPE insulated cable complete with sealing and armour clamping gland.

Secondary (L.T.) terminal box shall be suitable for terminating 1.1 KV grade, 300/240 sq. Mm as required, Al. conductor 3.5 core XLPE insulated cable complete with sealing and armour clamping gland.

Transformers shall be supplied in fully oil filled condition. Transformers should be manufactured according to latest I.S.S. Manufacturers' test shall be carried out in presence of the representative of M.E.Dte. and a test certificate to be submitted.

Temperature rise of the transformer shall not exceed 50 / 75°C over oil / winding and also comply with IS 1180 & IS 2026 Latest version, as applicable only in so far as they are applicable.

- 4.1 Two nos. 500 KVA 11 KV / 0.433 KV, DYN 11, ONAN, Distribution Transformer to be manufactured, shop tested, supplied, erected, tested & commissioned generally in conformity with latest revision of IS.
- 4.2 The transformers shall be of the latest design & the transformers shall be suitable for indoor installation. The transformer shall be suitable for operation at full rated power on all tapings without exceeding the following temperature rise. Winding temperature rise - 75 ° C over ambient of 45⁰ C.
- 4.3 The transformer shall be double copper wound and having CRGO silicon steel made core built up with class 'A' insulation, designed and constructed with particular reference to tropical conditions.
- 4.4 The transformer shall be designed to be capable of withstanding, without injury, the thermal and mechanical stress of short-circuits between phases or between phase and earth at the terminals of any winding with full voltage applied across the other winding. The transformers shall be capable of withstanding specified through fault currents for 2 seconds.
- 4.5 The transformers shall operate with minimum noise and vibration. The cores, enclosure / protective housings and other structural parts shall be properly constructed and windings properly braced so that the mechanical vibration is kept to the minimum, thus reducing the noise. The core-coil assembly shall be fixed in such a manner that no shifting or deformation occur during shipment or installation.
- 4.6 The transformer shall be designed for minimum losses as per I.S.1180 guidelines. All mechanism shall be of stainless steel, brass, gunmetal or other suitable material to prevent sticking due to rust or corrosion. If any temporary fitting is fixed to the enclosure / protective housing of a transformer for transporting / handling purposes, these shall be identified as well as instructions and illustrated drawings shall be furnished to facilitate their removal at site after erection.

4.7 The transformer shall have off-circuit tap changer in H.T. winding in steps of 2.5% for range (+) 5% to (-) 10 %.

4.8 Neutral terminal of star connected winding of each transformer shall be designed for the highest over current that can flow through the terminal. The neutral terminal shall in the LV cable terminal

box. The transformer also shall have one additional brought out neutral which is intended to be directly connected to earth permanently.

4.9 The transformer shall be generally conformity with latest revision of IS: 11171- 1985 (reaffirmed-2001) and IEC: 726 (1982). Ref standard IS 2026 (Part-I to Part II) IS 10028 (PII) IS 1180 etc. shall be applicable only in so far as they are applicable.

4.10 Transformer Fittings

The transformer shall be fitted with all standard and special fittings and accessories as per IS and CBIP Standard and shall include but not being limited to the following:

- a) Rating, diagram and tap connection plates
- b) Terminal marking plate
- c) Earthing terminal - 2 nos.
- d) Lifting lugs, jacking pads and haulage lugs / holes
- e) Winding temperature indicator with Alarm & Trip contacts.
- f) Oil temperature indicator with Alarm & Trip contacts.
- g) Bucholz's relay with Alarm and Trip contacts.
- h) PRV with Trip contact.
- i) MOG with contact
- j) Externally operated Off-circuit tap switch with position indicator

k) Cable terminal boxes (both HV & LV side)

l) Bi-directional wheels with locking and bolting devices

4.11 Each transformer shall be provided with a stainless steel rating plate fitted in a visible position showing the followings.

- a. Kind of transformer
- b. Ref to IS standard
- c. Manufacturer's name
- d. Manufacturer's serial number
- e. Year of manufacture
- f. Number of phases
- g. Rated KVA
- h. Rated frequency
- i. Rated voltage
- j. Rated current
- k. Connection symbol
- l. Percentage impedance voltage at rated current
- m. Type of cooling
- n. Total mass in Kg.
- o. Quantity of Oil.
- p. Percentage Impedance.

4.12 Transformer losses

Transformer losses shall be guided by the I.S.1180 guideline.

4.13 Following shop tests shall be carried out on the transformer along with the other tests in presence of departmental representative –

- a) Measurement of winding resistance.
- b) Measurement of voltage ratio and check on voltage vector relationship.
- c) Measurement of impedance voltage/ short circuit impedance on principal tapping and load loss.
- d) Measurement of no load loss and current.
- e) Measurement of insulation resistance

4.14 TECHNICAL PARTICULARS OF THE TRANSFORMER

Type	:	Indoor
Nature of cooling	:	ONAN
No. of phases	:	3 (three)
Winding connection & vector group	:	DYn-11
Rated frequency	:	50 cycles/sec.
Rated KVA	:	500 KVA
Rated primary voltage	:	11 KV
Rated secondary voltage	:	0.433 KV
Method of system earthing	:	Secondary solidly grounded
Tap-Changer 5% to (-) 10%	:	Off-circuit Tap-changer (OCTC) (+)
Tapings	:	in steps of 2.5%
HV side terminal arrangements terminating sq.mm. XLPE cable.	:	Cable end box on HV side suitable for 11 KV grade 3 core 300
LV side terminal arrangements	:	Secondary (L.T.) terminal box shall be suitable for terminating 1.1 KV grade, 300/240 sq.

mm as required, Al. conductor 3.5 core XLPE insulated cable complete with sealing and armour clamping gland.

5.0 Technical Specification OF 415 V, 2 Incomer & 1 Bus Coupler PDB at Substation

5.1 The PDB is required to provide power to the Pump House MCC cum PDB and auxiliary load at the Sub-station

5.2 The PDB shall be suitable for 415 V \pm 10%, 50 Hz \pm 5%, 3 phase, 4 wire supply system. The incoming power shall be provided from the secondary side of transformers.

5.3 The PDB shall be 2 mm CRCA sheet steel enclosed, floor mounted type, self supporting, fully compartmentalised, dust & vermin proof, cubicle pattern, non-draw out and modular in construction. It shall be finished painted with powder coated paint after necessary chemical treatment for rust free surfaces and application of anti rust chemical coating. The base frame of the panel shall be made of ISMC – 75 channel.

5.4 The PDB shall be dead front type with concealed type hinged doors at front and bolted covers at the rear. All hinged doors shall be interlocked with the respective switchgears such that the same cannot be opened while the feeder is ON.

5.5 It shall have rear access and the cable termination arrangement shall be provided at the rear of the respective feeder modules. For incomers, extended bus bars shall be installed preferably from the top of the panel as per respective specifications. The vertical dropper bus bars shall be placed in between two vertical aligned feeder modules.

- 5.6 The bus bar of PDB shall be spitted into two sections with one bus coupler in between. Each section will receive power through an incoming ACB connected from the secondary side of transformers.
- 5.7 The bus bar for the PDB shall be TPN, made of E91E grade Aluminium alloy insulated with 1.1KV grade heat shrink type PVC colour coded sleeve. The rating of the bus bar shall be 800 A for phases and 400 A for neutral. The current density of the bus bar shall not exceed 1Amp / sq. mm. The bus bars shall be supported on non-hygroscopic type resin moulded insulators and the distance between insulators shall be so designed to make the bus bar system capable of withstanding a short circuit fault current of 50 KA (r.m.s.) for 1 sec. The front bus bar chamber shall be fully shrouded to avoid accidental contact with the live bus bars.

The minimum clearance between bus bars and bus bar to earth shall be as per IS.

- 5.8 Incoming & Outgoing feeder termination shall be done with extended bus bar arrangement if required. The cable termination chamber shall be provided with cable supporting clamps. Each incoming ACB shall receive power through 1.1 KV grade 4 /3.5core 300/240 sq. mm XLPE insulated armouredaluminium cable as required. The control wiring of the panel shall be done with 1100 V grade PVC insulated 2.5 sq mm flexible copper wire with copper lugs and ferrule marking at each end.

All hinged door shall be earthed with flexible copper wire.

- 5.9 A continuous earth bus of size 50 x 8 mm and made of aluminium shall run throughout the length of the panel with drilled holes at the end for connecting the same with the station earth bus bar.

- 5.10 Feeder details with mounted components

The feeder details are as under:

- 5.11 800A incoming feeders 2 nos. each comprising of following components:

- i) 415 V, 4 pole, 800A, 50 KA electrically operated draw out type

- | | | |
|-------|--|-------|
| | ACB with microprocessor-based O/L, S/C, E/F & shunt trip release | 1 |
| | No | |
| ii) | 96 sq mm, suitably scaled Ammeter with cramped scale and selector switch | |
| | 1 No. | |
| iii) | 96 sq mm, 0 – 500 V Voltmeter with selector switch | |
| | 1 No. | |
| iv) | Current Transformer of suitable ratio & 5A secondary, Class: 1.0, 15 VA | 3 |
| | Nos. | |
| v) | Current Transformer of suitable ratio & 5A secondary, Class: 5P10, 10 VA | 3 |
| | Nos. | |
| vi) | Red, Yellow, Blue phase indicating lamp | |
| | as required | |
| vii) | CB ON / OFF / TRIP / Spring Charged Indicating Lamp | |
| | As required. | |
| viii) | TNC Breaker Control Switch | 1 No. |
| ix) | Local / Remote Selector Switch | 1 |
| | No. | |

5.12 800 A Bus coupler feeder one (1) number comprising of following components:

- i) 415 V, 4 Pole, 800 A, 50 KA electrically operated draw out

ACB without release.

1 No.

- ii) TNC Breaker Control Switch
1 No.
- iii) Local / Remote Selector Switch
No. 1
- iv) Bus Coupler ON / OFF / Spring Charged Indicating Lamp
3 Nos.

5.13 Outgoing feeders --- 2 Nos. each equipped with following:

- i) 415 V, 3 pole, 800A, 50 KA electrically operated draw out type MCCB/ACB with microprocessor-based O/L, S/C, E/F & shunt trip release
No. 1
- ii) 96 sq mm, suitably scaled Ammeter with cramped scale and selector switch
1 No.
- iii) Current Transformer of suitable ratio & 5A secondary, Class: 1.0, 15 VA
3 Nos.
- iv) CB ON / OFF / TRIP / Spring Charged Indicating Lamp
4 Nos.
- v) TNC Breaker Control Switch
1 No.
- vi) Local / Remote Selector Switch
No. 1

5.14 MCCB / MCB feeder of following rating

- a) 32A TPN MCCB with Microprocessor based O/C & E/F releases 3 Nos.
- b) 63A TPN MCCB with Microprocessor based O/C & E/F releases 3 Nos.

(Adjustable O/L) rated upto 50⁰ C without duration

c) ON / OFF / Trip Indicating Lamp (For each feeder) As
required.

d) 16 A DP MCB 6 Nos.

5.15 Technical Specification of Air Circuit Breaker (ACB)

The ACB shall be rated as specified elsewhere at 50⁰ C without duration and 50 KA for 1 Sec. The ACB shall be electrically operated drawout type with shunt trip release. The neutral conductor shall be 100% of the phase conductor. The ACB shall be provided with built-in LCD display. Over current releases, if specified, shall have on-line functional testing facility and trip indicators shall be provided to display the nature of fault without any external power supply. Earth fault protection shall have adjustable settings upto 10% of Nominal current. The CTs provided shall be air-core. The ACB shall have position indication with padlocking facility for all positions including door interlock and padlocking facility of the shutters in closed position. The ACB shall be provided with the following features in the front panel.

- Contact position indicator (ON / OFF)
- Stored energy status indicator
- Connected / Test / Disconnected position
- Trip indication on fault
- OK indicator (Mechanical) on the front panel when the trip or OFF conditions are cleared and the circuit breaker can be closed on "ON" command (Manual or Electrical)
- All the accessories viz. shunt, motor and under voltage coils shall be accessible from the front without removing the breaker from its panel for replacement any

7.0 415 V Multi panel MCC cum PDB(A) at Pump House

7.1 The MCC cum PDB is required to provide power to the Pump Motors, auxiliary load and Main Lighting Distribution Board at Pump House.

7.2 The MCC cum PDB shall be suitable for 415 V \pm 10%, 50 Hz \pm 5%, 3 phase, 4 wire supply system. The incoming power shall be provided from the outgoing feeder & PDB at substation

7.3 The MCC cum PDB shall be 2 mm CRCA sheet steel enclosed, floor mounted type, self-supporting, fully compartmentalised, dust & vermin proof, cubicle pattern, non-draw out and modular in construction. It shall be finished painted with powder coated paint after necessary chemical treatment for rust free surfaces and application of anti-rust chemical coating. The base frame of the panel shall be made of ISMC – 75 channels.

7.4 The MCC cum PDB shall be dead front type with concealed type hinged doors at front and bolted covers at the rear. All hinged doors shall be interlocked with the respective switchgears such that the same cannot be opened while the feeder is ON.

7.5 It shall have rear access and the cable termination arrangement shall be provided at the rear of the respective feeder modules. For incomers, extended bus bars shall be installed preferably from the top of the panel as per respective specifications. The vertical dropper bus bars shall be placed in between two vertical aligned feeder modules.

7.6 The bus bar for the MCC cum PDB shall be TPN, made of E91E grade Aluminium alloy insulated with 1.1KV grade heat shrink type PVC colour coded sleeve. The rating of the bus bar shall be 800A for phases and 400A for neutral. The current density of the bus bar shall not exceed 1Amp / sq mm. The bus bars shall be supported on non-hygroscopic type resin moulded insulators and the distance between insulators shall be so designed to make the bus bar system capable of withstanding a short circuit fault current of 50 KA (r.m.s.) for 1 sec. The front bus bar chamber shall be fully shrouded to avoid accidental contact with the live bus bars.

The minimum clearance between bus bars and bus bar to earth shall be as per IS.

7.7 Incoming & Outgoing feeder termination shall be done with extended bus bar arrangement if required. The cable termination chamber shall be provided with cable supporting clamps. Each incoming MCCB shall receive 1.1 KV grade 4/3.5 core 300/240 sq. mm XLPE insulated armoured aluminium cable. The control wiring of the panel shall be done with 1100 V grade PVC insulated 2.5 sq mm flexible copper wire with copper lugs and ferrule marking at each end.

All hinged door shall be earthed with flexible copper wire.

7.8 A continuous earth bus of size 50 x 8 mm and made of aluminium shall run throughout the length of the panel with drilled holes at the end for connecting the same with the station earth bus bar.

7.9 Feeder details with mounted components

The feeder details are as under:

7.10 A incoming feeder 2 nos. comprising of following components:

- | | | |
|-------|--|-------------|
| i) | 415 V, 3 pole, 800A, 50 KA , electrically operated draw out type MCCB/ACB with microprocessor based O/L, S/C, E/F & shunt trip release | 1 No |
| ii) | 96 sq mm, suitably scaled Ammeter with cramped scale & selector switch | 1 No. |
| iii) | 96 sq mm, 0 – 500 V Voltmeter with selector switch | 1 No. |
| iv) | Current Transformer of suitable ratio & 5A secondary, Class: 1.0, 15 VA | 3 Nos. |
| v) | Current Transformer of suitable ratio & 5A secondary, Class: 5P10, 10 VA | 3 Nos. |
| vi) | Red, Yellow, Blue phase indicating lamp | as required |
| vii) | MCCB ON / OFF / TRIP / Earth Fault Trip Indicating Lamp | 4 Nos. |
| viii) | TNC Breaker Control Switch | 1 No. |
| ix) | Local / Remote Selector Switch | 1 No. |

7.11 800 A Bus coupler feeder one (1) number comprising of following components:

- i) 415 V, 3 Pole, 800 A, 50 KA electrically operated draw out ACB without release. 1 No.
- ii) TNC Breaker Control Switch 1 No.
- iii) Local / Remote Selector Switch 1 No.
- iv) Bus Coupler ON / OFF / Spring Charged Indicating Lamp 3 Nos.

7.12 110KW Star – Delta Starter Motor feeders,(with individual capacitor feeder) each comprising of following components: Type 2 coordination should have to be followed.

(Number of feeders shall be no. of Pump sets installed plus one spare)

- a) **Not less than reqd. A, 50 KA MCCB with microprocessor-based trip unit with adjustable overload, short circuit & earth fault rated upto 50⁰ C without deration** - 1 No.
- b) **Not less than reqd. A Air Breaker Contactor with 240 V AC Coil arrangement** - 3 Nos.
- c) **Clustered LED type indicating lamp for ON / OFF / TRIP / EARTH FAULT TRIP** - 4 Nos.
Start / Stop Push Button - 1 Set
- d)
- e) **96 Sq mm suitably scaled including cramped scale Ammeter with selector switch** - 1 No.
- f) **True Digital Microprocessor based Motor Protection relay suitable for 5A CT secondary and having**

- thermal overload protection, instantaneous short circuit protection, inverse and definite time negative sequence current protection, instantaneous and definite time earth fault protection, locked rotor protection, loss of load protection and reverse phase sequence protection (Type P225 or equivalent)*** - **1 No.**
- g) High speed master trip relay type VAJH 13 or equivalent*** - **1 No.**
- h) CT of appropriate rating and 5A Secondary, Class 1.0, 10 VA*** - **3 Nos.**
- i) CT of appropriate rating and 5A Secondary, Class 5 P 10, 15 VA*** - **3 Nos.**

7.13 MCCB / MCB feeder of following rating

a) 32 A TPN MCCB/MPCB with Microprocessor based O/C & E/F releases for delivery valves, common delivery and annex load. with rated amp HRC Fuse.

(Adjustable O/L) rated upto 50⁰ C without duration 3 Nos

b) 63 A TPN MCCB with Microprocessor based O/C & E/F releases

(Adjustable O/L) rated upto 50⁰ C without deration 2 Nos

c) 100 A TPN MCCB with Microprocessor based O/C & E/F releases

(Adjustable O/L) rated upto 50⁰ C without deration 1 Nos

d) Not less than #A for actuator feeder 5 Nos

e) ON / OFF / Trip Indicating Lamp (For each feeder) as required.

f) 16 A DP MCB 3 Nos.

9.00 Battery & Battery Charging Equipment

There shall be one battery bank along with float and boost charger. The battery bank shall be Exide make 110 V Sealed Maintenance free VRLA battery with UPST type 55 nos. 2-volt 100Ah cells.

Inter row connectors / inter tier connectors shall be provided where necessary. Suitable battery stand complete with cell number plate shall be provided.

The three phase float and boost battery charger with integral DCDB shall be housed in a floor mounting type steel enclosure with adequate ventilation for natural air cooling. The broad specification of the float and boost charger with DCDB is as under :

Battery: 110 V, 100 AH SMF VRLA (2 V x 55 Nos.)

Load: 10 A DC, Boost: 15 A DC

9.1 A.C. Input

- a) Voltage : 415 V, \pm 10%
- b) Phase : 3 Phase, 4 Wire
- c) Frequency : 50 Hz \pm 6%
- d) Combined voltage & frequency variation within : \pm 10%
- e) System earthing : Solidly earthed

9.2 Float and Boost Battery Charger

9.2.1 Charger – I (Float Charger – SCR Control)

- a) Output Voltage : 110 – 125 V DC [sleeplessly adjustable]
- b) Output current : 10 A D.C. + trickle charging current

- c) Rectifier Configuration : Full wave fully controlled SCR bridge
- d) Control mode : Constant voltage current limiting
- e) Regulation : $\pm 1\%$
- f) Ripple voltage : 1% RMS

9.2.2 Charger – II (Boost cum Float Charger – SCR Control)

- a) Output Voltage : Boost : 110 – 127 V DC [steplessly adjustable]
Em. Float: 110 V – 125 V DC [steplessly adjustable]
- b) Output current : Boost: 15 A D.C.
Em. Float: 10 A DC + Trickle charging current
- c) Rectifier Configuration : Full wave fully controlled SCR bridge
- d) Control mode : Constant voltage current limiting
- e) Regulation : $\pm 1\%$
- f) Ripple voltage : 1% RMS
- g) Commencement & termination Automatic / Manual of boost charging

9.3 Protection

- a) Snubber across each device
- b) Phase failure / sequence reversal
- c) Soft start with current limiting (intrinsic feature of trigger PCB)

9.4 Annunciation

- a) Mains fail
- b) Phase fail & sequence reversal

- c) Float under voltage
- d) Float over voltage
- e) Battery fuse blown
- f) Battery under voltage

9.5 Indicating LEDs / Lamps

- a) AC supply healthy - 3 Nos.
- b) Float Charger ON - 1 No.
- c) Boost charger ON in Auto mode - 1 No.
- d) Boost charger ON in Manual mode - 1 No.
- e) Boost charger ON in Em. Float mode - 1 No.

9.6 Metering

- a) AC Voltmeter with Selector Switch at input
- b) DC Voltmeter with Selector Switch at output
- c) DC Ammeter at output
- d) Centre zero Ammeter at battery path

9.7 DCDB Outgoing Feeder

- a) 2 P, 16 A DC MCB - 6 Nos.

9.8 Enclosure

- a) Material - Mild Steel Sheet (2 mm thick)
- b) Painting - Powder coated (Shade RAL7032)
- c) Doors - Front – 1, Rear – 2
- d) Cable entry - From Bottom
- e) Ventilation - Air natural through louvers backed by fine wire mesh

10.00 CABLE:

All HT and M.V. power cables shall be with XLPE insulation, stranded aluminium / copper conductor and armoured

10.01 HT &M.V. Cables and Jointing

All HT and M.V. Cables shall be 11 KV (E) / 1.1 KV grade XLPE insulated and armoured of Al / Cu. conductor 3 core / 3½ core / 4 core as required. The core shall be stranded and the installation shall be suitable for the working condition. The cable wherever laid in underground trenches shall be of minimum 800 mm width x 1000mm average depth or with cable tray arrangement where necessary and in suitable size cable tray in the pump floor / Sub-station building / between Pump House & Substation Building. Where cable is laid in masonry trench, the cable trenches (where applicable) shall be filled up with sand or covered with chequered plate/RCC slab according to the direction of Engineer-in-Charge. Where necessary cables shall be supported on clamps of approved type and shall be properly protected with G.I. conduit or other protective covering as per direction of Engineer-in-Charge.

All Jointings should be of 'dry type' to be done with hydraulic crimping machine where applicable & done in accordance with the provision of I.E. rules. All jointing materials and other accessories shall be included in the quoted price.

10.02 Control cable and jointing

All Control cables shall be XLPE insulated of 1100 volts grade multi strand copper conductor and armoured of suitable size. The control cable should be terminated with proper sockets, glands etc. At least 2 cores shall be kept as spare in all control circuits.

FLOW SENSOR

There shall be one number of Full-bore Electromagnetic flow meter on the common delivery manifold. The flow meters are to be installed and commissioned for measuring the instant flow rates as well as the total flow for a period of time of the station passing throughout the common manifold. The flow rates shall be indicated in m³/hr & total flow in cubic meter. The flow sensor shall be suitable to measure Raw water. The flow meter shall be electromagnetic inline type to provide indication, totalization and signal transmission of the liquid. The display is required at the Control Desk around 50 mtr. away from the transmitter installation point on the pipe line. Amplification of signals, if necessary, are to be incorporated. The flow meter must be capable of measuring velocity of water upto 3 m / sec with accuracy of $\pm 0.5\%$. Flow sensitivity must be ± 0.3 m/s at any flow rate. The linearity of the instrument shall be 0.1% of scale. The sensor must have enclosure of class IP-68. The tenderer shall clearly indicate the position of flow sensor. The data sheet for flow sensor is as follows.

The flow meter will be full bore electromagnetic type should be capable to handle flow of Raw Water.

Type:- Pulsed DC electromagnetic.

Accuracy:- $\pm 0.5\%$ of measure value.

Repeatability:- $\pm 0.2\%$

Size of flow meter:- As per designed diameter of the common delivery manifold.

Sensor type:- In line full bore electromagnetic.

Process connection:- Flanged type.

Weather protection class:- IP68 NEMA 6 P or as per the specified by EIC.

Minimum conductivity:- 20 us/cm

Full scale velocity:- 1 to 5 m/sec.

Process temperature:- 50 °C max.

Process pressure:- 10 Bar max.

Electrodes:- SS 316 L/ SS 316.

Coil housing :- SS304

Flange MOC:- Carbon steel .

Flow sensor tube:- SS304

Cable between sensor and transmitter:- Copper cable of single Length as required as per site condition between sensor and transmitter.

Flow transmitter:- Microprocessor based, wall mounted.

Type of display of transmitter:- Display should be LCD or LED type and the size should be suitable for making it visible from at least 6m distance.

Out put:- 4-20 mA DC

Power supply :- 240 V AC 50 Hz and shall be supplied from the MCC cum PDB at a approximate distance of 50 m.

Input:- From flow tube

Web server:- The flow meter should be compatible for connection with web server for remote facility display facility.

Protection class :- IP 68.

Calibration shall be accredited according to ISO/IEC 17025.

13.00 Flow meter/ Flow sensor or Flow Tube fixing chamber

For fixing of Flow Tube at the delivery manifold, leak proof chamber of adequate dimension is to be constructed if required as per site condition with a rung-ladder of suitable length for getting down if necessary.

EARTHING

The total installation shall be effectively earthed by providing a ring main earthing. Each earthing set shall consist of one G.I. pipe of not less than 2" dia and 10' length. The electrode shall be buried below the ground upto the depth of moist earth which shall not be less than 8'-0" from ground level and must be 6'-0" away from any building structure. The bottom portion of the electrodes shall be properly perforated and one cast iron cap properly screwed of approved type and design and shall be fitted on the top of the electrode, connection leads to the earth bus inside the station. After fixing and drawing out of the earth leads, the top portion of the earth, electrode upto 1 ft. shall be properly brick pitched and shall be fitted with water proof bituminous compound. The connecting lead shall be GI strip 75 x 8 mm and shall be laid at a depth of not less than 600 mm from ground level. The leads shall be connected to GI earth bus bar inside the pumping station by means of proper welds. The nos. of individual earthing connected to the Earth bus should such that after installation the earth resistance of the system must be well below one ohm.

One GI bus bar 75mm wide and 8 mm thick shall be provided so that the frames of all electric motors, switch gears, transformers and other electrical accessories and installation shall be connected to this station earth bus by two separate GI strip of adequate dimension. All metallic cover frames, equipments, installation

etc. shall be earthed to the full satisfaction of Engineer-in-charge and the Govt. Electrical Inspector.

The earthing and bonding shall be according to the I.E. Rules 1956 with ammendment of 1990. All non current carrying metal parts associated with H.V. installation shall be effectively earthed to the grounding system to achieve:

- a) Limit the touch and step potential to tolerable values;
- b) Limit the ground potential rise to tolerable values so as to prevent danger due to transfer of potential through ground, earth wires, cable sheath etc.
- c) Maintain the resistance of the earth connection to such a value as to make operation of the protective device effective.

The same must be approved by the Govt. Electrical Inspector and shall pass the statutory tests.

The successful tenderer shall have to submit the detailed and fully dimensioned drawing of the whole electrical system showing the proper earthing duly approved by the Govt. Electrical Inspector before commencement of the actual installation work.

The distance between each individual Earth Pits should not be less than 3 meters.

16.00 LIGHTING SYSTEM

16.01 Luminaries

The scope includes indoor lighting of pump house, substation building, Annex area and reasonable area lighting around the Pump House and Substation Building. Industrial Medium bay luminaries with LED 150W lamps are to be provided in a row alternatively in the beams at each of the pump house ceiling. Motor/ Operating floor lighting should be provided with LED T/L industrial type fixtures and to be fixed on the wall at a level above the lintel. The positions are to be finalized as per requirement and direction of the E.I.C. The illumination level would be 150 Lux.

The Substation Room lighting should be provided with LED T/L type fixtures with reflectors tentatively 2X18W with watt cool day light type (Brilliant White). Illumination level would be 200-250 Lux.

In the corridors, toilet, LED T/L with are to be provided to generate an illumination level of 150 Lux.

Area illumination/access bridge level 100 LUX with suitable LED fittings.

All the entrance/exists of pump house shall be provided with LED down lighter or bracket mounted fittings with LED lamps of minimum 45 W as per site condition (minimum 90W for unloading bay entrance).

16.02 **WIRING**

All wiring installation work must be as per relevant I.S. with proper distribution network, M.C.B. are to be used in distribution boxes and there must be colour segregation for power/neutral/ground wires.

16.03 In strategic locations of the substation building / pump house, adequate number of 415 / 240 volt TPN / SPN MCB Distribution board shall be placed with multiple ways of different current rating (MCB) along with a incoming switch from where power to be fed to different switch board.

16.04. Individual switch board shall comprise of multiple number of switch (6/10 Amps rated) as the case may be, which shall be used for switching 'ON' and "OFF" operation of the lights / fans / receptacles etc. The individual switch board shall be double door design so as to cover up the switch / regulator etc i.e. switches / regulator etc shall be accessible on opening the door cover.

16.05 The above stated distribution board shall be fed from independent switch fuse unit / MCB / MCCB located in the PDB.

16.06 440 volt, 15 Amps and 240 volts/15 Amps socket outlet shall be provided where ever required and power shall be taken from the individual way of the distribution board.

16.07 The minimum required size of the conductor for internal distribution point wiring shall be as follows:

Sl. No	Type of fitting /wiring	Minimum size of wire
1.	LED Fluorescent	2 nos. 1 core -1.5 mm ² copper & 1 no. Earth wire of 1.0 mm ² copper
2.	LED Flood light fitting	2 nos. 1 core -2.5 mm ² copper & 1 no. Earth wire of 1.0 mm ² copper
3.	Receptacle-5A	2 nos. 1 core -2.5 mm ² copper & 1 no. Earth wire of 1.0 mm ² copper
4.	Receptacle-15A	2 nos – 1 core-4 mm ² copper & 1 no Earth wire of 1.0 mm ² copper

17.00 Ventilation & Fire fighting System:

17.01 Ventilation: The entire pump house including all electrical rooms and the Sub Station Rooms shall have proper ventilation arrangement. The scope shall include the supply and fixing of following equipments complete with GI conduit wiring /armoured cable including all other accessories as required.

- a) 3 - phase suitable Exhaust fans including proper louvers, duct work, rain cowl and bird protection screen ----- As required for the Pump House to ensure 10 Air changes/Hr..
- b) Single phase suitable Exhaust fans including proper louvers, duct work, rain cowl and bird protection screen ----- As required for all the rooms of Sub Station as per the direction of EIC.
- c) Wall mounting type control panel for exhaust fan and others ----- 2 Sets, one each for pump House and substation.
- e) 18" Pedestal fan with regulator and all other accessories --- 3 Nos.

17.02 Fire Extinguisher

- a) ABC type Portable type fire extinguisher consisting of welded cylinder, squeeze lever discharge valve, internal discharge tube, discharge nozzle suspension bracket, duly charged and pressurized with ISI marked.
- b) ABC stored pressure type fire extinguisher 5 Kg capacity with discharge hose and nozzle and consisting of welded cylinder, squeeze lever discharge valve, internal discharge tube, discharge nozzle suspension bracket, duly charged and pressurized with ISI marked.
- c) Dry type fire extinguisher 5 Kg capacity with discharge hose and nozzle and consisting of welded cylinder, squeeze lever discharge valve, internal discharge tube, discharge nozzle suspension bracket, duly charged and pressurized with ISI marked.
- d) Fire buckets (9 litre capacity) made from 24 SWG GI Sheet including wall mounting bracket and filling of sand.

20.00 OVERHEAD CRANE

20.1 EOT Crane.

The EOT. Crane will be minimum 5 M.T. capacity Electrically Operated Travelling

Crane (E.O.T.) with a lift from the operating floor level and up to the level above the installed motors. The long travel & the Cross Travel along with height of lift of the crane shall be finalised after freezing of the Pump House layout drawing. Suitable type of Crain rails, girders and all other accessories as necessary for installation and operation of the crane are to be designed & provided by the contractor within the lump sum quoted amount. The two travels of the main hoists i.e Long, Cross and the hoisting operation shall be manually operated. The buffers must be spring loaded operation.

The EOT Crane should be tested at manufacturer's works / site as per relevant IS. The same may be witnessed by the EIC. The Contractor has to arrange for such testing at his own cost.

21.00 MECHANICAL TYPE LEVEL INDICATOR

The Mechanical level Indicator shall be equipped with for continuous monitoring of sump level.

The level indicator shall be securely mounted on the pump floor platform. It shall be capable to monitor the sump level continuously. Range of measurement from LWL to HWL shall be around 05Mtr.

SECTION - H **List of Vendors**

Sl. No.	Equipment	Make
01.00	Pump	Kirloskar / Mather & Platt / WPIL Ltd.
02.00	Motor	Siemens / ABB / Marathon/ Crompton
03.00	Control Desk/ MV Switchboard / MCC cum PDB	Sellwin / PCE Projects / RNR.
04.00	ACB/MCCB	L&T / Siemens / ABB / Schneider
05.00	Fuse Switch Unit	L&T / Siemens / ABB / Schneider
06.00	Breaker control switch	Kaycee / Recom / Alstom
07.00 BCH	Relays	Schneider / ABB / ER/ Siemens(Reyrolle) /
08.00	Contactora	L&T/ Siemens / ABB / Schneider

09.00	Meters	AE / IMP / Enercon/ Secure
10.00	Cable :	
10.01	HT & LT Cable	Gloster / Polycab / Havells / UCL
10.02	Control / Signal Cable	Gloster / Polycab / Havells / UCL
11.00	Pressure Transmitters	Siemens / ABB / Honeywell / Micro System
12.00	Digital Indicators	Micro System /Meco
13.00	Temperature Scanner	Pecon/ Micro System /Laxon / Chino / Masuka Instruments Pvt. Ltd.
14.00	Radar type Level Monitoring System	Siemens / Khrone / Rosemount
14.01	Mechanical Level Indicator	NGM/JoydevEngg. /Star Enterprise
15.00	Flow meter, Indicator, Totaliser	Krohne / Endress Hauser/ABB/Siemens
16.00	Control Fuses	GE/Siemens
17.00	Current Transformer	Kappa /JAWS / Schneider
18.00	Capacitor	Unistar / L&T / Epcos
19.00	Butterfly Valves, Non-Return Valve & Sluice Valve	VAG/ IVC / Kirloskar / Fluidtech/IVI
20.00	Valve Actuators	Rotork / Auma
21.00	Gauges	Bell / Taylors / H. Guru /Bell/Baumer
22.00	Fire Extinguishers	Surex / Minimax / Cease Fire / Fire Shield
23.00	Submersible Sump Pump	KSB / Calama / Kirloskar
24.00	Air Conditioner	Carrier / LG / Voltas
25.00	Lighting system	
26.01	Light Fitting	Philips / Bajaj/C.G/KLITE
26.02	Wire	Finolex / KDK / Havells
26.03	Switches	Anchor / Havells / Cab
27.00	Ventilation System System /	P.N. Chakraborty & Co. / Universal Air PASCO
28.00	Exhaust Fan / Ventilation Fan	Alstom / EPC / Pasco / Marathon
29.00	Crane	Surekha / Pilcare / India Engineering & Implements Co.

30.00	H.T. Switchgear	Siemens / Schneider / ABB
31.00	Power Transformer	Schneider / KEC/ Voltamp (Vadodara)
	/AEG/CG	
32.00	Battery	Exide/Aamron
33.00	Battery Charger	Caldyne / Electro Service/Live line/Dekem

Technical Specification /Scope of Work for Major E/M Equipments.

This is indicative not exhaustive, will be finalized in detail engineering.

SI No.	Brief Description of Item	Qty	Unit
1	Supply, Delivery, Installation, Testing & Commissioning of 360 cu.m/hr& Head Approx. 72 m, Vertical Turbine Pump - Motor set with all req. accessories with, suitable motor, 415 V, 50 Hz with Caission Pipe	3	Nos.
2	Supply, Fabrication, installation, testing & Commissioning of flanged/ plain ended MS pipe made from MS sheet of relevant IS specification (bends, Enlarger, reducers, fittings, specials, flanges, bolts, nuts, gaskets, etc as required to complete the installation) for Delivery & Common Manifold and Jointing the MS to DI Lines (Minimum 12 mm thickness sheet.)	1	Lot
3	Supply, delivery, Installation, Testing and Commissioning of suitable DI Valves & Joints (i.e Sluice Valve, Butterfly Valve, NRV, DJ, MJ, Air Valve,etc.) for Delivery & Common Manifold.	1	Lot

4	Providing, Installation, Testing and Commissioning of Pressure gauges.	1	Lot
5	Providing, Installation, Testing and Commissioning of Electromagnetic Flow Meter of 350 mm dia.	1	Nos.
6	Supply, delivery, Installation, Testing & Commissioning of Mechanical Level Indicator for CWR/Sump/Well.	1	Nos.
7	Supply, delivery, Installation and commissioning of 5 M.Ton capacity EOT Crane complete in all respect including testing , certification and as per NIT and tender specifications Rectangular Type.	1	Job
8	Supply, delivery , Installation, Testing and Commissioning of suitable 11 kV, 800 Amp, 26.3 KA for 3 sec, 3 Panel VCB Switchboard with following: I/C Feeder - 1 No, O/G Transformer Feeder - 2 Nos.	1	Set
9	Supply, Installation, Testing & Commissioning of 500 kVA, 11 kV/0.433 kV, 3 phase, 50 Hz, ONAN type transformer as per specifications and NIT.	2	Nos
10	Supply , installation , testing & commissioning of Float cum boost charger suitable for 415V with variation 10% , 50 HZ , single phase/3-phase input & 24/48/110 Volt DC. and Battery Bank of minimum 100 AH capacity comprising SMF/VRLA batteries, MS stand, interconnect wiring etc as required complete in all respect	1	Set
11	Supply, installation, testing & commissioning of 415 V PDB Panel at Substation Building.	1	Nos.
12	Supply, installation, testing & commissioning of 415 V PMCC Panel at Pump House.	1	Nos.
13	Supply, delivery, Installation, Testing & Commissioning of suitable Earthing Systems, etc	1	Job
14	Supply, delivery, Laying, Testing & Commissioning of suitable Cable (HT Cables).	1	Job
15	Supply, delivery, Laying, Testing & Commissioning of suitable Cable (L.T Cables).	1	Job
16	Supply, delivery, Laying, Testing & Commissioning of suitable Cable (Control & Instruments Cables).	1	Job
17	Supply, delivery and Installation of safety equipment.	1	Job
18	Supply, delivery and Installtion of Perforated and Ladder type Cable tray, Panel base support,with all accessories & cable tray supports.	1	Job
19	Providing and fixing in position lightening arrester set	1	Job
20	SITC of Ventilation System for Pump House & Panel Room	1	Job
21	Illumination of Pump room & Panel room incl. supplying fitting, fixing all complete.	1	Job
22	Outdoor illumination for Access bridge & Compound lighting , including supplying, fixing all complete.	1	Job
23	Dehydration&Filtraion of Transformer Oil to raise the dielectric strength to the value specified in IS including submission of test result	1	Job
24	Commissioning of whole system & Performance test for (72 hours) including DOE clearance.	1	Job

25	Trial Run for (three) months after successful commissioning of the whole installation as per specification and direction of the EIC.	1	Job
26	Operation & Minor Maintenance for 5 years.	1	Job

Technical Specification of Major Electro-Mechanical Equipments for CWR AT PANSKURA

This is indicative not exhaustive, will be finalized in detail engineering.

2.0. VERTICAL TURBINE (VT) PUMP

3.0 **Vertical Wet Pit Pumps**

- 1.2 The pumps shall be of vertical wet pit type with mixed flow impeller. Pumps shall be placed vertically submerged in the wet pit and mounted on CWR Floor pumping station. The pump shall be self-service water lubricated type. Self-lubricated type guide bearings are to be provided at suitable positions of the shafts and shall not be more than 1.5M (approximately) apart. Since the service water may carry minor solid particles, the guide bearings shall have suitable passages within them to expel / pass these minor solid particles by self-working pressure, and the same will not stick inside the bearings deteriorating them. The specific gravity of Clear Water shall be considered as 1.00 M (Max.).
- 1.2 The pump battery shall contain suitable no pump sets out of which each pump shall deliver 100 % of the demand and also the system shall have minimum 50% stand-by Pumps.
- 1.3 Pumps shall be vertically driven with shaft directly & flexibly coupled with adequate rating, V1, SCIM. The pump rotational speed shall not be more than 1500 rpm (syn.).
- 1.4 The pumps shall be of non-pull out type. The individual pump discharge lines shall run over the main operating floor and shall be connected with the common delivery manifold. The pump discharge head/motor stool /sole plate shall be rigidly grouted on the Pump floor. The foundation plan and foundation pockets required to be kept with the civil construction, and the successful bidder on receipt of the orders shall furnish the pump-motor foundation plan authenticated by the OEM. The said foundation will take care and counter the horizontal back thrust as may be generated during start/stop of the same (at shutoff condition may be considered).

1.5 The pump impellers shall be securely held on the pump shaft as per provision of the pump manufacturer's design so as to prevent sliding of the impeller along the shaft during operation.

1.6 The pump shall be of having a fairly steep H-Q curve. The tenderer shall furnish the evaluated specific speed of the pump at the specific trim at duty point. The pump H-Q characteristics curves shall be stable all throughout. There shall be a margin of at least 25% in between the run-out flow and the duty point flow.

1.7 The pump efficiency shall be reasonably high. The head-discharge-efficiency-KW absorbed-NPSHR shall be guaranteed without any tolerances at the duty point working at river water level condition mentioned in the Obligatory Data.

The tenderer shall have to confirm the maximum power absorbed by the pump on the entire range starting from the shut-off to run-out without any positive tolerance

1.8 The suspension length of the pump assembly shall be such that it can safely work at the lowest low-level condition considering worst of (i) the NPSHR of the offered pump at the maximum water discharge condition on the entire operating range & (ii) minimum submergence requirement. It shall have one suitable basket type strainer preventing entry of foreign particle and of any solid in the pump.

1.9 The vertical column pipe assembly shall be of suitable dia fabricated from adequately mm thick MS plate, flanged type, and anti-corrosive epoxy painted both inside and outside. The column piping shall be of individual length not more than 1.5 M each for effective and easy handling.

1.11 The total suspension length including the bottom basket strainer if any, shall be fixed by the tenderer considering the minimum submergence requirement working at the lowest low level, the required bottom clearance at the indicated level etc. The total suspension length, as has been considered in the offer backed by technical justification shall be placed with the technical offer.

1.12 The pump assembly shall be provided with suitable anti-friction roller thrust bearing, non-reverse ratchet assembly, bowl bearing, suction bell bearing, shafts sleeves including sleeve at gland packing point, seal ring / wearing ring, provision for impeller adjustment nut, double throat air-valve at column vent point and other important features as provided by the manufacturer. Suitable motor stool, motor

sole plate with facility of pulling out the column and bowl assembly through it, anchoring bolts, nuts, washers, fixing bolts all complete are to be provided.

- 1.13 The pump rotating assembly shall be statically and dynamically accurately balanced. The impeller balancing shall be within the grade G- 6.4 as per IS: 11723. No hole or any piece being welded / bolted on the pump impeller for balancing shall be allowed. The shaft should be ground all over and perfectly aligned. Special care should be taken that the entire pump assembly do not experience vibration beyond the permissible limit as per IS:11724, of such class roto-dynamic unit while in operating even in worst operating condition at any combination.
- 1.14 The pump motor shall be considered as a single unit and the vibration limit should be within the limit specified in above IS.
- 1.15 The noise level shall be within the permissible limit of IS: 12065. The thrust bearing shall be designed in such a manner to be worked safely on any working condition even at the respective shut off.
- 1.16 The pump shall also withstand the condition of any back flow on it.
- 1.17 The static and dynamic loading of the pump motor assembly with other allied components shall be clearly indicated.
- 1.18 The pump shall be capable of continuous operation. The pump shaft, line shaft shall be accurately sized. Replaceable sleeves are to be provided at desired point. The Stuffing box shall be self sealed design provided with packing ring and preferably with Split type gland.
- 1.19 The impeller of the offered pump shall not be either on the lowest trim or the highest trim of the same pump family offered.
- 1.20 The wetted portion of the pump shall have a proper finish. The pump shall have a minimum efficiency of 80% at duty point. Pumps offered with lesser efficiency at duty point shall not be accepted.

- 1.21 The pump shaft shall be accurately machined and ground all over. The portion of the pump that will come under the contact with pumped liquid shall be protected by replaceable sleeves.

Suitable pump casing wearing ring and/or impeller neck ring as per the manufacturer's design shall be provided. Each pump shaft shall be adequately supported, both at driving and non-driving ends, on anti-friction type ball/roller bearings capable to withstand the worst thrust loading for the pump operation from shut-off to run-out.

- 1.22 The pump shall be suitable for valve open starting and also to take care of the condition of back water flow in it, if any. Grease injection nipples and grease collector at each bearing points shall be provided.

- 1.23 The overall noise level of the pump-motor unit shall be within the stipulations of the relevant BIS limit all round measured from a distance of 1.5 M.

- 1.24 The identical parts of the pumps shall be inter- changeable type.

- 1.25 The supply of the pump shall be completed by the pump manufacturer with the following components and accessories: -

Suitable motor stool, pump motor sole plate with facility of pulling out the column and bowl assembly through it, anchoring bolts, nuts, washers, fixing bolts all complete are to be provided. Sole Plate of the total pump-motor assembly, motor stool with all foundation bolts, nuts, washers, wedges, leveling shims and other erection materials as required. It may be noted that there shall be no other thrust encountering device on the pump discharge pipe branch and the common delivery header excepting the pump foundation bolts. The pump foundation bolts shall be adequate enough to withstand all the thrust that may occur during pump operation including start/stop. Additionally one MSDF short-piece with adequate stiffeners shall be provided just after the pump delivery flange and the same shall be anchored with pump / intermediate floor to minimize the back – thrust.

Suitable flexible coupling with bolts, nuts, pins, keys etc. for coupling the drive and driven unit.

Air-vent cock, priming cock suitably placed.

Self sealed packing box provided with packing rings, lantern rings, split type glands, gland cooling water connection with cock, valves etc., all service pipes, valves, fittings, drain plug, lifting lugs etc. as required for safe operation of pumps.

Any other accessories & component considered by the manufacturer for safe, efficient operation of pumps

1.26 The pump shall be capable for continuous operation at any stated level condition.

1.27 The material of construction of the pump is given below. If the tenderer feels that the MOC other than what have been stated will give better service and performance, he may offer the pumps with the MOC as per his choice, backed by technical justifications, but the same shall only be made as an alternative offer.

- | | | |
|--------------------------------------|---|--|
| a) Pump casing | : | CI as per IS 210 Grade FG 260 |
| b) Impeller | : | SS, CF8M |
| c) Pump Shaft & Intermediate shaft | : | SS 410 |
| d) Sleeves | : | SS 410 hardened |
| e) Shaft Pins, Keys | : | SS 410 |
| f) Shaft Coupling | : | SS 410 |
| g) Bearing (Except thrust bearing) | : | Self-lubricated type with cut-less nitrile rubber in SS shell (straight grooves preferred) |
| h) Wearing ring / seal ring | : | Material having at least 50 BHN hardness difference to the |

- | | | |
|----|---|--|
| | | nearest component |
| i) | Impeller Nut | : CI IS 210 GR. FG 260 |
| i) | All hardware used in total pump Assembly(nuts/bolts/fasteners etc.) | : SS-410 |
| k) | Column pipes | : MS, fabricated from adequately thick steel plate with anti-corrosive epoxy painted both inside and outside after proper surface finish |

1.29 All materials, casting used for manufacture of the pumps with allied components & accessories shall be of best tested quality and the contractor has to submit the test certificate for the MOC at the time of shop test as well as with the supplies.

Ultrasonic test to the shafts are to be conducted and test certificate to be furnished.

The dynamic balancing of the rotating unit with coupling, key etc. is to be conducted and test certificate is to be submitted on shop test.

Dye-penetration test to the impeller are to be conducted and the test certificate are to be furnished with the supply.

Hydrostatic tests at a pressure not less than 1.5 times of the shut-off pressure for duration of 30 minutes are to be performed and test certificates to be furnished.

The pump performance test of all the pumps for head, efficiency, power consumed etc. versus discharge shall be conducted as per IS: 9137 in presence of the departmental representatives and in full load, full speed with the job motor and preferably with full column setting.

The duration of the performance test at shop shall be not less than 8 hours continuous operation and the temperature monitoring of both pump and motor shall be conducted.

The tenderer should indicate the maximum column setting, they can accommodate in their factory test bed.

The NPSHR test as per IS: 9137 for at least one pump as per by the manufacturer choice of the department at various discharge conditions including duty point shall be conducted by the manufacturer and test report shall be submitted. The duration of the performance tests of all pumps shall be not less than 2 / 3 hours each, during which the temperature, noise, vibration shall be monitored and tested.

The minimum submergence test as per IS: 9137 shall be conducted to at least one pump as per choice of the department at various discharge conditions including at duty point during the joint shop test of the pumps.

Vibration analysis to all pump motor sets are to be made in all load conditions both during the shop-testing as well as at site after the pump sets have been fully commissioned.

After the performance tests, one pump as per choice of the department shall be stripped off and the internal components shall be checked

Apart from the stated shop tests all field tests including noise, temperature rise, and vibration analysis shall be conducted by the contractor.

1.30 The tenderer shall fill-up the guaranteed performance figure / data given in the separate section and submit with the technical offer

1.31 Hydraulic test at shop

1.31.1 All pressure parts shall be subject to hydraulic testing at a pressure of 150% of shut off head or 200% of rated head (effective head) whichever is higher, for a period not less than 30 minutes.

1.31.2 Performance test are to be conducted to cover the entire range of operation of the pumps. These shall be carried out to a span of at least 125% of rated capacity up to pump shut off condition. A minimum of five combinations of head and capacity are

to be achieved during testing to establish the performance curves including the design capacity points and the two extremities of the Range of operation specified. For range of operation, stipulation in relevant Clause may be followed.

1.31.3 Tests shall be conducted with actual drive motors / shop motors at full load and full speed.

1.31.4 Reports and test certificates of the above tests shall be submitted to the Engineer-in-charge for approval of the employer.

1.31.5 All rotating components of the pumps shall be subjected to dynamic balancing tests, & to be specified in Data Sheets.

1.36 Performance test at shop

1.36.1 Each pump shall have to be tested to determine the performance curves of the pumps. These tests are to be conducted, in presence of Employer or his representative, as per the requirements of the Hydraulic Institute Standard/ASME Power Test Code PTE 8.2/BS-599/I.S.S., latest edition/ relevant universally accepted codes.

1.36.2 The Contractor shall conduct necessary arrangements for establishing such test with adequate size of sump, to establish the suitability of suction conditions , flow correcting devices for measurement of flow.

1.36.3 The Employer or his authorized representative shall be given full access to all tests. Prior to performance tests, the Contractor shall intimate the Owner allowing adequate time so that if the Employer so desires, his representatives can witness the test.

1.37 PERFORMANCE GUARANTEE, TOLERANCE AND PENALTIES

1.37.1 Performance Guarantee and Tolerance

The Bidder shall guarantee the effective head at the specified designed capacity and also the corresponding pump efficiency, pump input power. Unless otherwise mentioned, the Bidder shall specify the allowable tolerance considered by him on the guaranteed performance on other operating points, which shall not be more than those specified in IS9137.

1.38 Rectification of Deficient Performance

The tenderer shall indicate the guaranteed efficiency of the pumps offered by him. While carrying out shop performance tests, the permissible limits of errors in measurement shall be in conformity with Class-B of BS:599 without any penalty whatsoever. Apart from that a negative tolerance of maximum (–) 3% on quoted efficiency shall be acceptable only with penalty. Variation more than (–) 3% will render the pump liable for rejection.

If the shop performance tests indicate any failure of the pump to achieve the guaranteed efficiency, the Contractor will be given a time, to be decided by the Owner, to make up the deficiency at his cost by incorporating necessary modification, alteration and replacement.

1.39 CLEANING, PROTECTION AND PAINTING

1.39.1 Cleaning before shipment

Surface of all parts shall be cleaned to remove scale, dirt, oil, water, grease and other foreign objects prior to final assembly of the equipment. All openings shall be covered to guard against damage and entry of foreign objects.

1.39.2 Painting

All surfaces shall thoroughly be cleaned in a manner approved by the manufacturer for necessary paint (Epoxy) coating to be applied on the surface. In case of any prevalent Standard/Codes on selection and application of painting/coating, the same shall be strictly adhered to.

The colour code for finished painting on the external surface shall be subject to Employer's approval. Necessary finish paintings including touch up paints, if not applied at shop, shall be done by the Contractor from sealed containers for site application.

1.39.3 Packing for shipment

All parts shall be properly boxed, crated or otherwise protected for transportation to suit the mode of transportation. Exposed finished surfaces shall be thoroughly greased before transportation.

1.40 TESTS AND INSPECTION

1.40.1 The manufacturers shall conduct all tests required to ensure that the equipment furnished shall conform the requirements of this specification and in compliance with requirements of applicable Codes and Standards. The particulars of the proposed tests and the procedures for the tests shall be submitted to the

Employer for approval before conducting the tests. The pump is to be tested on the test bed of manufacturers' works in presence of the EIC representatives. All relevant cost of such inspection by two representatives of EIC has to be borne by the manufacturer / contractor.

1.50 SPARE PARTS

- 1.50.1 The tenderer is to supply spare parts as per list enclosed vide list of spare parts as per tender specification.
- 1.50.2 The spare parts as mentioned are to be supplied within the completion period of the contract along with the main equipment.
- 1.50.3 Cost of spare parts as above are to be mentioned separately.
- 1.50.4 Replacement of spare parts during contract period would be borne by the Tenderer at their own cost.

List of spare parts

- vii) Rotating Unit: 01nos
- viii) TNC switch: 02nos
- ix) Tr. Feeder relay: 02nos
- x) Bearing: 02 sets
- xi) Indicating lamp "25" nos.
- xii) Contractor: 02 nos.

1.60 DRAWINGS, CURVES & INFORMATION REQUIRED

- 1.60.1 Characteristic curves of pumps showing effective head, pump input power, efficiency, submergence/NPSH, against capacity ranging from shut off condition to at least 125% of rated capacity along with a tentative General Arrangement Drawing showing relevant details shall be submitted with the offer.
- 1.60.2 The successful bidder shall furnish the following drawings/data for Employer's approval after award of the contract.
- 1.60.3 All data furnished during bidding stage shall be treated as final and binding on the Contractor if, however, any, minor change is essential during detail design stage for any improvement in the system, such changes shall be carried out only after obtaining approval of the Employer.
- 1.60.4 The G.D2 values of the impeller of the pump and Rotor of the motor at 1500 R.P.M. (syn.) are to be furnished.

1.51 INSTRUCTION MANUALS

- a) The instruction manual shall present the following basic categories of information in a comprehensive manner prepared for use by operating and/or maintenance personnel:

- i) Instruction of Erection
 - ii) Instruction for pre-commissioning check-up, operation, abnormal conditions, maintenance and repair.
 - iii) Write up on Controls and interlocks provided, if any
 - iv) Recommended inspection points and periods of inspections.
 - v) Schedule of preventive maintenance.
 - vi) Ordering information for all replacement parts.
 - vii) Recommendation for type of lubricants, lubricating points, frequency of lubrication and lubricant changing schedule.
 - viii) Trouble Shooting Procedure.
- b) The information shall be organized in a logical and orderly sequence. A general description of the equipment including significant technical characteristics shall be included to familiarize operating and maintenance personnel with the equipment.
 - c) Necessary drawings and/or other illustrations shall be included or copies of appropriate final drawings shall be bound in the manual. Test, adjustment and calibration information as appropriate shall be included and shall be identified to the specific equipment. Safety and other warning notices and installations, maintenance and operating cautions shall be emphasized.
 - d) A parts list shall be included showing part nomenclature, manufacture's part number and/or other information necessary for accurate identification and ordering of replacement parts.
 - e) Instruction manual shall be securely bound in durable folder.
 - f) If a standard manual is furnished covering more than the specific equipment purchased, the applicable model (or other identification) number, parts number and other information for the specific equipment purchased shall be clearly identified and highlighted. Sectional drawing to suitable scale and characteristic curves for the particular equipment supplied must be included in the Instruction manual.

13.00.00 PROPOSAL DATA

13.01.00 To complete the proposal, the Tenderer must fill up the following DATA SHEET / CHECK LIST furnished hereinafter.

DATA SHEET / CHECK LIST OF THE PUMPS BEING OFFERED

(FOLLOWING DATA SHEET ARE TO BE FILLED UP SEPARATELY FOR EACH CATEGORY OF PUMPS IF THERE BE ANY)

1.00.00 GENERAL

1.01.00 Manufacturer :

1.02.00 Model No. :

1.03.00	Type of Pump	:	
1.04.00	Non Pullout	:	Yes/No
1.05.00	Impeller Type	:	Closed/Semi open/Open
1.06.00	No. of Pumps offered	:	
1.07.00	Efficiency of Pump at duty condition for solo operation	:	
1.08.00	Efficiency of Pump at duty condition in parallel operation	:	
		:	
2.00.00	PERFORMANCES		
2.01.01	Guaranteed capacity - M ³ /hr without tolerance in single operation & parallel operation	:	
2.01.02	Guaranteed head - MWC at rated discharge discharge, without tolerance in single operation parallel operation.	:	
2.01.03	Input to the Pump (KW) at duty condition in single operation & parallel operation without tolerance	:	
2.01.04	Pump input power at worst operating condition on the range of operation (without positive tolerance)	:	
2.01.05	Pump input power at shut off	:	
2.01.06	Range of operation of Pump	:	
2.01.07	Recommended Motor KW	:	
2.02.08	Pump rated speed (RPM)	:	
2.01.09	Pump specific speed for duty condition	:	

2.01.10	Pump shut off head for duty condition	:
2.01.11	Minimum submergence required in MWC at worst flow condition	:
2.02.01	PUMP NPSHR	
2.02.02	-do- at highest water level condition	:
2.02.03	-do- at lowest water level condition	:
2.02.04	-do- in the operating range, without positive tolerance	:
2.02.05	Pump duty : continuous/intermittent	:
3.00.00	FLEXIBLE JOINTS AND SHAFT	
3.00.01	Flexible Coupling	
3.00.02	Type	:
3.00.03	Make	:
3.00.04	Factor of Safety adopted	:
3.00.05	Degree of Flexibility	:
3.00.06	Extent of Play allowed	:
3.00.07	Shaft diameter	:
3.00.08	Material	:
3.00.09	Factor of Safety adopted	:
4.00.00	THRUST BEARING	
4.00.01	Type	:
4.00.02	Whether separate thrust bearing for pump motor provided or not	:
4.00.03	Method of lubrication	
4.00.04	Whether the thrust bearing is capable for worst loading of both phases	:
4.00.05	Axial thrust at duty point (kg) approx	:
4.00.06	Whether thrust bearing temperature detector provided	:
5.00.01	Are the pumps suitable for parallel operation	:
5.00.02	Whether non-Reserve Ratchet is provided in pump or not	:
5.00.03	Type of lubrication for pump	:

- 5.00.04 Whether pre lubrication arrangement provided
- 6.00.00 **EXPECTED LIVES UNDER NORMAL OPERATION AND MAINTENANCE**
- 6.00.01 Impellers :
- 6.00.02 Pump Bowl Casing :
- 6.00.03 Shaft :
- 6.00.04 Thrust Bearing :
- 6.00.05 Whether pump performance curve (H-Q, Q-P, Q-n, Q-NPSHR) authenticated by the pump manufacturer provided with the offer along with :
system resistance curve
- 6.00.06 Whether the copy of the pump family curve, authenticated by the pump manufacturer provided with the offer :
- 6.00.07 Whether the Pump H-Q curve superimposed on the system head curve submitted with the offer :
- 7.00.00 **GENERAL**
- 7.00.01 Are companion flanges, air release valves, sole plate, arrangement for thrust encounging devices provided :
- 7.00.02 Whether lifting lugs, eye bolts etc. provided :
- 7.00.03 load data
- 7.00.04 Weight of total pump assembly (empty) :
- 7.00.05 Weight of total water column :
- 7.00.06 Total Static Load :
- 7.00.07 Total dynamic Load :
- 7.00.08 Maximum horizontal back thrust at maximum water level condition :

01.01 SUMP PUMP

Provision of two numbers sump pumps have made considering one unit will operate other would remain as standby. All seepage water from glands would be accumulated in a sump of dimension approximate 1.5-meter x 1.0-meter x 0.6 meters. The capacity of each pump would be 30M³/Hr at a head 15 Meter. The drive motors would be of adequate rating of 415± 10% volt, 50Hz ±3% and 2900 rpm to cater the load of the above pumps. The delivery pipes of individual pumps will be connected to a common manifold would be such that the water can be drained in a nearby location,

outside the pump house within a distance of 10 meter maximum. The NRV and pit valve shall be placed in each pump delivery line and one no pit valve shall be placed in delivery line which generates from the common header. All GI pipes and specials within the bidder's scope. The bidder has to provide suitable capacity DOL starter for individual pump motor set and placed in the suitable place for easy operation. The power will be taken from the control panel through switch fuse unit.

OR

The portable submersible dewatering pump motor set will be suitable for dewatering gland leakage muddy water with adequate rating of 415± 10% volt, 50Hz ±3% and 2900 rpm to cater the load of the above pumps. Submersible motor will be oil filled. The pump will be fitted with suitable mechanical seals, ball bearing etc. and shall be capable of performance details below when running in 2900. The pump will be fitted with cast iron / bronze impeller fitted in cast iron casing.

Pumps and motor shall be closed coupled and motor will be placed on top of the pump. This arrangement will ensure that in the sump can be drained to the maximum extent possible, so that the level of water in the sump is only a few cm above the pump inlet.

The motor winding will be insulated with oil and water resistance materials. The pump and motor unit shall be capable of running dry even when the motor oil seals fail draining out the oil from the motor and running which vertically no water sump.

Installation: -

As per technical specification and instruction manual of the manufacturer.

2.0 MOTORS

2.01.00 SCOPE

2.01.01 This specification covers the general requirements of the drive motors.

2.01.02 Motor shall be furnished in accordance with both this general specification and the accompanying driven equipment specification.

2.01.03 In case of any discrepancy, the driven equipment specification shall govern.

2.02.00 STANDARDS

All motors shall conform to the latest applicable IS/BS/DIN Publications.

2.03.00 TECHNICAL SPECIFICATION FOR DRIVE MOTORS

2.03.01 The drive electrical motors shall be of squirrel cage induction type vertical axis to suit the size of the pump and shall be able to drive the pump. The rating of the motor shall be minimum 90KW & 1500 RPM (Syn.), 415V ± 10%, 3 Phase, 50 Hz ± 5%,

2.03.02 The motor shall be designed for Star / Delta starting arrangements. The motor starting current shall be guided by IS 12615.

- 2.03.03 All the motors shall be rated for continuous duty operation (duty: S1) IE2. However, due to the operational schedule of the pumping station, the pump motor unit may demand for 8/10 start and stop in a day with a minimum time gap of 20 minutes for one stop after prolong operation and restart the same. The motor shall also be capable of one immediate hot restart and three equi spaced starts per hour.
- 2.03.04 The motor KW rating shall have at least 20% margin over the maximum pump input at duty point or 10% margin over the maximum pump input in the worst case of operation whichever is higher. The overload capacity of the such selected motor rating shall be 10% continuous by allowing temperature rise upto Class-F limits. If the tenderer feel that the above rated motor is not satisfying stated loading, they may offer their rating of motor.
- 2.03.05 The motor characteristics shall match the requirements of the driven equipment.
- 2.03.06 The motor should deliver rated output and accelerate the full speed with 85% of the rated voltage at motor terminal. The accelerating time of the motor should not be more than 3 sec.
- 2.03.07 With 85% rated voltage at motor terminal, the motor shall be capable of working satisfactorily at full load at least 5 minutes without injurious heating or stalling. For 3% voltage imbalance in power supply, the motor shall not be de-rated by more than 10%.
- 2.03.08 The locked rotor withstand time under hot condition at 110% rated voltage shall be more than motor starting time by at least 2.5 sec. Hot thermal withstand curve shall have a margin of at least 10% over the full load current of the motor to permit relay setting using motor rated capacity.
- 2.03.09 The motor shall be TEFC type having protection group of IP 55. Motor shall be suitable for rotation in both the direction.
- 2.03.10 The insulation of the stator winding of the motor shall be of Class-F but the heat exchanging arrangement shall be such that the temperature rise is limited to that of Class-B as IS:325 over the ambient temperature. The ambient temperature may be considered as 45°C and the relative humidity may vary from 80% to 100%.
- 2.03.11 The rotor of the motor should be sturdy in construction so as at ensure trouble free operation as indicated in relevant clause without any rotor bar fracture inside or outside the rotor slots or rotor bar end brazing failure or development of cracks in the brazed joint of the rotor bar with shorting ring. The rotor bar of the rotor shall be 99.99% electrolyte grade Cu and shall be well machined, insulated tightly placed and evenly press fitted inside the rotor slots, the later being broached to have smooth finish. The rotor shall be slotted end ring design. The rotor bars in the form of temple bars shall be used. Proper brazing materials shall be used.
- The rotor shall be dynamically balanced with all the fans and with key in the shaft extension.

The rotor must carry a guarantee of at least 20,000 starts as per the operations schedule mentioned in relevant clause without any rotor bar failure or any other type of rotor failure.

- 2.03.12 The motor shall be provided with anti-friction bearing, grease lubricated both at driving and non-driving ends.

The bearings shall be provided with seals to prevent leakage of lubricant or entrance of foreign matter like dirt, water etc. into the bearing area.

Grease lubricated bearings shall be pre-lubricated and shall have provision for on-service positive lubrication with drains and grease collectors to guard against over lubrication.

The type and number of bearing the lubricant details (limited to normally available types of IOC or, any standard make). Quantity and frequency of bearing lubrication should be clearly indicated in the offer as well as to be displayed in the rating plate of the motor.

- 2.03.13 The motor should be smooth in operation and the noise level should not exceed 85 db at 1.5M from the motor. The vibration level of the pump and motor should be within the specified the limit of IS:11724 and must be within 75 microns.

The motor should have adequate number of terminal boxes for main power cable, control cable & signal cable. The motor main terminal box shall be

rotatable in steps of 90°. The main terminal box should be suitable for 2 nos. 3 core, 1.1 KV grade, 150 sq.mm. Aluminium conductor, armoured, XLPE Cable. The terminal boxes shall be with removable cover with access to connection. No compound shall be used in the terminal box for easy handling. The motor terminal boxes shall be furnished with suitable cable lugs and double compression brass glands to match with the cable size. The terminals shall be clearly identified by phase markings and termination indication corresponding to direction of rotation.

The maximum system fault current for a duration of 1.0 sec. shall be considered.

The motor shall be equipped with built-in anti-condensation space heater of adequate rating suitable for operation at 240V AC supply. Separate terminal box for the space heater connection are to be provided.

The frame of each motor shall be provided with two separate and distinct grounding pads suitable for accommodation of grounding conductors of suitable size GI flat. The main cable terminal boxes shall have separate grounding pads.

- 2.03.14 The rating plate of the motor should contain, the minimum information as indicated in the relevant IS. Apart from the same, the information as indicated in relevant clause as well as the temperature rise in °C under rated condition, method of measurement, degree of protection shall be furnished.

- 2.03.15 The successful tenderer should furnish the motor load-efficiency curve, torque-speed curve load-power factor curve, thermal withstand curve (hot and cold), current-speed curve and current-time curve.

- 2.03.16 The dimensional drawing of the offered motor, terminal box drawings, load data, GD2 value of the drive unit and the driven unit shall be furnished to the EIC for approval.
- 2.03.17 Apart from the standard accessories provided by the motor manufacturer and those accessories mentioned in preceding paras, one local lock switch is to be provided with each motor having proper connection with the motor connecting switchgear so that the motor breaker can not be closed when the lock switch is in operation. The motor shall also be provided with suitable lifting lugs eye bolts having adequate provision for lifting installation.
- 2.03.18 The motor shall be provided with RTD's and BTD's for alarm and trip (for rating 75 KW and above). The leads shall be brought out to a separate terminal box.
- 2.03.19 The routine tests as per IS:325 shall be conducted to each motor. Temperature rise test are to be conducted on at least one motor of each rating. The motor vibration tests shall be conducted mounting the motor on the shop motor stool. All the above tests are to conducted at the manufacturer's shop in presence of the departmental representatives. Apart from the shop testing, normal field testing are to be carried out during installation, pre-commissioning and commissioning. All necessary arrangements for the tests are to be made by the contractor.
- 2.03.20 Motors upto 5 KW shall be of DOL starting and beyond 5 KW shall be Star-Delta Starting

CHECK LIST OF THE MOTORS BEING OFFERED

- 1.01.00 Manufacturer of the Motor
- 1.02.00 Rates output in KW
- 1.03.00 No of Poles
- 1.04.00 Speed
- 1.05.00 Nos. offered
- 1.06.00 Type of duty & duty designation (as per IS 325)
- 1.07.00 Whether the motor is capable for operation after one hot restart and/or three equispace hourly restarts.
- 1.08.00 Supply conditions

- 1.08.01 Rated voltage (Volts)
- 1.08.02 Allowable variation in voltage (%)
- 1.08.03 Frequency (Hz)
- 1.08.04 Allowable variation in frequency considered
- 1.09.00 No. of phase
- 1.10.00 Stator connection
- 1.11.00 Currents
 - 1.11.01 Full load current
 - 1.11.02 No load current
 - 1.11.03 Starting current % of full load current
- 1.12.00 Efficiency at 100% & 75% load
- 1.13.00 Power factor at 100% & 75% load
- 1.14.02 No load power factor
- 1.15.00 Method of starting
- 1.16.00 Starting torque (% of full load torque)
- 1.17.00 Maximum torque (% of full load torque)
- 1.18.00 Acceleration time (sec.) from dead stop to full load speed
 - 1.19.00 With 100% terminal voltage
 - 1.20.00 With 85% terminal voltage
- 1.21.00 Safe stall time - cold/hot
- 1.22.00 Class of insulation
- 1.23.00 Ref Ambient (temperature EC)
- 1.24.00 Temperature rise in (EC) by resistance method & class which limited
- 1.25.00 Type of enclosure

- 1.26.00 Degree of protection
- 1.27.00 Installation
- 1.28.00 Shaft orientation & mounting
- 1.29.00 Space heaters - No proposed
 - 1.29.01 Number
 - 1.29.02 Rating (Watts)
 - 1.29.03 Voltage, Phase, Frequency
- 1.30.00 Whether separate terminal box provided for
- 1.31.00 Bearings
 - 1.31.01 Driving end
 - 1.32.02 Non-driving end
 - 1.32.03 Anticipated life (hours)
- 1.33.00 Recommended lubricant
- 1.34.00 Whether separate lubricant nipple provided
- 1.35.00 Interval of lubrication (hours)
- 1.36.00 Whether winding temperature detectors & bearing temperature detector provided
(Rating 75 KW & above)
- 1.37.00 Whether separate terminal box for BTDs & RTD's provided
- 1.38.00 Approx. weight of the motor (kgs)
- 1.39.00 Dynamic load (kgs)
 - 1.39.01 Normal running condition
 - 1.39.02 Starting condition
 - 1.39.03 Short current condition
- 1.40.00 GD2 value of motor (kg M²)

1.41.00 GD2 value of load to motor shaft (kg M²)

1.42.00 Painting

1.43.00 Earth terminal & lifting lug provided (Y/N)

1.44.00 Technical leaflets/literatures provided or not

2.00.00 TESTS

2.01.00 Upon completion, each motor shall be subjected to standard routine tests as per I.S. In addition, type test (Temperature rise) of at least 1 no. motors as per choice of the customer, shall be performed. Further any special tests called for in the driven equipment specification shall be performed. The manufacturer/tenderer has to bear all expenses for such testing to witness the tests for max. two representatives of EIC to the manufacturer's premises.

2.02.00 3 (Three) copies of routine test certificates and type test certificate shall be submitted for approval prior to the despatch of the motors from the manufactures factory.

3.00.00 SPARES

Spare parts are to be supplied as specified separately. Recommended spares for five (5) years operation shall be quoted along with the bid clearly identifying the part nos. with recommended quantities.

i) DE & NDE Bearing :1 set.

4.00.00 DRAWINGS, DATA & MANUALS

Drawings, data & manuals for the motors shall be submitted as indicated below:

4.01.00 Along with the bid:

Individual motor data as per Check List

4.02.00 After Award of the Contract for Approval:

- a) Dimensional General Arrangement Drawing
- b) Foundation Plan & Loading
- c) Cable end box details
- d) Load Vs Efficiency & power factor, Current Vs Time / Speed curves
- e) Thermal withstand curves hot & cold
- f) Speed torque characteristics at 80% & 100% voltage
- g) Complete motor data

VALVES AND SPECIALS

11.01.01 Delivery side of pumps

The delivery side of each pump shall be provided with 1 no. Electrical Actuator operated butterfly valve and 1 no. non-return valve, 1 no. Dismantling joint & short pieces wherever required. The diameter of the valves and joints shall select based on velocity of 2.0 m/sec(approx.) with nearest sizes as per IS.

11.01.02 Non Return Valve

The non-return valve as mentioned here in before shall be manufactured conforming to IS: 5312 (Part-I) / equivalent international standard. The valves will be used for handling clear water and to maintain unidirectional flow. The valve shall be maintenance free, leak proof and shall have low life cycle cost. The PN rating of valves shall be PN 1.6.

The non-return valve shall be single door, Ductile Iron, double flanged, conventional non-slam design. The body, door, cover shall be of ductile iron (Gr. GGG 40). The seat and body shall withstand fluid pressure of 16kg / cm² and 24 kg / cm² respectively. The body seat, door face rings, bearing block, disc shaft, hinge pin, plug and fasteners shall be of SS 316. The bearings shall be suitable for maximum thrust imposed by the shaft during testing and in service.

The end connection shall be drilled flanged type as per IS or BS or equivalent standard. The non return valve shall have features for quick closing (up to 85%) and slow closing from 85 to 100%. It shall have by pass valve with cock. The valve shall be marked to indicate the direction of flow.

The design and construction of the non return valve shall be non slam type and the disc shall be so balanced that the it will not bump against the valve body while the pump is in operation.

The surface protection of the valve shall be done by either epoxy powder coating or epoxy painting (min. paint thickness - 250 micron) for both inside and outside.

All bolts and nuts for flange connection(s) of entire pipe line (delivery & common manifold) where applicable shall be of carbon steel having tensile strength 300 N/ mm².

The valves are subject to satisfactory hydrostatic test at manufacture's works and in presence of the department's representative for acceptance.

The MOC of other accessories to complete the individual delivery piping like Y or T bends, flanged end short piece, flanged end enlarger/ reducer or any other components required to complete the job in all respect shall be MS as per IS 226.

11.02.01 Butterfly Valve

The butterfly valves shall be DIDF, PN 1.6, conforming to IS 13095 of 1996 / BS

5155. The seat pressure shall be 16 kg/cm² and body pressure shall be 24 kg/cm². The valve shall operate smoothly & steadily in both directions, free from flow induced vibrations. The butterfly valve shall be double flanged, double eccentric design. The body, disc materials shall be of ductile iron (Gr. GGG 40). It should provide tight shut off closures & shall be suitable for frequent operation as well as from throttled duty conditions. The valve disk should rotate 90° from full open to full close. The valve disk shall be solid streamlined slab design, and to have minimum head loss. The seat ring shall be of stainless steel (SS) with micro finished nickel / Monel overlay. The seating shall preferably be integral. The disc seal shall be of elastomeric EPDM. The EPDM seal on the disc must be of easily replaceable type with the facility of replacement at site. The shaft bearings shall be medium free, steel backed PTFE / bronze and suitable for maximum axial thrust imposed by the shaft during testing and in service. The fasteners shall be of SS 304. The valve shall have suitable and adequate capacity of gear box actuator with hand wheel and indicating pointer. The gear box actuator unit shall be of so sealed type with necessary attachments such that external water do not enter the gear box housing to spoil the mechanism. The gear box shall be directly coupled to electrical actuators. The electrical actuators shall be complete with motor starter with reversing control gear, mechanical indication showing the amount of valve opening and shall have the following components.

- b) 415V ± 12.5% 3 phase, 50 Hz, AC motor.
- b) Reduction gearing arrangement.
- c) Torque & limit switch mechanism.
- d) Valve position indicator.
- e) Arrangements for pick up signals for displaying the % opening of the valves in the suitable meters to be placed on control desk.
- f) The hand wheel with clutch mechanism for manual operation. The manual operation shall be automatically declutched when actuator motors in operation.
- g) Motors shall be of outdoor construction, IP68 protection group.

The motors and gearing arrangement shall be of adequate to open and close the valve under full unbalance pressure and to overcome the seating torque. The torque switch should function as a full proof design by tripping the motor in case of over torque condition

11.02.02 ELECTRICAL ACTUATOR

- 2. The actuator motor for the BFV shall be suitable for use on 415 ± 10% Volts, 3 phase, 50 HZ power supply and shall have high torque and low inertia squirrel cage motor having minimum class F insulated, 15 minutes rated and shall be with temperature sensing protection by a thermostat / thermistor directly embedded in all phases of the stator winding.
- 2. The actuator motor shall be provided with complete environmental protection during prolonged period of inactivity to prevent condensation and must have IP 68 degree of protection for continuous submergence.

3. The actuator motor must have high starting torque and it shall be suitable for 60 Starts / hour. The actuator gear box assembly shall be of the totally enclosed oil bath lubricated type and shall be suitable for operation at any angle.
- 4 The actuator assembly shall have a mechanically independent hand wheel drive for emergency manual operation of the valve by declutching the actuator motor drive by integral lever or otherwise. The drive shall be restored to power drive mechanism automatically on starting of the actuator motor.
- 5 The actuator assembly shall be provided with following limit switches
 - iii. torque limit switches for 'open' and 'close'
 - iv. Position limit switches

All switches shall have contact ratings of 10 amps at 250 volts AC inductive.
- 6 The actuator assembly shall have integral reversing contactor starter, local control facilities and terminals for remote control and indication circuit at remote end. The starter shall be both mechanically and electrically interlocked and shall have adequately rated contactors to suit the actuator motor rating. The motor shall positively be protected from any earth leakage and single phasing. All electrical shall be mounted on a readily accessible printed circuit board to facilitate withdrawal of starter assembly without any electrical disconnection. Local control shall comprise of one pad lockable three position L/R selector switch and push button switches for open, close and stop. All external wire connections shall be within the scope of the contractor.
- 7 The actuator assembly shall have facilities to indicate the position of the valve in remote control desk (percentage opening of the valve). The actuator assembly shall have one mechanical dial indicator to indicate the position of the valve. In addition, end of travel indication shall be illuminated with red indicating valve open and green indicating valve closed. The valves and actuators are subject to satisfactory shop test at manufacture's works and PG test at site in presence of the department's representative for acceptance.

The electrical actuators shall have the following components.

- i) 415V \pm 12.5% 3 phase, 50 Hz, AC motor.

- j) Reduction gearing arrangement.
- k) Torque & limit switch mechanism.
- l) Valve position indicator.
- m) Arrangements for pick up signals for displaying the % opening of the valves in the suitable meters to be placed on control desk.
- n) Remote operation facility with selector switch and local control console.
- o) The hand wheel with clutch mechanism for manual operation. The manual operation shall be automatically declutched when actuator motors in operation.
- p) Motors shall be of outdoor construction, IP 68 protection group suitable for continuous submergence.

The motors and gearing arrangement shall be of adequate to open and close the valve under full unbalance pressure and to overcome the seating torque. The torque switch should function as a full proof design by tripping the motor in case of over torque condition.

11.04 **M.S. DISMANTLING JOINT ASSEMBLY AT INDIVIDUAL DELIVERY LINE AND MANIFOLD**

One M. S. dismantling joint of suitable diameter is to be fixed in each of the individual delivery and one no along with the Flow meter & BFV on the water delivery main for the ease of dismantling and fitting of Flow meter during maintenance and to relieve the pipe line stresses. The expansion range for each of the dismantling joint shall be minimum 40 mm. The M. S. dismantling joint shall be complete with long stud (SS 304) holding arrangements with split flange matching with the site requirement. The hydrostatic test pressure of the DJ shall be 16 kg/cm². One leak proof concrete chamber if required as per site condition is to be constructed. The Dimension of the Chamber would however depend on the final alignment and level of the site condition

11.05 **PUMP DELIVERY SIDE PIPING AND COMMON DELIVERY MANIFOLD**

The pump individual delivery side piping, valves and joints and Common Delivery Manifold shall be shall selected based on velocity of 2.0 m/sec(approx.) and 1.55 m/sec (Approx.) respectively with nearest sizes as per IS.

The pipes shall be made up of M.S. 12 mm thick plates for individual delivery line and Common Delivery manifold, painted both inside and outside by anticorrosive epoxy paints. The pipes shall be of welded joints and shall consist of necessary companion flanges so as to connect the piping with the DJ, NRV, BFV's of the individual pump delivery branch. The pump individual delivery side piping shall

be connected to be common delivery manifold as per the layout. Necessary gaskets of suitable thickness shall have to be provided to all flange joints complete with all necessary nuts, bolts, washers etc. The length shall be ascertained from the layout and from the dimensions of the valves/specials.

The common delivery manifold shall of such diameter as per the Technical offer. The manifold shall be fabricated from 12 mm thick MS plates. The common manifold shall have blank flange / Dish end on one side with adequate stiffening (as applicable) and the other side would be extended from the centre line of the last pump to install one each Dismantling Joint, Butterfly valve, Air Release Valve and further as required to install one Full bore Electromagnetic flow meter. The length of the manifold must be extended at least one meter on one side after the interconnections with the delivery pipe lines from the pumps at the one extreme end and in the other end it will be extended up to the specified length.

The common delivery manifold shall be provided with one no. 100 mm dia. air release valve (double throat) suitably placed. The pipe where ever laid underground shall be painted with anticorrosive paints at the inside and outside shall be wrapped and coated with anti-corrosive tape of not less than 4mm thick so as to prevent the pipes from corrosion.

(Necessary surface finish for proper painting and wrapping coating shall be made by the contractor and careful laying shall be done so as to prevent damages during laying).

11.06 Tamper proof Kinetic air release valve

Air valve for clean, cold potable water up to 50°C

PN 10 / 16

DN 80 – 200

Double chamber valve with twin float (Rubber / Vulcanite coated timber core / SS 304) - automatic operation with water.

Two-orifice venting system with 3 functions (supply and release of air as well as automatic venting during operation) Flange connection dimensions to IS 1538 Table 4 & 6

Body and Cover made of CAST IRON IS 210 Gr. FG 260

Seal made of EPDM

Corrosion protection:

Inside and outside with liquid epoxy coating; thickness >250 µm, colour: RAL 5005 blue

Accessories:

Must have a metal seated gate valves (description as above for Sluice Valves upto 800 mm) of same diameter for isolation purpose, complete with gasket and fasteners (steel galvanized)

19.00 Pressure Gauge (Dial Type):

The individual discharge line and common delivery manifold shall be provided with pressure gauge (6" dial) of bourdon type.

The bourdon tube shall be of SS 316. The gauge shall have cast aluminium weather proof case and casing shall be black stove enameled. The accuracy shall be of $\pm 1\%$. The full scale range shall be from 0 -16 Kg / Sq.cm. The pressure gauge shall have 3 way cock and fitting.

4.0 HTPDB

3.1. The HT PDB shall be multi panel switch board suitable for indoor installation and shall operate at 11 KV $\pm 10\%$, 3 ϕ , 50 Hz $\pm 5\%$ AC earthed system. The Switchboard shall comprise of the following

- I) Incomer panel – 1 no
- II) Outgoing transformer feeder panel – 2 nos.

3.2. The switch gear shall be indoor, metal clad, floor mounted, horizontal isolation and horizontal draw out type and shall be suitable for trouble free and continuous operation at 11 KV $\pm 10\%$, 3 phases, 3 wire, 50 Hz $\pm 5\%$, grounded system. The switch gear will be located in a hot, humid and tropical atmosphere.

Design and construction shall be such so as to allow extension at either ends. The base channel frame of the switch gear along with all hardware shall be within the scope of the contract.

The switch gear enclosure shall conform to the degree of protection IP-4X. The minimum thickness of sheet used shall be 2 mm except the gland plate where the sheet thickness shall be 3 mm.

The switch gear assembly shall comprise a continuous dead front, line up of free standing, vertical cubicles. Each cubical shall have front hinged door with latches and a removable back cover. All covers and doors shall be provided with neoprene gaskets.

Circuit breakers, instrument transformer, bus bars, cable chamber etc. shall be housed in separate compartments.

3.3 The Switch gear shall be fully wired at the factory to ensure proper functioning of indications, control, protection, transfer and inter-locking scheme.

Fuse & links shall be provided to permit individual circuit isolation without disturbing other circuits. All spare contacts of relays, switches and other devices shall be wired up-to terminal blocks.

Wiring shall be done with flexible, 1.1KV grade PVC insulated switchboard wires with stranded copper conductors of 2.5 sq. mm for control and current circuits and 1.5 sq. mm for voltage circuits.

Each wire shall be identified with both ends with permanent marker bearing wire number as per contractor's wiring diagram.

Wire termination shall be made with crimping type connectors with insulating sleeves.

Not more than two wires shall be connected to any terminal. At least 25% spare terminal shall be furnished in the terminal block.

3.4 Switch gear shall be designed for cable entry from bottom. Sufficient space shall be provided for ease of termination and connection.

Power cables shall be XLPE insulated, armoured, overall PVC sheathed with stranded aluminum conductors.

Control cables shall be XLPE insulated, armoured, overall PVC sheathed with 2.5 sq. mm stranded copper conductors.

All provisions and accessories shall be furnished for termination and connection of cables, including removable gland plates (3 mm thick), cable supports, crimping type tinned copper / aluminum lugs, brass compression glands with washers and terminal blocks.

3.5 The main buses and connections shall be of high conductivity electrolyte grade copper, sized for specific current rating with maximum temperature rise limited to 90°C.

Bus-bars and connection shall be fully insulated for working voltage with adequate phase / ground clearance. Insulating sleeves for bus bars and cast resin shrouds for joints shall be provided.

All buses and connections shall be supported and braced to withstand stress due to maximum short circuit current and also to take care of any thermal expansion.

Bus-bars shall be color coded for easy identification and the bus-bar chamber shall be provided with inter panel barrier with epoxy cast seal-off bushings through which the buses will pass through so as to prevent fire from one panel to other.

3.6 A copper ground bus, rated to carry maximum fault current for 3 secs., shall extend for full length of the switchgear. The ground bus shall be provided with two bolt drilling with GI bolts, nuts and washers at each end to receive GI flat of adequate sizes to withstand earth fault current.

CT & VT secondary neutrals shall be earthed through removable links so that earth of the one circuit may be removed without disturbing the others.

Each stationery unit shall be directly connected to the ground bus.

3.7 The circuit breaker shall be vacuum type triple pole 800 Amps, 25 KA for 3 secs., horizontal draw out, horizontal isolation having Service / Test / Isolated position with positive indication for each position. The V.C.B. shall have 220 V AC motorized spring charged trip free mechanism and mounted on a carriage complete with self contained manually operated fully interlocked, raising and lowering mechanism with integral earthing /earthing truck. The operating mechanism shall normally be operated from remote electrical control but arrangement should also be made for local electrical control. Mechanical device shall also be provided on the breaker for manually tripping and closing. Each set of the circuit breaker shall have the following features:

- e) 1 set mechanical ON & OFF indicator.
- f) 1 rear entry cable box with glands suitable for 11 KV grade XLPE cable.
- g) 1 set of indicating lamp ON / OFF / TRIP / SPRING CHARGED / TRIP CIRCUITHEALTHY / Service & Test Position Indications for each breaker & in addition DC FAIL / R-Y-B Phase Indications (for Incomer only).
- d) 3 double core current transformers of suitable ratio and accuracy class 5P10 & 1.0 shall be provided for protection & metering
- e) Shunt trip coil and closing coil rated for 110 V DC.
- f) 1 space heater with ON & OFF switch
- g) 15A / 15A 3 Pin Plug Socket
- h) In – panel lighting with control switch
- i) Space heater for each Switchgear panel
- j) 240 V AC Alarm Bell & Buzzar for non – trip fault & trip with provision for alarm cancellation (common)
- k) Auxiliary switches with required contact.
- l) 1 suitable label

In addition, 1 no resin cast and draw out type PT shall be provided suitable for 3 phase, 3 wire 5 limb 50 Hz system with a ratio of 11 KV / 110 / $\sqrt{3}$ / 110 / $\sqrt{3}$ volts, 100 VA, class 1.0 / 3 P. Symmetrical breaking capacity of the circuit breaker shall be 25 KA and making capacity shall be 62KA. The short time rating of the circuit breaker shall be 25 KA for 3 secs.

The circuit breaker shall be capable of carrying rated current at 45°C ambient temperature without derating.

3.8 The feeder details of the Multi panel HT PDB shall be as under:

- A) Incoming feeder Panel: 1 No. (800 A)
 - i) 96 sq mm (0 – 12 KV) Voltmeter with Selector Switch - 1 Set
 - ii) 96 sqmm Ammeter suitably dual scaled with Selector Switch - 1 Set

- iii) Local/ Remote selector switch - 1 No.
 - iv) TNC Breaker Control switch - 1 No.
 - v) Double core Dual Ratio Cast Resin CT of appropriate ratio and 5A Secondary, Class 5 P10 & 1.0, 10VA burden - 1 Set
(3 Nos.)
 - vi) Microprocessor based draw out directional combined IDMTL over current & earth fault relay type P127 or equivalent - 1 No.
 - viii) Trip Circuit Supervision Relay type VAX 31 or equivalent - 1 No.
 - ix) Master Trip Relay type VAJH 13 or equivalent - 1 No.
 - x) Multifunction meter (For Amp. Voltage, frequency, power factor etc.) type ELITE 445 or equivalent - 1 No.
 - xi) Power Factor Meter - 1 No.
 - xii) KW Meter - 1 No.
 - xiii) 12 Channel alarm annunciator & Indicating Lamps - 1 Set
- B) Out going feeder panels for transformers: 2 Nos. (800 A)
Each Transformer feeder panel shall be equipped with the following:
- i) 96 sq mm Ammeter suitably scaled with Selector Switch - 1 Set

- | | | | |
|-------|--|---|------------------------|
| ii) | Local / Remote selector switch | - | 1 No. |
| iii) | TNC Breaker Control switch | - | 1 No. |
| iv) | Double core Cast Resin CT of appropriate ratio and 5A Secondary, Class 5 P10 & 1.0, 10VA burden | - | 1 Set
(3 Nos.
) |
| v) | Microprocessor based draw out type non directional combined IDMTL over current relay with high set instantaneous element and instantaneous earth fault element type P122 or equivalent | - | 1 No. |
| vi) | Master trip relay type VAJH-13 | - | 1 No. |
| vii) | Trip Circuit Supervision Relay type VAX 31 or equivalent | - | 1 No. |
| viii) | Auxiliary relay type VAA -33 or equivalent | - | 3 Nos. |
| ix) | 12 Channel alarm annunciator & Indicating Lamps | - | 1 Set |
- C) Common for all above feeders:
- i) Anti – pumping relay

3.9. Following power supplies shall be arranged to switch-gear.

AC Supply: 220V AC from MCC cum PDB to the switch-gear panels

DC Supply: 110V DC supply in each panel by duplicate feeders shall be made available from the station battery bank / Battery Charger / DCDB stated elsewhere. Hooking up with the station switchgear and other equipments is within the scope of the contractor and shall be done through cables.

- 3.10. All equipment, accessories and wiring shall have fungus protection. Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent the entrance of insects. All surfaces shall be sand blasted, pickled and grounded as required to produce a smooth, clean surface free of scale, grease and rust. After cleaning, the surfaces shall be given a phosphate coating followed by two coats of high quality primer and stove after each coat.

The switch gear shall be finished in RAL 7032 with two coats of epoxy paints

- 3.11 Notwithstanding whatever mentioned elsewhere in the document, following tests shall include but not necessarily limited to the following:
- (a) Operation under simulated service condition to ensure accuracy of wiring, correctness of control scheme and proper functioning of the equipment.
 - (b) All wiring and current carrying part shall be given appropriate high voltage test.
 - (c) Primary current and voltage shall be applied to all instrument transformers.
 - (d) Routine test shall be carried out on all equipment such as circuit breakers, instruments, transformers, relays and meters.

All tests shall be performed in presence of owner's representative.

Certified copies of all the tests carried out at the manufacturer's premises shall be furnished in three copies.

4.0 TRANSFORMER

There will be total two (2) number of transformers, each having a capacity of 800 KVA.

The voltage rating of the Transformer shall be 11 KV / 433 V

Normally the specification of all the transformers are, 11 / 0.433 KV with neutral brought out, 3 ph, 50 c/s, Dyn. 11 vector group, shall be supplied and installed by the contractor. Each of the transformers should be equipped with:

- iv) Conservator with drain valves and oil gauge.
- v) Silica gel breather
- vi) Bidirectional rollers
- iv) PRV with contact.
- v) Oil filter valve
- vi) Transformer tank drain valve, one upper and one lower.

- vii) Earthing terminals – 2 nos.

- viii) Air relieve plugs
- ix) Rating and diagram plate
- x) Bucholz's relay with Alarm and Trip
- xi) OTI with Alarm and Trip contacts
- xv) WTI with Alarm and Trip contacts
- xvi) MOG with contact
- xvii) Marshalling box with contacts of Bucholz, OTI, WTI, MOG & PRV duly wired up to the terminal block

Transformers will be wound with 99.99% electrolytic grade copper wires / flat and the H.T. sides of the transformer will be fitted with OFF circuit tap changing device with a range of +5% to -10% in step of 2½%.

Primary side (H.T.) terminal box shall be suitable for terminating one no. 11 KV grade, 300 sq. mm, Al. conductor 3 core XLPE insulated cable complete with sealing and armour clamping gland.

Secondary (L.T.) terminal box shall be suitable for terminating 1.1 KV grade, 300/240 sq. Mm as required, Al. conductor 3.5 core XLPE insulated cable complete with sealing and armour clamping gland.

Transformers shall be supplied in fully oil filled condition. Transformers should be manufactured according to latest I.S.S. Manufacturers' test shall be carried out in presence of the representative of M.E.Dte. and a test certificate to be submitted. Temperature rise of the transformer shall not exceed 50 / 75°C over oil / winding and also comply with IS 1180 & IS 2026 Latest version, as applicable only in so far as they are applicable.

- 4.1 Two nos. 800 KVA 11 KV / 0.433 KV, DYN 11, ONAN, Distribution Transformer to be manufactured, shop tested, supplied, erected, tested & commissioned generally in conformity with latest revision of IS.
- 4.2 The transformers shall be of the latest design & the transformers shall be suitable for indoor installation. The transformer shall be suitable for operation at full rated power on all tapings without exceeding the following temperature rise. Winding temperature rise - 75 ° C over ambient of 45⁰ C.

- 4.3 The transformer shall be double copper wound and having CRGO silicon steel made core built up with class 'A' insulation, designed and constructed with particular reference to tropical conditions.
- 4.4 The transformer shall be designed to be capable of withstanding, without injury, the thermal and mechanical stress of short-circuits between phases or between phase and earth at the terminals of any winding with full voltage applied across the other winding. The transformers shall be capable of withstanding specified through fault currents for 2 seconds.
- 4.5 The transformers shall operate with minimum noise and vibration. The cores, enclosure / protective housings and other structural parts shall be properly constructed and windings properly braced so that the mechanical vibration is kept to the minimum, thus reducing the noise. The core-coil assembly shall be fixed in such a manner that no shifting or deformation occur during shipment or installation.
- 4.6 The transformer shall be designed for minimum losses as per I.S.1180 guidelines. All mechanism shall be of stainless steel, brass, gunmetal or other suitable material to prevent sticking due to rust or corrosion. If any temporary fitting is fixed to the enclosure / protective housing of a transformer for transporting / handling purposes, these shall be identified as well as instructions and illustrated drawings shall be furnished to facilitate their removal at site after erection.
- 4.7 The transformer shall have off-circuit tap changer in H.T. winding in steps of 2.5% for range (+) 5% to (-) 10 %.
- 4.8 Neutral terminal of star connected winding of each transformer shall be designed for the highest over current that can flow through the terminal. The neutral terminal shall in the LV cable terminal
- box. The transformer also shall have one additional brought out neutral which is intended to be directly connected to earth permanently.

4.9 The transformer shall be generally conformity with latest revision of IS: 11171- 1985 (reaffirmed-2001) and IEC: 726 (1982). Ref standard IS 2026 (Part-I to Part II) IS 10028 (PII) IS 1180 etc. shall be applicable only in so far as they are applicable.

4.10 Transformer Fittings

The transformer shall be fitted with all standard and special fittings and accessories as per IS and CBIP Standard and shall include but not being limited to the following:

- a) Rating, diagram and tap connection plates
- b) Terminal marking plate
- c) Earthing terminal - 2 nos.
- d) Lifting lugs, jacking pads and haulage lugs / holes
- e) Winding temperature indicator with Alarm & Trip contacts.
- f) Oil temperature indicator with Alarm & Trip contacts.
- g) Bucholz's relay with Alarm and Trip contacts.
- h) PRV with Trip contact.
- i) MOG with contact
- j) Externally operated Off-circuit tap switch with position indicator
- k) Cable terminal boxes (both HV & LV side)
- l) Bi-directional wheels with locking and bolting devices

4.11 Each transformer shall be provided with a stainless steel rating plate fitted in a visible position showing the followings.

- a. Kind of transformer
- b. Ref to IS standard
- c. Manufacturer's name
- d. Manufacturer's serial number
- e. Year of manufacture

- f. Number of phases
- g. Rated KVA
- h. Rated frequency
- i. Rated voltage
- j. Rated current
- k. Connection symbol
- l. Percentage impedance voltage at rated current
- m. Type of cooling
- n. Total mass in Kg.
- o. Quantity of Oil.
- p. Percentage Impedance.

4.12 Transformer losses

Transformer losses shall be guided by the I.S.1180 guideline.

4.13 Following shop tests shall be carried out on the transformer along with the other tests in presence of departmental representative –

- a) Measurement of winding resistance.
- b) Measurement of voltage ratio and check on voltage vector relationship.
- c) Measurement of impedance voltage/ short circuit impedance on principal tapping and load loss.
- d) Measurement of no load loss and current.
- e) Measurement of insulation resistance

4.14 TECHNICAL PARTICULARS OF THE TRANSFORMER

Type	:	Indoor
Nature of cooling	:	ONAN
No. of phases	:	3 (three)
Winding connection & vector group	:	DYn-11
Rated frequency	:	50 cycles/sec.
Rated KVA	:	800 KVA
Rated primary voltage	:	11 KV
Rated secondary voltage	:	0.433 KV
Method of system earthing	:	Secondary solidly grounded
Tap-Changer 5% to (-) 10%	:	Off-circuit Tap-changer (OCTC) (+)
Tapings	:	in steps of 2.5%
HV side terminal arrangements terminating sq.mm. XLPE cable.	:	Cable end box on HV side suitable for 11 KV grade 3 core 300
LV side terminal arrangements	:	Secondary (L.T.) terminal box shall be suitable for terminating 1.1 KV grade, 300/240 sq. mm as required, Al. conductor 4 core XLPE insulated cable complete with sealing and armour clamping gland.

5.0 Technical Specification OF 415 V, 2 Incomer & 1 Bus Coupler PDB at Substation

5.1 The PDB is required to provide power to the Pump House MCC cum PDB and auxiliary load at the Sub-station

- 5.2 The PDB shall be suitable for 415 V \pm 10%, 50 Hz \pm 5%, 3 phase, 4 wire supply system. The incoming power shall be provided from the secondary side of transformers.
- 5.3 The PDB shall be 2 mm CRCA sheet steel enclosed, floor mounted type, self supporting, fully compartmentalised, dust & vermin proof, cubicle pattern, non-draw out and modular in construction. It shall be finished painted with powder coated paint after necessary chemical treatment for rust free surfaces and application of anti rust chemical coating. The base frame of the panel shall be made of ISMC – 75 channel.
- 5.4 The PDB shall be dead front type with concealed type hinged doors at front and bolted covers at the rear. All hinged doors shall be interlocked with the respective switchgears such that the same cannot be opened while the feeder is ON.
- 5.5 It shall have rear access and the cable termination arrangement shall be provided at the rear of the respective feeder modules. For incomers, extended bus bars shall be installed preferably from the top of the panel as per respective specifications. The vertical dropper bus bars shall be placed in between two vertical aligned feeder modules.
- 5.6 The bus bar of PDB shall be spitted into two sections with one bus coupler in between. Each section will receive power through an incoming ACB connected from the secondary side of transformers.
- 5.7 The bus bar for the PDB shall be TPN, made of E91E grade Aluminium alloy insulated with 1.1KV grade heat shrink type PVC colour coded sleeve. The rating of the bus bar shall be 1250 A for phases and 630 A for neutral. The current density of the bus bar shall not exceed 1Amp / sq. mm. The bus bars shall be supported on non-hygroscopic type resin moulded insulators and the distance between insulators shall be so designed to make the bus bar system capable of withstanding a short circuit fault current of 50 KA (r.m.s.) for 1 sec. The front bus bar chamber shall be fully shrouded to avoid accidental contact with the live bus bars.

The minimum clearance between bus bars and bus bar to earth shall be as per IS.

5.8 Incoming & Outgoing feeder termination shall be done with extended bus bar arrangement if required. The cable termination chamber shall be provided with cable supporting clamps. Each incoming ACB shall receive power through 1.1 KV grade 4 /3.5core 240/300 sq. mm XLPE insulated armouredaluminium cable as required. The control wiring of the panel shall be done with 1100 V grade PVC insulated 2.5 sq mm flexible copper wire with copper lugs and ferrule marking at each end.

All hinged door shall be earthed with flexible copper wire.

5.9 A continuous earth bus of size 50 x 8 mm and made of aluminium shall run throughout the length of the panel with drilled holes at the end for connecting the same with the station earth bus bar.

5.10 Feeder details with mounted components

The feeder details are as under:

5.11 1250A incoming feeders 2 nos. each comprising of following components:

- x) 415 V, 4 pole, 1250A, 50 KA electrically operated draw out type ACB with microprocessor-based O/L, S/C, E/F & shunt trip release 1 No
- xi) 96 sq mm, suitably scaled Ammeter with cramped scale and selector switch 1 No.
- xii) 96 sq mm, 0 – 500 V Voltmeter with selector switch 1 No.
- xiii) Current Transformer of suitable ratio & 5A secondary, Class: 1.0, 15 VA 3 Nos.
- xiv) Current Transformer of suitable ratio & 5A secondary, Class: 5P10, 10 VA 3 Nos.

- xv) Red, Yellow, Blue phase indicating lamp
as required
- xvi) CB ON / OFF / TRIP / Spring Charged Indicating Lamp
As required.
- xvii) TNC Breaker Control Switch 1 No.
- xviii) Local / Remote Selector Switch 1
No.

5.12 1250 A Bus coupler feeder one (1) number comprising of following components:

- v) 415 V, 4 Pole, 1250 A, 50 KA electrically operated draw out
ACB without release. 1 No.
- vi) TNC Breaker Control Switch 1 No.
- vii) Local / Remote Selector Switch 1
No.
- viii) Bus Coupler ON / OFF / Spring Charged Indicating Lamp
3 Nos.

5.13 Outgoing feeders --- 2 Nos. each equipped with following: (for CWR)

- vii) 415 V, 3 pole, 800A, 50 KA electrically operated draw out type
ACB with microprocessor-based O/L, S/C, E/F & shunt trip release 1
No
- viii) 96 sq mm, suitably scaled Ammeter with cramped scale and selector switch
1 No.
- ix) Current Transformer of suitable ratio & 5A secondary, Class: 1.0, 15 VA
3 Nos.
- x) CB ON / OFF / TRIP / Spring Charged Indicating Lamp
4 Nos.
- xi) TNC Breaker Control Switch 1 No.
- xii) Local / Remote Selector Switch 1 No.

5.14 Outgoing feeders --- 2 Nos. for WTP each equipped with following:

- i) 415 V, 3 pole, 630A, 50 KA electrically operated draw out type
ACB with microprocessor-based O/L, S/C, E/F & shunt trip release 1
No
- ii) 96 sq mm, suitably scaled Ammeter with cramped scale and selector switch
1 No.
- iii) Current Transformer of suitable ratio & 5A secondary, Class: 1.0, 15 VA
3 Nos.
- iv) CB ON / OFF / TRIP / Spring Charged Indicating Lamp
4 Nos.
- v) TNC Breaker Control Switch
1 No.

- vi) Local / Remote Selector Switch 1
No.

5.14 MCCB / MCB feeder of following rating

- a) 32A TPN MCCB with Microprocessor based O/C & E/F releases 3 Nos.

- c) 63A TPN MCCB with Microprocessor based O/C & E/F releases 3 Nos.

(Adjustable O/L) rated upto 50⁰ C without duration

- c) ON / OFF / Trip Indicating Lamp (For each feeder) As
required.

- d) 16 A DP MCB 6 Nos.

5.15 Technical Specification of Air Circuit Breaker (ACB)

The ACB shall be rated as specified elsewhere at 50⁰ C without duration and 50 KA for 1 Sec. The ACB shall be electrically operated drawout type with shunt trip release. The neutral conductor shall be 100% of the phase conductor. The ACB shall be provided with built-in LCD display. Over current releases, if specified, shall have on-line functional testing facility and trip indicators shall be provided to display the nature of fault without any external power supply. Earth fault protection shall have adjustable settings upto 10% of Nominal current. The CTs provided shall be air-core. The ACB shall have position indication with padlocking facility for all positions including door interlock and padlocking facility of the shutters in closed position. The ACB shall be provided with the following features in the front panel.

- Contact position indicator (ON / OFF)
- Stored energy status indicator
- Connected / Test / Disconnected position
- Trip indication on fault
- OK indicator (Mechanical) on the front panel when the trip or OFF conditions are cleared and the circuit breaker can be closed on "ON" command (Manual or Electrical)
- All the accessories viz. shunt, motor and under voltage coils shall be accessible from the front without removing the breaker from its panel for replacement any

7.0 415 V Multi panel MCC cum PDB(A) at Pump House

7.1 The MCC cum PDB is required to provide power to the Pump Motors, auxiliary load and Main Lighting Distribution Board at Pump House.

7.2 The MCC cum PDB shall be suitable for 415 V \pm 10%, 50 Hz \pm 5%, 3 phase, 4 wire supply system. The incoming power shall be provided from the outgoing feeder & PDB at at substation

7.3 The MCC cum PDB shall be 2 mm CRCA sheet steel enclosed, floor mounted type, self supporting, fully compartmentalised, dust & vermin proof, cubicle pattern, non-draw out and modular in construction. It shall be finished painted with powder coated paint after necessary chemical treatment for rust free surfaces and application of anti rust chemical coating. The base frame of the panel shall be made of ISMC – 75 channel.

7.4 The MCC cum PDB shall be dead front type with concealed type hinged doors at front and bolted covers at the rear. All hinged doors shall be interlocked with the respective switchgears such that the same cannot be opened while the feeder is ON.

7.5 It shall have rear access and the cable termination arrangement shall be provided at the rear of the respective feeder modules. For incomers, extended bus bars shall be installed preferably from the top of the panel as per respective specifications. The vertical dropper bus bars shall be placed in between two vertical aligned feeder modules.

7.6 The bus bar for the MCC cum PDB shall be TPN, made of E91E grade Aluminium alloy insulated with 1.1KV grade heat shrink type PVC colour coded sleeve. The rating of the bus bar shall be 800A for phases and 400A for neutral. The current density of the bus bar shall not exceed 1Amp / sq mm. The bus bars shall be supported on non hygroscopic type resin moulded insulators and the distance between insulators shall be so designed to make the bus bar system capable of withstanding a short circuit fault current of 50 KA (r.m.s.) for 1 sec. The front bus bar chamber shall be fully shrouded to avoid accidental contact with the live bus bars.

The minimum clearance between bus bars and bus bar to earth shall be as per IS.

7.7 Incoming & Outgoing feeder termination shall be done with extended bus bar arrangement if required. The cable termination chamber shall be provided with cable supporting clamps. Each incoming MCCB shall receive 1.1 KV grade 4/3.5 core 300/240 sq mm XLPE insulated armoured aluminium cable. The control wiring of the panel shall be done with 1100 V grade PVC insulated 2.5 sq mm flexible copper wire with copper lugs and ferrule marking at each end.

All hinged door shall be earthed with flexible copper wire.

7.8 A continuous earth bus of size 50 x 8 mm and made of aluminium shall run throughout the length of the panel with drilled holes at the end for connecting the same with the station earth bus bar.

7.9 Feeder details with mounted components

The feeder details are as under:

7.10 A incoming feeder 2 nos. comprising of following components:

- x) 415 V, 3 pole, 800A, 50 KA electrically operated draw out type ACB with microprocessor-based O/L, S/C, E/F & shunt trip release 1 No
- xi) 96 sq mm, suitably scaled Ammeter with cramped scale & selector switch 1 No.
- xii) 96 sq mm, 0 – 500 V Voltmeter with selector switch 1 No.

- xiii) Current Transformer of suitable ratio & 5A secondary, Class: 1.0, 15 VA 3 Nos.
- xiv) Current Transformer of suitable ratio & 5A secondary, Class: 5P10, 10 VA 3 Nos.
- xv) Red, Yellow, Blue phase indicating lamp as required
- xvi) MCCB ON / OFF / TRIP / Earth Fault Trip Indicating Lamp 4 Nos.
- xvii) TNC Breaker Control Switch 1 No.
- xviii) Local / Remote Selector Switch 1 No.

7.11 800 A Bus coupler feeder one (1) number comprising of following components:

- iv) 415 V, 3 Pole, 800 A, 50 KA electrically operated draw out ACB without release. 1 No.
- v) TNC Breaker Control Switch 1 No.
- vi) Local / Remote Selector Switch 1 No.
- iv) Bus Coupler ON / OFF / Spring Charged Indicating Lamp 3 Nos.

7.12 90KW Star – Delta Starter Motor feeders (with individual capacitor feeder), each comprising of following components: Type 2 coordination should have to be followed.

(Number of feeders shall be no. of Pump sets installed plus one spare)

- a) Not less than reqd. A, 50 KA MCCB with microprocessor-based trip unit with adjustable overload, short circuit & earth fault rated upto 50⁰ C without deration - 1 No.**
- b) Not less than reqd. A Air Breaker Contactor with - 3**

	240 V AC Coil arrangement	Nos.
c)	Clustered LED type indicating lamp for ON / OFF / TRIP / EARTH FAULT TRIP	- 4 Nos.
	Start / Stop Push Button	- 1 Set
d)		
e)	96 Sq mm suitably scaled including cramped scale Ammeter with selector switch	- 1 No.
f)	True Digital Microprocessor based Motor Protection relay suitable for 5A CT secondary and having thermal overload protection, instantaneous short circuit protection, inverse and definite time negative sequence current protection, instantaneous and definite time earth fault protection, locked rotor protection, loss of load protection and reverse phase sequence protection (Type P225 or equivalent)	- 1 No.
g)	High speed master trip relay type VAJH 13 or equivalent	- 1 No.
h)	CT of appropriate rating and 5A Secondary, Class 1.0, 10 VA	- 3 Nos.
i)	CT of appropriate rating and 5A Secondary, Class 5 P 10, 15 VA	- 3 Nos.

7.13 7.5 KW Star – Delta Starter Motor feeders, each comprising of following components: Type 2 coordination should have to be followed.

(Number of feeders shall be no. of Pump sets installed.)

a)	Motor protection circuit breaker	1 no
b)	Power contractor	3 no
c)	Aux. contractor	5 no
d)	Current transformer	3 no
e)	Analog ammeter	1no
f)	Ammeter selector switch	1 no
g)	Indicating lamp	3 no
h)	On/off push button	2 no.
i)	Star delta timer	1 no
j)	Thermal overload relay	1 no
k)	Power terminal,	2 no

7.14 MCCB / MCB feeder of following rating

a) 32 A TPN MCCB/MPCB with Microprocessor based O/C & E/F releases for delivery valves, common delivery and annex load. with rated amp HRC Fuse.

(Adjustable O/L) rated upto 50⁰ C without duration 3 Nos

b) 63 A TPN MCCB with Microprocessor based O/C & E/F releases

(Adjustable O/L) rated upto 50⁰ C without deration 2 Nos

C) Not less than #A TPN MCCB for actuator feeder 5 Nos

D) 100 A TPN MCCB with Microprocessor based O/C & E/F releases 1 nos.

e) ON / OFF / Trip Indicating Lamp (For each feeder) as required.

f) 16 A DP MCB 6 Nos.

9.00 Battery & Battery Charging Equipment

There shall be one battery bank along with float and boost charger. The battery bank shall be Exide make 110 V Sealed Maintenance free VRLA battery with UPST type 55 nos. 2 volt 100Ah cells.

Inter row connectors / inter tier connectors shall be provided where necessary. Suitable battery stand complete with cell number plate shall be provided.

The three phase float and boost battery charger with integral DCDB shall be housed in a floor mounting type steel enclosure with adequate ventilation for natural air cooling. The broad specification of the float and boost charger with DCDB is as under :

Battery: 110 V, 100 AH SMF VRLA (2 V x 55 Nos.)

Load : 10 A DC, Boost: 15 A DC

9.1 A.C. Input

- a) Voltage : 415 V, $\pm 10\%$
- b) Phase : 3 Phase, 4 Wire
- c) Frequency : 50 Hz $\pm 6\%$
- d) Combined voltage & frequency variation within : $\pm 10\%$
- e) System earthing : Solidly earthed

9.2 Float and Boost Battery Charger

9.2.1 Charger – I (Float Charger – SCR Control)

- a) Output Voltage : 110 – 125 V DC [steplesslyadjustable]
- b) Output current : 10 A D.C. + trickle charging current
- c) Rectifier Configuration : Full wave fully controlled SCR bridge
- d) Control mode : Constant voltage current limiting
- e) Regulation : $\pm 1\%$
- f) Ripple voltage : 1% RMS

9.2.2 Charger – II (Boost cum Float Charger – SCR Control)

- a) Output Voltage Boost : 110 – 127 V DC [steplessly adjustable]
Em. Float: 110 V – 125 V DC [steplessly adjustable]
- b) Output current Boost: 15 A D.C.
Em. Float: 10 A DC + Trickle charging current
- c) Rectifier Configuration Full wave fully controlled SCR bridge
- d) Control mode Constant voltage current limiting
- e) Regulation $\pm 1\%$
- f) Ripple voltage 1% RMS
- g) Commencement & termination Automatic / Manual
of boost charging

9.3 Protection

- a) Snubber across each device
- b) Phase failure / sequence reversal
- c) Soft start with current limiting (intrinsic feature of trigger PCB)

9.4 Annunciation

- a) Mains fail
- b) Phase fail & sequence reversal
- c) Float under voltage
- d) Float over voltage
- e) Battery fuse blown
- f) Battery under voltage

9.5 Indicating LEDs / Lamps

- a) AC supply healthy - 3 Nos.
- b) Float Charger ON - 1 No.
- c) Boost charger ON in Auto mode - 1 No.
- d) Boost charger ON in Manual mode - 1 No.
- e) Boost charger ON in Em. Float mode - 1 No.

9.6 Metering

- a) AC Voltmeter with Selector Switch at input
- b) DC Voltmeter with Selector Switch at output
- c) DC Ammeter at output
- d) Centre zero Ammeter at battery path

9.7 DCDB Outgoing Feeder

- a) 2 P, 16 A DC MCB - 6 Nos.

9.8 Enclosure

- a) Material - Mild Steel Sheet (2 mm thick)
- b) Painting - Powder coated (Shade RAL7032)
- c) Doors - Front – 1, Rear – 2
- d) Cable entry - From Bottom
- e) Ventilation - Air natural through louvers backed by fine wire mesh

10.00 CABLE:

All HT and M.V. power cables shall be with XLPE insulation, stranded aluminium / copper conductor and armoured

10.01 HT &M.V. Cables and Jointing

All HT and M.V. Cables shall be 11 KV (E) / 1.1 KV grade XLPE insulated and armoured of Al / Cu. conductor 3 core / 3½ core / 4 core as required. The core shall be stranded and the installation shall be suitable for the working condition. The cable wherever laid in underground trenches shall be of minimum 800 mm width x 1000mm average depth or with cable tray arrangement where necessary and in suitable size cable tray in the pump floor / Sub-station building / between Pump House & Substation Building. Where cable is laid in masonry trench, the cable trenches (where applicable) shall be filled up with sand or covered with chequered plate/RCC slab according to the direction of Engineer-in-Charge. Where necessary cables shall be supported on clamps of approved type and shall be properly protected with G.I. conduit or other protective covering as per direction of Engineer-in-Charge.

All Jointings should be of 'dry type' to be done with hydraulic crimping machine where applicable & done in accordance with the provision of I.E. rules. All jointing materials and other accessories shall be included in the quoted price.

10.02 Control cable and jointing

All Control cables shall be XLPE insulated of 1100 volts grade multi strand copper conductor and armoured of suitable size. The control cable should be terminated with proper sockets, glands etc. At least 2 cores shall be kept as spare in all control circuits.

FLOW SENSOR

There shall be one number of Full bore Electromagnetic flow meter on the common delivery manifold. The flow meters is to be installed and commissioned for measuring the instant flow rates as well as the total flow for a period of time of the station passing throughout the common manifold. The flow rates shall be indicated in m³/hr& total flow in cubic meter. The flow sensor shall be suitable to measure Raw water. The flow meter shall be electromagnetic inline type to provide indication, totalization and signal transmission of the liquid. The display is required at the Control Desk around 50 mtr. away from the transmitter installation point on the pipe line. Amplification of signals, if necessary, are to be incorporated. The flow meter must be capable of measuring velocity of water

upto 3 m / sec with accuracy of $\pm 0.5\%$. Flow sensitivity must be ± 0.3 m/s at any flow rate. The linearity of the instrument shall be 0.1% of scale. The sensor must have enclosure of class IP-68. The tenderer shall clearly indicate the position of flow sensor. The data sheet for flow sensor is as follows.

The flow meter will be full bore electromagnetic type should be capable to handle flow of Raw Water.

Type:- Pulsed DC electromagnetic.

Accuracy:- $\pm 0.5\%$ of measure value.

Repeatability:- $\pm 0.2\%$

Size of flow meter:- As per designed diameter of the common delivery manifold.

Sensor type:- In line full bore electromagnetic.

Process connection:- Flanged type.

Weather protection class:- IP68 NEMA 6 P or as per the specified by EIC.

Minimum conductivity:- 20 us/cm

Full scale velocity:- 1 to 5 m/sec.

Process temperature:- 50 °C max.

Process pressure:- 10 Bar max.

Electrodes:- SS 316 L/ SS 316.

Coil housing :- SS304

Flange MOC:- Carbon steel .

Flow sensor tube:- SS304

Cable between sensor and transmitter:- Copper cable of single Length as required as per site condition between sensor and transmitter.

Flow transmitter:- Microprocessor based, wall mounted.

Type of display of transmitter:- Display should be LCD or LED type and the size should be suitable for making it visible from at least 6m distance.

Out put:- 4-20 mA DC

Power supply :- 240 V AC 50 Hz and shall be supplied from the MCC cum PDB at a approximate distance of 50 m.

Input:- From flow tube

Web server:- The flow meter should be compatible for connection with web server for remote facility display facility.

Protection class :- IP 68.

Calibration shall be accredited according to ISO/IEC 17025.

13.00 Flow meter/ Flow sensor or Flow Tube fixing chamber

For fixing of Flow Tube at the delivery manifold, leak proof chamber of adequate dimension is to be constructed if required as per site condition with a rung-ladder of suitable length for getting down if necessary.

EARTHING

The total installation shall be effectively earthed by providing a ring main earthing. Each earthing set shall consist of one G.I. pipe of not less than 2" dia and 10' length. The electrode shall be buried below the ground upto the depth of moist earth which shall not be less than 8'-0" from ground level and must be 6'-0" away from any building structure. The bottom portion of the electrodes shall be properly perforated and one cast iron cap properly screwed of approved type and design and shall be fitted on the top of the electrode, connection leads to the earth bus inside the station. After fixing and drawing out of the earth leads, the top portion of the earth, electrode upto 1 ft. shall be properly brick pitched and shall be fitted with water proof bituminous compound. The connecting lead shall be GI strip 75 x 8 mm and shall be laid at a depth of not less than 600 mm from ground level. The leads shall be connected to GI earth bus bar inside the pumping station by means of proper welds. The nos. of individual earthing connected to the Earth bus should such that after installation the earth resistance of the system must be well below one ohm.

One GI bus bar 75mm wide and 8 mm thick shall be provided so that the frames of all electric motors, switch gears, transformers and other electrical accessories and installation shall be connected to this station earth bus by two separate GI strip of adequate dimension. All metallic cover frames, equipments, installation etc. shall be earthed to the full satisfaction of Engineer-in-charge and the Govt. Electrical Inspector.

The earthing and bonding shall be according to the I.E. Rules 1956 with amendment of 1990. All non-current carrying metal parts associated with H.V. installation shall be effectively earthed to the grounding system to achieve:

- a) Limit the touch and step potential to tolerable values;
- b) Limit the ground potential rise to tolerable values so as to prevent danger due to transfer of potential through ground, earth wires, cable sheath etc.
- c) Maintain the resistance of the earth connection to such a value as to make operation of the protective device effective.

The same must be approved by the Govt. Electrical Inspector and shall pass the statutory tests.

The successful tenderer shall have to submit the detailed and fully dimensioned drawing of the whole electrical system showing the proper earthing duly approved by the Govt. Electrical Inspector before commencement of the actual installation work.

The distance between each individual Earth Pits should not be less than 3 meters.

16.00 LIGHTING SYSTEM

16.01 Luminaries

The scope includes indoor lighting of pump house, substation building, Annex area and reasonable area lighting around the Pump House and Substation Building. Industrial Medium bay luminaries with LED 150W lamps are to be provided in a row alternatively in the beams at each of the pump house ceiling. Motor/ Operating floor lighting should be provided with LED T/L industrial type fixtures and to be fixed on the wall at a level above the lintel. The positions are to be finalized as per requirement and direction of the E.I.C. The illumination level would be 150 Lux.

The Substation Room lighting should be provided with LED T/L type fixtures with reflectors tentatively 2X18W with watt cool day light type (Brilliant White). Illumination level would be 200-250 Lux.

In the corridors, toilet, LED T/L with are to be provided to generate an illumination level of 150 Lux.

Area illumination/access bridge level 100 LUX with suitable LED fittings.

All the entrance/exists of pump house shall be provided with LED down lighter or bracket mounted fittings with LED lamps of minimum 45 W as per site condition (minimum 90W for unloading bay entrance).

16.02 WIRING

All wiring installation work must be as per relevant I.S. with proper distribution network, M.C.B. are to be used in distribution boxes and there must be colour segregation for power/netural/ground wires.

16.03 In strategic locations of the substation building / pump house, adequate number of 415 / 240 volt TPN / SPN MCB Distribution board shall be placed with multiple ways of different current rating (MCB) along with a incoming switch from where power to be fed to different switch board.

16.04. Individual switch board shall comprise of multiple number of switch (6/10 Amps rated) as the case may be, which shall be used for switching 'ON' and "OFF" operation of the lights / fans / receptacles etc. The individual switch board shall

be double door design so as to cover up the switch / regulator etc i.e. switches / regulator etc shall be accessible on opening the door cover.

- 16.05 The above stated distribution board shall be fed from independent switch fuse unit / MCB / MCCB located in the PDB.
- 16.06 440 volt, 15 Amps and 240 volts/15 Amps socket outlet shall be provided wherever required and power shall be taken from the individual way of the distribution board.
- 16.07 The minimum required size of the conductor for internal distribution point wiring shall be as follows:

Sl. No	Type of fitting /wiring	Minimum size of wire
1.	LED Fluorescent	2 nos. 1 core -1.5 mm ² copper & 1 no. Earth wire of 1.0 mm ² copper
2.	LED Flood light fitting	2 nos. 1 core -2.5 mm ² copper & 1 no. Earth wire of 1.0 mm ² copper
3.	Receptacle-5A	2 nos. 1 core -2.5 mm ² copper & 1 no. Earth wire of 1.0 mm ² copper
4.	Receptacle-15A	2 nos – 1 core-4 mm ² copper & 1 no Earth wire of 1.0 mm ² copper

17.00 Ventilation & Fire fighting System:

- 17.01 Ventilation: The entire pump house including all electrical rooms and the Sub Station Rooms shall have proper ventilation arrangement. The scope shall include the supply and fixing of following equipments complete with GI conduit wiring /armoured cable including all other accessories as required.
- d) 3 - phase suitable Exhaust fans including proper louvers, duct work, rain cowl and bird protection screen ----- As required for the Pump House to ensure 10 Air changes/Hr..
 - e) Single phase suitable Exhaust fans including proper louvers, duct work, rain cowl and bird protection screen ----- As required for all the rooms of Sub Station as per the direction of EIC.
 - f) Wall mounting type control panel for exhaust fan and others ----- 2 Sets, one each for pump House and substation.

e) 18" Pedestal fan with regulator and all other accessories --- 3 Nos.

17.03 Fire Extinguisher

a) ABC type Portable type fire extinguisher consisting of welded cylinder, squeeze lever discharge valve, internal discharge tube, discharge nozzle suspension bracket, duly charged and pressurized with ISI marked.

b) ABC stored pressure type fire extinguisher 5 Kg capacity with discharge hose and nozzle and consisting of welded cylinder, squeeze lever discharge valve, internal discharge tube, discharge nozzle suspension bracket, duly charged and pressurized with ISI marked.

c) Dry type fire extinguisher 5 Kg capacity with discharge hose and nozzle and consisting of welded cylinder, squeeze lever discharge valve, internal discharge tube, discharge nozzle suspension bracket, duly charged and pressurized with ISI marked.

d) Fire buckets (9 litre capacity) made from 24 SWG GI Sheet including wall mounting bracket and filling of sand.

20.00 OVERHEAD CRANE

20.1 EOT Crane.

The EOT. Crane will be minimum 5 M.T. capacity Electrically Operated Travelling Crane (E.O.T.) with a lift from the operating floor level and up to the level above the installed motors. The long travel & the Cross Travel along with height of lift of the crane shall be finalised after freezing of the Pump House layout drawing. Suitable type of Crain rails, girders and all other accessories as necessary for installation and operation of the crane are to be designed & provided by the contractor within the lump sum quoted amount. The two travels of the main hoists i.e Long, Cross and the hoisting operation shall be manually operated. The buffers must be spring loaded operation.

The EOT Crane should be tested at manufacturer's works / site as per relevant

IS. The same may be witnessed by the EIC. The Contractor has to arrange for such testing at his own cost.

21.00 MECHANICAL TYPE LEVEL INDICATOR

The Mechanical level Indicator shall be equipped with for continuous monitoring of sump level.

The level indicator shall be securely mounted on the pump floor platform. It shall be capable to monitor the sump level continuously. Range of measurement from LWL to HWL shall be around 05Mtr.

SECTION - H **List of Vendors**

Sl. No.	Equipment	Make
01.00	Pump	Kirloskar / Mather & Platt / WPIL Ltd.
02.00	Motor	Siemens / ABB / Marathon/ Crompton
03.00	Control Desk/ MV Switchboard / MCC cum PDB	Sellwin / PCE Projects/RNR.
04.00	ACB/MCCB	L&T / Siemens / ABB / Schneider
05.00	Fuse Switch Unit	L&T / Siemens / ABB / Schneider
06.00	Breaker control switch	Kaycee / Recom / Alstom
07.00	Relays	Schneider / ABB / ER/ Siemens(Reyrolle) /
BCH		
08.00	Contactors	L&T/ Siemens / ABB / Schneider
09.00	Meters	AE / IMP / Enercon/ Secure
10.00	Cable :	
10.01	HT & LT Cable	Gloster / Polycab / Havells / UCL
10.02	Control / Signal Cable	Gloster / Polycab / Havells / UCL
11.00	Pressure Transmitters	Siemens / ABB / Honeywell / Micro System
12.00	Digital Indicators	Micro System /Meco
13.00	Temperature Scanner	Pecon/ Micro System /Laxon / Chino / Masuka Instruments Pvt. Ltd.
14.00	Radar type Level Monitoring	Siemens / Khrono / Rosemount

14.01	System Mechanical Level Indicator	NGM/JoydevEngg. /Star Enterprise
15.00	Flow meter, Indicator, Totaliser	Krohne / Endress Hauser/ABB/Siemens
16.00	Control Fuses	GE/Siemens
17.00	Current Transformer	Kappa /JAWS / Schneider
18.00	Capacitor	Unistar / L&T / Epcos
19.00	Butterfly Valves, Non-Return Valve & Sluice Valve	VAG/ IVC / Kirloskar / Fluidtech/IVI
20.00	Valve Actuators	Rotork / Auma
21.00	Gauges	Bell / Taylors / H. Guru /Bell/Baumer
22.00	Fire Extinguishers	Surex / Minimax / Cease Fire / Fire Shield
23.00	Submersible Sump Pump	KSB / Calama / Kirloskar
24.00	Air Conditioner	Carrier / LG / Voltas
25.00	Lighting system	
26.01	Light Fitting	Philips / Bajaj/C.G/KLITE
26.02	Wire	Finolex / KDK / Havells
26.03	Switches	Anchor / Havells / Cab
27.00	Ventilation System System /	P.N. Chakraborty & Co. / Universal Air PASCO
28.00	Exhaust Fan / Ventilation Fan	Alstom / EPC / Pasco / Marathon
29.00	Crane	Surekha / Pilcare / India Engineering & Implements Co.
30.00	H.T. Switchgear	Siemens / Schneider / ABB
31.00	Power Transformer /AEG/CG	Schneider / KEC/ Voltamp (Vadodara)
32.00	Battery	Exide/Aamron
33.00	Battery Charger	Caldyne / Electro Service /Live line/Dekem

Technical Specification /Scope of Work for Major E/M Equipments.

This is indicative not exhaustive, will be finalized in detail engineering.

SI No.	Brief Description of Item	Qty	Unit
1	Supply, Delivery, Installation, Testing & Commissioning of 330 cu.m/hr& Head Approx 65 m, Vertical Turbine Pump - Motor set with all req. accessories with, suitable motor, 415 V, 50 Hz.	3	Nos.
2	Supply, Fabrication, installation, testing & Commissioning of flanged/ plain ended MS pipe made from MS sheet of relevant IS specification (bends, Enlarger, reducers, fittings, specials, flanges, bolts, nuts, gaskets, etc as required to complete the installation) for Delivery & Common Manifold and Jointing the MS to DI Lines (Minimum 12 mm thickness sheet.)	1	Lot
3	Supply, delivery, Installation, Testing and Commissioning of suitable DI Valves & Joints (i.e Sluice Valve, Butterfly Valve, NRV, DJ, MJ, Air Valve, etc.) for Delivery & Common Manifold.	1	Lot
4	Providing, Installation, Testing and Commissioning of Pressure gauges.	1	Lot
5	Providing, Installation, Testing and Commissioning of Electromagnetic Flow Meter of 350 mm dia.	1	Nos.
6	Supply, delivery, Installation, Testing & Commissioning of Mechanical Level Indicator for CWR/Sump/Well.	1	Nos.
7	Supply, delivery, Installation, Testing and Commissioning of Dewatering Pump set (1W+1S) with all accessories complete.	1	Job
8	Supply, delivery, Installation and commissioning of 5 M.Ton capacity EOT Crane complete in all respect including testing , certification and as per NIT and tender specifications Rectangular Type.	1	Job
9	Supplying, Installation, testing & Commissioning of Chlorination for Automatic/Manual Gaseous chlorination unit by 2x5 kg/hr. auto cum manual with chlorinator accessories chlorine analyser, tonner(900 kg), safety kit and allied accessories all complete with EOT crane arrangement.	1	Job
10	Supply, delivery , Installation, Testing and Commissioning of suitable 11 kV, 800 Amp, 26.3 KA for 3 sec, 3 Panel VCB Switchboard with following: I/C Feeder - 1 No, O/G Transformer Feeder - 2 Nos.	1	Set
11	Supply, Installation, Testing & Commissioning of 800 kVA, 11 kV/0.433 kV, 3 phase, 50 Hz, ONAN type transformer as per specifications and NIT.	2	Nos
12	Supply, installation, testing & commissioning of Float cum boost charger suitable for 415V with variation 10%, 50 HZ, single phase/3-phase input & 24/48/110 Volt DC. and Battery Bank of minimum 100 AH capacity comprising SMF/VRLA batteries, MS stand, interconnect wiring etc as required complete in all respect	1	Set
13	Supply, installation, testing & commissioning of 415 V PDB Panel at Substation Building.	1	Nos.
14	Supply, installation, testing & commissioning of 415 V PMCC Panel at Substation Building.	1	Nos.

15	Supply, delivery, Installation, Testing & Commissioning of suitable Earthing Systems, etc	1	Job
16	Supply, delivery, Laying, Testing & Commissioning of suitable Cable (HT Cables).	1	Job
17	Supply, delivery, Laying, Testing & Commissioning of suitable Cable (L.T Cables).	1	Job
18	Supply, delivery, Laying, Testing & Commissioning of suitable Cable (Control & Instruments Cables).	1	Job
19	Supply, delivery and Installation of safety equipment.	1	Job
20	Supply, delivery and Installation of Perforated and Ladder type Cable tray, Panel base support, with all accessories & cable tray supports.	1	Job
21	Providing and fixing in position lightening arrester set	1	Job
22	SITC of Ventilation System for Pump House & Panel Room	1	Job
23	Illumination of Pump room & Panel room incl. supplying fitting, fixing all complete.	1	Job
24	Outdoor illumination for Access bridge & Compound lighting, including supplying, fixing all complete.	1	Job
25	Dehydration & Filtration of Transformer Oil to raise the dielectric strength to the value specified in IS including submission of test result	1	Job
26	Commissioning of whole system & Performance test for (72 hours) including DOE clearance.	1	Job
27	Trial Run for (three) months after successful commissioning of the whole installation as per specification and direction of the EIC.	1	Job
28	Operation & Minor Maintenance for 5 years.	1	Job

**The Superintending Engineer,
South Circle**

