GOVERNMENT OF WEST BENGAL
OFFICE OF THE SUPERINTENDING ENGINEER
WEST CIRCLE
MUNICIPAL ENGINEERING DIRECTORATE
UD & MA DEPARTMENT
PATAL BAZAR, 3RD FLOOR, TINKONIA PURBA BARDHAMAN, PIN:-713101
E-mail-sewestcircle1@gmail.com

Memo No. :- MED/SE(W)/ 143 /W-280/2024 Dated:-07.06.2024

NOTICE INVITING e-TENDER

Notice Inviting e-Tender No: **32 of SE (WC)/MED/2023-24 (2nd Call)**

Notice Inviting e-Bid No.-

The Superintending Engineer, West Circle ,M.E.Dte invites sealed competitive Tender on turnkey basis from a reliable and resourceful Companies/Firms/Contractors having experience and acumen in construction work as noted below and the eligibility is depicted here under for participating in the e-Bid.

1. Name of Work : Augmentation of water supply scheme by renovating of 14 MGD existing water treatment plant at Angadpur, including Piyala Boosting station, Dgp-15 and Construction of Overhead reservoir (900 cum) staging height 20 mtr. Under 15 MGD W.T.P with 5 (Five) years operation and maintenance of the Plant on turnkey basis under AMRUT-2.0 within Durgapur Municipal Corporation

2. Location of the work:Angadpur ,Mouza- Angadpur , Ward No-37, Under Durgapur Municipal Corporation

3. Brief Scope of Work:

Augmentation and repairing of all the Civil & Electro-Mechanical Works with renovation work of Alam House , Annex Building , Chlorine House , Filter House , Alam House No-2 , 2 nosClariflocculator including all electromechanical accessories , High lift room , Boundary wall , Repair Security room and shade of sludge pond , Raw water pump house , Sub-station Building , Boundary wall and concrete road , Control room etc. under 14 MGD W.T.P , Construction of Overhead reservoir (900 cum) staging height 20 mtr. under 15 MGD W.T.P , Renovation of Clear water pumping station and substation at piyala boosting station , Renovation of Clear water pumping station and substation at Angadpur WTP , Renovation of Raw water pumping station and substation at Angadpur WTP with all others allied works like civil and electro-mechanical work (according to Indian Electricity rules) and others , if any will be executed as per instruction by EIC including yard lightening and internal illumination (all building) complete in all respect including satisfactory completion and commissioning, necessary training of staffs & thereafter (subsequently) five (5) years operation and maintenance works with Operator, security, gardening arrangement including supply items (viz: Alam, Chlorine, Bleaching, Electrical Tools & Tackles, Torch, Duster, Soap, Gum Boot, Rain coat, Umbrella, Hand gloves etc.) on Turnkey basis at the Piyala Boosting Station, Angadpur 14 MGD WTP & 15 MGD WTP within Durgapur Municipal Corporation area under AMRUT 2.0.

Preamble:

It is desired to strengthen and improve its existing water supply system by repairing and renovation ofexisting Water Treatment Plantwith strengthening of existing assets related to WTP. These priority works have now been approved under AMRUT 2.0. The scope of work for the works covered under the present tender is as follows:

Intake point:-

1) Supply & fixing of suitably designed rotating GI Screen (15 mtrApprox) in feeder canal with lifting arrangement

Sump:-

1) Supply & fixing of Head stock with shaft other necessary components to make the sluice gates operational- 3x1200x1500 mm , Shaft Length - 6mtr(each)

2) Supply & fixing of GI Screen with fixing structural parts (L 65mmx65mmx6mm)suitable for removing and cleaning with proper lifting arrangement

Size:- 2x4.50mtrx4.50mtr

3) Repairing of stair at sump.

4) Concreting of pathway.

5) Minor concreting and plastering work at sump.

6) Handrail to be derusting and need painting.

7) Cleaning and disposal of sludge from intake pit and intake well.

8) Overhauling of inlet gates of intake pump house, 3 Nos

9) Supply of new screens to be fixed in pump suction at intake well-6 Nos.

Raw water Pump House:-

1) 1 no Float Type level indicator at Raw water sump to be changed with proper support and functioning.

2) Replacement of 6 nos 300 mm dia sluice valve at raw water pump need, shaft length Ht-6 mtr (each).

3) Replacement of 6 nos 300 mm dia non return valve need at raw water pump house.

4) Replacement of 6 nos 300 mm dia dismantling joint, short piece -500 mm (incl flange).

5) Replacement of Actuators control with butterfly valve - 6 nos 300 mm dia.

6) Replacement of Suction valve at raw water pump house, 6 nos 350 mm dia.

7) 12 nos thrust block at raw water pump house is required.

8) Painting of 6 nos 300 mm dia raw water delivery pipeline.

9) Supply & fixing of pressure gauge (2 kg) at 300 mm dia delivery pipeline - 6nos

10) Supply and fixing of 3x35 sqmm cable aluminium armour from starter to motor, 300 mtr.

11) Overhauling/replacement of all exhausts fans and makes them working.

12) Overhauling/replacement of one no raw water delivery valves (900mm dia)

13) Overhauling/replacement of 2nos. raw water delivery motorised actuator of valves (600mm dia)

14) Fire extinguisher to be changed.

15) Steel rolling shutter at raw water pump house to be changed.

16) Stair at raw water pumps house- derusting, repairing and painting.

17) Repair and painting of raw water pump house room, with replacement of broken windows with new windows.

Chlorine room:-

1) 2 nos neutralisation pit is required.

2)2nos Manual monorail joist to be extended up to neutralisation pit – (6 mtr, ISMB 400mm-each)

3) Supplying, fitting & fixing of new chlorinator for pre-chlorination with pump motor set, 5kg,- 3 nos

4) Supplying fitting fixing of new chlorinator for post- chlorination with pump motor set ,5 kg,-3nos

5) New leakage detector for chlorine is required.

6) Replacement of Trunion rollers for tonners,- 12 nos with fixing plate.

7) Repair, Servicing of EOT crane-2 nos.3 MT Capacity with manual push pull travelling trolley.

8) Complete replacement of PVC piping 25mmdia for chlorination (pre & post)- 400 mtr approx.

9) Repair and painting of chlorine room, with replacement of broken doors & windows with new windows.

Alum room:-

1) Supply, erection & commissioning of motors (0.75 kW) with all accessories-3 nos and repairing servicing of motors (0.75 kw)-3nos.

2) Supply, erection & commissioning of new Gear boxes and agitators with all accessories-3 nos. and repairing servicing of Gear boxes and agitators with all accessories-3nos.

3) Supply, Laying & fixing of pipes for transfer of alum solution – 40mm dia, 20mtr approx

4) Supply & fixing of valves for Alum solution-8 nos , 40mm dia.

5) Supply & fixing of constant head boxes with complete accessories, 2nos.

6) Supply & fixing of level indicator for alum solution, 6 nos.

7) Low level window to be closed with brickwork.

8) App membrane coating on inside wall of alum room up to 2 mtr height.

9) Steel window to be replaced with new aluminium window.

10) Lime chamber to be converted to alum chamber.

11) Repair and painting of chlorine room , with replacement of broken window with new window

Flash mixer:-

1) Supply and fixing of sluice gates/ Pen stock gate with shaft & wheel complete, to make it operational-(3x1200x1500)mm, Shaft Length -6mtr(each)
2) Supply, erection & commissioning of new Gear boxes and agitators with all accessories-3 nos.

3) Supply, erection and commissioning of raw water ultrasonic flow meter-1 no.

4) Repair/ Replacement of walkway gratings and replacement of handrail.

Clariflocculator(2Nos):-

1) 2 nosclariflocculator required full maintenance.

2) Replacement of squizer rubbers including hanger with epoxy painting- 2 nos.

3) Rail alignment levelling & fixing- 2 no.

4) Replacement & fixing of Traction wheel 200 mm dia of end carriage- 4 nos.

5) Replacement of current collector complete with carbon brushes-8 nos.

Filter House:-

1) Replacement of under drainage lateral pipes(100mm dia,7.5mtr approx) of filter beds by HDPE/PVC pipes of designed dia-16 nos.

2) Supply & replacement of filter media of all the filter beds using specific quality & standard of media, washing, Screening, after removing from bed as per IS 8419- 16 nos.

3) Replacement of Pneumatic actuator valves & gates-(Backwash valve-400mm, Clear water outlet valve-300mm, Drain valve-500mm,airvalve-150mm,inlet valve-300mm-1 no each in single filter bed, Total filter bed-16 nos)

4) Replacement of filter falcon levers 25 mm dia, 4mtr (length each) - 16 nos.

5) Replacement of float guide pipes 25 mm dia, 4mtr (length each)-32 nos.

6) Changing of complete compressed air pipeline (DI- 150mm dia) used for actuator-160mtr approx

7) Replacement of rate setters-16 nos.

8) Repair and painting of Filter House, with replacement of broken doors & windows with new window.

Sludge well:-

1) Shed is required.

2) Staircase is required.

3) Supply, fitting & fixing of new sludge pump-motor set- 2 nos suction pipe line (100mm dia)

4) Removal of sludge from drying bed-3 nos.

5) Supply &laying of sludge overflow line 500 mm dia-50 mtr.

6) Railing around sludge well.

7) Concreting, plaster with neat cement finish at sludge well.

Clear water pump house:-

1) Supply & fixing of Level indicator at CWR- 1 no.

2) Replacement of electrical actuator valves (450 mm dia) with necessary components as required- 7 nos.

3) Supply, laying & fixing of Ms Pipe, 500 mm dia for suction of clear water pumps complete with fittings- 50 mtr.

4) Supply, laying & fixing of MS pipe 450 mm dia for delivery of clear water industry pipeline-50 mtr.

5) Floor screed concreting for existing pump house.

6) Requirement of new 14 nos exhausts fans.

7) Repair and painting of Clear water pump house, with replacement of broken window with new window.

8) Ducting line (Aluminium) 750mmx 750mm need to replace.

Laboratory:-

1) New Jar test apparatus required.

2) Air conditioner to be replaced -3Nos.

3) New Computer required.

4) New Ph meter, new turbidity meter, Specto-photometer required.

Carryout O & M for a period of 5 year from the date of successfully hand over of WTP.

Eligibility to participate in the Bid:	1) Having experience and technical acumen in Construction / Renovation of similar nature of work of minimum capacity 4.2 MGD (viz. WTP/ I.G /Intake etc.) with substation including all Civil, Electro-mechanical works completed in a single contract the value of which should be minimum 18.4 crore during 5 (five) years prior to the date of issue of the tender notice in any Government Department/Board/Semi-Govt./Corporation / Statutory Authority / Undertaking etc. OR 2) Having experience and technical acumen in Construction / Renovation of similar nature of work of minimum capacity 3.5 MGD (viz. WTP/ I.G /intake etc.) with substation including all Civil, Electro-mechanical works completed in two nos. of single contracts value of each should be 15.4 crore minimum during 5 (five) years prior to the date of issue of the tender notice in any Government Department/Board/SemiGovt./Corporation/Statutory Authority / Undertaking etc. OR 3) Having experience and technical acumen in Construction/ Renovation of similar nature of work (viz. WTP/ I.G/Intake etc.)with substation including all Civil, Electro-mechanical works in a running single contract which has been completed to the extent of 75% (seventy five percent) or more and value of which is not less

than the desired value of Sl. No. (1) above during 5 (five) years prior to the date of issue of the tender notice in any Government Department/Board/Semi-Govt./Corporation/Statutory Authority / Undertaking etc

AND

Having qualified technical personnel (to be employed under the firm for at least 2 consecutive years) with sound knowledge and experience in execution of similar nature of works.

AND

Having valid electrical license with electrical Supervisor, GST, P. Tax Clearance Certificates, PAN Card, P.F., & E.S.I Registration Certificate etc

Note: Producing P.F. & E.S.I Registration with bid proposal Mandatory however successful bidder have to produce said certificates before agreement.

Note:Only works completed successfully will be treated as credential. Joint venture, Consortiums etc are not allowed.

A certificate from the executing authority/ client not below the rank of Executive Engineer/ Divisional Engineer/ equivalent is to be produced in support of above criteria clearly stating that the works entrusted to the bidder have been successfully completed.

Each work must have been executed by the bidder successfully under a single contract within the last 5 (Five) years as prime Contractor anywhere in India in drinking water supply project with State or Central Government / Govt. Autonomous body.

Machinery & Equipment

Having in possession of Sophisticated & Modern Equipment, Machineries etc. for construction specially required for Water Treatment Plant. The bidder must submitted proof of ownership or copy of lease agreement with bid document.

Technical Personnel

Having full time qualified salaried technical personnel with sound knowledge & experience in execution ofsimilar works. The following personnel are

1. Civil Engineer (Degree holders with min. 3 Yrs. of experience in construction field): 1 no.
2. Mechanical Engineer (Degree holders with min. 3 yrs. of experiencein similar field): 1 no.
3. Electrical Engineer (Degree holders with min. 3 yrs. of experience in similar field): 1 no.
4. Civil Engineer (Diploma holders with min. 3 Yrs. of experience in construction field): 1 no.
5. Mechanical Engineer (Diploma holders with min. 3 yrs. of experience in similar field): 1 no.
6. Electrical Engineer (Diploma holders with min. 3 yrs. of experience in similar field): 1 no.
7. Licensed Electrician & Electrical Supervisor having certification of 11 KV HT line: 1 no.

8. Environment Engineer (BE/B.TECH/Chemist/B.Sc Chemistry (Hons) with minimum 2 years experience-1 no.

9. Provide adequate skilled and experience manpower to operate the WTP onSCADA on 24x7 basis and achieve desire consistency in operation and result.

Note: The bidder must be submitted the relevant document in proof of employment along with educational qualification & experience.

Declaration

The bidder should not have a history of any penal measures taken by any authority/ client on any account against the organization / firm for any project of similar nature or any other project executed during the last 3(three) years. A declaration to this effect will have to be submitted by the bidder in A4 the form of Affidavit in non-judicial stamp paper duly certified by 1st class Judicial Magistrate. Without submission of this document the bidder will be disqualified.

5. Financial Criteria:

i) Completion certificate produced as credential should clearly indicate the description of works, value of contract, executed work value, date of award, actual date of completion etc. and name, address, telephone no. of the client.

ii) The Bidder should have Average Annual Turnover during last 5 (five) financial years (i.e. 2018-2019, 2019-2020, 2020-21, 2021-22 & 2022-23)

of not less than Rs. 10.00 Crore (Rupees Ten Crore) (General Notes:- The average annual turnover shall be based on Tax Audited Report in 3CD Form duly signed by a registered chartered accountant of immediate proceeding last 5 (five) financial years authenticated by UDIN.)

iii) The Bidder should have a valid Trade License/Registration Certificate, Professional Tax Challan, PAN Card, GST Registration Certificate & GSTIN No.

iv) Bidder should submit Banker's certificate having Solvency of at least Rs 6.00 Crores (Six Crores) only from Nationalized/Scheduled Banks during one year prior to the last dates of submission of the tender .

v) All documents in original to be produced in due course of time as & when asked by the Tender Inviting Authority

6. <u>Earnest Money:</u>

(a) The intending bidders shall have to deposit Earnest Money in the following manner Initial earnest money of Rs. 10.00 Lakh to be submitted online through ICICI bank gateway linked with the e-tender website as an initial Earnest Money.

Deposit shall accompany with Bid Proposal, in the form of The Earnest Money, as specified in this NIeB. Bid will be declared informal if earnest

money receipt is not submitted and uploaded with bid document.

(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 NIeB. 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.

The amount will be converted into security deposit.

b) Balance Earnest Money Deposit i.e. 2% of bid amount beyond Rs. 10.00 Lakh shall have to be deposited after acceptance of Bid Proposal in the form of Demand Draft from any nationalized/scheduled Bank in favour of the Executive Engineer, Asansol Division,M.E.Dte Payable at Asansol.

7. Date and Time Schedule :-

Sl. No.	Particulars	Date and Time
a)	Date of uploading of NIB (Bid Documents(online) (Publishing date)	**07/06/2024 at 06.00 p.m**
b)	Document download start date (online)	**07/06/2024 at 06.30 p.m**
c)	Date of Pre Bid Meeting (offline) with the intending Bidders in the office of the Superintending Engineer, WestCircle, Municipal Engineering Directorate, Burdwan .	**21/06/2024 at 01.00 p.m**
d)	Bid submission start date (On line)	**08/06/2024 at 10.00 a.m**
e)	Bid Submission closing (On line)	**02/07/2024 at 06.00 p.m**
f)	Bid opening date for Technical Proposals (Online)	**05/07/2024 at 10.00 a.m**
g)	Date of uploading list for Technically Qualified Bidders (online)	To be notified later
h)	Date and Place for opening of Financial Proposal (Online)	To be notified during uploading of Technical Evaluation Sheet of Bidders
i)	Date of uploading of list of qualified bidders along with the offer rates through (on line),	To be notified later.
j)	Also if necessary for further negotiation Through offline for final rate.	To be notified later.

8. Time of completion — Time of completion of the Contract is 18months from the date of issuance of Work Order.

9. 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, CPHEEO manuals, Clauses & Sub Clauses of the Bid documents and to have fully acquainted with all details of work front, 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 general information including topological condition & existing level and level pertaining to and needed for the work to be completed in time properly.

10 Bid documents

A full set of Bid documents consists of Two Parts.

I) Part I containing all documents in relation to the name of the firm applied for and credentials possessed by them along with all documents

AND

Section A: Description of the Project.

Section B: Conditions & requirements for Bidding.

Section C: General conditions of the Contract.

Section D: Special provisions.

Section E: General specifications of Workmanship & materials for Civil Works.

Section F: General technical specification.

Section G: Detailed technical specifications for Civil works.

Section H: Annexure

Section I: Technical specification of motor

Section J: Technical specification of pump

Section K: Motor Control Panel & Power Distribution Panel.

Section L : Technical specification Mechanical

Section M: Technical specification Pile

Section N : Detailed Specification For Fabrication of Steel Pipes and Specials and Other Allied Works

Section O: High Tension Sub-Station.

Annexure under Section H :

Soil Investigation Report.

ii)Physio-chemical and Bacteriological Characteristics of Damodar River Waterat Angadpur Durgapur

List of instruments

iv) List of tools / Electrical equipment.

v)List of vendors (for treatment plant)

vi)List of Vendors (For Clear Water Pumping Station)

vii)List of laboratory equipments with vendors list

viii)List of drawings etc. To be furnished by the successful bidder

ix)Deviation list, if any

x) Performance guarantee

xi)Typical Sketch showing Location of OHR in respect of WTP

xii)2911 (ii) agreement form.

xiii) Other form.

II) **Part II** containing following documents;

a. Bid Price / Price Schedule (.xls. sheet)

11.	Validity of Bid	A Bid submitted shall remain valid for a period of 180 calendar days from the date set for opening of Bids. Any extension of this validity period if required will be subject to concurrence of the Bidders.
12.	Withdrawal of Bid	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.
13.	Acceptance of Bid	The Superintending Engineer, West Circle will accept the Bid after due approval of Financial Evaluation sheet by State Level Technical committee of AMRUT . The committee does not bind itself to accept otherwise the lowest Bid and reserves to itself the right to reject any or all of the Bids received without assigning any reason thereof.
14.	Intimation	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 Govt. Form with the Superintending Engineer, West Circle and fulfil all his obligations as required by the Contract. After the Bid is provisionally accepted, the Bidder shall submit detail Design, Drawing and working specifications phase wise based on existing site condition & proposed levels at site. If it is found technically correct and acceptablewith proper examination by the Superintending Engineer, West Circle, M.E. Directorate,provisional approval of the

		submitted drawings
		will be accorded phase wise for execution and Drawings are to be vetted by the reputed Govt technical Institute before submission of same to the Superintending Engineer, South Circle, M.E. Directorate, Eventually, all the parts, Design, Drawings etc. of the successful Bidder shall be taken as a part of the agreement.
15.	Escalation of Cost	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 O&M of the contract.
16.	Name & address of Engineer-In-Charge (EIC) of the Work	OFFICE OF THE EXECUTIVE ENGINEER, ASANSOL DIVISION, MUNICIPAL ENGINEERING DIRECTORATE,WEST ISMILE, VIVEKANANDAPALLY(Beside PHE Housing Complex), ASANSOL, BURDWAN - 713301
17.	Execution of Work	The Contractor is liable to execute the whole work as per direction and instruction of the Executive Engineer, Asansol Division of Municipal Engineering Directorate who is the Engineer in Charge of the work after due approval of "The Superintending Engineer, West Circle, M. E. Dte."
18.	**Payment**	Payment will be made to the successful Bidder by the Executive Engineer, Asansol Division of Municipal Engineering Directorate as per availability of fund.

19. In case office faces sudden closure owing to reason beyond the scope and control of The Superintending Engineer, South Circle, any of last date/dates as schedule in Sl. No 7 may be extended up-to/to next and following working day without issuing further separate notice.

20. Persons having authenticated and having registered Power of Attorney may be considered lawfully becoming to be acting on and for behalf of the Bidder.

21. Sufficient care has been taken to avoid variance in between the contents of the listed documents in the Bid documents. 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.

22. 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.

23. Bid Acceptance Authority is the Superintending Engineer, West Circle, M.EDte.

24. In case of any dispute arising from any clauses of similar nature between bid documents, the decision of Superintending Engineer, West Circle, M.E. Directorate, Burdwan will be final and binding.

25. All usual deductions for taxes i.e. ST, IT, and Labour Welfare Cess etc. as applicable will be made from the bills from time to time (please refer cl.57 of section C)

26. No conditional/ incomplete Bid shall be entertained.

27 **General notes:**

(a) No joint venture in the form of M.O.U. or in any shape will be Accepted at any stage of tendering.

(b) The Bidder should also upload Place of Registration, Principal Place of

Business & Power of attorney of signatory of tender.

(c) The average annual turnover shall be based on audited balance sheets of last 3 (three) consecutive financial years.

(d) The drawing and design to be submitted by the successful bidder in connection to the work.

(e) 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.

(f) Partnership Firms shall furnish the registered partnership deed and Companies shall furnish the Article of Association and Memorandum. [Non Statutory Documents]

(g) 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]

(h) Submission of Income Tax Acknowledgement Receipt for CurrentAssessment Year is mandatory.

(i) Any legal matter will be settled within the jurisdiction of the Hon'ble District Judges' Court at Bardhaman, West Bengal.

(j) 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-NIT. Beyond such period no representation in this regard will be entertained by the Tender Inviting Authority. The Pre-Bid Meeting will be held at the Office of the Superintending Engineer, West Circle, M.E Dte on Stipulated date &time .

(k) 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.

(l) 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.

(m) The successful Bidder may submit the payment break-up supported with analysis of the cost as % wise against each item of work in order to assess the value of Work done and make payment thereof within 3(three) working days after acceptance of bid for necessary approval from the Superintending Engineer, West circle, M.E. Dte., Burdwan. In case of any dispute arising in that breakup and analysis thereof, decision of the Superintending Engineer, West circle, M.E. Dte., Burdwan will be binding and final.

(n) Job Card holders shall be mandatorily engaged where unskilled workers required.

(o) Successful contractor shall furnish certificate after completion of work that only Job Card holders where engaged where unskilled workers required.

28. Electrical Licence and Labour Licence:

Upon receipt of acceptance order, the successful bidder has also to obtain the labour licence 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.

29. 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 one-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, thetender inviting authority may take appropriate legal action against such defaulting bidder.

30. 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 who's 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.

31. 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.

32.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 engineersshall 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.

32 A. PAYMENT TERM

Terms of payment : Item wise break up			
1	**Repairing and renovation work of Annex Building , Chlorine House , Filter House , Alum House (2 Nos), High lift room , Boundary wall ,Repair Security room and shade of sludge pond , Raw water pump house , Sub-station Building , concrete road and Control room etc. under 14 MGD W.T.P within Durgapur Municipal Corporation.**		
A	Repairing and renovation work of Filter House ,High lift room , Raw water pump house , Sub-station Building. under 14 MGD W.T.P	40%	
B	Repairing and renovation work of Chlorine House, Alum House (2 Nos)under 14 MGD W.T.P	30%	
C	Repairing and renovation work Annex Building ,Boundary wall ,Repair Security room and shade of sludge Well and contrete road ,Control room etc. under 14 MGD W.T.P	30%	
	Total =	100%	
2	**Construction of over head reservoir (capacity 900 cum, staging height 20.00 mtr) at 15 mgd WTP within Durgapur Municipal Corporation**		
A	Foundation up to 1st Bracing	30%	A

B	Up to Heel Beam	15%	B
C	Up to Top Dome incl. all Structural Works.	45%	C
D	Complete in all Respect (Plaster , Flooring ,Pipes fittings , Sluice Valves etc .)	10%	D
	Total =	100%	
3	**Supply delivery, installation, testing and commissioning of all Electro-Mechanical Equipment of Raw water pumping station and substation at Angadpur 14 MGD WTP including alied civil works**		
	Break up :		
A	Supply of all Electro-Mechanical equipment	50%	
B	Installation of Electro-mechanical equipment and any other work required to complete the item in all respect.	30%	
C	Testing, Commissioning and after successful trial run of the plant.	20%	
	Total =	100%	
4	**Supply delivery, installation, testing and commissioning of all treatment processing Machinery & Allied Accessories of Electro-Mechanical work at Angadpur 14 MGD WTP including alied civil works**		
	Break up :		
A	Supply of all Electro-Mechanical equipments	50%	
B	Installation of Electro-mechanical equipment and any other work required to complete the item in all respect.	30%	
C	Testing, Commissioning and after successful trial run of the plant.	20%	
	Total =	100%	
5	**Supply delivery, installation, testing and commissioning of all Electro-Mechanical Equipment of Clear water pumping station and substation at Angadpur 14 MGD WTP including alied civil works**		
	Break up :		
A	Supply of all Electro-Mechanical equipments	50%	
B	Installation of Electro-mechanical equipment and any other work required to complete the item in all respect.	30%	
C	Testing, Commissioning and after successful trial run of the plant.	20%	
	Total =	100%	
6	**Supply delivery, installation, testing and commissioning of all Electro-Mechanical Equipment of Clear water pumping station and substation at Piyala Boosting Station Under DMC**		
	Break up :		
A	Supply of all Electro-Mechanical equipments	50%	
B	Installation of Electro-mechanical equipment and any other work required to complete the item in all respect.	30%	
C	Testing, Commissioning and after successful trial run of the plant.	20%	
	Total =	100%	

7	**Comprehensive Operation and maintenance of 14 MGD Water Treatment plant (Including all Component) with Piyala Boosting Station for 5 (Five) year. The work includes supplying adequate number of operator personnel and skilled Labor with a provision for necessary training to the personnel appointed by the ULB including supplying all sundry materials (viz: Alum, Chlorine, Bleaching, Electrical Tools & Tackles, Torch, Duster, Soap, Gum Boot, Rain coat, Umbrella, Hand gloves etc.), disposing of sludgeand replacement of all types of damaged component etc. as per Bid document and complete in all respect and direction of the E.I.C with including all cost and complete.** **N.B:- This item will be executed after three (3) months trial run.**		
A	After completion in all respect for 1st Year	20%	
B	After completion in all respect for 2nd Year	20%	
C	After completion in all respect for 3rd Year	20%	
D	After completion in all respect for 4th Year	20%	
E	After completion in all respect for 5th Year	20%	
	Total =	100%	

Note:	***a)2%ofEarnestmoneydepositedearlierwillbeconvertedintoSecuritydepositafterawardingthe Contractand8%ofsecuritydeposit,willberecoveredfromeachrunningaccountbill.***
	b)Securitydepositorretentionmoneywillbereturnedunderprovisionof WBF-2911(ii)clause-17 amendment No-5784-PW/L&A/2M-175/2017Dated:12.09.2017consideringfiveyearsDefectLiability Period.Anyotherterms&conditionforrefundofDmentioninanyotherformshouldbeignored.
	The WBSEDCLconnectionat 1400 KVA Sub-Stationwill beinthe name of The Mayor Administrators/Commissioner of Durgapur Municipal Corporation and Monthly Electric charges payable to WBSEDCL will be borned completely by DMC
	The cost temporary power connection will be borned by the agency.

33. Deduction of tax, royalty ,Labour welfare Cess& GST

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.

34. NO INTEREST ON DUES

No interest shall be payable on amounts, due to contractor's pending final settlement of claim. Further, no interest shall be payable by the authority on an amount /payment.

35. 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.

36. 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.

37. No Mobilizations 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.

38. 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.

39. 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) NIeB

(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 to the relevant schedule of rates and / or technically sanctioned estimate.

40. Bid Evaluation Committee (BEC):

A Bid Evaluation Committee (BEC) has been constituted under the Superintending Engineer (West 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 (West Circle)- Chairman
2. Executive Engineer(Asansol Division)- Member.
3. Executive Engineer, (West Circle)- - Member.
4. Divisional Accounts Officer / Divisional Accountant (Asansol 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:-

(a) Financial Capacity

(b) Technical Capability

(c) 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 documentsubmitted 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 &Convener of the Bid Evaluation Committee.

41.Defect Liability Period:-

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

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.

42. 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 **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.**

The Superintending Engineer,
West Circle, M.E. Directorate

Memo No. :- MED/SE(W)/ 143 (1-11) /W-280/2024 Dated:-07.06.2024

Copy forwarded for wide circulation through:

1. The State Mission Director, AMRUT-II, SUBHANNA, 10th Floor, DF 9 Block, Sector -01, Bidhannagar, Kol-700064
2. The Joint Secretary, UD&MA Department, Govt of WB , Nagarayan Bhawan , DF-8,Saltlake City
3. The Secretary, Municipal Engineering Directorate, Bikash Bhavan, Salt Lake, Kolkata-700091 for his kind information
4. The Chief Engineer (South Zone), Municipal Engineering Directorate, Bikash Bhavan, Salt Lake, Kolkata-700091 for his kind information.
5. The Additional Chief Engineer (South), Municipal Engineering Directorate, Bikash Bhavan, Salt Lake, Kolkata-700091 for his kind information.
6. The District Magistrate, Paschim Bardhaman for his kind information.
7. The Chairperson , Board of Administrator, Durgapur Municipal Corporation for his kind information.
8. The Executive Engineer, Asansol Division, Municipal Engineering Directorate.
9. The District Information & cultural affair Officer, Paschim Bardhaman
10. Office Notice Board.
11. Any Three leading Newspaper for publication.

7/6/24

The Superintending Engineer,

West Circle, M.E. Directorate

INSTRUCTION TO TENDERERS/BIDDERS

SECTION – A

1. *General guidance for e-tendering*

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

2. *Registration of Tenderer*

Any tenderer 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 **https://** wbtenders.gov.in**.** The tenderer is to click on the link for e-tendering site as given on the web portal.

3. *Digital Signature certificate (DSC)*

Each tenderer 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 Tenderer. 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 uploadedvirusscanned 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

i. Prequalification Application (Sec-B, Form – I)

ii. Scanned Copy of acknowledgement towards earnest money (EMD) as prescribed in the NIB should be uploaded.

iii. Financial Statement (Section – C, Form – II).

iv. Affidavits (Ref:- format for general affidavit shown in "Y" Part "B".)

v. Printed Tender Form and NIB (Sl. 10; Part I) with all addenda and corrigendum **(download and upload the same Digitally Signed, quoting rate will only encrypted in the Price Schedule under Financial Bid. In case quoting any rate in Printed Tender Form the tender will be summarily rejected).**

vii. Special Terms, condition and specification of works.

viii. Certificate of Bank Guarantee by any Nationalized Bank (if required).

ix. Bank Solvency Certificate.

A-2. Non statutory Cover Containing

Professional Tax(PT) deposit receipt challan (up to date), PAN Card, IT, IT Return for the Current Assessment year, VAT Registration Certificate(up to date).

ii. Registration Certificate under Company Act. (if any).

iii. Registered Deed of partnership Firm/ Article of Association and

Memorandum

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 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 Register of Co-Op(S) (ARCS) bye laws are to be submitted by the Registered labour Co-Op(S) Engineers' Co.-Opt.(S)

vii. List of machineries possessed by own/arranged through lease deed along with authenticated documents of lease / sub-lease / hire basis etc.

viii. List of laboratory Instrument.

ix. List of technical staff along with structure and organization (Section – B, Form – III).

x. Credential: Scanned copy of Original Credential Certificate as stated in NIB (under sl. no -3).

xi. Electrical Supervisory competency certificate (as required in NIB, Sl-3) from Directorate of Electricity, Govt. of W.B./ competent authority of other Govt. as applicable.

Note: - Failure of submission of any of the above mentioned documents (as stated in A1 and A2) will render the tender liable to be summarily rejected for both statutory and non statutory cover.

B. Tender Evaluation

Opening and evaluation of tender: - If any tenderer is exempted from payment of EMD, copy of relevant Government order needs to be furnished (applicable in case of Registered Labour Co-Operative Society).

ii. Opening of Technical proposal: - Technical proposals will be opened by the Tender 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 tender 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 Tender Evolution 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 Deptt. 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.

vii. While evaluation, the committee may summon the bidder and seek clarification / information or additional documents or original hard copy of any of the documents already submitted and if these are not produced within the stipulated time frame, their proposals will be liable for rejection.

C. Financial proposal

As per Sl. 10 , Part II. To be uploaded Digitally signed by the Bidder.

6. Financial capacity of a tenderer will be judged on the basis of working capital and available bid capacity as mentioned in the N.I.(E) B. 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 first class 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 Tenderer, the Tenderer 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 Tenderer's financial position, showing long term profitability including an estimated financial projection of the next two years.

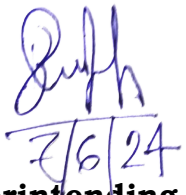
7. Penalty for suppression / distortion of facts
Submission of false document by bidder is strictly prohibited and in case of such act by the bidder the same may be referred to the appropriate authority for prosecution as per relevant IT Act with forfeiture of earnest money forthwith.

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 whose 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.(E) 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 Tenderer.



The Superintending Engineer,
West Circle, M.E. Directorate

SECTION – B
FORM –I
PRE-QUALIFICATION APPLICATION

To
Superintending Engineer,
West Circle,
Municipal Engineering Directorate,
Department Of Municipal Affairs,
Burdwan, West Bengal,

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
_____duly authorized tosubmit 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.
Enclo:- e-Filling:-

1. Statutory Documents

2. Non Statutory Documents

Date: - **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)

	1st Year (Rs. In lakh)	2nd Year (Rs. In lakh)	3rd Year (Rs. In lakh)	4th Year (Rs. In lakh)	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 : (As per clause G.2. with all sub clauses)					

B.3 Annual value of construction works undertaken :						
Work in hand i.e. Work order issued	As on 31.03.2023	As on 31.03.2022	As on 31.03.2021	As on 31.03.2020	As on 31.3.2019	As on 31.03.2018

Signed by an authorized officer of the firm

Title of the officer

Name of the Firm with Seal
Date_____

AFFIDAVIT "Y"

Declaration of the Bidder

(Affidavit to be affirmed on a Non Judicial Stamp Paper of Appropriate Value And Duly Notarized)

I, ..., son of .....

....., aged about ..... years by occupation ..... do 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 NIB (NIB 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 site of 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)

Annexure – A

Information of audited financial statements for the last year to demonstrate the current soundness of the Bidder"s financial position :

1. The Bidder's Net worth for the last year calculated as the difference between total assets and total liabilities should be positive.

2. Bidders, who meet the minimum qualification criteria, will be qualified only if their available bid capacity at the expected time of bidding is more than the total estimated cost of the works. The available bid capacity will be calculated as under:
   Assessed Available Bid capacity = (A×N×2 – B) where

   A = Maximum value of engineering works in respect of Projects executed in any one year during the last five years (updated to the price level of the year indicated in table below under note) taking into account the completed as well as works in progress. The projects include turnkey project/ Item rate contract/ Construction works.
   N = Number of years (i.e.,____year) prescribed for completion of the works for which Bids are invited.

   B = Financial Liability of the bidder to be incurred for existing commitments and on-going works during the period of the subject contract.

To calculate the value of "A"

i) A table containing value of Engineering Works in respect to Projects (Turnkey projects / Item rate contract/ Construction works) undertaken by the Bidder during the last 5 years is as follows:

Sl. No.	Year	Value of Engineering Works undertaken w.r.t. Projects (Rs. In Crores)
1.	Year-5	
2.	Year-4	
3.	Year-3	
4.	Year-2	
5.	Year-1	

ii) Maximum value of projects that have been undertaken during the F.Y. _____ out of the last 5 years and value thereof is Rs._____Crores (Rupees_____). Further, value updated to the price level of the year indicated in Table is as follows:

Rs. _____ Crores x _____(Updation Factor as per Table annexed)

= Rs. _____ Crores (Rupees_____).

Table indicating The factor for the year for updation to the price level is indicated as under

Sl.No.	F.Y. / Calender Year	Updation factor
1.	Year-1	1.00
2.	Year-2	1.05
3.	Year-3	1.10
4.	Year-4	1.15
5.	Year-5	1.20

iii) Net worth for the last year of _____ (name of the company)

=

.....
.....
Signature, name and designation of Authorised Signatory

For and on behalf of
.....(*Name of the Applicant*)

.....
.....
Name of the Statutory Auditor's firm:

Seal of the audit firm:
(Signature, name and designation and Membership No. of authorised signatory).

To calculate the value of "B"

3. A table # containing value of all the existing commitments and on-going workings to be completed during the next ____ years (prescribed time for completion of the works for which Bids are invited) is as follows:

Sl. No.	Name of Work/ Project	Name of the Employer	Percentage of participation of Bidder in the project	Stipulated period of completion as per Agreement/LOA with the Start date	Value of Contract as per Agreement / LOA Rs. ___	Value of work completed Rs. ___	Balance value of work to be completed Rs. ___	Anticipated date of completion	Financial liability to incurred for the said work/ project during the period of the subject contract Rs. ___
1	2	3	4	5	6	7	8	9	10

.....
.....
Signature, name and designation of Authorised Signatory

For and on behalf of
.....*(Name of the Applicant)*

Note:

1. All the documents to be submitted in support of Annexure-A must be duly signed and sealed by the applicant/bidder and authenticated by Statutory Auditor's firm.
2. In case of a Joint Venture, Lead Member of such joint venture shall be required to meet 60% of required Bid Capacity and each of the Joint Venture Members shall be required to meet at least 30% of requirement of Bid Capacity. Bid capacity of all the members in total should be at least 100% of required Bid capacity.

SECTION - D

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 If 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 – A

DESCRIPTION OF THE PROJECT

1.
General

Theworkisonturnkey-basisandinvolvesDesign,Engineering,Supply,Storage,Installation, Commissioningandone month trial run Renovation of Clear water pumping station and sub station at Piyala under Durgapur Municipal Corporation.

2.Location

The Raw Water Pumping Station with Water Treatment plant &Clear Water Pumping Station at Angadpur, Clear Water Pumping station at Piyala and 15 MGD WTP Angadpur (Proposed OHR)) within DMC.

3. Scope of work

3.1 Thisisadesign-cum-executiontender.Thetenderers areadvisedtogothrough the documentsmeticulouslyandsubmitofferonthebasisofdatasupplied.Incaseofanyclarification, thetenderersareadvised toraisetheirqueriesduringpre-bid meetingbefore submissionof Tender.

3.2 Thescopealso includes trial runof thecompletepumpingstation and Electrical Power Distribution Systemsfora period of 3 (Three) month.

3.3 Theworkinvolvesdesign,engineeringsupply,storage,installationandcommissioning of Vertical Centrifugalpumpswithallaccessories,VerticalMotorandallalliedelectricalandmechanicalequipmentsas

specifiedinthescope of work and1 (one) month Trial Run. Trial run shall be reckoned from the next day after successful commissioning of the complete electro-mechanical system.

4. WorksunderthisTender

As mentioned earlier the work is on turnkey basis involving a Clear Water pumping station with its Electrical Power Distribution System along with other major works which are mentioned in the Scope of work.

4.1 ClearWaterPumpingStation & Power Distribution System

ItisproposedtoinstalladequatenumbersofVerticalCentrifugalpumpswithall accessories as per scope of work.The maximum allowable speed of the Pump shall be 1500 rpm (syn). Each Pump shall be complete with shafts & couplings including suitable accessories etc. complete in all respect. ThePumpswillbeinstalledin the Clear Water Pump HousetodeliverClearWater fromUGRto the distribution grid.

Thepumpsshallbeconnectedwithelectricalmotorsasprimemoverthrough flexible coupling including allotheraccessoriesasrequired.ThedrivingmotorsandpumpsshallbeprovidedwithsuitablebearingsandtheyshalldemonstrateminimumvibrationasperIS. The Deliverysideofeachpump shallbeconnectedwith one each Non-Returnvalve, MS dismantlingjoint,butterflyvalvefittedwithelectricalactuatoretcallcompleteasspecifiedelsewhereinthetenderdocuments.Deliverypipesofeachset ofpumpsshallbeconnectedtoacommondeliverymanifoldwithsuitablelength. Oneendofmanifold/take off lineshallbeconnectedwithanelectrically operated butterflyvalveand full bore electro-magnetic flow meter along with one MS Dismantling Joint.The butterfly valve&flowsensormaybeinstalledwithinRCCchambers if required as per site condition, whichisalsowithinthescopeofthework.

TheHTPDB in the Sub-stationwillfeedpowertotheTransformers& Motors at Pump House through suitablecables. ScopeofthistenderstartsfromPower Distribution system whichwillultimatelycaterpowertothe motors at Pump House and transformers at substation.ThereshallalsobeaRemoteControlDesk cum Instrument Panel for normal operation of Pumps sets and associated equipments including remote control of Power

Distribution system with all indications, controls etc. The LT board /ACDB at the substation and pump house shall feed all other auxiliary loads

5.0. Tentative Data & Information to the tenderer to work out the system

1.	i) Liquid to be handled	-	Treated Clear water
	ii) Turbidity	-	Below 5 Unit (Max)
	iii) Temperature	-	$10 – 45^0$ C
	iv) Specific Gravidity	-	1.0 (Max.)
	v) Relative Humidity	-	100% Maximum
2.	NB of Pump Suction pipe& SV(Mild Steel) NB of Pump Delivery pipe (Mild Steel) , BFV and NRV on delivery line, NB of Common Delivery Manifold, BFV and Electromagnetic flow meter	-	As per scope of work.
3.	Length of common delivery manifold	-	As required including mandatory requirement for installation of Electro-magnetic flow meter
15.	Supply voltage at Substation	-	11.0 KV ± 10%, 50 c/s ± 5%, combined variation ± 10%, 3 phase AC
16.	Power supply for the prime mover of pumps	-	11KV ± 10%, 50 c/s ± 5%, combined variation ± 10%, 3 phase AC

5. Limitof Contract

Thecontractstartsfromdesign, engineering supply, storage, installation, testingoftheequipment and commissioning, and 1 month Trial Runasper scope of work.

Itistheresponsibilityofthecontractortomakegoodorconstructthepartorwholeof astructureifitgetsdamagedduringthecourseofexecutionofthework.Thecontractorshallbeconsi deredtotallyresponsibleforanyaccidentcausedduetonegligenceonhispartorpoorworkmanship orfaultydesignetc.

3.0 . TREATMENT PROCEDURE TO BE ADOPTED

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

a) Inlet Well / channel with Parshall Flume, Flow meter, Alum dosing systemcascade aerator

b) Chemical House including storing, feeding and thorough mixing of chemicals with raw water.

c) Rapid Flash Mixer (one working + one stand by)

d) Clariflocculator (one working+ one stand by)

e) Rapid sand gravity filtration

f) Back washing through Over Head Reservoir placed on the roof of the Filter Bed/ChemicalHouse.

g) Sludge drainage and disposal including sludge pond with drying bed, if required

h) All Electro-Mechanical works related to water treatment process.

i) Post, Pre-Chlorination by gaseous chlorine.

j) Filter water conveying main to underground reservoir (CWR).

k) Clear water pumping station with Pumps, motors& other electromechanical works.

l) clear water Under Ground Reservoir with pumping station

m) Inter Plant Piping and plant road facility within WTP compound.

n) Plant Wastewater and solid waste disposal system.

o) Laboratory Building with supply of necessary laboratory Equipment's

p) HT substation

q) Flow measurement with recording system.

r) Carryout SCADA Based Comprehensive O & M of the proposed WTP at D.C. Sankarara and for a period of 5 years from the date of successful commissioning of WTP and the head work

The contractor has the liberty of using alternative arrangement but the design parameters and technical specifications should strictly conform to relevant IS Code & CPHEEO manual

.4.0 Different levels of Water Treatment Plant 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 450mm above HFL (High Flood Level) as shown in drawing & demarcated at site as well as it should be surveyed by the participant & finally fixed from the HFL .

iii) Proposed top Level of Clear Water Reservoir: - the level will be the +0.500 M above HFL (High Flood Level).

iv) 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, Clariflocculator, Filter Beds, Clear water duct, inlet pipes of reservoir etc. are to be fixed to ascertain the positive suction head of vertical turbine pump.

v) **Note- HFL/LWL/ HTL (high tide level) should be collected by the bidder**.

A) SPECIFIC SCOPE OF WORK

(i) The Bid is a design-cum-execution Bid on Turnkey basis. The Bidder is advised to go through the documents meticulously and prepare Bid on the basis of the data made available. In case of any doubt about any data the Bidder shall submit his/her queries in writing at least four working days in advance from the date of pre-bid meeting.
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(ii) The scope of work includes

For Civil Works: - Surveying, Geo-Technical investigation, Planning, Designing, augmentation and repairing of all the Civil & Electro-Mechanical Works with renovation work of Alam House , Annex Building , Chlorine House , Filter House , Alam House No-2 , 2 nosClariflocculator including all electromechanical accessories , High lift room , Boundary wall , Repair Security room and shade of sludge pond , Raw water pump house , Sub-station Building , Boundary wall and concrete road , Control room etc. under 14 MGD W.T.P , Construction of Overhead reservoir (900 cum) staging height 20 mtr. under 15 MGD W.T.P , Renovation of Clear water pumping station and substation at piyala boosting station , Renovation of Clear water pumping station and substation at Angadpur WTP , Renovation of Raw water pumping station and substation at Angadpur WTP with all others allied works like civil and electro-mechanical work (according to Indian Electricity rules) and others , if any will be executed as per instruction by EIC including yard lightening and internal illumination (all building) complete in all respect including satisfactory completion and commissioning, necessary training of staffs & thereafter (subsequently) five (5) years operation and maintenance works with Operator, security, gardening arrangement including supply items (viz: Alam, Chlorine, Bleeching, Electrical Tools & Tackles, Torch, Duster, Soap, Gum Boot, Rain coat, Umbrella, Handgloves etc.) on Turnkey basis at the Piyala Boosting Station, Angadpur 14 MGD WTP & 15 MGD WTP within Durgapur Municipal Corporation area under AMRUT 2.0.

For Electro-mechanical works:- Planning, design, drawing, manufacture, supply, delivery at site, installation, fabrication and erection of all mechanical and electrical equipment including pipes, valves, pumps, motors as per detail technical specification & vendor list that may be necessary and specified herein to make the treatment plant complete in all respects to treat raw water delivering 865 m3/hr of potable water of quality (physical, chemical and bacteriological) as specified by relevant IS codes and World Health Organization.

a) Commissioning & trial run: - The scope also includes Trial Run and Testing the Plant for three months after commissioning (72 Hours).

b) Operation & maintenance: - Operation and maintenance of the same for a period of 60 (sixty) months after the completion of specified period of successful Trial Run, under the overall supervision of the Employer / his representative and from the date of commissioning.

c) Training: - This also include necessary training to the employees engaged at WTP by ULB.

The Bid comprises of following major works:

(A) Water Treatment Plant:

Intake point:-

1) Supply & fixing of suitably designed rotating GI Screen (15 mtrApprox) in feeder canal with lifting arrangement

Sump:-

1) Supply & fixing of Head stock with shaft other necessary components to make the sluice gates operational- 3x1200x1500 mm , Shaft Length - 6mtr(each)

2) Supply & fixing of GI Screen with fixing structural parts (L 65mmx65mmx6mm)suitable for removing and cleaning with proper lifting arrangement

Size:- 2x4.50mtrx4.50mtr

3) Repairing of stair at sump.

4) Concreting of pathway.

5) Minor concreting and plastering work at sump.

6) Handrail to be derusting and need painting.

7) Cleaning and disposal of sludge from intake pit and intake well.

8) Overhauling of inlet gates of intake pump house, 3 nos

9) Supply of new screens to be fixed in pump suction at intake well-6 nos.

Raw water Pump House:-

1) 1 no Float Type level indicator at Raw water sump to be changed with proper support and functioning.

2) Replacement of 6 nos 300 mm dia sluice valve at raw water pump need, shaft length Ht-6 mtr (each).

3) Replacement of 6 nos 300 mm dia non return valve need at raw water pump house.

4) Replacement of 6 nos 300 mm dia dismantling joint, short piece -500 mm (incl flange).

5) Replacement of Actuators control with butterfly valve - 6 nos 300 mm dia.

6) Replacement of Suction valve at raw water pump house, 6 nos 350 mm dia.

7) 12 nos thrust block at raw water pump house is required.

8) Painting of 6 nos 300 mm dia raw water delivery pipeline.

9) Supply & fixing of pressure gauge (2 kg) at 300 mm dia delivery pipeline - 6nos

10) Supply and fixing of 3x35 sqmm cable aluminium armour from starter to motor, 300 mtr.

11) Overhauling/replacement of all exhausts fans and makes them working.

12) Overhauling/replacement of one no raw water delivery valves (900mm dia)

13) Overhauling/replacement of 2nos. raw water delivery motorised actuator of valves (600mm dia)

14) Fire extinguisher to be changed.

15) Steel rolling shutter at raw water pump house to be changed.

16) Stair at raw water pumps house- derusting, repairing and painting.

17) Repair and painting of raw water pump house room, with replacement of broken windows with new windows.

Chlorine room:-

1) 2 nos neutralisation pit is required.

2)2nos Manual monorail joist to be extended up to neutralisation pit – (6 mtr, ISMB 400mm-each)

3) Supplying, fitting & fixing of new chlorinator for pre-chlorination with pump motor set, 5kg,- 3 nos

4) Supplying fitting fixing of new chlorinator for post- chlorination with pump motor set ,5 kg,-3nos

5) New leakage detector for chlorine is required.

6) Replacement of Trunion rollers for tonners,- 12 nos with fixing plate.

7) Repair, Servicing of EOT crane-2 nos.3 MT Capacity with manual push pull travelling trolley.

8) Complete replacement of PVC piping 25mmdia for chlorination (pre & post)- 400 mtr approx.

9) Repair and painting of chlorine room, with replacement of broken doors & windows with new windows.

Alum room:-

1) Supply, erection & commissioning of motors (0.75 kW) with all accessories-3 nos and repairing servicing of motors (0.75 kw)-3nos.

2) Supply, erection & commissioning of new Gear boxes and agitators with all accessories-3 nos. and repairing servicing of Gear boxes and agitators with all accessories-3nos.

3) Supply, Laying & fixing of pipes for transfer of alum solution – 40mm dia, 20mtr approx

4) Supply & fixing of valves for Alum solution-8 nos , 40mm dia.

5) Supply & fixing of constant head boxes with complete accessories, 2nos.

6) Supply & fixing of level indicator for alum solution, 6 nos.

7) Low level window to be closed with brickwork.

8) App membrane coating on inside wall of alum room up to 2 mtr height.

9) Steel window to be replaced with new aluminium window.

10) Lime chamber to be converted to alum chamber.

11) Repair and painting of chlorine room , with replacement of broken window with new window

Flash mixer:-

1) Supply and fixing of sluice gates/ Pen stock gate with shaft & wheel complete, to make it operational-(3x1200x1500)mm, Shaft Length -6mtr(each)
2) Supply, erection & commissioning of new Gear boxes and agitators with all accessories-3 nos.

3) Supply, erection and commissioning of raw water ultrasonic flow meter-1 no.

4) Repair/ Replacement of walkway gratings and replacement of handrail.

Clariflocculator(2Nos):-

1) 2 nosclariflocculator required full maintenance.

2) Replacement of squizer rubbers including hanger with epoxy painting- 2 nos.

3) Rail alignment levelling & fixing- 2 no.

4) Replacement & fixing of Traction wheel 200 mm dia of end carriage- 4 nos.

5) Replacement of current collector complete with carbon brushes-8 nos.

Filter House:-

1) Replacement of under drainage lateral pipes(100mm dia,7.5mtr approx) of filter beds by HDPE/PVC pipes of designed dia-16 nos.

2) Supply & replacement of filter media of all the filter beds using specific quality & standard of media, washing, Screening, after removing from bed as per IS 8419- 16 nos.

3) Replacement of Pneumatic actuator valves & gates-(Backwash valve-400mm, Clear water outlet valve-300mm, Drain valve-500mm,airvalve-150mm,inlet valve-300mm-1 no each in single filter bed, Total filter bed-16 nos)

4) Replacement of filter falcon levers 25 mm dia, 4mtr (length each) - 16 nos.

5) Replacement of float guide pipes 25 mm dia, 4mtr (length each)-32 nos.

6) Changing of complete compressed air pipeline (DI- 150mm dia) used for actuator-160mtr approx

7) Replacement of rate setters-16 nos.

8) Repair and painting of Filter House, with replacement of broken doors & windows with new window.

Sludge well:-

1) Shed is required.

2) Staircase is required.

3) Supply, fitting & fixing of new sludge pump-motor set- 2 nos suction pipe line (100mm dia)

4) Removal of sludge from drying bed-3 nos.

5) Supply &laying of sludge overflow line 500 mm dia-50 mtr.

6) Railing around sludge well.

7) Concreting, plaster with neat cement finish at sludge well.

Clear water pump house:-

1) Supply & fixing of Level indicator at CWR- 1 no.

2) Replacement of electrical actuator valves (450 mm dia) with necessary components as required- 7 nos.

3) Supply, laying & fixing of Ms Pipe, 500 mm dia for suction of clear water pumps complete with fittings- 50 mtr.

4) Supply, laying & fixing of MS pipe 450 mm dia for delivery of clear water industry pipeline-50 mtr.

5) Floor screed concreting for existing pump house.

6) Requirement of new 14 nos exhausts fans.

7) Repair and painting of Clear water pump house, with replacement of broken window with new window.

8) Ducting line (Aluminium) 750mmx 750mm need to replace.

Laboratory:-

1) New Jar test apparatus required.

2) Air conditioner to be replaced -3Nos.

3) New Computer required.

4) New Ph meter, new turbidity meter, Specto-photometer required.

Carryout O & M for a period of 5 year from the date of successfullyhand over of WTP.

7/6/24

The Superintending Engineer,
West Circle, M.E. Directorate.[i]

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

TheSuperintending Engineer,

West 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.Thecontractor 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 Tamralipta 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, South Circle or his representatives of Municipal Engineering Directorate from time to time or approved in writing by the Superintending Engineer, South 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, South Circle, M.E.Dte., and Govt. of W.B.

(w) "Store" means such storage areas including depot, go down, 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 conveyor 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 cleans 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 overhand 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, accept 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 form 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 Biding(omittedportion) 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 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 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 or 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 advice 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 EICshall 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 Biding 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 al1 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

(I) 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 arc 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 hem), 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, sigh trails 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 affected 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 of 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 (I) hereof

(2) Minimum Amount of third party insurance - Such insurance shall be affected with an insurer and in terms approved by the EIC, which approval shall not be unreasonably withheld, and for a least the amount started 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 It1dcnJmty 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 111 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 Employerand 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 of1961) 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 LaborCommissioner: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 is the Contract in sufficient detail to enable to 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 or 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 if 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 (I) 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 deed 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 values 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 undersite 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. 0 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 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 fail 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 of 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 form 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 alterative 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 (I %) 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 be 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 the 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 of 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 multify 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 commissioningi.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 011 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, GST, 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 GST 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-Biding 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 eights 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 proceeding 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 (I), (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 or both parties, arises after the Contract is made so that either party is prevent 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 jurisdictionprovided 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 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 renderer 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 renderer 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.

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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.

The Superintending Engineer,

West Circle. MED

SECTION – D

SPECIAL PROVISIONS

1.0. GENERAL

1.1 Extended scope of the contract

The contract comprises the surveying,planning, designing, drawing supplying materials and equipment, construction, testing of the plant, Trial Run for 3 months, commissioning of E/M Equipment's with continuous operation for 72 hrs. (or part thereof) and maintenance for a period of (60) sixty months after successful trial run upon completion of the works and commissioning and except in so for as the contract otherwise provides, the provision of all labour, materials, constructional plant, temporary works and everything (whether of a temporary or permanent nature) required red in and for such planning, design, construction, completion and maintenance so far as the necessity for providing the same in specified in or reasonably to be inferred from the contract.

1.2. Item wise details of the lump sum prices and interim payment schedule

The successful contractor will, against each of the job items quoted in the schedule or prices on lump sum basis, submit a detailed break up of lump sum prices for the approval of the TIA through EIC for the purpose of preparing interim payment schedule. The break ups will be such as to fairly agree with the lump sum price quoted. The Superintending Engineer of South

Circle of Municipal Engineering Directorate shall have the authority to modify the breakup of prices keeping, however, the total of the prices fairly equal to the lump sum amount quoted. Lump sum prices quoted in the schedule of prices shall remain fixed irrespective of the variations (i) in Items and quantities during actual execution compared with those provided in the break-ups.

Such break-ups for Civil Works shall include for each of the unit of the treatment plant the following broad items of works:

i) Piling (if required)

ii) Cement Concrete

iii) Reinforcement

iv) Brick Work

v) Structural Steel Work

vi) Doors, Windows, Rolling Shutters, Gates etc.

vii) Roof Treatment

viii) Plumbing and Sanitary Works

ix) Pipe Lines and appurtenant structures

x) Finishing works and other miscellaneous works (to be specified by the Contractor)

Break-ups for Mechanical Equipment shall be into the following broad items:

i) Pumps, Sump pump , vacuum pump and air blower

ii) Sluice valves, Butterfly valves, Non return valve, dismantling joint, common delivery lines and penstocks Etc.

iii) Structural Steel Works

iv) Pipes and specials

v) Miscellaneous (to be specified by the Contractor)

Break-ups for Electrical Equipment shall be into the following broad items:

i) Motors

ii) Cables

iii) Motor control panel, internal illumination, walk way illumination, lightening arrestor and aviation lamp arrangement.

iv) Other electrical equipment (to be specified by the contractor)

The above-mentioned details should be submitted by the contractor as early as possible after receipt of the Letter of Intent in order to enable him to start any sub-items of work and to receive interim payments. Where a component includes civil mechanical and electrical equipment, the break ups should invariably be submitted.

1.3. Store shed

The Contractor shall provide at his own cost a store shed of adequate capacity for storing materials. The shed should be of such construction that it must protect the materials against deterioration. A raised platform well above the highest flood level shall be made for stacking cement in such a way that the cement procured earlier can be consumed first so as to avoid deterioration due to prolonged stacking. If any modifications to the store shed in suggested by the Superintending Engineer recommendation of the Engineer for better storing of materials will be carried out by the Contractor at his own cost.

1.4. Land for Contractor's Establishment

For the purpose of constructing Contractor's Store yard, go-downs, site office and ancillaries, he may utilize portion of the land belonging to the Employer at such location as would not interfere to execute other co works. For all these, the Contractor shall have to obtain the requisite permission of the Engineer. The Contractor shall for this purpose submit to the Engineer for his approval a plan of the proposed layouts for the site facilities. The Engineer reserves the right to alter and modify the Contractor's proposals as the Superintending Engineer may deem fit.

1.5 Water and Electricity for Construction

1.5.1 The Contractor shall have to make his own arrangement for supply of water and for electrical power that may be required for or in connection with the works. No payment on this account will be entertained. However, Municipality may assist in getting power.

1.5.2 Arrangement for supply of piped water may not be possible. The Contractor will have to make arrangement for supply of drinking water and water required for constructions works by sinking tube wells or other suitable alternatives. The Tenderers shall investigate this matter during site inspection before submission of tenders: No payment will be entertained on ·this account.

1.5.3 Nevertheless electrical power from usual supply agencies may not be continuously available due to various reasons including load shedding. In case of non-availability of electrical power the contractor will have to make his own arrangements for electrical power through generations. Contractor should include such aspects while quote his rate. No payment will be entertained on this account. When drawing power from the Municipality power point, the contractor shall have to bear the cost of electrical charges. The route of conveyance shall be subject to approval by the Engineer-in-Charge and will be in accordance with prevailing I.E. Rules.

1.6 First-Aid Facilities

The Contractor shall arrange for medical attentions to be promptly available when necessary. He shall for this purpose provide a number of First-Aid stations at suitable locations within easy reach of the workmen and other staff engaged in the Works. Each First-Aid station shall be properly equipped and will remain in charge of a suitably qualified person. The Contractor shall also provide for transport of serious cases to the nearest hospital. All these arrangements shall be to the approval of the EIC.

1.7 Fire Extinguish Arrangement

The Contractor shall provide suitable arrangement for fire extinguish. For this purpose he shall provide requisite number of Fire Extinguishers and adequate number of buckets, some of which are to be always filled with sand and some with water. This equipment shall be provided at suitable prominent and easily accessible places and shall be properly maintained.

1.8 Safety Measures

The Contractor shall be responsible for the safety of all workmen and other persons entering or in the works and shall at his own expense and to the approval of the EIC, take all measures necessary to ensure their safety.

Such measures shall include the provisions of helmets (Specially where work at a height is involved), provision of gum-boots to workers engaged in cement concrete or other works, scaffolding or other measures required for working at a height, shall be strong and rigid and have to be provided with suitable and convenient access. Shoring required for deep excavation must be adequate and rigidly braced and strutted. The Contractor shall provide depending on the exigencies of the location and nature of work and other relevant factors, other safety measure that the EIC may direct.

1. 9 Supervisory Staff

The Contractor shall engage an experienced and qualified Site Manager to be in day-to-day charge of the work and he should be authorized to receive instructions from the Engineer. He shall receive orders given by the Engineer from time to time and shall act on them promptly. The Contractor shall, during working hours, maintain engineer and supervisors of sufficient training and experience to supervise the various items and operations of the work. Orders and directions as given to such engineers and supervisors or other staff of the Contractor shall be deemed to have been given to the Contractor. The Chief Engineer of the Contractor responsible for this work, by whatever designation he may be known, but who will be specified on award of the Contract shall at least once in a fortnight inspect the works and shall discuss with the Engineer the conduct and progress of the work.

1.10 Joint Survey

The Contractor shall satisfy himself regarding the correctness of the layouts, levels etc. as are shown in the drawings or given in the specifications. Before starting the work he shall also carry out at his own cost, survey of the whole work site jointly with the representative(s) of the Authority. Discrepancies noticed between drawings and the joint survey shall be informed in writing to the EIC and got set right before execution of works. Such deviations as may arise out of the joint survey shall not viable the provisions of contract or entitle the Contractor to any extras in any way.

1.11 Layout and Checking

The contractor shall provide all labour, skilled and unskilled and all materials needed for carrying out, as directed, survey, laying out, setting out, checking of works, taking measurements, testing hydraulic and other structures, without any extra payment.

The Contractor shall also provide approach and access to all the works and stores without any extra cost.

1.12 Reference Points

After the joint survey has been plotted and approved by the EIC recommendation of the Engineer, permanent base lines, cross line and bench marks shall be established by the Contractor so as to serve as reference points and "Dimensional Control Basis" of works. He shall prepare and submit a plan showing such reference points with their full description.

1.13 Co-operation with other Contractors

Some works in plant site, have been already done/are being done/will be done through other contractors. In the event of any such work the contractor shall have to work in full co-operation and in close co-ordination with other contractor/contractors. Any difficulty that may arise in this connection will have to be amicably settled by the contractors amongst themselves. If that be not possible, the matter shall be referred to the EIC whose decision shall be final and binding on all the parties.

However, the site allocated to the contractor may be fenced at the Contractor's cost provided any necessary access to others as it required is given. The contractor will be permitted to use only the access to the site as indicated on the site plan of Tender Drawing.

1.14 Approval of Materials and Equipment to be used

Samples in large enough quantity of materials and descriptive data therefore requiring prior approval shall be furnished by the contractor to the EIC in good time before the collection of such materials and equipment so as to permit inspection and testing. The samples shall be properly marked to show the name of the materials, name of the manufacturer, place of origin and item for which it is to be used. Only upon approval, the materials of approved quality shall be brought to site. Samples approved shall be on exhibition at all times, properly stores and prevented from deterioration for the purpose of comparison with the materials brought to site of work from time to time for use in work.

1.15 Testing & Testing Equipment

1.15.1 Testing of materials to be used in the permanent work or of the quality of finished items, sha11 have to be done from approved laboratory at the expense of the contractor.

The contractor shall afford at his own cost necessary facilities in providing the requisite materials and other assistance that may be required by the Engineer including transport of the test specimens to the laboratory referred to above,

1.15.2 The Contractor shall provide at his own cost necessary equipment for such testing which by the nature of work may have to be done at site or for taking samples for testing in laboratories. These include sufficient number of slump cones, standard 150 mm metal cube molds, sets of I.S sieves, weighing balances, graduated measuring cylinders, complete set of equipment for in-site density test, thermometers and any other miscellaneous equipment that may be required by the Engineer or his Representative. The Contractor shall also provide necessary arrangement for curing of concrete cube specimens as instructed by the Engineer.

1.16 Construction Records

The Contractor shall keep and supply to the Engineer the up-to-date records of the dimensions and positions of all permanent works (showing therein any approved deviation between the drawing and the work as actually executed), The information available from the records must be adequate and complete to enable preparation of "as-made" drawing by the Contractor from these records,

1.17 Progress Photographs

The Contractor shall at his own cost and expense arrange to take periodic photographs to show the progress of work or interesting features thereof. The time and the position where from a photograph is to be taken should be as per direction of the Engineer or his Representative, Three copies of each of these photographs to an enlarged size of about 25 cm x 20 cm together with the CD/DVD, shall be supplied to the EIC and these shall become the property of the Employer. Each photograph shall be suitably captioned with the date of the photograph, location and other relevant particulars, further prints and CD of the photograph, location and other relevant particulars shall not be kept by the Contractor or reproduced without written permission of the Employer. Digital Camera with 6.0 Mega pixels should be used for taking photos.

Restrictions to photography or security restrictions that may be applicable to any particular area must be carefully and rigidly observed.

The number of photographs (each consisting of three prints and the CD/DVD as aforesaid) for the complete works is not expected to exceed 100 (one hundred), No photograph of the plant and other insta11ations shall be taken without prior approval of the concerned officers

1.18 Satisfactory completion of various items

The sub-works included in the Schedule of Prices are job works on lump sum basis. The various items of the sub-work are to fit in perfectly in the whole plant in every respect so as to form effective working parts of the whole plant as per satisfaction of

the EIC. Each sub-work wi11 be considered as complete when it is completed as per specifications and put into commission, as per standards, as a successful component part of the whole plant.

1.19 Checking Quality of Work

Should the Engineer consider it necessary to satisfy himself as to the quality of the work, the Contractor shall, at any time during continuance of the contract, offer sample of work done or if necessary pull down a reasonable part of the work enough for such inspection and testing as the Engineer may direct and the Contractor shall make good the same at his cost and to the satisfaction of the Engineer without any extra cost.

1.20 Recording Measurements

Though the offer is on lump sum basis, the Contractor shall give not less than five days notice, in writing to the Engineer, about the work which is proposed to be covered or placed beyond the reach of measurements so that measurements may be taken before the work is covered, bar bending schedule is to be provided five days before the casting date. If any work is covered without such written notice, the same shall be uncovered at the cost of the Contractor and in default hereof no payment or allowances shall be made for such work. These requirements apply for all the component items executed for the sub-work for which lump sum price is quoted

1.21 Reports and Returns

The Contractor shall maintain at Site daily records of progress with regard to the works carried out, labour engaged and construction equipment deployed. These will form the basis of preparing periodic reports and returns as may be required by the Engineer and in the manner as directed by him.

These daily records shall be made accessible to the EIC & Engineer or his Representative as and when desired by him.

1.22 Site order Books

1.22.1 For the purpose of quick communication between the Engineer or his Representative and the Contractor or his Agent or Representative, Site Books shall be maintained at site in the manner described below. Any communication relating to the works may be conveyed through records in the Site Books. Such a communication from one party to the other shall be deemed to have been adequately served specified elsewhere in the General Conditions of Contract. Each Site Book shall have machine-numbered pages in triplicate and shall be carefully maintained and preserved.

1.22.2 The Contractor shall keep Site Books at various places Site work is being carried out so as to be readily available to the Engineer or his Representative. Any instruction or order which the Engineer or his Representative may like to issue to the Contractor may be recorded by him in the Site Book and two copies thereof taken by him for his record.

The Contractor or his Agent or Representative may similarly maintain separate Site Book for any communication he may like to send to the Engineer or his Representative. Two copies thereof when sent to the Engineer's Representative and receipt obtained thereof, will constitute adequate service of the communication to the Engineer.

2.0 MATERIAL

2.1 The Contractor is liable to procure materials like Cement and Steel of required specifications from his own for smooth progress of the work under terms and conditions stipulated hereinafter.

2.2 However, if, in the interest of the Works, any material be issued to the Contractor, the provisions of Clause 2 shall apply mutates mutants and the issue rate thereof shall be as fixed by EIC.

2.3 Cement

The Cement shall be Ordinary Portland Cement 53 of approved make as per vender listGrade complying with IS: 12269; 1987.The unit weight of cement would be taken as 1440 kg/cubic meter in accordance with IS: 875, Part-I-1987.

2.4 Steel

Steel bars for use in reinforcement shall be cold twisted bars of approved make as per vender list complying with IS: 1786; 1985 (Reaffirmed 1990) specifications

3. TECHNICAL ASSISTANCE

Training of Technical Personnel

The Contractor shall undertake to train one technical personnel selected and sent by the ULB to the works of the Contractor. These engineers shall be given special training in the shop and drawing office where the equipment will be designed and manufactured and where possible in any other plant where Contractor's manufactured equipment of similar type is under installation tests or maintenance, to enable them to become fully familiar with the equipment being supplied by the Contractor. The period of training shall be as decided by the ULB but in any case shall not exceed six months for any individual. During the period of training the Contractor shall arrange for reasonable accommodation of the engineers and transport from the place of accommodation to the works or plant.

The Contractor's supervisory personnel at site shall continuously and intensively instruct and train an adequate number of the ULB authority operating and maintenance personnel at site during erection and commissioning of the plant to enable them to take over the operation and maintenance of the plant after the maintenance period.

No extra payment shall be made by ULB for the training of personnel under this clause.

4. TERMS OF PAYMENT

A) Mechanical Equipment

i) 65% value of the equipment shall be payable on receipt of materials at site subject to submission of authenticated Challan and Test Certificate issued by the manufacturer.

ii) The next 25% value of equipment shall be payable on successful completion of erection of equipment.

iii) Balance 10% value of the equipment shall be payable after successful operation of the plant for 12 (Twelve) months after completion of three month trial run.

B) Electrical Equipment

i) 65% value of the equipment shall be payable on receipt of materials at site subject to submission of authenticated Challan and Test Certificate issued by the manufacturer.

ii) The next 25% value of equipment shall be payable on successful completion of the erection of equipment.

iii) Balance 10% value of the equipment shall be payable after successful operation of the plant for 12 (Twelve) months after completion of three month trial run.

C) Civil Works

i) 90% value of civil works shall be payable against running account Bill.

ii) Balance 10% value of the civil works shall be payable after completion of the entire Civil works, putting the plant into commission and after successful trial run of the plant, provided that the said balance payment for bored piles, if provided by bidder, shall be payable after 180 days from the date of completion of the last pile or last testing whichever is later.

D) Operation & Maintenance cost

i) The operation and maintenance cost shall be payable after minimum 3(Three) months from the completion of Trial Run or extended period of Trial Run followed by commissioning in 5(Five) installment subject to satisfactory performance of O&M. In no case the Contractor would be allowed to raise O & M bills, more frequently.

ii) Payment may be released in installment on pro-rata basis

Note: Security Deposit @ 8 % will be deducted against all payment. This will form 10% altogether (2% of Earnest money deposited earlier and converted into Security deposit after awarding the Contract and 1% of security deposit, to be recovered from running account bill).

E) Security Deposit: (Retention Money)

Retention money will be returned after completion of successful operation & maintenance period for 60 months and after submission of all documents specified in Clause-7.2 of Section F

5. NO INTEREST ON DUES

No interest will be payable by the Employer on the amount due to Contractor pending final settlement.

6. DISPOSAL OF THE EXCAVATED MATERIALS

All materials obtained from any excavation required to be carried out under this contract will be the property of the ULB and the Contractor shall not have any claim on it. It will not be used for any purpose other than refilling the excavations as needed or leveling the compound or in construction of any embankment or in any manner as directed by the Engineer. After completion of work or earlier if so directed by the Employer the surplus excavated materials shall be disposed off by the contractor to any distance without any extra cost, but only after being so directed by the Employer.

7. POSSESSION PRICE TO COMPLETION

The Authority shall have the right to take possession for use of any completed or partly completed part of the work. Such possession or use shall not be deemed to be an acceptance of any work not completed in accordance with the agreement.

8. TENDER TO STRICTLY COMPLY WITH SPECIFIED CONDITIONS AND ALL OTHER SPECIFICATIONS

It should be clearly noted that the Bidders have to strictly comply with the specifications and other terms and conditions laid down in this document and no variations are permissible. This is necessary for the purposes of comparison of tenders received.

The Contractor shall stand guarantee for producing potable water as per the standards laid down in the tender and for the works carried out under this Contract.

The Superintending Engineer,
West Circle, M.E. Dte

SECTION – E

GENERAL SPECIFICATIONS OF WORKMANSHIP AND MATERIALS FOR CIVIL WORK

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
IS:1893 (Part I)	Indian Seismic Code.

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 pilling (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 soi1 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 pilling 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 ranm1ed. 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: 5l5. 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 project 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 smoothening 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-m-Charge. The minimum thickness of PYC 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./Cm2
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 vo1canised. 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/ Cm2
Maximum safe continuous temperature	750C
Ultimate elongation	Not less than 350%
Water Absorption	Not more than 350% by weight in a7 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 I (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 on 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 it to be previously cleaned down to remove loose dust or dirt by use of stiff wire brush. All inequalities to be rubbed down and defects rectified. The surface to be wetted well with water and the surface water is to be allowed to run off. The 'Snowcem' or equivalent to be mixed will be 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 (1S: 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 smoothened 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 is 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 ships laid in rectangular panel with diagonal length not exceeding 3.00M and finished smooth with neat comment 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/Sqm 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 rum 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 made, 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, discalced 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 read/ 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: 8l4. All steel work shall be fabricated and erected as per IS: 800 and IS: 806. Welding shall be carried out as per IS: 8l4, 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. Floor 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 failing 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 the 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. PIPLINES / 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 insulting 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 handing 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-l 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 LIGHTENTING ARRESTOR AND AVIATION LIGHT

Required sets of Lightening 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 TRIAL RUN

When in the opinion of the Engineer the initial performance tests as specified in Section- I are satisfactory the Contractor shall arrange for trial run of the plant at its rated capacity and also their performance tests. During such tests, the Contractor shall arrange to collect samples of effluents from the clarifier and representative. Samples minimum of SLX samples of each effluent shall be collected at intervals specified by the Engineer each day for 14 consecutive days. These samples shall be sent by the Engineer or his authorized representative to the plant laboratory or any other laboratory nominated by the Engineer, for analysis and determination of the quality of the two effluents. All costs of the sample collection, delivery to the laboratory and test shall be borne by the Contractor.

The Plant shall be deemed to be ready to be put into normal use when trial run of the plant and the quality of the clarified water and filtered water are certified satisfactory by the Engineer. The period of maintenance shall be reckoned from the date of the Engineer's certificate.

30.0 OPERATION AND MAINTENANCE

After the plant is deemed to be ready to be put into normal use the Contractor shall operate and maintain the same for a period of twelve months by his own establishment and technical experts under the overall supervision chemicals and other consumable stores required for the operation of the plant shall be provided by the contractor at his cost. The Employer shall also bear the cost of electrical energy only. During the aforesaid period of operation of the plant the Contractor's supervisory staff shall train and instruct technicians and other staff deputed by the Employer about the correct method of operation and maintenance of the plant as a whole and its various mechanical and electrical components. The Training shall be such as would enable the Employer's staff to take over the plant from the Contractor for its operation and maintenance independently. The Contractor's training personnel shall give special attention to this.

During the period of operation and maintenance the Contractor shall arrange to take regular samples of the clarified and filtered effluents as directed by the Engineer and shall have such samples tested at his cost in the plant laboratory or any other laboratory nominated by the Engineer, to determine the quality of the samples and the performance of the plant. Such tests shall be continued up-to the penultimate week prior to the end of the maintenance period and the plant shall be taken over by the Employer subject to the final performance tests being certified as satisfactory by the Engineer.

The Bidders shall submit with their offer a list of technical and non-technical staff they propose to engage for operation and maintenances of the plant for twelve months.

31.0 GUARANTEE PERIOD

The Contractor shall stand guarantee for the successful operation of the plant for 12 (Twelve) months period from the date of the certified commissioning as stated in clause C-48 & 49 within which any defects and short coming due to faulty design of the plant, defective mechanical and electrical equipment or defective construction will have to be made good without any extra cost to the Authority. During the guarantee period the Contractor shall ensure thorough checking of the plant at least once every month and arrange for immediate rectification of any defects detected during this special drive by his experts.

32.0 GUARANTEES

The Contractor shall give the following guarantees

32.1 Civil and Structural Works

The Contractor shall guarantee the plant against any structural failure due to faulty design, bad workmanship, substandard materials, etc. for a period of twelve months. Any defect found during the guarantee period shall be rectified by the Contractor to the satisfaction of the Engineer without any extra cost.

32.2 Plant and Equipment

Even when a plant or equipment has been manufactured and / or marketed by a vendor, it would be deemed to have been supplied and installed under the contractor's supervision. The Contractor shall provide back-to-back guarantee along with the vendor but shall solely be responsible for its repair/replacement. He shall not cite the vendor and claim absolvent. In addition, all equipment shall be free from any defects due to faulty designs, materials and / or workmanship. The equipment shall operate satisfactorily and performances and efficiencies shall not be less than the values guaranteed by the manufacturer and endorsed by the Contractor.

Formal acceptance of the work or equipment covered under the Contract by the Engineer shall not be made until all the work done by the Contractor has satisfactorily passes all tests required by the specifications.

If, during testing of work and / or equipment prior to formal acceptance, any equipment or materials shall fail in any respect to meet the guarantees, the Contractor shall replace such equipment in a condition, which will meet the guaranteed performance. Any such work shall be carried out by the Contractor at his own cost and expenses in 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 were additional work.

If the Contractor shall fail to do any such work as aforesaid, required by the Engineer, the Employer shall be entitled to carry out such work by its own workman or by others and if such work is supposed to be carried out by Contractor the cost thereof, or may deduct the same from any money due or that may become due to the Contractor.

33.0 IMPORTANT GUIDELINES AND SPECIFICATIONS

33.1 Unless otherwise specified elsewhere, the work shall be carried out as per the following specifications.

33.2 All civil works shall be carried out as per specifications contained in other section of these tender specifications.

33.3 All electrical works including supply of all electrical equipment shall be carried out as per specifications contained in other section of the tender specification.

33.4 All mechanical works including supply of equipment shall be carried out as per specifications contained in other section of these tender specifications.

33.5 The erection and commissioning works shall be carried out as per specifications contained in other section of these tender specifications.

34.6 All the exterior doors and windows shall be provided with R.C.C. chajja of approved design.

34.7 All windows and ventilators/skylights shall be provided with mild steel grills of approved design.

34.8 For all water retaining structure, grade of Concrete shall be M30.

34.9 All components (Civil,Electrical and Mechanical) should be designed in congruence with the relevant data and accordingly the same should be incorporated in the drawing which are sufficient go draw 17.21 MLD water from Rupnarayan River and to Deliver the same to proposed WTP which are approximately 6.0 KM away from in take and after due execution if any component fails to meet the requirement of the project as mentioned in the e bid ,it has to be modified or replaced by the L1 bidder in his own cost

The **Superintending Engineer,**
West Circle. MED

SECTION - F

General Technical Specification

RAW WATER PUMPING STATION AT ANGADPUR

SECTION -

Technical Specification for Pump

1.00.00 **GENERAL INFORMATION**

There will be adequate number of pumps which are to be located at the Pump House. The RAW Water pumping station shall be as under:

The horizontal axially split centrifugal pumps are to be installed in a dry pit for horizontal execution. The prime mover would be squirrel cage induction motor. Connection of pump & motor shall be with flexible coupling. The vibration level shall be 50 microns both in horizontal & vertical direction, sound level of maximum

85 db during running condition of pump & motor at a distance of 1.50 mtr. The pump shall be supplied with base plate, grounding pad, lifting lug, eyebolts, foundation bolts, and nuts, flexible coupling, coupling guard etc. The pump shall have provision for fixing pressure gauge, vent pipe, etc.

- The Pump models shall be selected in such a manner that apart from the present duty condition mentioned above, the future duty condition of 10% increase in flow and corresponding increase in Head could be achieved by changing only the impeller assembly. The price is to be quoted for pumps with present duty condition. Necessary Data from the pump manufacturer is required to be submitted including family curve of the offered model by the successful tenderer. Further during detail engineering, the pump head may undergo a change upto a maximum of (+) 10%. Pump rotational speed shall not exceed 1000 rpm (syn).

2.00.00 **SPECIFIC REQUIREMENTS**

Design

The design, manufacturing, performance of the horizontal centrifugal axially pumps as specified hereinafter, shall comply with the requirements of applicable codes, the latest applicable Indian/British/American/DIN standards, in particular and in that order of application, the following.

2.01.01 IS 1520 Horizontal centrifugal pump for clean, cold, fresh water.

2.01.02 IS 5120 Technical requirements, rotodynamic special purpose pumps.

2.01.03 IS 9137 Code for acceptance test for centrifugal, mixed flow and axial pumps - Class C.

2.01.04 Hydraulic Institute Standards.

2.01.05 BS 599 Methods for Testing Pumps.

2.01.06 BS 5316 Acceptance tests for centrifugal, mixed flow and axial pumps.

2.01.07 PTC 8.2 Centrifugal pumps-Power test codes.

2.01.08 The materials of the various components shall be as per data sheet or equivalent material conforming to applicable IS/BS/ASTM/DIN Standards in that order of application.

2.01.09 In case of any contradiction between the aforesaid standards and the stipulations as per the technical specification as specified hereinafter, the stipulations of the technical specification shall prevail. In case of contradiction between this specification and the pump data specification sheets enclosed, stipulations of the data specification sheets' shall prevail.

3.00.00 **GENERAL PERFORMANCE REQUIREMENTS**

3.01.00 The pump shall be designed to have best efficiency at the specified duty point. The Pump set shall be suitable for continuous operation at any point within the — 'Range of Operation', so as to match with the system resistance curve.

3.02.00 Pumps shall have a continuously rising head capacity characteristics from the specified duty point towards shut off point, the maximum being at shut off.

3.03.00 Pumps shall be suitable for parallel operation. The characteristics curves such as head vs. capacity, KW vs. capacity EFFICIENCY vs. capacity etc., shall match to ensure equal load sharing and trouble free parallel operation throughout the range. In the event of tripping of one of the operating pumps, the other operating pumps shall be capable of passing the maximum flow through it as dictated by the system resistance corresponding to both maximum and minimum water level in the pump suction sump.

3.04.00 The pump motor set shall be designed in such a way that there is no damage on account of any reverse flow through the pump which may occur due to any abnormal operation of the system.

3.05.00 Where reverse flow through the pump is specified in data specification sheets, the drive motor shall be capable of bringing the pump to its rated speed in the normal direction from the point of maximum possible reverse speed without injurious heating, when power to the motor is restored with a minimum voltage of 90% at the motor terminal.

External head that may be imposed on the pump under reverse flow condition is to be decided by the Bidder after analyzing the complete system and the particular abnormal condition of run. However, any specific requirement as mentioned in the Pump Data Sheet shall be adhered to Torque-speed curve for pump and motor for such reverse flow condition shall have to be submitted along with the offer.

4.00.00 **DESIGN & CONSTRUCTION**

4.01.00 **Pump type**

Pump shall be axially split case, single volute, double suction, mixed flow type and shall be constructed in a manner that they can be placed on their foundation with their shaft in horizontal axis.

4.02.00 **Casing**

The casing shall be a single volute, double suction design and shall be so constructed that when it will be placed on its existing foundation the integrally cast with one half of the casing so that the other half of the casing can be removed without having to disturb the suction and discharge pipelines. A suitable fixture shall be provided with each pump for easy removal of one half of casing, which will have no connection with the pipelines, for inspection and / or replacement of the Rotating Elements.

4.03.00 **Impeller**

The impeller shall be double entry type and dynamically balanced.

4.04.00 **Wearing Rings**

Casing wearing rings shall be provided with torque and groove arrangement to prevent rotation and shall be easily removable.

4.05.00 **Impeller Shaft**

The impeller shaft shall be ground finished on its entire length and shall be protected with sleeves so that the shaft itself cannot come into contact with the actual liquid pumped.

4.06.00 **Sleeves**

Sleeves shall be keyed onto the shaft and located by grub screws to prevent relative rotation between the sleeve and the shaft. The impeller shall be kept in position on the shaft by means of two sleeves, which in turn shall be locked by means of suitably designed sleeve nuts.

4.07.00 **Stuffing Box**

The Stuffing box shall be an integral part of the casing and shall be fitted with lantern rings. The lantern rings shall be sandwiched between gland packings. The packings inside the stuffing box shall be held in position by glands.

4.08.00 **Glands**

The glands shall be designed to facilitate easy removal for inspection and replacement of packing.

4.09.00 **Bearings**

Adequate capacity thrust bearings ball/roller shall be provided to take the full axial thrust of the pump as well as the weight of the pump-rotating element. Thrust bearing shall be placed in the non-driving end of the pump and shall be grease lubricated anti friction type and ball bearing shall be placed in the driving end of the pump and shall be grease lubricated anti-friction type. Suitable Temperature detectors shall be provided for both DE & NDE side and the signal from the same shall be hooked upto the Control Desk & Instrument Panel

4.10.00 **Discharge Branch**

4.10.01 Discharge branch pipe upto the battery limit under this specification shall be flanged and bolted and shall be complete with gaskets, nuts and bolts of shall screwed as specified in data specification sheets. A dismantling joint in to be provided in each delivery pipeline along with valves.

4.11.00 **Suction Branch**

4.11.01 A dismantling joint will be provided at the pump individual suction side pipeline along with valves to avoid the pipe assembly from any additional thrust. Any thrust loading is to be transmitted to the foundation bolts of the pump assembly.

4.12.00 **Pump Motor Supports, Base Plate etc.**

The pumps and motors shall have common base plate supporting arrangements. The pumps & motors base frame shall be fixed on the foundation through foundation bolts.

5.00.00 **Hydraulic test at shop**

5.01.00 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.

5.02.00 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.

5.03.00 Tests shall be conducted with shop/job motors at full load and full speed.

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

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

6.00.00 **Performance test at shop**

6.01.00 Each pump shall have to be tested to determine the characteristic 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.

6.02.00 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.

6.03.00 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.

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7.00.00 **PERFORMANCE GUARANTEE, TOLERANCE AND PENALTIES**

7.01.00 **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, which shall not be more than those specified under clause 2.01.03.

7.02.00 **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 to 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.

8.00.00 CLEANING, PROTECTION AND PAINTING

8.01.00 **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.

8.02.00 **Painting**

All surfaces shall thoroughly be cleaned in a manner approved by the manufacturer for necessary paint 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.

8.03.00 **Packing for shipment**

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

9.00.00 **TESTS AND INSPECTION**

9.01.00 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 MED's representatives. All relevant cost of such inspection by two representatives of MED has to be borne by the manufacturer / contractor.

9.02.00 Where stage inspection is to be witnessed by Employer in addition to above, the bidder shall submit to the Employer at the initiation of the contract, the deadline of PERT-CHART showing the manufacturing progress and indicating the periods where inspection of the Employer or his authorized inspection agency is required at the manufacturers premises.

9.03.00 Where stage inspection is to be witnessed by Employer, the various stages of inspection, together with the program shall be submitted to the Employer. The inspection and test procedures shall also be submitted for Employer's approval.

10.00.00 **SPECIAL TOOLS AND TACKLE**

10.01.00 The Tenderer shall quote separately for a complete and unused set of all special tools, tackles etc., if any, including tool boxes, specifying the quantum of requirement, for erection, maintenance, overhaul or complete replacement of equipment under this specification. A complete list of tools necessary shall be enclosed with the Proposal.

10.02.00 The Price quoted for tools, shall not be considered for evaluation of Tender.

11.00.00 **SPARE PARTS**

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

12.00.00 **DELIVERY**

12.01.00 The schedule of the project demands early delivery of the equipments.

12.02.00 The delivery date shall be indicated by the Successful Tenderer in the Progress Schedule showing the time required for different phases of the work under the scope of this specification taking the date of issue of Letter of Intent as datum.

12.03.00 The Successful Tenderer shall guarantee the delivery date subject to penalty.

13.00.00 **DRAWINGS, CURVES & INFORMATION REQUIRED**

13.01.00 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.

13.02.00 Speed Vs. torque curve of the pump corresponding to recommended mode of pump starting, super-imposed on speed Vs. torque curves of the motor, corresponding to 85%, 90%, 100% rated voltage and also extending over Quadrant I & Quadrant II covering reverse flow conditions, if applicable.

13.03.00 Diagram showing the type of lubrication system, etc.

13.04.00 Complete descriptive and illustrated literature on the equipment and accessories being offered.

13.05.00 Experience list for the similar type of equipment supplied, which should indicate name of customer, date of ordering, value of order date of commissioning, pump parameters and number.

13.06.00 A comprehensive write up or brochure on the details of manufacturing and test rig facilities in the shop of the manufacturer.

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

13.08.00 All data furnished during bidding stage including details furnished under Clause 13.00.00 above 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.

13.09.00 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.

14.00.00 **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.

   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.

b) The information shall be organised 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.

g) The Instruction Manual shall include the list of spare parts that are required for 2 years normal operation and maintenance for equipment. It shall also include list of all special tools and tackle furnished with complete drawings and instructions for use of such tools and tackles.

15.00.00 **DEVIATIONS**

The Tenderer is required to submit with his proposal a detailed list of any and all exceptions taken to this specification by filling up the Deviations Sheet. In absence of such a list it will be understood and agreed that Tenderer's proposal is based on strict conformance to the specification in all respects. These requirements, however, are not intended to prohibit Tenderers from offering alternate quotation for equipment which they consider to be equal or superior to that specified for the intended service and for which he believes he can show economic and/or technical advantages, provided that he is not allowed to add to the Vendors list and is confined to items not appearing therein. However acceptance of the same is at the sole discretionary power of the T.I.A.

16.00.00 **PROPOSAL DATA**

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

16.02.00 Each Tenderer shall supply the data requested in Proposal Data paragraph as above by typing in appropriate places on each page. These filled in data sheets must be properly signed by authorised representative of the Tenderer or

Manufacturer as verification of the data submitted. These signed pages, in their entirety, shall be returned with and shall be part of the Tenderer's formal proposal. The Tenderer shall completely fill in the above information required for each of the above mentioned sheets. Failure to comply with this requirement may result in the rejection of the tender.

17.00.00 **FOREIGN EXCHANGE AVAILABILITY**

No foreign exchange license will be available for this specification, if any foreign exchange is required by any Tenderer, it will have to be arranged from his own quota, through his own arrangement.

DATA SHEET / CHECK LIST OF THE PUMPS BEING OFFERED

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

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 present duty condition for solo operation	:	
1.08.00	Efficiency of Pump at future duty condition for Solo operation	:	
1.09.00	Efficiency of Pump at present & future duty condition in parallel operation	:	
2.00.00	**PERFORMANCES**		
2.01.01	Guaranteed capacity - M^3/hr in peak flow without tolerance in single operation & parallel operation.	:	
2.01.02	Guaranteed head - MWC at peak flow discharge, without tolerance in single operation & parallel operation.	:	
2.01.03	Input to the Pump (KW) at present & future 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 at present & future duty condition	:
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 present and future duty condition	:
2.01.10	Pump shut off head for present and future 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	:
2.02.06	Pump shut off head	
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 :

The following data are obligatory for all the pumps

5.00 **MATERIAL OF CONSTRUCTION**

5.00.01 ***Impeller*** ***: ASTMA-743, Gr- CF8M***

5.00.02 Casing : CI, IS- 210, FG-260

5.00.03 Casing ring : SS, Type- 304

5.00.04 Pump shaft : SS410

5.00.05 Coupling for pump Motor : Flexible pin and Bush type, C.I.

5.00.04 Shaft sleeve

: SS, ASTMA-276, Type- 410

5.00.06 Base Plate : M.S

The following data are to be filled up by the tenderer

6.00.01 Are the pumps suitable for parallel operation :

6.00.02 Whether non-Reserve Rutchet is provided in pump or not :

6.00.03 Type of lubrication for pump :

6.00.04 Whether pre lubrication arrangement provided

7.00.00 **EXPECTED LIVES UNDER NORMAL OPERATION AND MAINTENANCE**

7.00.01 Impellers :

7.00.02 Pump Bowl Casing :

7.00.03 Shaft :

7.00.04 Thrust Bearing :

7.00.05 Whether pump performance curve (H-Q, Q-P, Q-n, Q-NPSHR) authenticated by the pump manufacturer provided with the offer resistance curve :

7.00.06 Whether the copy of the pump family curve, authenticated by the pump manufacturer provided with the offer :

7.00.07	Whether the system head curve superimposed with pump performance curve & modified performance curve provided with the offer	:
8.00.00	**GENERAL**	
8.00.01	Are companion flanges, air release valves, sole plate, arrangement for thrust encounting devices provided	:
8.00.02	Whether lifting lugs, eye bolts etc. provided	:
8.00.03	load data	
8.00.04	Weight of total pump assembly (empty)	:
8.00.05	Weight of total water column	:
8.00.06	Total Static Load	:
8.00.07	Total dynamic Load	:
8.00.08	Maximum horizontal back thrust at maximum water level condition	:

HORIZONTAL PUMP AXIALLY SPLIT CASE

DATA SPECIFICATION SHEET

GENERAL INFORMATION

Service pump case	Clear Water	Pump Type	Horizontal axially split
Designation			
No of pumps Reqd.:		Duty	Continuous
(To be filled in by the tenderer)			
Pumps working condition	Solo / Parallel	Location	Indoor

ELECTRICAL DOCUMENT

Electrical Motors Technical Specification Enclosed : Yes/No

SUPPLY OF ACCESSORIES AND SERVICE

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

Base Plate	Yes/No	Eye bolts, Lifting tackle etc.
	Yes/No	
Sole Plate	Yes/No	Vent and drain with isolation
	Yes/No	
		valves
Foundation bolts, nuts, sleeves nut	Yes/No	
Companion flanges at Pump		Universal Joint
	Yes/No	
Suction & Discharge reducers	Yes/No	Thrust block reqd.
	Yes/No	
along with nuts, bolts & gaskets		Non reverse ratchet
	Yes/No	
External cooling/sealing/lubrication	Yes/No	Special Tools & Tackle
	Yes/No	
		Spare parts (for 4 years operation)
	Yes/No	
Cooling/sealing/lubrication system	Yes/No	Painting & Protective coating
	Yes/No	
Discharge pressure gauge	Yes/No	Suction side low level switch
	Yes/No	
		with annunciation hooter complete with accessories.
Suction pressure/VAC Gauge	Yes/No	
Pump Motor Coupling & Guard	Yes/No	

DATA SPECIFICATION SHEET

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

PUMP PARAMETERS

Design Capacity 2.5%	Individual Pump of required capacity	Permissible tolerance in design	(±)
Effective head (excluding loss in pump discharge branch pipe)	Discharge at duty point with parallel operation	Permissible tolerance in efficiency : in all the cases	(–) 3%

Available at design capacity : Tenderer to indicate. required	Tenderer to indicate from the data supplied	Minimum submergence :	
Discharge pressure :	In MLC	Static head of pumping system	
Pump shut off head :	In MLC	Frictional head of system : at design capacity	
Range of operation : (Tenderer to indicate)	% to % of design capacity	Yes/No Reverse flow through pump to be considered for motor selection	
Maximum speed : (Tenderer to indicate)			
Only rising stable HQ characteristics throughout the 'Range of Operation' is acceptable	Yes/No		

LIQUID DATA

Liquid handled ppm	Clear Water	Chloride	39
Specific Gravity ppm	Nearly 1.0	Total hardness as	144
	$CaCO_3$ max		
Temperature	10- 40^0 C	Chlorine	2 ppm
pH Value ppm max	7.3 to 8.6	Total dissolved solids	500
Turbidity	5 NTU/ JTU (Max)		

DATA SPECIFICATION SHEET

INSPECTION AND TESTING

Item	Specification
Stage inspection by owner :	Yes/No

(details of Stage Inspection by Owner to be added in due course)

Material testing and Identification — Required/not required

RADIOGRAPHY

Parts to be tested:
Testing Std:

Acceptance Std:

ULTRASONIC Test

Parts to be tested
Testing Std.

Acceptance Std

.

DYE PENETRATION

Parts to be checked

Testing Std.

Acceptance Std.

MAGNETIC PARTICLES

Parts to be checked

Testing Std.

Acceptance Std.

Hydrostatic test
Testing Std.

Acceptance Std.

Dynamic balancing pump impeller shop to be witnessed — Yes/No

Performance test at shop reqd. at full speed & full load — Yes/No

NOTES

1. Pump motor set to be designed for starting with discharge valve partly open/closed condition.
2. Motor cooling arrangement shall be self-circulation type having fans mounted on motor shafts.
3. For sealing/cooling water shall be tapped from the pump discharge.
4. Range of operation of the pumps shall be selected by the Tenderer shall also indicate the minimum water level at which pumps can be satisfactorily operated on continuous basis. Tenderer shall furnish with his offer NPSH Vs capacity curve for the entire range of operation based on the above conditions and considering single pump operation & all installed pump operation.

As per technical specification and instruction manual of the manufacturer.

09.00 SUMP PUMP

The portable submersible dewatering pump motor set will be suitable for dewatering gland leakage muddy water withadequate 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 bellow 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 confirm 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 Horizontal axis to suit the size of the pump and shall be able to drive the pump. The rating of the

motor shall be minimum 45KW & 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

rotable in steps of 90°. The main terminal box should be suitable for 2 nos. 3 core, 1.1 KV grade, 95sq.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(110KW & above). 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 M^2)
1.41.00	GD2 value of load to motor shaft (kg M^2)
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. motor (110 KW & above) 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 dispatch 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

1.0 HTPDB

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

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

3.2. The switch gearshall 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 ± 10%, 3 phases, 3 wire, 50 Hz ± 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 90^0C.
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 3he 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 3 limb 50 Hz system with a ratio of 11 KV / 110 / √3 / 110 / √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 – 15 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) Out going feeder panels for CWPS: 1 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)	12 Channel alarm annunciator & Indicating Lamps	-	1 Set

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D) Common for all feeders

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.

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 ± 10%, 50 Hz ± 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 1600 A for phases and 800 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 armored aluminum 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 aluminum 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 1600A incoming feeders 2 nos. each comprising of following components:

i) 415 V, 4 pole, 1600A, 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.

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5.12 1600 A Bus coupler feeder one (1) number comprising of following components:

i) 415 V, 4 Pole, 1600 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.

5.13 Outgoing feeders --- 2 Nos. each equipped with following:

i) 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

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 Outgoing feeders --- 2 Nos. each equipped with following:

i) 415 V, 3 pole, 630A, 50 KA
ACB/MCCB with O/L, S/C, E/F trips 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 Outgoing feeders --- 2 Nos. for each equipped with following:

i) 415 V, 3 pole, 400A, 50 KA MCCB with O/L, S/C, E/F trips

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) 32/63A TPN MCCB with Microprocessor based O/C & E/F releases 9 Nos.

a) 100A TPN MCCB with Microprocessor based O/C & E/F releases 2 Nos.

(Adjustable O/L) rated upto 50^0 C without duration

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c) ON / OFF / Trip Indicating Lamp (For each feeder) As required.

d) 16 A DP MCB 3 Nos.

5.15 Technical Specification of Air Circuit Breaker (ACB)

The ACB shall be rated as specified elsewhere at 50^0 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 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 ± 10%, 50 Hz ± 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 compartmentalized, 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 400A for phases and 200A 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 molded 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, 400A, 50 KA MCCB with O/L, S/C, E/F trips 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.

7.11 400 A Bus coupler feeder one (1) number comprising of following components:

i) 415 V, 3 Pole, 400 A, 50 KA MCCB 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 **45**KW Star – Delta Starter Motor feeders (with individual capacitor feeder), each comprising of following components: Type 2 coordination should have to be followed.6nos

a)	**Not less than reqd. A, 50 KA MCCB with microprocessor-based trip unit with adjustable overload, short circuit & earth fault rated upto 50^0 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.**
d)	**Start / Stop Push Button**	**-**	**1 Set**
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 (BOCR 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.**

7.14 MCCB / MCB feeder of following rating

a) 32/63 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 50^0 C without duration 20Nos

C) Not less than #A TPN MCCB for actuator feeder 6Nos

e) ON / OFF / Trip Indicating Lamp (For each feeder) as required.

f) 16 A SPN 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, ± 10%
b) Phase	:	3 Phase, 4 Wire
c) Frequency	:	50 Hz ± 6%
d) Combined voltage & frequency variation within	:	± 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 [steplessly 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	:	± 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	± 1%
f) Ripple voltage	1% RMS
g) Commencement & termination of boost charging	Automatic / Manual

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 find wire mesh

6) CABLE (SUBSTATION AND PUMPING STATION) :

All HT and M.V. power cables shall be with XLPE insulation, stranded aluminium / copper conductor and armoured

6.01 HT &M.V. Cables and Jointing

All HT and M.V. Cables shall be 33 KV (E) / 11 KV (E) / 1.1 KV grade XLPE insulated and armoured of Al / Cu. conductor 3 core / 3½ / 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 1000 mm 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.

6.02 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.

6.03 Signal Cable

The signal cable shall be PVC insulated 650 / 1100 V grade screened and with stranded copper conductor of appropriate no. of cores as per scheme requirement. Minimum 2 cores shall be kept as spare in all circuits.

6.04 Data Sheet for Cables

<u>HT & M.V. Cables</u>

i) Make

ii) Voltage grade & type

iii) Size

<u>Control cable</u>

i) Make

ii) Voltage grade & type

iii) Size

Screened signal cable

i) Make

ii) Voltage grade & type

iii) Size

7) VALVES AND SPECIALS

7.01 Delivery side of pumps

The delivery side of each pump shall be provided with 1 no. Electrical Actuator operated butterfly valve, 1 no. non-return valve with external damping arrangement, 1 no. Dismantling joint & short pieces wherever required. The diameter of the valves and joints shall as per technical offer.

7.02 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 potable water to maintain the flow unidirectional. The valve shall be maintenance free, leak proof and shall have low life cycle cost. The PN rating of valves shall be 1.0/1.6.

The non return valve shall be single door and double flanged, conventional non slam design with external dashpot arrangement(as per decision of EIC) . The body, door, cover shall be of ductile iron (Gr. GGG 40). The seat and body shall withstand fluid pressure of 16kg / cm^2 and 24 kg / cm^2 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/ mm^2.

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

7.021 Material or construction & other specifications of Non Return Valve shall preferably be as follows:

Fluid to be Handled	:	Clear Water
Pressure Rating	:	PN 1.0/1.6
Design Temperature	:	45 Deg. C
Design Standard	:	IS 5312 (Part – I) / 84
Type of Disc	:	Single Disc (Swing Type)
Closure Characteristic	:	Non – Slamming
Seating Faces	:	Metal to Metal
End Connection	:	IS 1538 / 93 (Table – 4 & 6), Flat Face
Operation	:	Self
Installation	:	Horizontal
By Pass arrangement	:	Yes

Dashpot	:	External

Material of Construction		
Body, Cover	:	Ductile Iron GGG 40
Disc with Hinge	:	Ductile Iron GGG 40
Body Seat Ring	:	L.T.B. to IS 318 Gr.2
Disc Face Ring	:	L.T.B. to IS 318 Gr.2
Hinge Pin	:	H.T.B. to IS 320 Gr. HT 2
Air Release Plug	:	Carbon Steel
Plug / Retainer	:	Carbon Steel
Gasket	:	Rubber, IS 638, Type: B
Bolts / Studs & Nuts	:	Carbon Steel, IS 1367/67 Cl 4.6& 4.0
Shaft	:	SS 410

Testing			Inspection	
Testing Standard : IS 5312(Part-I)/84			Hydro Test : Witness & Test Report	
Hydro Body : 24 Kg / Sq. Cm			Visual : Witness & Test Report	
Hydro Seat : 16 Kg / Sq. Cm			Material Test : Test Report	
Quantity			**Note**	
Size (NB)	Qty.	Location		

As per BOQ	As per BOQ		1. Valves shall have free acting, quick opening non-slam closure characteristic 2. Reinforcing ribs are provided on body, cover & disc. 3. Flow direction mark shall be Cast Integrally on the body to indicate the Direction of flow 4. Valves shall be painted with one coat of Red oxide primer & Two coats of Epoxy Paint 5. Marking: Brand / Size / PN – Rating / Heat No. & Arrow Mark Sl. No.

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.

NON – RETURN VALVE DATA SHEET

1.01	Make	:
1.02	Size	:
1.03	Quantity offered	:
1.04	Type	:
1.05	Test standard, test pressure & duration of test	:
1.05.1	Body	:
1.05.2	Seat	:
1.06	Surface protection	:
1.07	Whether damping arrangement provided or not	:
1.08	Whether by pass arrangement provided or not	:
1.09	Face to face distance	:
2.00	Material of Construction	:
2.01	Body	:
2.02	Seat	:
2.03	Disc	:
2.04	Door Face Ring	:
2.05	Bearing Block	:
2.06	Disk shaft	:

2.07	Disk Seat	:
2.08	Hinge pin, plug, fasteners	:

07.**03** **SLUICE VALVE**

The sluice valves shall be manufactured from ductile iron (Gr. GGG 40).conforming to IS-14846 / 2000. Flange ends as per IS 1538 or as per other standards to match with other flanges. The body seat shall be of S.S. AISI-410 stem shall be of S.S. AISI-410 & the stem nut shall be Gun metal conforming to I.S. 305:1981/BS 2874. Other details are to be submitted for approval.

The seat pressure shall be 10 kg/cm2 and body pressure shall be 15 kg/cm2. The valves should pass through hydrostatics test for duration of 5 minutes.

Body, Cover, Wedge	:	Ductile Iron GGG 40
Shaft	:	S.S. to AISI-410
Body Seat	:	S.S. to AISI-304
Bearing	:	G.M./Teflon
Wedge Sit	:	S.S. to AISI-304
Packing	:	Rubber “O” ring
Internal Fasteners & Clamping Ring	:	S.S. to AISI-304
External Fasteners	:	Carbon Steel to IS:1367 Cl. 4.6 & 4.0.
Hand wheel	:	Fabricated Steel
Worm Gear Unit	:	Mfg. Std.
Actuator	:	No

Testing (as per IS : 13095 / 91)		**Inspection**		
Hydro Body	: 15 Kg / Sq.cm for 5 minutes	Hydro Test	:	Witness & Test Report
Hydro Seat	: 10 Kg / Sq.cm for 2 minutes	Visual	:	Witness & Test Report
Disc. Test	: 10 Kg / Sq.cm for 5 minutes	Material Test	:	Test Report
Quantity		**Note:**		

Size (NB)	Qty (Nos.)	Location	Service / Application	
				1. Valves shall be tight shut-off closures for frequent operation 2. Valve should closed with clock wise rotation of Hand wheel. In case of hand wheel operation) 3. Valves shall be painted with one coat of Red oxide primer & two coats of Black bituminous paints before dispatch. 4. Marking : Brand / Size / PN – Rating / Heat No. & Sl. No.

Materials of construction test certificates shall be provided during supplies. The sluice valves shall be rising spindle type with gearing arrangement / hand wheel for easy manual operation.

7.03 Butterfly Valve

The butterfly valves shall be DIDF, PN 1.0/1.60, conforming to IS 13095 of 1996 / BS 5155. The seat pressure shall be 16 kg/cm^2 and body pressure shall be 24 kg/cm^2. 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 90º 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 ± 10% 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, IP 68 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.

Material of construction & other specifications of Butterfly Valve shall preferably be as follows:

Fluid to be Handled	:	Clear Potable Water
Pressure Rating	:	PN 1.6
Design Temperature	:	(-) 10^0 C to 65^0 C
Design Standard	:	IS 13095 / 91
Service application	:	Tight shut-off
Type	:	Double Flanged Quarter Turn
Disc Type	:	Double eccentric
Seal (Nitrile rubber)	:	Mounted on disc
End Connection	:	Flanged ends to IS 1538/93 (Table-4 & 6), Flat Face
Operation	:	Actuator operated
Installation	:	Horizontal

Material of Construction		
Body, End Cover & Gland Plate	:	Ductile Iron GGG 40
Disc	:	Ductile Iron GGG 40
Shaft	:	SS to AISI 410
Body Seat	:	Nickel weld overlay micro finished
Bearing	:	G.M. / Teflon
Disc Seal	:	Nitrile Rubber (Shore Hardness 55' – 65'A)
Packing	:	Rubber "O" Ring
Internal Fasteners & Clamping Ring	:	SS to AISI 304
External Fasteners	:	Carbon Steel, IS 1367 Cl 4.6 & 4.0
Hand Wheel	:	Fabricated Steel
Worm Gear Unit	:	Manufacturer standard
Actuator	:	Yes

Testing (as per IS 13095 /91)			Inspection	
Hydro Body : 24 Kg / Sq. Cm for 5 min			Hydro Test :	Witness & Test Report
Hydro Seat : 16 Kg / Sq. Cm for 2 min			Visual :	Witness & Test Report
Disc Test : 16 Kg / Sq. Cm for 5 min			Material Test :	Test Report
Quantity			**Note**	
Size (NB)	Qty.	Location		
As per BOQ	As per BOQ			

MOTORISED BUTTERFLY VALVE DATA SHEET

1.1	Make	:
1.2	Size	:
1.3	Quantity offered	:
1.4	Type	:
1.5	Test pressure & duration of test	:
1.6	Material of Construction	
1.6.1	Body	:
1.6.2	Body seat	:
1.6.3	Seat Ring	:
1.6.4	Disk	:
1.6.5	Bonnet	:
1.6.6	Spindle	:
1.6.7	Disc nut	:
1.6.8	Gasket	:
1.6.9	Bolts & Nuts	:
1.6.10	Gland packing	:
1.6.11	Gland	:
1.6.12	Spindle Nut	:
1.6.13	Handle wheel	:
1.6.14	Thrust plate	:
1.6.15	Cover	:
1.6.16	Face Rings	:
1.6.17	Yoke	:

1.7 Face to Face Distance :

ELECTRICAL ACTUATOR

1. The actuator motor for the Butterfly valves 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.

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 ± 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.

DATA SHEET

1.1 Make

1.2 Type

1.3 Rating of Motors

1.4 Whether provided with limit & Torque Switches, if so, torque limit

1.5 Protection Group (IP)

1.6 Whether suitable for outdoor & temporary submergence duty/indoor type

1.7 Whether equipped with suitable component & termination arrangement for transmitting signals for displaying valve opening % indicating in the valve opening indication meters.

1.8 I.S. Standard to which it conforms

8.0) M.S. DISMANTLING JOINT ASSEMBLY AT DELIVERY RISING MAIN

One M. S. dismantling joint of suitable diameter is to be fixed along with the Flow meter & BFV on the delivery rising mainfor the ease of dismantling andfitting of Flow meter during maintenance and to relieve the pipe line stresses. The expansionrange for each of the dismantling joint shall be minimum 40 – 50 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.

The datasheet for the same is as follows-

DATA SHEET

I. Joint Size

II. Pipe thickness

III. Maximum length

IV. Minimum length

V. O.D.

VI. P.C.D.

VII. Thickness

VIII. Flange size

IX. Flange thickness

X. Stud Nos.

XI. Stud dia.

XII. Rubber Gasket

M.S. PUDDLE COLLAR / PLATE

1.1 Collar size

1.2 O.D.

1.3 I.D.

1.4 Thickness of the Collar

1.5 Number of Hooks

9.0) PUMP DELIVERY SIDE PIPING AND COMMON DELIVERY MANIFOLD

The pump individual delivery side piping, valves and dismantling joints shall be of such diameter as per Technical offer.

One dismantling joint of respective diameter is to be fixed along with the Butterfly Valve & NRV on the individual delivery pipe line of each pump within a suitable distance on individual pump delivery pipe line.

The pipes shall be made up of M.S. 10/12 mm thick plates for individual delivery line & 10/12 mm thick plate for Common Delivery manifolds, 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'sof the individual pumpdelivery 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 tenderer should also provide the necessary arrangements to encounter the horizontal back thrust if any and the details as per the pump manufacture's recommendation shall be clearly indicated in the layout drawing.

The common delivery manifold shall of such diameter as per the Technical offer. The manifold shall be fabricated from 10/12 mm thick MS plates.

12.0) RADAR TYPE LEVEL MONITORING SYSTEM

12.01 The radar level transmitter shall be equipped with K- band (25 GHZ) pulseradar level transmitter for continuous monitoring of sump level and a hand-held programmer. The 25 GHZ frequency shall create a narrow-focused beam allowing for a smaller horn antenna and decreasing sensitivity to obstruction.

12.02 The transmitter 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 10 Mtr. with provision of ALARM function of the operating pumps at HWL & LWL and Trip function at LLWL.

12.03 The transmitter shall have ingress protection of IP 67 / 68. Mounting arrangement shall be included in the scope of work.

12.04 The cable connection between transmitter and the controller (to be mounted on the Control Desk) shall be carried out by PVC wire 0.5sq mm copper conductor shielded screened cable and the same shall preferably run in a grounded metal conduit. The controller shall have communication ports with Modbus protocol so as to communicate the field data for interfacing with SCADA in future.

12.05 The signal output shall be 4 – 20 mA and accuracy level shall be ±0.25%.

12.06 The field (hand held) programmer shall be compatible with the transmitter. The transmitter / controller shall have memory backed up by in-built battery. All displays shall be back-lit LED type.

12.07 Auxiliary AC / DC power supply, if required, shall be provided with the system.

13.0) DISMANTLING JOINT FOR INDIVIDUAL DELIVERY

One dismantling joint of respective diameter is to be fixed along with the Butterfly Valve & NRV on the individual delivery pipe line of each pump within a suitable distance on individual pump delivery pipe line..

14.0) EARTHING (FOR SUBSTATION & PUMPING STATION)

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 100 mm wide and 10 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 Earthing should not be less than 3 meters.

15.0) LIGHTING SYSTEM (SUBSTATION AND PUMPING STATION)

15.01 Luminaries

The scope includes indoor lighting of pump house and substation building. Industrial Medium bay luminaries with Metal 250W / 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 Control Room, lighting should be provided with LED T/L with decorative 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.

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).

15.02 **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.

15.03 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.

15.04 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.

15.05 The above stated distribution board shall be fed from independent switch fuse unit / MCB located in the PDB.

15.06 440 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.

15.07 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.	Fluorescent fitting	2 nos. 1 core -1.5 mm² copper & 1 no. Earth wire of1.0 mm² copper
2.	HPSV fitting	2 nos. 1 core -1.5 mm² copper & 1 no. Earth wire of 1.0 mm² copper
3.	Flood light fitting	2 nos. 1 core -2.5 mm² copper & 1 no. Earth wire of 1.0 mm² copper
4.	Receptacle-5A	2 nos. 1 core -2.5 mm² copper & 1 no. Earth wire of 1.0 mm² copper
5.	Receptacle-15A	2 nos – 1 core-4 mm² copper & 1 no Earth wire of 1.0 mm² copper

16.0) Ventilation and Fire fighting :

16.01 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 including all other accessories as required.

a) 3 - phase 450 dia, 1000 / 1500 r.p.m. (Syn) or as applicable Exhaust fans including proper louvers, duct work, rain cowl and bird protection screen ----- As required for the Pump House .

b) 300 dia, 1000 / 1500 r.p.m. (Syn), Exhaust fans including proper louvers, duct work, rain cowl and bird protection screen ----- As required for the Sub-station

c) Wall mounting type control panel for ventilation system ----- 2 Sets

e) 18" Pedestal fan with regulator and all other accessories ---4 Nos.

16.02 Firefighting: The pump house and substation building shall be provided with the following:

a) ABC type Portable type fire extinguisher (2 Kg Capacity) 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.

18.0) Pressure Gauge (Dial Type)

18.01 The individual discharge line pressure gauge (6" dial) shall be of bourdon type.

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

SECTION - F

List of Vendors

Sl. No.	Equipment	Make
01.00	Pump	Kirloskar / Mather & Platt / WPIL Ltd.
02.00	Motor	Siemens / ABB / Marathon/CG
03.00	Control Desk / PDB	Siemens / Sellwin / ABB/Schneider / PCE Projects/ Bhartiya Cutler Hammer / 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)
08.00	Contactor	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
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

15.00 System	Flowmeter & Recorder Indicator, Totaliser	Krohne / Endress Hauser/ ABB / Micro
16.00	Control Fuses	GE/Siemens / L & T
17.00	Current Transformer	Kappa/JAWS / Schneider
18.00	Capacitor	Universal / L&T / Epcos
19.00	Butterfly Valves, Non-Return Valve& Sluice Valve	VAG / IVC / Kirloskar / Fluidtech
20.00	Valve Actuators	Rotork / Auma
21.00	Pressure Gauges	Bell/Taylors/H. Guru
22.00	Fire Extinguishers	Surex / Minimax / Cease Fire / Fire Shield
23.00	Submersible Pump	KSB / Calama / Kirloskar
24.00	Air Conditioner	Carrier / LG / Voltas/ Hitachi
25.00	Lighting system	
26.01	Light Fitting	Philips / Bajaj/Havells/KLITE
26.02	Wire	Finolex / KDK/ Havells
26.03	Switches	Anchor / Havells / Cab
27.00 System /	Ventilation System	P.N. Chakraborty & Co. / Universal Air PASCO
28.00	Exhaust Fan / Ventilation Fan	Alstom / EPC / Pasco / Marathon
29.00	Crane	Surekha / Plicare / India Engineering & ImplementsCo.
30.00	H.T. Switchgear	Siemens / Schneider / ABB
31.00 CGL	Power Transformer	Schneider / KEC/ Voltamp (Vadodara) /
32.00	Battery	Exide/Aamaron
33.00 Line	Battery Charger	Caldyne / Electro Service/Dekem/Live

7.02 **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 potable water to maintain the flow unidirectional. The valve shall be maintenance free, leak proof and shall have low life cycle cost. The PN rating of valves shall be 1.0

The non-return valve shall be single door and double flanged, conventional non-slam design with external dashpot arrangement (as per decision of EIC). The body, door, cover shall be of ductile iron (Gr. GGG 40). The seat and body shall withstand fluid pressure of 10kg / cm^2 and 16 kg / cm^2 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/ mm^2.

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

7.021 Material or construction & other specifications of Non Return Valve shall preferably be as follows:

Fluid to be Handled	:	Clear Water
Pressure Rating	:	PN 1.0
Design Temperature	:	45 Deg. C
Design Standard	:	IS 5312 (Part – I) / 84
Type of Disc	:	Single Disc (Swing Type)
Closure Characteristic	:	Non – Slamming
Seating Faces	:	Metal to Metal
End Connection	:	IS 1538 / 93 (Table – 4 & 6), Flat Face
Operation	:	Self
Installation	:	Horizontal
By Pass arrangement	:	Yes
Dashpot	:	External

Material of Construction		
Body, Cover	:	Ductile Iron GGG 40
Disc with Hinge	:	Ductile Iron GGG 40
Body Seat Ring	:	L.T.B. to IS 318 Gr.2
Disc Face Ring	:	L.T.B. to IS 318 Gr.2
Hinge Pin	:	H.T.B. to IS 320 Gr. HT 2
Air Release Plug	:	Carbon Steel
Plug / Retainer	:	Carbon Steel
Gasket	:	Rubber, IS 638, Type: B
Bolts / Studs & Nuts	:	Carbon Steel, IS 1367/67 Cl 4.6& 4.0
Shaft	:	SS 410

<table>
<tr><td colspan="3">Testing</td><td>Inspection</td></tr>
<tr><td colspan="3">Testing Standard : IS 5312(Part-I)/84</td><td>Hydro Test : Witness & Test Report</td></tr>
<tr><td colspan="3">Hydro Body : 24 Kg / Sq. Cm</td><td>Visual : Witness & Test Report</td></tr>
<tr><td colspan="3">Hydro Seat : 16 Kg / Sq. Cm</td><td>Material Test : Test Report</td></tr>
<tr><td colspan="3">Quantity</td><td>Note</td></tr>
<tr><td>Size (NB)</td><td>Qty.</td><td>Location</td><td></td></tr>
<tr><td>As per BOQ</td><td>As per BOQ</td><td></td><td>1. Valves shall have free acting, quick opening non-slam closure characteristic
2. Reinforcing ribs are provided on body, cover & disc.
3. Flow direction mark shall be Cast Integrally on the body to indicate the Direction of flow
4. Valves shall be painted with one coat of Red oxide primer & Two coats of Epoxy Paint
5. Marking: Brand / Size / PN – Rating / Heat No. & Arrow Mark Sl. No.</td></tr>
</table>

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.

NON – RETURN VALVE DATA SHEET

1.01	Make	:
1.02	Size	:
1.03	Quantity offered	:
1.04	Type	:
1.05	Test standard, test pressure & duration of test	:
1.05.1	Body	:
1.05.2	Seat	:
1.06	Surface protection	:
1.07	Whether damping arrangement provided or not	:
1.08	Whether by pass arrangement provided or not	:
1.09	Face to face distance	:

2.00	Material of Construction	:
2.01	Body	:
2.02	Seat	:
2.03	Disc	:
2.04	Door Face Ring	:
2.05	Bearing Block	:
2.06	Disk shaft	:
2.07	Disk Seat	:
2.08	Hinge pin, plug, fasteners	:

07.**03** **SLUICE VALVE(Actuator operated)**

The sluice valves shall be manufactured from ductile iron (Gr. GGG 40).conforming to IS-14846 / 2000. Flange ends as per IS 1538 or as per other standards to match with other flanges. The body seat shall be of S.S. AISI-410 stem shall be of S.S. AISI-410 & the stem nut shall be Gun metal conforming to I.S. 305:1981/BS 2874. Other details are to be submitted for approval.

The seat pressure shall be 10 kg/cm2 and body pressure shall be 15 kg/cm2. The valves should pass through hydrostatics test for duration of 5 minutes.

Body, Cover, Wedge	:	Ductile Iron GGG 40
Shaft	:	S.S. to AISI-410
Body Seat	:	S.S. to AISI-304
Bearing	:	G.M./Teflon
Wedge Sit	:	S.S. to AISI-304
Packing	:	Rubber “O” ring
Internal Fasteners & Clamping Ring	:	S.S. to AISI-304
External Fasteners	:	Carbon Steel to IS:1367 Cl. 4.6 & 4.0.
Hand wheel	:	Fabricated Steel
Worm Gear Unit	:	Mfg. Std.
Actuator	:	No

Testing (as per IS : 13095 / 91)		Inspection	
Hydro Body	: 15 Kg / Sq.cm for 5 minutes	Hydro Test	: Witness & Test Report
Hydro Seat	: 10 Kg / Sq.cm for 2 minutes	Visual	: Witness & Test Report
Disc. Test	: 10 Kg / Sq.cm for 5 minutes	Material Test	: Test Report

Quantity				Note:
Size (NB)	Qty (Nos.)	Location	Service / Application	1. Valves shall be tight shut-off closures for frequent operation 2. Valve should closed with clock wise rotation of Hand wheel. In case of hand wheel operation) 3. Valves shall be painted with one coat of Red oxide primer & two coats of Black bituminous paints before dispatch. 4. Marking : Brand / Size / PN – Rating / Heat No. & Sl. No.

Materials of construction test certificates shall be provided during supplies. The sluice valves shall be rising spindle type with gearing arrangement / hand wheel for easy manual operation.

7.03 Butterfly Valve

The butterfly valves shall be DIDF, PN 1.0 conforming to IS 13095 of 1996 / BS 5155. The seat pressure shall be 10 kg/cm^2 and body pressure shall be 16 kg/cm^2. 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 90º 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, IP 68 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.

Material of construction & other specifications of Butterfly Valve shall preferably be as follows:

Fluid to be Handled	:	Clear Potable Water
Pressure Rating	:	PN 1.0
Design Temperature	:	(-) 10^0 C to 65^0 C
Design Standard	:	IS 13095 / 91
Service application	:	Tight shut-off
Type	:	Double Flanged Quarter Turn
Disc Type	:	Double eccentric
Seal (Nitrile rubber)	:	Mounted on disc
End Connection	:	Flanged ends to IS 1538/93 (Table-4 & 6), Flat Face
Operation	:	Actuator operated
Installation	:	Horizontal

Material of Construction		
Body, End Cover & Gland Plate	:	Ductile Iron GGG 40
Disc	:	Ductile Iron GGG 40
Shaft	:	SS to AISI 410
Body Seat	:	Nickel weld overlay micro finished
Bearing	:	G.M. / Teflon
Disc Seal	:	Nitrile Rubber (Shore Hardness 55' – 65'A)
Packing	:	Rubber "O" Ring
Internal Fasteners & Clamping Ring	:	SS to AISI 304
External Fasteners	:	Carbon Steel, IS 1367 Cl 4.6 & 4.0
Hand Wheel	:	Fabricated Steel
Worm Gear Unit	:	Manufacturer standard
Actuator	:	Yes

Testing (as per IS 13095 /91)			Inspection	
Hydro Body : 24 Kg / Sq. Cm for 5 min			Hydro Test :	Witness & Test Report
Hydro Seat : 16 Kg / Sq. Cm for 2 min			Visual :	Witness & Test Report
Disc Test : 16 Kg / Sq. Cm for 5 min			Material Test :	Test Report
Quantity			**Note**	
Size (NB)	Qty.	Location		
As per BOQ	As per BOQ			

MOTORISED BUTTERFLY VALVE DATA SHEET

1.1	Make	:
1.2	Size	:
1.3	Quantity offered	:
1.4	Type	:
1.5	Test pressure & duration of test	:
1.6	Material of Construction	
1.6.1	Body	:
1.6.2	Body seat	:
1.6.3	Seat Ring	:
1.6.4	Disk	:
1.6.5	Bonnet	:
1.6.6	Spindle	:
1.6.7	Disc nut	:
1.6.8	Gasket	:
1.6.9	Bolts & Nuts	:
1.6.10	Gland packing	:
1.6.11	Gland	:
1.6.12	Spindle Nut	:
1.6.13	Handle wheel	:

1.6.14	Thrust plate	:
1.6.15	Cover	:
1.6.16	Face Rings	:
1.6.17	Yoke	:
1.7	Face to Face Distance	:

ELECTRICAL ACTUATOR

2. The actuator motor for the Butterfly valves 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.

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 ± 10% 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.

DATA SHEET

1.1 Make

1.2 Type

1.3 Rating of Motors

1.4 Whether provided with limit & Torque Switches, if so, torque limit

1.5 Protection Group (IP)

1.6 Whether suitable for outdoor & temporary submergence duty/indoor type

1.7 Whether equipped with suitable component & termination arrangement for transmitting signals for displaying valve opening % indicating in the valve opening indication meters.

1.8 I.S. Standard to which it conforms

8.0) M.S. DISMANTLING JOINT ASSEMBLY AT DELIVERY RISING MAIN

One M. S. dismantling joint of suitable diameter is to be fixed along with the Flow meter & BFV on the delivery rising mainfor the ease of dismantling andfitting of Flow meter during maintenance and to relieve the pipe line stresses. The expansionrange for each of the dismantling joint shall be minimum 40 – 50 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.

The datasheet for the same is as follows-

DATA SHEET

XIII. Joint Size

XIV. Pipe thickness

XV. Maximum length

XVI. Minimum length

XVII. O.D.

XVIII. P.C.D.

XIX. Thickness

XX. Flange size

XXI. Flange thickness

XXII. Stud Nos.

XXIII. Stud dia.

XXIV. Rubber Gasket

Sluice Gate

Single faced Cast Iron Manually/Electrically operated sluice gate rising spindle type, **generally conforming to IS 3042/1965,** having cast iron IS 210 Gr. FG 260 spigot cast at back & door fitted with gunmetal **IS 318 Gr. LTB 2** seating faces, complete SS extension spindle SS AISI 410,CI guide bracket, SS coupling & CI headstock. Motorised Gates are complete with Rotork Syncropak/ AUMA Epak Electrical Actuator.

Material of Construction

Gate frame, Door, headstock, guide bracket	: CI IS:210 Gr FG 260
Sealing Faces	: GM to IS:318 Gr LTB2
Spindle & Extension Spindle	: SS AISI 410
Coupling	: SS AISI 410
Stem Nut	: LTB IS:318 Gr LTB 2
Fasteners & Anchor Bolts	: CS IS:1367 Cl 4 & 4.6

BLOWER

Type: positive displacement twin lobe blower with motor

Capacity:2050m3/hr with 0.5 kgf./cm2 pressure

Qty: 2 nos.

Inlet pressure; atmospheric

Discharge pressure;5000mmwg+atm pr.

RPM:1440

MOC:

Casing: FG 260 IS:210

Integral shaft with lobe; forged carbon steel class 4 ,IS:2004(EN-8)

EN-353, BS-970

Bearing; escape/fag/team ken

Noise lebel;85-90 dba

Flash Mixer

Flash mixer unit complete with turbine type ss304 flash mixing paddle with base frame bearing housing, motor reduction gear box coupling, Gm guide bush supporting channel with ss304 bolt nut washer complete.

Alum Agitator:(6 nos.)

Alum agitator of new ss304 agitator for alum preparation tank complete with base frame motor reduction gear box coupling, bearing housing ss304 impeller and shaft, reduction gear box, flexible coupling etc. complete

Clariflocculator:(2 nos.)

q) Slewing ring type central bearing with cast iron body forged carbon steel racer ,38 mm dia. steel ball, grouting bolt and nuts complete with base place fitted with socket with clariflocculator bridges.

ii) Carriage drive complete with idle shaft, driving shaft, idle wheel, plumber coupling etc. complete with motor and gear box for 7 MGD capacity.

Control console:(16 nos.)

Control console for opening /closing of actuator operated valves with indicating lamp, switch, internal electrical wiring suitable for operation of inlet, outlet wash, drain, and air valve with wiring for ROF and LOH indicators capacitance type rate

flow /loss head indicator complete with all fitting and fixture necessary pipe fittings and valves as required.

Chlorinator

Automatic/Manual Gaseous chlorination unit by 4 x5 kg/hr. auto cum manual with chlorinator accessories chlorine analyser, tonner (900 kg), safety kit and allied accessories all complete with HOT (3 Ton x 3.5 metre lift chain pulley block with geared trolley) crane arrangement.

Hoist.

1 **HOT Crane. (Hoist)**

The HOT. Crane will be minimum 3 M.T. capacity Manually Operated Travelling Crane (H.O.T.) with a lift from the operating floor level and up to the level above the installed motors. 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.

Main L.T panel At Annex building WTP

7.1 The PDB is required to provide power to the all E/m equipment's of WTP with auxiliary load and Main Lighting Distribution Board at WTP.

7.2 The PDB shall be suitable for 415 V ± 10%, 50 Hz ± 5%, 3 phase, 4 wire supply system. The incoming power shall be provided from the outgoing feeder & PDB at substation

7.3 The PDB shall be 2 mm CRCA sheet steel enclosed, floor mounted type, self-supporting, fully compartmentalized, 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 ThePDB 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 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 630A for phases and 300A 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 molded 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 ACB/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, 630A, 50 KA MCCB/ACB with O/L, S/C, E/F trips1 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 VA3 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.

7.11 630 A Bus coupler feeder one (1) number comprising of following components:

iv) 415 V, 3 Pole,630 A, 50 KA ACB/MCCB 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.

5.14 Outgoing feeders --- 5 Nos. for each equipped with following:

A) 415 V, 3 pole, 200A, 50 KA MCCB with O/L, S/C, E/F trips 1 No

B) 96 sq mm, suitably scaled Ammeter with cramped scale and selector switch 1 No.

C) Current Transformer of suitable ratio & 5A secondary, Class: 1.0, 15 VA 3 Nos.

D) CB ON / OFF / TRIP / Spring Charged Indicating Lamp 4 Nos.

E) TNC Breaker Control Switch 1 No.

F) Local / Remote Selector Switch 1 No.

5.14 MCCB / MCB feeder of following rating

a) 32/63A TPN MCCB with Microprocessor based O/C & E/F releases 6 Nos.

b) 100A TPN MCCB with Microprocessor based O/C & E/F releases 2 Nos.

(Adjustable O/L) rated upto 50^0 C without duration

c) ON / OFF / Trip Indicating Lamp (For each feeder) As required.

The above panel to feed to LT PMCC at (To be replaced as per existing one and also to suit the site requirement).

A) LT panel for chemical house
B) LT MCC outdoor type for clarifier
C) LT PMCC for supernatant pumps
D) LT PMCC for sludge pump house.
E) LT panels for laboratory house

CLEAR WATER PUMPING STATION AT ANGADPUR

SECTION -E

Technical Specification for Pump

1.00.00 **GENERAL INFORMATION**

There will be adequate number of pumps which are to be located at the Pump House. The Clear Water pumping station shall be as under:

The horizontal axially split centrifugal pumps are to be installed in a dry pit for horizontal execution. The prime mover would be squirrel cage induction motor. Connection of pump & motor shall be with flexible coupling. The vibration level shall be 50 microns both in horizontal & vertical direction, sound level of maximum 85 db during running condition of pump & motor at a distance of 1.50 mtr. The pump shall be supplied with base plate, grounding pad, lifting lug, eyebolts, foundation bolts, and nuts, flexible coupling, coupling guard etc. The pump shall have provision for fixing pressure gauge, vent pipe, etc.

- The Pump models shall be selected in such a manner that apart from the present duty condition mentioned above, the future duty condition of 10% increase in flow and corresponding increase in Head could be achieved by changing only the impeller assembly. The price is to be quoted for pumps with present duty condition. Necessary Data from the pump manufacturer is required to be submitted including family curve of the offered model by the successful tenderer. Further during detail engineering, the pump head may undergo a change upto a maximum of (+) 10%. Pump rotational speed shall not exceed 1500 rpm (syn).

2.00.00 **SPECIFIC REQUIREMENTS**

Design

The design, manufacturing, performance of the horizontal centrifugal axially pumps as specified hereinafter, shall comply with the requirements of applicable codes, the latest applicable Indian/British/American/DIN standards, in particular and in that order of application, the following.

2.01.01 IS 1520 Horizontal centrifugal pump for clean, cold, fresh water.

2.01.02 IS 5120 Technical requirements, rotodynamic special purpose pumps.

2.01.03 IS 9137 Code for acceptance test for centrifugal, mixed flow and axial pumps - Class C.

2.01.04 Hydraulic Institute Standards.

2.01.05 BS 599 Methods for Testing Pumps.

2.01.06 BS 5316 Acceptance tests for centrifugal, mixed flow and axial pumps.

2.01.07 PTC 8.2 Centrifugal pumps-Power test codes.

2.01.08 The materials of the various components shall be as per data sheet or equivalent material conforming to applicable IS/BS/ASTM/DIN Standards in that order of application.

2.01.09 In case of any contradiction between the aforesaid standards and the stipulations as per the technical specification as specified hereinafter, the stipulations of the technical specification shall prevail. In case of contradiction between this specification and the pump data specification sheets enclosed, stipulations of the data specification sheets' shall prevail.

3.00.00 **GENERAL PERFORMANCE REQUIREMENTS**

3.01.00 The pump shall be designed to have best efficiency at the specified duty point. The Pump set shall be suitable for continuous operation at any point within the — 'Range of Operation', so as to match with the system resistance curve.

3.02.00 Pumps shall have a continuously rising head capacity characteristics from the specified duty point towards shut off point, the maximum being at shut off.

3.03.00 Pumps shall be suitable for parallel operation. The characteristics curves such as head vs. capacity, KW vs. capacity EFFICIENCY vs. capacity etc., shall match to ensure equal load sharing and trouble free parallel operation throughout the range. In the event of tripping of one of the operating pumps, the other operating pumps shall be capable of passing the maximum flow through it as dictated by the system resistance corresponding to both maximum and minimum water level in the pump suction sump.

3.04.00 The pump motor set shall be designed in such a way that there is no damage on account of any reverse flow through the pump which may occur due to any abnormal operation of the system.

3.05.00 Where reverse flow through the pump is specified in data specification sheets, the drive motor shall be capable of bringing the pump to its rated speed in the normal direction from the point of maximum possible reverse speed without injurious heating, when power to the motor is restored with a minimum voltage of 90% at the motor terminal.

External head that may be imposed on the pump under reverse flow condition is to be decided by the Bidder after analyzing the complete system and the particular

abnormal condition of run. However, any specific requirement as mentioned in the Pump Data Sheet shall be adhered to Torque-speed curve for pump and motor for such reverse flow condition shall have to be submitted along with the offer.

4.00.00 **DESIGN & CONSTRUCTION**

4.01.00 **Pump type**

Pump shall be axially split case, single volute, double suction, mixed flow type and shall be constructed in a manner that they can be placed on their foundation with their shaft in horizontal axis.

4.02.00 **Casing**

The casing shall be a single volute, double suction design and shall be so constructed that when it will be placed on its existing foundation the integrally cast with one half of the casing so that the other half of the casing can be removed without having to disturb the suction and discharge pipelines. A suitable fixture shall be provided with each pump for easy removal of one half of casing, which will have no connection with the pipelines, for inspection and / or replacement of the Rotating Elements.

4.03.00 **Impeller**

The impeller shall be double entry type and dynamically balanced.

4.04.00 **Wearing Rings**

Casing wearing rings shall be provided with torque and groove arrangement to prevent rotation and shall be easily removable.

4.05.00 **Impeller Shaft**

The impeller shaft shall be ground finished on its entire length and shall be protected with sleeves so that the shaft itself cannot come into contact with the actual liquid pumped.

4.06.00 **Sleeves**

Sleeves shall be keyed onto the shaft and located by grub screws to prevent relative rotation between the sleeve and the shaft. The impeller shall be kept in position on the shaft by means of two sleeves, which in turn shall be locked by means of suitably designed sleeve nuts.

4.07.00 **Stuffing Box**

The Stuffing box shall be an integral part of the casing and shall be fitted with lantern rings. The lantern rings shall be sandwiched between gland packings. The packings inside the stuffing box shall be held in position by glands.

4.08.00 **Glands**

The glands shall be designed to facilitate easy removal for inspection and replacement of packing.

4.09.00 **Bearings**

Adequate capacity thrust bearings ball/roller shall be provided to take the full axial thrust of the pump as well as the weight of the pump-rotating element. Thrust bearing shall be placed in the non-driving end of the pump and shall be grease

lubricated anti friction type and ball bearing shall be placed in the driving end of the pump and shall be grease lubricated anti-friction type. Suitable Temperature detectors shall be provided for both DE & NDE side and the signal from the same shall be hooked upto the Control Desk & Instrument Panel

4.10.00 **Discharge Branch**

4.10.01 Discharge branch pipe upto the battery limit under this specification shall be flanged and bolted and shall be complete with gaskets, nuts and bolts of shall screwed as specified in data specification sheets. A dismantling joint in to be provided in each delivery pipeline along with valves.

4.11.00 **Suction Branch**

4.11.01 A dismantling joint will be provided at the pump individual suction side pipeline along with valves to avoid the pipe assembly from any additional thrust. Any thrust loading is to be transmitted to the foundation bolts of the pump assembly.

4.12.00 **Pump Motor Supports, Base Plate etc.**

The pumps and motors shall have common base plate supporting arrangements. The pumps & motors base frame shall be fixed on the foundation through foundation bolts.

5.00.00 **Hydraulic test at shop**

5.01.00 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.

5.02.00 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.

5.03.00 Tests shall be conducted with job motors (H.T) and shop motors (L.T) at full load and full speed.

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

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

6.00.00 **Performance test at shop**

6.01.00 Each pump shall have to be tested to determine the characteristic 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.

6.02.00 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.

6.03.00 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.

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7.00.00 PERFORMANCE GUARANTEE, TOLERANCE AND PENALTIES

7.01.00 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, which shall not be more than those specified under clause 2.01.03.

7.02.00 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 to 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.

8.00.00 CLEANING, PROTECTION AND PAINTING

8.01.00 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.

8.02.00 Painting

All surfaces shall thoroughly be cleaned in a manner approved by the manufacturer for necessary paint 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.

8.03.00 Packing for shipment

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

9.00.00 TESTS AND INSPECTION

9.01.00 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 MED's representatives. All relevant cost of such inspection by two representatives of MED has to be borne by the manufacturer / contractor.

9.02.00 Where stage inspection is to be witnessed by Employer in addition to above, the bidder shall submit to the Employer at the initiation of the contract, the deadline of PERT-CHART showing the manufacturing progress and indicating the periods where inspection of the Employer or his authorized inspection agency is required at the manufacturers premises.

9.03.00 Where stage inspection is to be witnessed by Employer, the various stages of inspection, together with the program shall be submitted to the Employer. The inspection and test procedures shall also be submitted for Employer's approval.

10.00.00 **SPECIAL TOOLS AND TACKLE**

10.01.00 The Tenderer shall quote separately for a complete and unused set of all special tools, tackles etc., if any, including tool boxes, specifying the quantum of requirement, for erection, maintenance, overhaul or complete replacement of equipment under this specification. A complete list of tools necessary shall be enclosed with the Proposal.

10.02.00 The Price quoted for tools, shall not be considered for evaluation of Tender.

11.00.00 **SPARE PARTS**

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

12.00.00 **DELIVERY**

12.01.00 The schedule of the project demands early delivery of the equipments.

12.02.00 The delivery date shall be indicated by the Successful Tenderer in the Progress Schedule showing the time required for different phases of the work under the scope of this specification taking the date of issue of Letter of Intent as datum.

12.03.00 The Successful Tenderer shall guarantee the delivery date subject to penalty.

13.00.00 **DRAWINGS, CURVES & INFORMATION REQUIRED**

13.01.00 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.

13.02.00 Speed Vs. torque curve of the pump corresponding to recommended mode of pump starting, super-imposed on speed Vs. torque curves of the motor, corresponding to 85%, 90%, 100% rated voltage and also extending over Quadrant I & Quadrant II covering reverse flow conditions, if applicable.

13.03.00 Diagram showing the type of lubrication system, etc.

13.04.00 Complete descriptive and illustrated literature on the equipment and accessories being offered.

13.05.00 Experience list for the similar type of equipment supplied, which should indicate name of customer, date of ordering, value of order date of commissioning, pump parameters and number.

13.06.00 A comprehensive write up or brochure on the details of manufacturing and test rig facilities in the shop of the manufacturer.

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

13.08.00 All data furnished during bidding stage including details furnished under Clause 13.00.00 above 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.

13.09.00 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.

14.00.00 **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.

   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.

b) The information shall be organised 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.

g) The Instruction Manual shall include the list of spare parts that are required for 2 years normal operation and maintenance for equipment. It shall also include list of all special tools and tackle furnished with complete drawings and instructions for use of such tools and tackles.

15.00.00 **DEVIATIONS**

The Tenderer is required to submit with his proposal a detailed list of any and all exceptions taken to this specification by filling up the Deviations Sheet. In absence of such a list it will be understood and agreed that Tenderer's proposal is based on strict conformance to the specification in all respects. These requirements, however, are not intended to prohibit Tenderers from offering alternate quotation for equipment which they consider to be equal or superior to that specified for the intended service and for which he believes he can show economic and/or technical advantages, provided that he is not allowed to add to the Vendors list and is confined to items not appearing therein. However acceptance of the same is at the sole discretionary power of the T.I.A.

16.00.00 **PROPOSAL DATA**

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

16.02.00 Each Tenderer shall supply the data requested in Proposal Data paragraph as above by typing in appropriate places on each page. These filled in data sheets must be properly signed by authorised representative of the Tenderer or Manufacturer as verification of the data submitted. These signed pages, in their entirety, shall be returned with and shall be part of the Tenderer's formal proposal. The Tenderer shall completely fill in the above information required for each of the above mentioned sheets. Failure to comply with this requirement may result in the rejection of the tender.

17.00.00 **FOREIGN EXCHANGE AVAILABILITY**

No foreign exchange license will be available for this specification, if any foreign exchange is required by any Tenderer, it will have to be arranged from his own quota, through his own arrangement.

DATA SHEET / CHECK LIST OF THE PUMPS BEING OFFERED

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

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 present duty condition for solo operation	:	
1.08.00	Efficiency of Pump at future duty condition for Solo operation	:	
1.09.00	Efficiency of Pump at present & future duty condition in parallel operation	:	
2.00.00	**PERFORMANCES**		
2.01.01	Guaranteed capacity - M^3/hr in peak flow without tolerance in single operation & parallel operation.	:	
2.01.02	Guaranteed head - MWC at peak flow discharge, without tolerance in single operation & parallel operation.	:	
2.01.03	Input to the Pump (KW) at present & future 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 at present & future duty condition	:	
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 present and future duty condition	:	
2.01.10	Pump shut off head for present and future 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	:
2.02.06	Pump shut off head	
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	:

The following data are obligatory for all the pumps

5.00	**MATERIAL OF CONSTRUCTION**	
5.00.01	***Impeller***	***: ASTMA-743, Gr- CF8M***
5.00.02	***Casing***	***: CI, IS- 210, FG-260***
5.00.03	***Casing ring***	***: SS, Type- 304***
5.00.04	***Pump shaft***	***: SS410***
5.00.05	***Coupling for pump Motor***	***: Flexible pin and Bush type, C.I.***
5.00.04	***Shaft sleeve***	***: SS, ASTMA-276, Type- 410***
5.00.06	***Base Plate***	***: M.S***

The following data are to be filled up by the tenderer

6.00.01	Are the pumps suitable for parallel operation	:
6.00.02	Whether non-Reserve Rutchet is provided in pump or not	:
6.00.03	Type of lubrication for pump	:
6.00.04	Whether pre lubrication arrangement provided	
7.00.00	**EXPECTED LIVES UNDER NORMAL OPERATION AND MAINTENANCE**	
7.00.01	Impellers	:
7.00.02	Pump Bowl Casing	:
7.00.03	Shaft	:
7.00.04	Thrust Bearing	:
7.00.05	Whether pump performance curve (H-Q, Q-P, Q-n, Q-NPSHR) authenticated by the pump manufacturer provided with the offer resistance curve	:
7.00.06	Whether the copy of the pump family curve, authenticated by the pump manufacturer provided with the offer	:
7.00.07	Whether the system head curve superimposed with pump performance curve & modified performance curve provided with the offer	:
8.00.00	**GENERAL**	
8.00.01	Are companion flanges, air release valves, sole plate, arrangement for thrust encounting devices provided	:
8.00.02	Whether lifting lugs, eye bolts etc. provided	:
8.00.03	load data	
8.00.04	Weight of total pump assembly (empty)	:
8.00.05	Weight of total water column	:
8.00.06	Total Static Load	:
8.00.07	Total dynamic Load	:
8.00.08	Maximum horizontal back thrust at maximum water level condition	:

HORIZONTAL PUMP AXIALLY SPLIT CASE

DATA SPECIFICATION SHEET

GENERAL INFORMATION

Service pump case	Clear Water	Pump Type	Horizontal axially split
Designation			
No of pumps Reqd.:		Duty	Continuous
(To be filled in by the tenderer)			
Pumps working condition	Solo / Parallel	Location	Indoor

ELECTRICAL DOCUMENT

Electrical Motors Technical Specification Enclosed : Yes/No

SUPPLY OF ACCESSORIES AND SERVICE

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

Base Plate	Yes/No	Eye bolts, Lifting tackle etc.
	Yes/No	
Sole Plate	Yes/No	Vent and drain with isolation
	Yes/No	
		valves
Foundation bolts, nuts, sleeves nut	Yes/No	
Companion flanges at Pump		Universal Joint
	Yes/No	
Suction & Discharge reducers	Yes/No	Thrust block reqd.
	Yes/No	
along with nuts, bolts & gaskets		Non reverse ratchet
	Yes/No	
External cooling/sealing/lubrication	Yes/No	Special Tools & Tackle
	Yes/No	
		Spare parts (for 4 years operation)
	Yes/No	

Cooling/sealing/lubrication system	Yes/No Yes/No	Painting & Protective coating
Discharge pressure gauge	Yes/No Yes/No	Suction side low level switch with annunciation hooter complete with accessories.
Suction pressure/VAC Gauge	Yes/No	
Pump Motor Coupling & Guard	Yes/No	

DATA SPECIFICATION SHEET

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

PUMP PARAMETERS

Design Capacity 2.5%	Individual Pump of required capacity	Permissible tolerance in design	(±)
Effective head (excluding loss in pump discharge branch pipe)	Discharge at duty point with parallel operation	Permissible tolerance in efficiency : in all the cases	(–) 3%
Available at design capacity : Tenderer to indicate. required	Tenderer to indicate from the data supplied	Minimum submergence :	
Discharge pressure :	In MLC	Static head of pumping system	
Pump shut off head :	In MLC	Frictional head of system : at design capacity	
Range of operation : (Tenderer to indicate)	% to % of design capacity	Yes/No Reverse flow through pump to be considered for motor selection	
Maximum speed : (Tenderer to indicate)			
Only rising stable HQ characteristics throughout	Yes/No		

the 'Range of Operation' is acceptable

LIQUID DATA

Liquid handled ppm	Clear Water	Chloride	39
Specific Gravity ppm	Nearly 1.0	Total hardness as	144
	$CaCO_3$ max		
Temperature	10- 40^0 C	Chlorine	2 ppm
pH Value ppm max	7.3 to 8.6	Total dissolved solids	500
Turbidity	5 NTU/ JTU (Max)		

DATA SPECIFICATION SHEET

INSPECTION AND TESTING

Item	Specification
Stage inspection by owner :	Yes/No
(details of Stage Inspection by Owner to be added in due course)	
Material testing and Identification	Required/not required

RADIOGRAPHY

Parts to be tested:
Testing Std:

Acceptance Std:

ULTRASONIC Test

Parts to be tested
Testing Std.

Acceptance Std

.

DYE PENETRATION

Parts to be checked

Testing Std.

MAGNETIC PARTICLES

Parts to be checked

Testing Std.

Acceptance Std.	Acceptance Std.

Hydrostatic test
Testing Std.

Acceptance Std.

Dynamic balancing pump impeller shop to be witnessed	Yes/No
Performance test at shop reqd. at full speed & full load	Yes/No

NOTES

1. Pump motor set to be designed for starting with discharge valve partly open/closed condition.
2. Motor cooling arrangement shall be self-circulation type having fans mounted on motor shafts.
3. For sealing/cooling water shall be tapped from the pump discharge.
4. Range of operation of the pumps shall be selected by the Tenderer shall also indicate the minimum water level at which pumps can be satisfactorily operated on continuous basis. Tenderer shall furnish with his offer NPSH Vs capacity curve for the entire range of operation based on the above conditions and considering single pump operation & all installed pump operation.

09.00 SUMP PUMP

The portable submersible dewatering pump motor set will be suitable for dewatering gland leakage muddy water withadequate 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 bellow 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 (H.T)

2.1 ThemaindrivemotorsshallbeofsquirrelcageTEFC / CACAinductionmotor,Horizontalaxis,H1, continuousdutytosuit theofferedpumpsandshall becapable todrive the pumpinalldeclaredworkingconditions.The motorshallbeofhighstartingtorquetype suitablefor 11 KV ±10%;50C/S ±5%; combinedvariation±10%AC;3-phase supply and not greater than 1500R.P.M.(Syn).

2.2 Allthemotorsshallberated forcontinuousduty (S1)andshallhaveIP 55degreeof protectioninaccordancewith IS:4691.

However,duetooperationalneed,thepump-motorsetmaydemand forfrequentstartor stopoperation,withamaximumtimegapof5-10minutesfromonestopafterprolonged operationinratedloadandmaydemandrestarting ofthesame.Thepumpmotorsetshall becapabletotakecareofthestatedsituation.

2.3 Allthemotorsshallhave highefficiency and power factor. Itshallhaveunchangedefficiencyduringratedoutput utilization.

2.4 All the motor ratings shallbe 350KWconsideringatleast 20% marginover themaximumpumpinputatdutypointor10%marginoverthemaximumpumpinputinthe worstcaseofthepumpoperationinthetotalrange(fromshut-offtorunout),whicheveris higher.Theoverallcapacityof themotor shallbeselectedfor continuousoperationatthe ratedoutputforthevoltageandfrequencyconditionmentionedaboveintheworstcaseby allowingthetemperatureriselimitedtothatofclass-Bovertheambienttemperatureof45° centigrade. But theclassofinsulationofthemotorsshall be ClassF.

2.5 Themotorcharacteristicsshall matchtherequirementsofthedrivenunit (pump)sothat adequatestartingtorque,acceleration,pullup,breakdownand fullloadtorqueare available fortheintendedservice. The motorshallbesuitable tostartthepumpsinvalve open condition. It shallalso not be overloaded in case of back water flow occurs occasionally.

2.6 The motorshall have rotating rotationalspeednot greater than1500RPM (syn).Thepercentage slip

ofthemotoratdifferentloadconditionsshallmatchthepumpspeedsrequiredthenat thedifferentloadconditions.Thetenderershallclearlyindicatethemotor speedandslip atdifferentloadconditions.

2.7 Thestatorwindingsdesignshall besuchthat itshall havesuperiorelectrical,mechanical and thermalpropertiesandshallachievebetterheat transferandhigherdielectric strength.

2.8 The rotor of the motor should be sturdy in construction so as to ensure trouble free operation. Special care shall be taken to ensure better torque characteristics.

9.9 All the motors shall be provided with a very efficient cooling system so that the temperature of the stator windingdoesnot riseabnormally. The method ofcoolingshall beat least IC411 / IC 611asper IS:6362:1995. All the motorsshallbeprovided withbidirectional speciallydesignedexternalcooling fan for lownoiseoperation. Noise levelshallbe within the valuesas stipulated in IS: 12065.

2.10 The motorshallbe suitable forDOL starting.

2.11 The motor shall deliver ratedoutput and accelerateat full speed with85% of rated voltageat the motor terminal. With85% rated voltage at motor terminal, it shallbecapable of workingsatisfactorilyat full load forat least 10 minutes without injuriousheating or stalling.

2.12 The motor locked rotor currentshallbe limited within720% of the motor ratedcurrent without any positive tolerance.

2.13 The locked rotor withstand timeunder hot condition at110% rated voltageshall be more than motorstarting timeby at least2.5seconds. Hot thermal withstandcurveshall havea margin of at least10%over the full loadcurrent of the motor topermit relaysetting using motor ratedcapacity.

2.14 The motorshallbeprovided with12 Nos. simplex type RTD's and BTD's for alarm and trip. In addition 2 Nos. dia type thermometers with 1 NO + 1 NC potential free contacts shall be provided. The leadsshall be brought out toaseparate terminal box.

Suitable wiringbysignalcableshall be made to receive thesignal from the field to the

control deskand thecircuitry foralarmand tripshall bearrangedsoas to givealarmand or trip the motor, as the case maybe.

2.15 The rotorshallbedynamically balanced withall the fans and withhalfkey in theshaft extensionand to vibrationseverity grade asper IS:12075. But thenoise levelof thepump and motor incombineshall notexceed the stipulationsas mentioned in IS: 12065.

2.16 The motorshallbe provided withanti-frictionbearings, grease lubricatedboth atdriving andnon-drivingends.

Thebearingsshallbeprovided withseals toprevent leakage of lubricantorentrance of foreign matter like dirt, wateretc. into thebearingarea. Grease lubricated bearings shall bepre-lubricated andshallhaveprovision for in-servicepositive lubrication withdrains and greasecollectors to guard against over lubrication.

2.17 The motor terminalboxshallbeofdetachable typeand rotate-ableby360º insteps of90° ineachposition. The terminalboxshallhave IP55degree ofprotection. Itshall be suitable for terminatingone number 3-core, 11 KV(E) grade,300 sq. mm XLPEaluminum conductorarmoredcables for main motor feeding. Mounting of the terminalbox shall match with thesite requirement.

The terminalboxesshallbe with removablecover /adopterpieces withaccess to connection. The motor terminalboxesshallbe furnished withsuitable cable lugsand doublecompression brass glands to match with thecablesize.

2.18 The motor shall be equipped with built-in anti-condensation thermostatically controlled space heater of adequate rating suitable for operation in 230 V AC supply. Separate terminal box (s) for the space heater connection is to be provided.

2.19 The frame of each motorshallbeprovided with twoseparateanddistinctgroundingpads suitable foraccommodation ofsuitablysizedgroundingconductors. The maincable terminal boxesshall haveseparategroundingpads.

2.20 The ratingplate of the motorshouldcontain the minimum informationas indicated in the relevant BIS standardandshall be made of stainless steel.

2.21 Thesuccessful tenderershall furnish the motor load-efficiencycurve, torque-speed curve, load-power factorcurve, thermal withstandcurve (hotandcold), current-speed curveandcurrent-time curve for approval of the Department.

Thedimensional drawing of the offered motor, terminalbox drawings, loaddata, GD^2 valueof thedriveunitand thedrivenunitalong with final Data Sheet shall alsobe furnishedby the successful tenderer for approval of the Department.

2.22 The motorshallalsobeprovided withsuitable lifting lugs/eyeboltshavingadequate provision for lifting/ installation. Commonbase frame for thepump& motoras indicated earliershallbe used withsuitable foundation bolts, Dowellingpinetc.shallalsobe provided.

2.23 The routine tests asper IS:325shallbeconducted oneach motorat Shop i.e. at manufacturer's works. Similarly, the type test (Heat Run Test)shallbeconductedon at leastone motor randomlyselectedduring the tests. Allnecessaryarrangementsandcosts thereof for the testsare tobe madeby thecontractorandshallbe included in the offered cost.

2.24 Apart from the technical offer, the tenderershould furnish theCheck Listduly filled-in in the Part-I offer.

CHECK LIST OF THE MOTORS

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
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 M^2)

1.41.00 GD2 value of load to motor shaft (kg M^2)

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. motor as per choice of the customer, shall be performed. Further any special tests called for in the driven equipment specification shall be performed. The tenderer has to bear all expenses for such testing to witness the tests for max. two representatives of MEDat 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 premises.

3.00.00 SPARE PARTS

Spare parts are to be supplied as specified separately.

2.0 MOTORS (L.T)

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 confirm 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 Horizontal 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,30KW,22KW,18.5KW & 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

rotable in steps of 90°. The main terminal box should be suitable for 2 nos. 3 core, 1.1 KV grade, 150sq.mm,95sq.mm,50sq.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 M^2)
1.41.00	GD2 value of load to motor shaft (kg M^2)
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. motor (110KW & above) 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

3)HT PDB CUM MCC AT PUMP HOUSE

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

I) Incomer panel – 2 Nos.

II) Motor Feeder panel – 3NOS

III) Capacitor reactor panel. - 2 nos.

IV) Bus Coupler Panel – 1 No.

3.2. The switch gearshall 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± 10%, 3 phases, 3 wire, 50 Hz ± 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 90^0C.
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 / 110 V DC (to be freezed during detail engineering) motorized spring charged trip free mechanism and mounted on a carriage complete with self contained manually operated fully interlocked, raising and lowering mechanism with 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 CIRCUIT HEALTHY/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 rated for 110 V DC.
f) 1 space heater with ON & OFF switch
g) 15A / 5A 3 Pin Plug Socket

h) In – panel lighting with control switch

i) Space heater for each individual motor shall be fed from the individual motor feeder and provision for such distribution as well as interlocks shall be provided in HT PDB cum MCC.

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 in the Incoming Panel, suitable for 3 phase, 3 wire 3 limb 50 Hz system with a ratio of 11 KV /110 / √3 / 110 / √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 62.5KA. 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 cum MCC shall be as under:

A) Incoming feeder Panel :1 Nos. (800 A) each equipped with the following:

i)	96 sq mm (0 – 8 KV) Voltmeter with Selector Switch	-	1 Set
ii)	96 sq mm (Dual scale) Ammeter 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 rating with 5 A 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.
vii)	Master trip relay type VAJH – 13	-	1 No.

viii)	Trip Circuit Supervision Relay type VAX - 31	-	1 No.
ix)	Multifunction meter (For Amp. Voltage, frequency, power factor etc.) type ELITE445 or equivalent	-	1 No.
x)	Power Factor Meter	-	1 No.
xi)	KW Meter	-	1 No.
xii)	8 Channel alarm annunciator	-	1 Set.
xiii)	ON / OFF / TRIP / SPRING CHARGED / TRIP CIRCUIT HEALTHY / SERVICE / TEST POSITION / DC FAIL / R – Y – B Phase Indication Lamp	-	11 Nos.

B) Bus Coupler Panel : 1 No. equipped with the following

i)	Local / Remote selector switch	-	1 No.
ii)	TNC Breaker Control switch	-	1 No.
iii)	ON / OFF / SPRING CHARGED / SERVICE / TEST POSITION / TRIP CIRCUIT HEALTY Indication Lamp with Push Button	-	6 Nos.

C) Out going feeder panels for Motors
Each Motor feeder panel shall be equipped with the following :

i)	Dual Scale Ammeter 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 rating with 5A Secondary, Class 5 P10 & 1.0, 10VA burden	-	1 Set (3 Nos.)

v)	True Digital Microprocessor based draw out 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.
vi)	Master trip relay type VAJH-13	-	1 No.
vii)	Trip Circuit Supervision Relay type VAX 31	-	1 No.
viii)	8 Channel alarm annunciators	-	1 Set
ix)	ON / OFF / TRIP / SPRING CHARGED / TRIP CIRCUIT HEALTHY / SERVICE / TEST POSITION Indication Lamp	-	7 Nos.
x)	Surge Arrestor	-	1 Set

D) 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 MV Switchboard 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.

CHECK LIST OF THE HT PDB CUM MCC

1.0 Buses:

1.01	Bus-bar material	:
1.02	Bus-bar size	:
1.03	Minimum Clearance of bare bus and connections (a) phase to phase - mm (b) phase to ground - mm	: :
1.04	Bus-bar provided with (a) Insulated Sleeve (b) Insulating barriers	: :
1.05	Current Ratings (a) Continuous (Amp) (b) 3-Second (KA rms)	: :

1.06	Temperature rise over 45°C Ambient (°C)	:		
1.07	Standard to which buses conform	:		
2.0.	**Vacuum Circuit Breakers:**			
2.01	Make	:		
2.02	Type & Service	:		
2.03	Execution	:		
2.04	Rated Voltage: (a) Nominal (b) Highest	: :		
2.05	No of Poles	:		
2.06	Frequency	:		
2.07	Current Ratings (a) Rated current at Standard ambient (b) 3-second thermal rating (KA rms) (c) Momentary (KA rms)	: : :		
2.08	Temperature rise over 45°C ambient	:	°C	
2.09	Interrupting Capacity (a) Symmetrical- KA (rms) at rated voltage (b) Asymmetrical (if any)- KA (rms)	: :		
2.10	Making Capacity (a) Peak KA (b) RMS symmetrical	: :		
2.11	Closing time	:		Cycle/mille-sec
2.12	Opening time	:		Cycle/mille-sec
2.13	No of breaks per phase	:		
2.14	Insulation level	:		
	(a)1-Minute dry withstand (KV rms) (b) Impulse withstand (KV Peak)	:		

2.15	Standard to which conforms	:
2.16	No load mechanical operation	:
2.17	Number of operation at rated current	:
3.00	**Operating Mechanism**	
3.01	Type	:
3.02	Trip free or fixed	:
3.03	Charging Time	:
3.04	Closing :	:
	(a) Closing voltage	:
	(b) Tripping voltage	
3.05	Allowable variation in Control Voltage	:
	(a) Closing	:
	(b) Tripping	
3.06	Current required for Tripping	:
3.07	No of auxiliary switch furnished (a) Normally open	:
	(b) Normally close	
	(c) Breaking Capacity	:
	(d) Type	
	(e) No of spare contacts furnished	:
	(f) Are the auxiliary contacts convertible type	:
		:
		:
3.08	Operation counter furnished or not	:

3.09	Mechanical trip furnished or not	:	
3.10	Mechanical safety interlocks provided or not	:	
3.11	Breaker provided with service/test and isolated position	:	
3.12	Type of indication provided with above position	:	
3.13	Can cubicle door be closed when Breaker in service or not in test Position	:	
3.14	Impact for foundation design to include dead load plus impact values on opening at maximum interrupting rating	:	
3.15	Standard to which conforms	:	
4.0.	**Panel Assembly**		
4.1	Dimensions (LXBXH)	:	
4.2	Approximate weight	:	
4.3	Material of construction and thickness	:	
4.4	Degree of protection of external enclosure	:	
4.5	Space for power cable termination	:	
4.6	Space for multicore cable termination	:	
4.7.	Space Heater		Yes/No
	(a)Thermostat controlled space heater furnished for each cubicle	:	
	(b) Rating		
	(i) Voltage	:	
	(ii) Watts	:	
4.8	Ground Bus		
	(a) Material	:	
	(b) Size	:	

4.9	Wiring		:
	(a)	Size of wire	:
	(b)	Insulation	:
	(c)	Voltage class	
4.10	Minimum space required for installation		:
	(a)	Minimum rear space	:
	(b)	Minimum front space	

4.11	Current Transformer details		:
	(a)	Type	:
	(b)	Make	:
	(c)	Frequency & voltage	:
			:
	(d)	Pole	:
	(e)	Protection Class	:
	(f)	Metering Class	:
	(g)	Rated burden	
	(h)	Class of insulation	:
	(i)	Short time thermal rating	:
	(j)	Dynamic current rating	
	(k)	Mounting	:
	(l)	IS .Standard to which conform	:
	(m)	CT ratio	:
	(i)	Incoming feeder	
	(ii)	Transformer feeder	
	iii)	Motor Feeder	
	iv)	Capacitor Feeder	
			:
			:
			:
			:

4.12 Voltage Transformer

(a)	Type	:
(b)	Make	:
(c)	Frequency & voltage	:
(d)	Pole	:
(e)	Accuracy class	:
(f)	Rated burden	

	(g) Connection	:
	(h) Class of insulation	
	(i) Mounting whether withdrawal type	:
	(j) Standard to which conform	
		:
		:
4.13	Indicating lamp	:
	Type	:
	Make	:
	Voltage	:
	Wattage	
4.15	Fuses	:
		:
	Type	:
	Make	:
	Voltage	:
	Rupturing Capacity	:
	IS standard to which conforms	
5.0.	**Tests**	
5.1.	Indicate the tests to be performed	:
	(a)	
	(b)	:
	(c)	
	(d)	
	(e)	:
		:
		:
6.0.	**General :**	
6.1	Whether GA drawing submitted or not	:

6.2 Technical literature submitted or not :

1.0 POWER FACTOR IMPROVEMENT CAPACITORS AND REACTORS

1.1 There shall be such number of sets of Capacitor-Reactor-RVT Panel units corresponding to the

number of running motors connected through the HT PDB cum MCC for the total scheme.

1.2 12.0 KV capacitors along with 02% Series reactors shall be provided so as to improve the

power factor to at least 0.98. The capacitors shall be suitable for operation in 11.0 KV ± 10%,

50HZ ± 5%, 3-phase, AC earthed system. It shall be indoor type, free standing, floor mounted,

sheet steel enclosed complete with all base channels, anchor bolts and hard wares.

1.3 The capacitors shall conform to IS 13925 and shall be suitable for stringent applications and

low loss. The capacitor shall be natural cooled type manufactured with non-PCB fluid, having

bio degradable and non inflammable and non-deteriorating chemical properties. The same

shall be equipped with self discharging devices. Suitable rated HT external HRC fuses with

striker pin arrangement, in addition to the internal fuses, if any, shall be used. The final ratings

of the capacitors shall be determined from the load current of the motor at pump duty point

loading.

1.4 The capacitor shall be hermetically sealed and fully protected from atmospheric ingress and

hazards. The capacitor shall withstand abnormal system hazards like switching transients and

surges, inrush currents, over voltages and over currents.

1.5 The capacitors shall have suitable cable termination boxes for terminating 11 KV (E) grade 3-

Core, up-to 300 Sq. mm XLPE cable with glands & clamps. The successful tenderer shall have

to submit the detail calculation for selection of capacitors & reactors during detailed

engineering for approval of the department prior to ordering on the sub-vendor.

1.6 The suitable rating Reactors shall be in series with the capacitor for inrush current limiting service and shall be indoor dry type, 11 KV, 3-phase, 50 HZ. It shall conform to IS: 5553.

1.7 The interconnection of the capacitors and the series reactors shall be made through suitable bus ducting. Copper bars having high conductivity and electrolytic grade shall be of adequate size. Suitable insulators, supports as required shall be provided.

1.8 The termination arrangement shall be such that there shall be no possibility of impregnant leakage with internal lug crimping to an assembly of epoxy moulded insulator bushings with terminal studs being inserted moulded.

1.9 Three numbers single phase indoor, resin impregnate dry type, air cooled RVT in 3 limb construction having ratio 11000 / 110 / 110 with Star / Star / Open – Delta connection, 100 VA

√ 3 √3 √3

burden and accuracy class 1.0 / 3P shall be provided in conjunction with the Capacitor – Reactor for unbalance protection. The RVT shall have bushing as terminal arrangement and fuses on LV side. The RVT shall conform to IS: 3156.

1.10 The Capacitor – reactor unit along with the RVT shall be housed in a common sheet steel with wire mesh enclosure.

1.11 Since the major load is inductive type, major VAR shall be introduced in the system on Energisation and acceleration of main motor.

CHECK LIST OF CAPACITORS & REACTORS

1.01 Manufacturer name with contact address,

telephone, Fax, E-Mail etc

:

1.02

Overall dimension (L x B x W) :

1.03

Approximate Weight :

1.04

System Voltage :

1.05

Capacitor Rating :

1.06

No. of units :

1.07

Capacitor Rated Voltage :

1.07 Capacitor Type :

1.08 Type of internal connection :

1.09 Whether the capacitor is capable to

improve the power factor of the motor at

pump duty point load condition to 0.98

: Yes/No

1.10 Type of connection with motor :

1.11 Rated current :

1.12 Cooling system :

1.13 Dielectric :

1.14 Whether external HRC fuses provided

and ratings

:

1.15 Type of installation :

1.16 Whether discharging resistance have been

provided

:

1.17 Standard to which conform :

2.00 REACTORS

2.01 Make :

2.02 Rating :

2.03 Type of installation :

2.04 Cooling system :

2.05 Type of connection with capacitor: :

2.05 Type of connection with capacitor: :

7.0 415 V Multi panel MCC cum PDB 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 ± 10%, 50 Hz ± 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 compartmentalized, 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:

xix) 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
xx) 96 sq mm, suitably scaled Ammeter with cramped scale & selector switch 1 No.
xxi) 96 sq mm, 0 – 500 V Voltmeter with selector switch 1 No.
xxii) Current Transformer of suitable ratio & 5A secondary, Class: 1.0, 15 VA 3 Nos.
xxiii) Current Transformer of suitable ratio & 5A secondary, Class: 5P10, 10 VA 3 Nos.
xxiv) Red, Yellow, Blue phase indicating lamp as required
xxv) MCCB ON / OFF / TRIP / Earth Fault Trip Indicating Lamp 4 Nos.
xxvi) TNC Breaker Control Switch 1 No.
xxvii) Local / Remote Selector Switch 1 No.

7.11 800 A Bus coupler feeder one (1) number comprising of following components:

vii) 415 V, 3 Pole, 800 A, 50 KA electrically operated draw out ACB without release. 1 No.

viii) TNC Breaker Control Switch 1 No.

ix) Local / Remote Selector Switch 1 No.

iv) Bus Coupler ON / OFF / Spring Charged Indicating Lamp 3 Nos.

7.12 **110**KW 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 50^0 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.**
d)	**Start / Stop Push Button**	**-**	**1 Set**
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.**

7.12 **30KW,22KW,18.5** KW 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 50^0 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.
d)	Start / Stop Push Button	-	1 Set
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 (BOCR 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.

7.14 MCCB / MCB feeder of following rating

a) 32/63 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 50^0 C without duration 20Nos

D) Not less than #A TPN MCCB for actuator feeder 12Nos

e) ON / OFF / Trip Indicating Lamp (For each feeder) as required.

f) 16 A SPN 6 Nos.

6) CABLE (SUBSTATION AND PUMPING STATION) :

All HT and M.V. power cables shall be with XLPE insulation, stranded aluminium / copper conductor and armoured

6.01 HT &M.V. Cables and Jointing

All HT and M.V. Cables shall be 33 KV (E) / 11 KV (E) / 1.1 KV grade XLPE insulated and armoured of Al / Cu. conductor 3 core / 3½ / 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 1000 mm 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.

6.02 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.

6.03 Signal Cable

The signal cable shall be PVC insulated 650 / 1100 V grade screened and with stranded copper conductor of appropriate no. of cores as per scheme requirement. Minimum 2 cores shall be kept as spare in all circuits.

6.04 Data Sheet for Cables

HT & M.V. Cables

i) Make

ii) Voltage grade & type

iii) Size

Control cable

i) Make

ii) Voltage grade & type

iv) Size

Screened signal cable

i) Make

ii) Voltage grade & type

iii) Size

7) VALVES AND SPECIALS

7.01 Delivery side of pumps

The delivery side of each pump shall be provided with 1 no. Electrical Actuator operated butterfly valve, 1 no. non-return valve with external damping arrangement, 1 no. Dismantling joint & short pieces wherever required. The diameter of the valves and joints shall as per technical offer.

7.02 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 potable water to maintain the flow unidirectional. The valve shall be maintenance free, leak proof and shall have low life cycle cost. The PN rating of valves shall be 1.0/1.6.

The non return valve shall be single door and double flanged, conventional non slam design with external dashpot arrangement(as per decision of EIC) . The body, door, cover shall be of ductile iron (Gr. GGG 40). The seat and body shall withstand fluid pressure of 16kg / cm^2 and 24 kg / cm^2 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/ mm^2.

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

7.021 Material or construction & other specifications of Non Return Valve shall preferably be as follows:

Fluid to be Handled	:	Clear Water
Pressure Rating	:	PN 1.0/1.6
Design Temperature	:	45 Deg. C
Design Standard	:	IS 5312 (Part – I) / 84
Type of Disc	:	Single Disc (Swing Type)
Closure Characteristic	:	Non – Slamming
Seating Faces	:	Metal to Metal
End Connection	:	IS 1538 / 93 (Table – 4 & 6), Flat Face
Operation	:	Self
Installation	:	Horizontal
By Pass arrangement	:	Yes
Dashpot	:	External

Material of Construction		
Body, Cover	:	Ductile Iron GGG 40
Disc with Hinge	:	Ductile Iron GGG 40
Body Seat Ring	:	L.T.B. to IS 318 Gr.2
Disc Face Ring	:	L.T.B. to IS 318 Gr.2
Hinge Pin	:	H.T.B. to IS 320 Gr. HT 2
Air Release Plug	:	Carbon Steel
Plug / Retainer	:	Carbon Steel
Gasket	:	Rubber, IS 638, Type: B
Bolts / Studs & Nuts	:	Carbon Steel, IS 1367/67 Cl 4.6& 4.0
Shaft	:	SS 410

<table>
<tr><td colspan="3">Testing</td><td colspan="3">Inspection</td></tr>
<tr><td colspan="3">Testing Standard : IS 5312(Part-I)/84</td><td colspan="3">Hydro Test : Witness & Test Report</td></tr>
<tr><td colspan="3">Hydro Body : 24 Kg / Sq. Cm</td><td colspan="3">Visual : Witness & Test Report</td></tr>
<tr><td colspan="3">Hydro Seat : 16 Kg / Sq. Cm</td><td colspan="3">Material Test : Test Report</td></tr>
<tr><td colspan="3">Quantity</td><td colspan="3">Note</td></tr>
<tr><td>Size (NB)</td><td>Qty.</td><td>Location</td><td colspan="3"></td></tr>
<tr><td>As per BOQ</td><td>As per BOQ</td><td></td><td colspan="3">1. Valves shall have free acting, quick opening non-slam closure characteristic
2. Reinforcing ribs are provided on body, cover & disc.
3. Flow direction mark shall be Cast Integrally on the body to indicate the Direction of flow
4. Valves shall be painted with one coat of Red oxide primer & Two coats of Epoxy Paint
5. Marking: Brand / Size / PN – Rating / Heat No. & Arrow Mark Sl. No.</td></tr>
</table>

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.

NON – RETURN VALVE DATA SHEET

1.01	Make	:
1.02	Size	:
1.03	Quantity offered	:
1.04	Type	:
1.05	Test standard, test pressure & duration of test	:
1.05.1	Body	:
1.05.2	Seat	:
1.06	Surface protection	:
1.07	Whether damping arrangement provided or not	:
1.08	Whether by pass arrangement provided or not	:

1.09	Face to face distance	:
2.00	Material of Construction	:
2.01	Body	:
2.02	Seat	:
2.03	Disc	:
2.04	Door Face Ring	:
2.05	Bearing Block	:
2.06	Disk shaft	:
2.07	Disk Seat	:
2.08	Hinge pin, plug, fasteners	:

07.**03** **SLUICE VALVE**

The sluice valves shall be manufactured from ductile iron (Gr. GGG 40).conforming to IS-14846 / 2000. Flange ends as per IS 1538 or as per other standards to match with other flanges. The body seat shall be of S.S. AISI-410 stem shall be of S.S. AISI-410 & the stem nut shall be Gun metal conforming to I.S. 305:1981/BS 2874. Other details are to be submitted for approval.

The seat pressure shall be 10 kg/cm2 and body pressure shall be 15 kg/cm2. The valves should pass through hydrostatics test for duration of 5 minutes.

Body, Cover, Wedge	:	Ductile Iron GGG 40
Shaft	:	S.S. to AISI-410
Body Seat	:	S.S. to AISI-304
Bearing	:	G.M./Teflon
Wedge Sit	:	S.S. to AISI-304
Packing	:	Rubber “O” ring

Internal Fasteners & Clamping Ring	:	S.S. to AISI-304
External Fasteners	:	Carbon Steel to IS:1367 Cl. 4.6 & 4.0.
Hand wheel	:	Fabricated Steel
Worm Gear Unit	:	Mfg. Std.
Actuator	:	No

Testing (as per IS : 13095 / 91)		**Inspection**	
Hydro Body	: 15 Kg / Sq.cm for 5 minutes	Hydro Test	: Witness & Test Report
Hydro Seat	: 10 Kg / Sq.cm for 5 minutes	Visual	: Witness & Test Report
Disc. Test	: 10 Kg / Sq.cm for 5 minutes	Material Test	: Test Report

Quantity				**Note:**
Size (NB)	Qty (Nos.)	Location	Service / Application	1. Valves shall be tight shut-off closures for frequent operation 2. Valve should closed with clock wise rotation of Hand wheel. In case of hand wheel operation) 3. Valves shall be painted with one coat of Red oxide primer & two coats of Black bituminous paints before dispatch. 4. Marking : Brand / Size / PN – Rating / Heat No. & Sl. No.

Materials of construction test certificates shall be provided during supplies. The sluice valves shall be rising spindle type with gearing arrangement / hand wheel for easy manual operation.

7.03 Butterfly Valve

The butterfly valves shall be DIDF, PN 1.0/1.60, conforming to IS 13095 of 1996 / BS 5155. The seat pressure shall be 16 kg/cm^2 and body pressure shall be 24 kg/cm^2. 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 90º 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, IP 68 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.

Material of construction & other specifications of Butterfly Valve shall preferably be as follows:

Fluid to be Handled	:	Clear Potable Water
Pressure Rating	:	PN 1.6
Design Temperature	:	(-) 10^0 C to 65^0 C
Design Standard	:	IS 13095 / 91
Service application	:	Tight shut-off
Type	:	Double Flanged Quarter Turn

Disc Type	:	Double eccentric
Seal (Nitrile rubber)	:	Mounted on disc
End Connection	:	Flanged ends to IS 1538/93 (Table-4 & 6), Flat Face
Operation	:	Actuator operated
Installation	:	Horizontal

Material of Construction		
Body, End Cover & Gland Plate	:	Ductile Iron GGG 40
Disc	:	Ductile Iron GGG 40
Shaft	:	SS to AISI 410
Body Seat	:	Nickel weld overlay micro finished
Bearing	:	G.M. / Teflon
Disc Seal	:	Nitrile Rubber (Shore Hardness 55' – 65'A)
Packing	:	Rubber "O" Ring

Internal Fasteners & Clamping Ring	:	SS to AISI 304
External Fasteners	:	Carbon Steel, IS 1367 Cl 4.6 & 4.0
Hand Wheel	:	Fabricated Steel
Worm Gear Unit	:	Manufacturer standard
Actuator	:	Yes

Testing **(as per IS 13095 /91)**	**Inspection**
Hydro Body : 24 Kg / Sq. Cm for 5 min	Hydro Test : Witness & Test Report
Hydro Seat : 16 Kg / Sq. Cm for 2 min	Visual : Witness & Test Report
Disc Test : 16 Kg / Sq. Cm for 5 min	Material Test : Test Report

Quantity			Note
Size (NB)	Qty.	Location	
As per BOQ	As per BOQ		

MOTORISED BUTTERFLY VALVE DATA SHEET

1.1	Make	:
1.2	Size	:
1.3	Quantity offered	:
1.4	Type	:
1.5	Test pressure & duration of test	:
1.6	Material of Construction	
1.6.1	Body	:
1.6.2	Body seat	:
1.6.3	Seat Ring	:
1.6.4	Disk	:
1.6.5	Bonnet	:

1.6.6	Spindle	:
1.6.7	Disc nut	:
1.6.8	Gasket	:
1.6.9	Bolts & Nuts	:
1.6.10	Gland packing	:
1.6.11	Gland	:
1.6.12	Spindle Nut	:
1.6.13	Handle wheel	:
1.6.14	Thrust plate	:
1.6.15	Cover	:
1.6.16	Face Rings	:
1.6.17	Yoke	:
1.7	Face to Face Distance	:

ELECTRICAL ACTUATOR

3. The actuator motor for the Butterfly valves 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.

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

v. torque limit switches for 'open' and 'close'
vi. 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.

r) 415V ± 10% 3 phase, 50 Hz, AC motor.

s) Reduction gearing arrangement.

t) Torque & limit switch mechanism.

u) Valve position indicator.

v) Arrangements for pick up signals for displaying the % opening of the valves in the suitable meters to be placed on control desk.

w) Remote operation facility with selector switch and local control console.

x) The hand wheel with clutch mechanism for manual operation. The manual operation shall be automatically declutched when actuator motors in operation.

y) 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.

DATA SHEET

1.1 Make

1.2 Type

1.3 Rating of Motors

1.4 Whether provided with limit & Torque Switches, if so, torque limit

1.5 Protection Group (IP)

1.6 Whether suitable for outdoor & temporary submergence duty/indoor type

1.7 Whether equipped with suitable component & termination arrangement for transmitting signals for displaying valve opening % indicating in the valve opening indication meters.

1.8 I.S. Standard to which it conforms

8.0) M.S. DISMANTLING JOINT ASSEMBLY AT DELIVERY RISING MAIN

One M. S. dismantling joint of suitable diameter is to be fixed along with the Flow meter & BFV on the delivery rising mainfor the ease of dismantling andfitting of Flow meter during maintenance and to relieve the pipe line stresses. The expansionrange for each of the dismantling joint shall be minimum 40 – 50 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.

The datasheet for the same is as follows-

DATA SHEET

XXV. Joint Size

XXVI. Pipe thickness

XXVII. Maximum length

XXVIII. Minimum length

XXIX. O.D.

XXX. P.C.D.

XXXI. Thickness

XXXII. Flange size

XXXIII. Flange thickness

XXXIV. Stud Nos.

XXXV. Stud dia.

XXXVI. Rubber Gasket

M.S. PUDDLE COLLAR / PLATE

1.1 Collar size

1.2 O.D.

1.3 I.D.

1.4 Thickness of the Collar

1.5 Number of Hooks

9.0) PUMP DELIVERY SIDE PIPING AND COMMON DELIVERY MANIFOLD

The pump individual delivery side piping, valves and dismantling joints shall be of such diameter as per Technical offer.

One dismantling joint of respective diameter is to be fixed along with the Butterfly Valve & NRV on the individual delivery pipe line of each pump within a suitable distance on individual pump delivery pipe line.

The pipes shall be made up of M.S. 10/12 mm thick plates for individual delivery line & 10/12 mm thick plate for Common Delivery manifolds, 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'sof the individual pumpdelivery 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 tenderer should also provide the necessary arrangements to encounter the horizontal back thrust if any and the details as per the pump manufacture's recommendation shall be clearly indicated in the layout drawing.

10.0) FLOW SENSOR

There shall be Full bore Electromagnetic flow meter as per scope of work .The flow meter 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 Clear water. The flow meter shall be electromagnetic inline type to provide indication, totalization and signal transmission of the liquid. The display is

required at suitable location as per site condition. 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 ± 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 date sheet for flow sensor is as follows.

The flow meter will be full bore electromagnetic type should be capable to handle flow of Clear Potable Water.

Type:- Pulsed DC electromagnetic.

Accuracy:- ± 0.5 % of measure value.

Repeatability:- ± 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 to IS 1538

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 Length as per site condition
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 PDB at a maximum 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.

Data Sheet of Flow Sensor

1.1 Make

1.2 Type

1.3 Model No.

1.4 Flow range

1.5 Accuracy

1.6 Display system

1.7 Relays

1.8 Power supply

1.9 Sensitivity

1.10 Details of cabling

1.11 Physical specification

1.12 Details of transmitter including installations details

1.13 Working temperature

1.14 Details of microprocessor if any

11.0) Flow meter/ Flow sensor or Flow Tube fixing chamber

For fixing of Flow Tube at the rising main , leak proof chamber with rung - ladder of dimension 2.5M x 1.5M x 2.5M (approx)is to be constructed if required as per site condition.

12.0) RADAR TYPE LEVEL MONITORING SYSTEM

12.01 The radar level transmitter shall be equipped with K- band (25 GHZ) pulseradar level transmitter for continuous monitoring of sump level and a hand-held programmer. The 25 GHZ frequency shall create a narrow-focused beam allowing for a smaller horn antenna and decreasing sensitivity to obstruction.

12.02 The transmitter 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 10 Mtr. with provision of ALARM function of the operating pumps at HWL & LWL and Trip function at LLWL.

12.03 The transmitter shall have ingress protection of IP 67 / 68. Mounting arrangement shall be included in the scope of work.

12.04 The cable connection between transmitter and the controller (to be mounted on the Control Desk) shall be carried out by PVC wire 0.5sq mm copper conductor shielded screened cable and the same shall preferably run in a grounded metal conduit. The controller shall have communication ports with Modbus protocol so as to communicate the field data for interfacing with SCADA in future.

12.05 The signal output shall be 4 – 20 mA and accuracy level shall be ±0.25%.

12.06 The field (hand held) programmer shall be compatible with the transmitter. The transmitter / controller shall have memory backed up by in-built battery. All displays shall be back-lit LED type.

12.07 Auxiliary AC / DC power supply, if required, shall be provided with the system.

13.0) DISMANTLING JOINT FOR INDIVIDUAL DELIVERY

One dismantling joint of respective diameter is to be fixed along with the Butterfly Valve & NRV on the individual delivery pipe line of each pump within a suitable distance on individual pump delivery pipe line..

14.0) EARTHING (FOR SUBSTATION & PUMPING STATION)

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 100 mm wide and 10 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 Earthing should not be less than 3 meters.

15.0) LIGHTING SYSTEM (SUBSTATION AND PUMPING STATION)

15.01 **Luminaries**

The scope includes indoor lighting of pump house and substation building. Industrial Medium bay luminaries with Metal 250W / 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 Control Room, lighting should be provided with LED T/L with decorative 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.

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).

15.02 **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.

15.03 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.

15.04 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.

15.05 The above stated distribution board shall be fed from independent switch fuse unit / MCB located in the PDB.

15.06 440 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.

15.07 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.	Fluorescent fitting	2 nos. 1 core -1.5 mm² copper & 1 no. Earth wire of1.0 mm² copper
2.	HPSV fitting	2 nos. 1 core -1.5 mm² copper & 1 no. Earth wire of 1.0 mm² copper
3.	Flood light fitting	2 nos. 1 core -2.5 mm² copper & 1 no. Earth wire of 1.0 mm² copper
4.	Receptacle-5A	2 nos. 1 core -2.5 mm² copper & 1 no. Earth wire of 1.0 mm² copper
5.	Receptacle-15A	2 nos – 1 core-4 mm² copper & 1 no Earth wire of 1.0 mm² copper

16.0) Ventilation and Fire fighting :

16.01 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 including all other accessories as required.

d) 3 - phase 450 dia, 1000 / 1500 r.p.m. (Syn) or as applicable Exhaust fans including proper louvers, duct work, rain cowl and bird protection screen ----- As required for the Pump House .

e) 300 dia, 1000 / 1500 r.p.m. (Syn), Exhaust fans including proper louvers, duct work, rain cowl and bird protection screen ----- As required for the Sub-station

f) Wall mounting type control panel for ventilation system ----- 2 Sets

e) 18" Pedestal fan with regulator and all other accessories ---4 Nos.

16.02 Fire fighting: The pump house and substation building shall be provided with the following:

a) ABC type Portable type fire extinguisher (2 Kg Capacity) 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.

17.0) Pressure transducer / Pressure Sensor

i. The pressure transducer / pressure sensor shall be used to indicate, record the

   a. individual pump discharge line water pressure, manifold line pressure. The recording instrument unit (indicator unit) shall be mounted in the control desk cum instrument panel.

ii. The transducer / sensor shall be field mounting type with separate display at suitable location and most reliable. It shall have protection for surge and over voltage in both positive and reverse polarity. The pressure port shall be from stainless steel and shall be 100% leak proof.

iii. The accuracy of the sensors/ transducers shall be ± 0.25% full scale

iv. It shall have output signal option of 4 -20 mA and shall have requisite power supply.

   a. The enclosure shall be with required length of interconnecting cable so that the same can be fed to a recorder/ indicator unit located in central control desk. If for transmission of such signal, any signal conditioner and or any signal booster is necessary, the same shall be incorporated within the offered cost.

v. The entire process connection is the responsibility of the contractor and the offered

   a. Rate shall include all such field requirements like watertight joint box, additional cable length etc to complete the job in all respect.

vi. The scope of this itemized job is all inclusive of SITC of complete transducer/ sensor Sets (field mountable) including recorder units (desk mountable) with all associated signal transmission cabling (specified elsewhere) works in one length including all other accessories within the offered cost for the specific item.

18.0) Pressure Gauge (Dial Type)

18.01 The individual discharge line pressure gauge (6" dial) shall be 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 ±1%.

The full-scale range shall be from 0 -16 Kg / Sq.cm. The pressure gauge shall have 3-way cock and fitting.

SECTION - F

List of Vendors

Sl. No.	Equipment	Make
01.00	Pump	Kirloskar / Mather & Platt / WPIL Ltd.
02.00	Motor	Siemens / ABB / Marathon/CG
03.00	Control Desk / PDB	Siemens / Sellwin / ABB/Schneider / PCE Projects/ Bhartiya Cutler Hammer / 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)
08.00	Contactor	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
15.00	Flowmeter & Recorder Indicator, Totaliser	Krohne / Endress Hauser/ ABB / Micro System
16.00	Control Fuses	GE/Siemens / L & T
17.00	Current Transformer	Kappa/JAWS / Schneider

18.00	Capacitor	Universal / L&T / Epcos
19.00	Butterfly Valves, Non-Return Valve& Sluice Valve	VAG / IVC / Kirloskar / Fluidtech
20.00	Valve Actuators	Rotork / Auma
21.00	Pressure Gauges	Bell/Taylors/H. Guru
22.00	Fire Extinguishers	Surex / Minimax / Cease Fire / Fire Shield
23.00	Submersible Pump	KSB / Calama / Kirloskar
24.00	Air Conditioner	Carrier / LG / Voltas/ Hitachi
25.00	Lighting system	
26.01	Light Fitting	Philips / Bajaj/Havells/KLITE
26.02	Wire	Finolex / KDK/ Havells
26.03	Switches	Anchor / Havells / Cab
27.00 System /	Ventilation System	P.N. Chakraborty & Co. / Universal Air PASCO
28.00	Exhaust Fan / Ventilation Fan	Alstom / EPC / Pasco / Marathon
29.00	Crane	Surekha / Plicare / India Engineering & ImplementsCo.
30.00	H.T. Switchgear	Siemens / Schneider / ABB
31.00 CGL	Power Transformer	Schneider / KEC/ Voltamp (Vadodara) /
32.00	Battery	Exide/Aamaron
33.00 Line	Battery Charger	Caldyne / Electro Service/Dekem/Live

CLEAR WATER PUMPING STATION AT PIYALA

Section-E

B. PUMPING STATION

1.0) Vertical Wet Pit Pumps

1.1 Thepumpsshallbeofverticalwetpittypewithmixedflowimpeller.Pumpsshallbe placedverticallysubmergedwithintheSump of the wet pit pump house.Thepumpshallbeself-servicewaterlubricated type.Self-lubricated type guidebearingsareto beprovidedat suitablepositionsoftheshaftsandshallnotbe morethan1.5M(approximately)apart. Sincetheservicewatermaycarryminor solid particles,the guidebearingsshallhave suitablepassageswithinthemto expel /pass these minor solid particles byself-working pressure,and thesame will notstuckinside thebearingsdeteriorating them.

1.2 Thepumpbatteryshallcontainsuitableno pump setsoutofwhicheach pump shall deliver50 % of the demand and also the system shall have minimum 50% stand-by Pumps.

1.3 Pumpsshallbeverticallydrivenwithshaftdirectly&flexiblycoupledwith adequate rating, V1,SCIM. Thepumprotational speedshall not bemorethan1500 rpm (syn).

1.4 Thepumpsshallbeofnon-pull outtype.Theindividualpumpdischargelineshallrun overthemainoperatingfloorandshallbeconnectedwiththecommondeliverymanifold.The pumpdischargehead/motorstool /soleplate shallbe rigidly grouted on the Pump floor. Thefoundation planand foundationpocketsrequired tobekeptwiththecivil construction, and the successfulbidderon receipt oftheordershall furnish the pump-motor foundationplan authenticatedbytheOEM. Thesaid foundationwilltake careandencounterthe horizontalbackthrustas may be generatedduringstart/stop ofthe same(at shutoff condition maybeconsidered).

1.5 Thepump impellershall besecurelyheldon thepumpshaft asper provisionofthe pump manufacturer'sdesignsoastopreventslidingof theimpelleralong theshaft duringoperation.

1.6 Thepumpsshallbeofhavingafairly steep H-Q curve.Thetenderershallfurnishthe evaluatedspecificspeed ofthe pumpat thespecific trimatduty point.ThepumpH-Q

characteristicscurveshallbestableallthroughout.Thereshallbeamarginofat-leas 25%in between therun-out flowandthedutypoint flow.

1.7 The pump efficiencyshallbereasonablyhigh. The head-discharge-efficiency-KW absorbed- NPSHR shall beguaranteedwithoutany tolerancesat thedutypointworking at riverwaterlevel condition mentioned in the Obligatory Data.

Thetenderershallhavetoconfirmthemaximumpowerabsorbedbythepumponthe entire rangestarting from theshut-off torun-out withoutanypositive tolerance

1.8 Thesuspension length of thepumpassemblyshallbesuch that itcansafely work at the lowest lowIG levelconditionconsidering worst of (i) the NPSHR of the offeredpump at the maximum waterdischarge condition on the entireoperating range &(ii) minimum submergence requirement. Itshallhaveonesuitablebasket type strainerpreventing entry of foreignparticle and of any solid in the pump.

1.9 The verticalcolumnpipeassemblyshallbe of suitable dia fabricated from adequately thick MS plate, flanged type,andanti-corrosiveepoxypaintedboth insideandoutside. The column pipingshallbe of individual lengthnot more than 1.5Meach for effectiveand easyhandling.

1.10 The totalsuspension length including thebottombasketstrainer if any,shallbe fixedby the tendererconsidering the minimumsubmergence requirement workingat the lowest low sump level, the required bottomclearanceat the indicatedSump leveletc. The total suspension length,ashasbeenconsidered in the offerbackedby technical justification shall beplaced with the Part-I offer.

1.11 Thepump assemblyshallbeprovided withsuitableanti-friction roller thrustbearing with a

PT-100 probe so as to measure the pump bearing temperature, non-reverse ratchet assembly,bowlbearing,suctionbellbearing,shaftssleeves includingsleeveat gland packingpoint, seal ring/ wearing ring, provision for impelleradjustmentnut,double throat air-valve atcolumnventpointand other important features as provided by the manufacturer. Suitable motorstool, motorsole plate with facility ofpullingout thecolumn

andbowlassembly through it,anchoringbolts,nuts, washers, fixingboltsallcomplete are tobeprovided.

1.12 Thepump rotatingassemblyshallbestatically anddynamicallyaccuratelybalanced. The impeller balancingshallbe within the grade G- 6.4asper IS:11723. No holeoranypiece being welded/bolted on thepump impeller forbalancingshallbeallowed. Theshaft shouldbe groundalloverand perfectly aligned. Specialcare shouldbe taken that the entirepumpassemblydonotexperience vibrationbeyond thepermissible limitasper IS:11724, ofsuchclass roto-dynamicunit while inoperatingeven in worstoperating conditionat anycombination.

1.13 Thepump motor shall beconsidered asa singleunit and the vibration limitshouldbe within the limit specified inabove IS.

1.14 Thenoise level shall be within thepermissible limit of IS: 12065. The thrust bearing shallbedesigned insucha manner tobe workedsafelyonany working conditionevenat the respectiveshut off.

1.15 Thepumpshall also withstand thecondition ofanyback flowon it.

1.16 The static and dynamic loading of the pump motor assembly with other allied components shall be clearly indicated.

1.17 Thepumpshallbecapable ofcontinuousoperation. Thepumpshaft, lineshaftshallbe accuratelysized. Replaceablesleevesare tobeprovidedatdesiredpoint. The Stuffingboxshallbeselfsealeddesign provided withpacking ringandpreferably with Split type gland.

1.18 The impeller of the offeredpumpshallnotbeeitheron the lowest trimor thehighest trim of thesamepump familyoffered.

1.19 The wettedportion of thepumpshallhaveaproper finish.Thepumpshallhavea minimum efficiency of80%atdutypoint. Pumps offered with lesser efficiencyatdutypoint shall notbeaccepted.

1.20 Thepumpshaftshall beaccurately machined andgroundallover. Theportion of the pump that willcome under the contact with pumped liquidshallbe protectedby replaceable sleeves.

1.21 Suitable pump casing wearing ring and/or impeller neck ringas per the manufacturer'sdesignshallbeprovided. Each pumpshaftshallbeadequately supported,both atdrivingandnon-drivingends, onanti-friction typeball/rollerbearings capable to withstand the worst thrust loading for thepumpoperation fromshut-off to run-out.

1.22 Thepumpshallbesuitable for valveopenstartingandalso to takecare of thecondition of back water flow in it, ifany. Grease injectionnipplesandgreasecollector at eachbearing pointsshall be provided.

1.23 Theoverallnoise level of thepump-motorunit shallbe within the stipulations of the relevant BIS limit all round measured from adistance of1.5 M.

1.24 The identical parts of thepumpsshall be inter- changeable type.

1.25 Thesupply of thepump shallbecompletedby thepump manufacturer with the following componentsandaccessories: -

Suitable motor stool,pump motorsoleplate with facility ofpullingout the columnandbowl assembly through it, anchoring bolts, nuts, washers, fixingboltsallcomplete are tobeprovided. Sole Plate of the total pump-motorassembly, motor stool withall foundationbolts, nuts, washers, wedges, levelingshimsand othererection materialsas required. It maybenoted that thereshallbe noother thrust encounteringdeviceon thepump dischargepipebranchand thecommon deliveryheaderexcepting thepump foundation bolts. Thepump foundationboltsshall be adequateenough to withstandall the thrust that mayoccurduring pumpoperation includingstart/stop. Additionally one MSDF short-piece with adequate stiffners 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 flexiblecoupling withbolts, nuts, pins, keysetc. for coupling the driveanddriven unit.

Air-ventcock, primingcocksuitablyplaced.

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.

Anyotheraccessories&componentconsideredbythemanufacturerforsafe,efficient operationofpumps

1.26 Thepumpsshall becapablefor continuousoperationat anystatedlevel condition.

1.27 Thematerialofconstructionofthepumpisgivenbelow.Ifthetendererfeelsthat theMOCother than whathavebeen stated willgivebetterserviceandperformance,he mayoffer thepumpswiththeMOC asperhischoice,backedby technicaljustifications, but thesameshall onlybe madeasanalternativeoffer.

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)	:	Selflubricatedtypewithcut-lessnitrile rubber in SS shell (straightgroovespreferred)
h)	Wearing ring / seal ring	:	Materialshavingat least50 BHNhardnessdifference to the nearest component
i)	Impeller Nut	:	CI IS 210 GR. FG 260
i)	All hardwareused in total pump Assembly(nuts/bolts/fastenersetc.)	:	SS-410

k)	Column pipes	:	MS, fabricatedfrom adequatelythicksteel platewithanti-corrosiveepoxypaintedboth insideandoutsideafter propersurfacefinish

1.28 All materials,casting used for manufacture of thepumps withalliedcomponents& accessoriesshallbe ofbest tested qualityand thecontractorhas to submit the test certificate for the MOC at the time of shop test as well as with the supplies.

Ultrasonic test to theshaftsare tobeconducted and test certificate tobe furnished.

Thedynamicbalancing of the rotatingunit with coupling, keyetc. is tobe conductedand test certificate is tobesubmittedonshop test.

Dye-penetration test to the impeller are tobeconductedand the testcertificate are tobe furnished with thesupply.

Hydrostatic tests atapressurenot less than 1.5 times of theshut-off pressure forduration of30 minutes are tobe performedand testcertificates tobe furnished.

Thepumpperformance test ofall thepumps forhead, efficiency,powerconsumed etc. versusdischargeshall beconductedasper IS:9137 inpresence of thedepartmental representativesand in full load, fullspeed with the job motorand preferably with full columnsetting.

The duration of theperformance testatshop shallbenot less than8 hourscontinuous operationand the temperature monitoring ofbothpumpand motor shall beconducted.

The tenderershould indicate the maximumcolumnsetting, theycanaccommodate in their factory testbed.

The NPSHR test asper IS:9137 to at least one pumpasper choice of thedepartment at variousdischargeconditions includingdutypointshallbeconductedduring the joint shop tests ofpumps. Theduration of theperformance tests ofallpumpsshallbenot less than8 hourseach,during which the temperature,noise, vibrationshallbe monitoredand tested.

The minimum submergence test asper IS: 9137shall beconducted toat leastonepump asperchoice of thedepartmentat variousdischargeconditions includingatduty point during the jointshop test of thepumps.

Vibrationanalysis toall pump motorsets are tobe made inall loadconditionsbothduring theshop-testingas well asat site after thepumpsetshavebeen fullycommissioned.

After the performance tests,one pump asperchoice of the department shallbestripped offand the internal componentsshall bechecked

Apart from thestated shop testsall field tests includingnoise, temperature rise,and vibrationanalysisshall beconductedby thecontractor.

1.29 The tenderershall fill-up the guaranteedperformance figure/data given in theseparate sectionandsubmit with thepart-I offer

1.30 **Hydraulic test at shop**

1.30.1 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.

1.30.2 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 topump 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.

1.30.3 Tests shall be conducted with actual drive motors at full load and full speed.

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

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

1.31 Performance test at shop

1.31.1 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 PTE8.2/BS-599/I.S.S., latest edition/ relevant universally accepted codes.

1.31.2 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.

1.31.3 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.

1.32 PERFORMANCE GUARANTEE, TOLERANCE AND PENALTIES

1.32.1 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.

1.33 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.

1.34 CLEANING, PROTECTION AND PAINTING

1.34.1 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.

1.34.2 Painting

All surfaces shall thoroughly be cleaned in a manner approved by the manufacturer for necessary paint 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.

1.34.3 Packing for shipment

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

1.35 TESTS AND INSPECTION

1.35.1 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 MED's representatives. All relevant cost of such inspection by two representatives of MED has to be borne by the manufacturer / contractor.

1.36 SPARE PARTS

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

1.36.2 The spare parts as mentioned are to be supplied within the completion period of the contract along with the main equipment.

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

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

1.37 DRAWINGS, CURVES & INFORMATION REQUIRED

1.37.1 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.

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

1.37.3 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.

1.37.4 The $G.D^2$ values of the impeller of the pump and Rotor of the motor at 1500 R.P.M. (syn.) are to be furnished.

1.38 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.

1.39 PROPOSAL DATA

1.39.1 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 Rutchet 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 encounting 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	:

7.00.09 SUMP PUMP

The portable submersible dewatering pump motor set will be suitable for dewatering gland leakage muddy water withadequate 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 bellow 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

2.1 ThemaindrivemotorsshallbeofsquirrelcageTEFC / CACAinductionmotor,verticalaxis,V1(as per IS: 2253), continuousdutytosuit theofferedpumpsandshall becapable todrive the pumpinalldeclaredworkingconditions.The motorshallbeofhighstartingtorquetype suitablefor 11 KV ±10%;50C/S ±5%; combinedvariation±10%AC;3-phase supply and not greater than 1500R.P.M.(Syn).

2.2 Allthemotorsshallberated forcontinuousduty (S1)andshallhaveIP 55degreeof protectioninaccordancewith IS:4691.

However,duetooperationalneed,thepump-motorsetmaydemand forfrequentstartor stopoperation,withamaximumtimegapof5-10minutesfromonestopafterprolonged operationinratedloadandmaydemandrestarting ofthesame.Thepumpmotorsetshall becapabletotakecareofthestatedsituation.

2.3 Allthemotorsshallhave highefficiency and power factor. Itshallhaveunchangedefficiencyduringratedoutput utilization.

2.4 All the motor ratings shallbe200KW & 350KWconsideringatleast 20% marginover themaximumpumpinputatdutypointor10%marginoverthemaximumpumpinputinthe worstcaseofthepumpoperationinthetotalrange(fromshut-offtorunout),whicheveris higher.Theoverallcapacityof themotor shallbeselectedfor continuousoperationatthe ratedoutputforthevoltageandfrequencyconditionmentionedaboveintheworstcaseby allowingthetemperatureriselimitedtothatofclass-Bovertheambienttemperatureof45° centigrade. But theclassofinsulationofthemotorsshall be ClassF.

2.5 Themotorcharacteristicsshall matchtherequirementsofthedrivenunit (pump)sothat adequatestartingtorque,acceleration,pullup,breakdownand fullloadtorqueare available fortheintendedservice. The motorshallbesuitable tostartthepumpsinvalve open condition. It shallalso not be overloaded in case of back water flow occurs occasionally.

2.6 The motorshall have rotating rotationalspeednot greater than1500RPM (syn).Thepercentage slip ofthemotoratdifferentloadconditionsshallmatchthepumpspeedsrequiredthenat thedifferentloadconditions.Thetenderershallclearlyindicatethemotor speedandslip atdifferentloadconditions.

2.7 Thestatorwindingsdesignshall besuchthat itshall havesuperiorelectrical,mechanical and thermalpropertiesandshallachievebetterheat transferandhigherdielectric strength.

2.8 The rotor of the motor should be sturdy in construction so as to ensure trouble free operation. Special care shall be taken to ensure better torque characteristics.

9.9 All the motors shall be provided with a very efficient cooling system so that the temperature of the stator windingdoesnot riseabnormally. The method ofcoolingshall beat least IC411 / IC 611asper IS:6362:1995. All the motorsshallbeprovided withbidirectional speciallydesignedexternalcooling fan for lownoiseoperation. Noise levelshallbe within the valuesas stipulated in IS: 12065.

2.10 The motorshallbe suitable forDOL starting.

2.11 The motor shall deliver ratedoutput and accelerateat full speed with85% of rated voltageat the motor terminal. With85% rated voltage at motor terminal, it shallbecapable of workingsatisfactorilyat full load forat least 10 minutes without injuriousheating or stalling.

2.12 The motor locked rotor currentshallbe limited within720% of the motor ratedcurrent without any positive tolerance.

2.13 The locked rotor withstand timeunder hot condition at110% rated voltageshall be more than motorstarting timeby at least2.5seconds. Hot thermal withstandcurveshall havea

margin of at least10%over the full loadcurrent of the motor topermit relaysetting using motor ratedcapacity.

2.14 The motorshallbeprovided with12 Nos. simplex type RTD's and BTD's for alarm and trip. In addition 2 Nos. dia type thermometers with 1 NO + 1 NC potential free contacts shall be provided. The leadsshall be brought out toaseparate terminal box.

Suitable wiringbysignalcableshall be made to receive thesignal from the field to the

control deskand thecircuitry foralarmand tripshall bearrangedsoas to givealarmand or trip the motor, as the case maybe.

2.15 The rotorshallbedynamically balanced withall the fans and withhalfkey in theshaft extensionand to vibrationseverity grade asper IS:12075. But thenoise levelof thepump and motor incombineshall notexceed the stipulationsas mentioned in IS: 12065.

2.16 The motorshallbe provided withanti-frictionbearings, grease lubricatedboth atdriving andnon-drivingends.

Thebearingsshallbeprovided withseals toprevent leakage of lubricantorentrance of foreign matter like dirt, wateretc. into thebearingarea. Grease lubricated bearings shall bepre-lubricated andshallhaveprovision for in-servicepositive lubrication withdrains and greasecollectors to guard against over lubrication.

2.17 The motor terminalboxshallbeofdetachable typeand rotate-ableby360º insteps of90° ineachposition. The terminalboxshallhave IP55degree ofprotection. Itshall be suitable for terminatingone number 3-core, 11 KV(E) grade,300 sq. mm XLPEaluminum conductorarmoredcables for main motor feeding. Mounting of the terminalbox shall match with thesite requirement.

The terminalboxesshallbe with removablecover /adopterpieces withaccess to connection. The motor terminalboxesshallbe furnished withsuitable cable lugsand doublecompression brass glands to match with thecablesize.

2.18 The motor shall be equipped with built-in anti-condensation thermostatically controlled space heater of adequate rating suitable for operation in 230 V AC supply. Separate terminal box (s) for the space heater connection is to be provided.

2.19 The frame of each motorshallbeprovided with twoseparateanddistinctgroundingpads suitable foraccommodation ofsuitablysizedgroundingconductors. The maincable terminal boxesshall haveseparategroundingpads.

2.20 The ratingplate of the motorshouldcontain the minimum informationas indicated in the relevant BIS standardandshall be made of stainless steel.

2.21 Thesuccessful tenderershall furnish the motor load-efficiencycurve, torque-speed curve, load-power factorcurve, thermal withstandcurve (hotandcold), current-speed curveandcurrent-time curve for approval of the Department.

Thedimensional drawing of the offered motor, terminalbox drawings, loaddata, GD^2 valueof thedriveunitand thedrivenunitalong with final Data Sheet shall alsobe furnishedby the successful tenderer for approval of the Department.

2.22 The motorshallalsobeprovided withsuitable lifting lugs/eyeboltshavingadequate provision for lifting/ installation. Commonbase frame for thepump& motoras indicated earliershallbe used withsuitable foundation bolts, Dowellingpinetc.shallalsobe provided.

2.23 The routine tests asper IS:325shallbeconducted oneach motorat Shop i.e. at manufacturer's works. Similarly, the type test (Heat Run Test)shallbeconductedon at leastone motor randomlyselectedduring the tests. Allnecessaryarrangementsandcosts thereof for the testsare tobe madeby thecontractorandshallbe included in the offered cost.

2.24 Apart from the technical offer, the tenderershould furnish theCheck Listduly filled-in in the Part-I offer.

CHECK LIST OF THE MOTORS

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

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 M^2)

1.41.00 GD2 value of load to motor shaft (kg M^2)

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 (Temperaturerise) of at least 1 no. motor as per choice of the customer, shall be performed. Further any special tests called for in the driven equipment specification shall be performed. The tenderer has to bear all expenses for such testing to witness the tests for max. two representatives of MEDat the manufacturers 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 premises.

3.00.00 SPARE PARTS

Spare parts are to be supplied as specified separately.

3)HT PDB CUM MCC AT PUMP HOUSE

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

I) Incomer panel – 1 Nos.

II) Motor Feeder panel – 6 NOS

III) Capacitor reactor panel. - 3 nos.

IV) Transformer Feeder Panel - 2 Nos.

3.2. The switch gearshall 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± 10%, 3 phases, 3 wire, 50 Hz ± 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 90^0C.
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 / 110 V DC (to be freezed during detail engineering) motorized spring charged trip free mechanism and mounted on a carriage complete with self contained manually operated fully interlocked, raising and lowering mechanism with 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:

d) 1 set mechanical ON & OFF indicator.
e) 1 rear entry cable box with glands suitable for 11 KV grade XLPE cable.
f) 1 set of indicating lamp ON / OFF / TRIP / SPRING CHARGED / TRIP CIRCUIT HEALTHY/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 rated for 110 V DC.
f) 1 space heater with ON & OFF switch
g) 15A / 5A 3 Pin Plug Socket
h) In – panel lighting with control switch
i) Space heater for each individual motor shall be fed from the individual motor feeder and provision for such distribution as well as interlocks shall be provided in HT PDB cum MCC.

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 in the Incoming Panel, suitable for 3 phase, 3 wire 3 limb 50 Hz system with a ratio of 11 KV /110 / √3 / 110 / √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 62.5KA. 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 cum MCC shall be as under:

A) Incoming feeder Panel :1 Nos. (800 A) each equipped with the following:

i)	96 sq mm (0 – 8 KV) Voltmeter with Selector Switch	-	1 Set
ii)	96 sq mm (Dual scale) Ammeter 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 rating with 5 A 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.
vii)	Master trip relay type VAJH – 13	-	1 No.
viii)	Trip Circuit Supervision Relay type VAX - 31	-	1 No.

ix)	Multifunction meter (For Amp. Voltage, frequency, power factor etc.) type ELITE445 or equivalent	-	1 No.
x)	Power Factor Meter	-	1 No.
xi)	KW Meter	-	1 No.
xii)	8 Channel alarm annunciator	-	1 Set.
xiii)	ON / OFF / TRIP / SPRING CHARGED / TRIP CIRCUIT HEALTHY / SERVICE / TEST POSITION / DC FAIL / R – Y – B Phase Indication Lamp	-	11 Nos.
B)	Bus Coupler Panel : 1 No. equipped with the following		
i)	Local / Remote selector switch	-	1 No.
ii)	TNC Breaker Control switch	-	1 No.
iii)	ON / OFF / SPRING CHARGED / SERVICE / TEST POSITION / TRIP CIRCUIT HEALTY Indication Lamp with Push Button	-	6 Nos.
C)	Out going feeder panels for Motors Each Motor feeder panel shall be equipped with the following :		
i)	Dual Scale Ammeter 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 rating with 5A Secondary, Class 5 P10 & 1.0, 10VA burden	-	1 Set (3 Nos.)

v)	True Digital Microprocessor based draw out 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.
vi)	Master trip relay type VAJH-13	-	1 No.
vii)	Trip Circuit Supervision Relay type VAX 31	-	1 No.
viii)	8 Channel alarm annunciators	-	1 Set
ix)	ON / OFF / TRIP / SPRING CHARGED / TRIP CIRCUIT HEALTHY / SERVICE / TEST POSITION Indication Lamp	-	7 Nos.
x)	Surge Arrestor	-	1 Set

D) 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 MV Switchboard 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.

CHECK LIST OF THE HT PDB CUM MCC

1.0 Buses:

1.01	Bus-bar material	:
1.02	Bus-bar size	:
1.03	Minimum Clearance of bare bus and connections (a) phase to phase - mm (b) phase to ground - mm	: :
1.04	Bus-bar provided with (a) Insulated Sleeve (b) Insulating barriers	: :
1.05	Current Ratings (a) Continuous (Amp) (b) 3-Second (KA rms)	: :

1.06	Temperature rise over 45°C Ambient (°C)	:		
1.07	Standard to which buses conform	:		
2.0.	**Vacuum Circuit Breakers:**			
2.01	Make	:		
2.02	Type & Service	:		
2.03	Execution	:		
2.04	Rated Voltage: (a) Nominal (b) Highest	: :		
2.05	No of Poles	:		
2.06	Frequency	:		
2.07	Current Ratings (a) Rated current at Standard ambient (b) 3-second thermal rating (KA rms) (c) Momentary (KA rms)	: : :		
2.08	Temperature rise over 45°C ambient	:	°C	
2.09	Interrupting Capacity (a) Symmetrical- KA (rms) at rated voltage (b) Asymmetrical (if any)- KA (rms)	: :		
2.10	Making Capacity (a) Peak KA (b) RMS symmetrical	: :		
2.11	Closing time	:		Cycle/mille-sec
2.12	Opening time	:		Cycle/mille-sec
2.13	No of breaks per phase	:		
2.14	Insulation level	:		
	(a)1-Minute dry withstand (KV rms) (b) Impulse withstand (KV Peak)	:		

2.15	Standard to which conforms	:
2.16	No load mechanical operation	:
2.17	Number of operation at rated current	:
3.00	**Operating Mechanism**	
3.01	Type	:
3.02	Trip free or fixed	:
3.03	Charging Time	:
3.04	Closing :	:
	(a) Closing voltage	:
	(b) Tripping voltage	
3.05	Allowable variation in Control Voltage	:
	(a) Closing	:
	(b) Tripping	
3.06	Current required for Tripping	:
3.07	No of auxiliary switch furnished (a) Normally open	:
	(b) Normally close	
	(c) Breaking Capacity	:
	(d) Type	
	(e) No of spare contacts furnished	:
	(f) Are the auxiliary contacts convertible type	:
		:
		:
3.08	Operation counter furnished or not	:

3.09	Mechanical trip furnished or not	:	
3.10	Mechanical safety interlocks provided or not	:	
3.11	Breaker provided with service/test and isolated position	:	
3.12	Type of indication provided with above position	:	
3.13	Can cubicle door be closed when Breaker in service or not in test Position	:	
3.14	Impact for foundation design to include dead load plus impact values on opening at maximum interrupting rating	:	
3.15	Standard to which conforms	:	
4.0.	**Panel Assembly**		
4.1	Dimensions (LXBXH)	:	
4.2	Approximate weight	:	
4.3	Material of construction and thickness	:	
4.4	Degree of protection of external enclosure	:	
4.5	Space for power cable termination	:	
4.6	Space for multicore cable termination	:	
4.7.	Space Heater		Yes/No
	(a)Thermostat controlled space heater furnished for each cubicle	:	
	(b) Rating		
	(i) Voltage	:	
	(ii) Watts	:	
4.8	Ground Bus		
	(a) Material	:	
	(b) Size	:	

4.9	Wiring		:
	(a)	Size of wire	:
	(b)	Insulation	:
	(c)	Voltage class	
4.10	Minimum space required for installation		:
	(a)	Minimum rear space	:
	(b)	Minimum front space	

4.11	Current Transformer details		:
	(a)	Type	:
	(b)	Make	:
	(c)	Frequency & voltage	:
			:
	(d)	Pole	:
	(e)	Protection Class	:
	(f)	Metering Class	:
	(g)	Rated burden	
	(h)	Class of insulation	:
	(i)	Short time thermal rating	:
	(j)	Dynamic current rating	
	(k)	Mounting	:
	(l)	IS .Standard to which conform	:
	(m)	CT ratio	:
	(i)	Incoming feeder	
	(ii)	Transformer feeder	
	iii)	Motor Feeder	
	iv)	Capacitor Feeder	
			:
			:
			:
			:

4.12 Voltage Transformer

(a)	Type	:
(b)	Make	:
(c)	Frequency & voltage	:
(d)	Pole	:
(e)	Accuracy class	:
(f)	Rated burden	

	(g) Connection	:
	(h) Class of insulation	
	(i) Mounting whether withdrawal type	:
	(j) Standard to which conform	
		:
		:
4.13	Indicating lamp	:
	Type	:
	Make	:
	Voltage	:
	Wattage	
4.15	Fuses	:
		:
	Type	:
	Make	:
	Voltage	:
	Rupturing Capacity	:
	IS standard to which conforms	
5.0.	**Tests**	
5.1.	Indicate the tests to be performed	:
	(a)	
	(b)	:
	(c)	
	(d)	
	(e)	:
		:
		:
6.0.	**General :**	
6.1	Whether GA drawing submitted or not	:

6.2 Technical literature submitted or not :

1.0 POWER FACTOR IMPROVEMENT CAPACITORS AND REACTORS

1.1 There shall be such number of sets of Capacitor-Reactor-RVT Panel units corresponding to the

number of running motors connected through the HT PDB cum MCC for the total scheme.

1.2 12.0 KV capacitors along with 02% Series reactors shall be provided so as to improve the power factor to at least 0.98. The capacitors shall be suitable for operation in 11.0 KV ± 10%, 50HZ ± 5%, 3-phase, AC earthed system. It shall be indoor type, free standing, floor mounted, sheet steel enclosed complete with all base channels, anchor bolts and hard wares.

1.3 The capacitors shall conform to IS 13925 and shall be suitable for stringent applications and

low loss. The capacitor shall be natural cooled type manufactured with non-PCB fluid, having bio degradable and non inflammable and non-deteriorating chemical properties. The same shall be equipped with self discharging devices. Suitable rated HT external HRC fuses with striker pin arrangement, in addition to the internal fuses, if any, shall be used. The final ratings of the capacitors shall be determined from the load current of the motor at pump duty point loading.

1.4 The capacitor shall be hermetically sealed and fully protected from atmospheric ingress and

hazards. The capacitor shall withstand abnormal system hazards like switching transients and surges, inrush currents, over voltages and over currents.

1.5 The capacitors shall have suitable cable termination boxes for terminating 11 KV (E) grade 3-

Core, up-to 300 Sq. mm XLPE cable with glands & clamps. The successful tenderer shall have

to submit the detail calculation for selection of capacitors & reactors during detailed engineering for approval of the department prior to ordering on the sub-vendor.

1.6 The suitable rating Reactors shall be in series with the capacitor for inrush current limiting service and shall be indoor dry type, 11 KV, 3-phase, 50 HZ. It shall conform to IS: 5553.

1.7 The interconnection of the capacitors and the series reactors shall be made through suitable

bus ducting. Copper bars having high conductivity and electrolytic grade shall be of adequate size. Suitable insulators, supports as required shall be provided.

1.8 The termination arrangement shall be such that there shall be no possibility of impregnant leakage with internal lug crimping to an assembly of epoxy moulded insulator bushings with terminal studs being inserted moulded.

1.9 Three numbers single phase indoor, resin impregnate dry type, air cooled RVT in 3 limb construction having ratio 11000 / 110 / 110 with Star / Star / Open – Delta connection, 100 VA

√ 3 √3 √3

burden and accuracy class 1.0 / 3P shall be provided in conjunction with the Capacitor – Reactor for unbalance protection. The RVT shall have bushing as terminal arrangement and fuses on LV side. The RVT shall conform to IS: 3156.

1.10 The Capacitor – reactor unit along with the RVT shall be housed in a common sheet steel with

wire mesh enclosure.

1.11 Since the major load is inductive type, major VAR shall be introduced in the system on Energisation and acceleration of main motor.

CHECK LIST OF CAPACITORS & REACTORS

1.01 Manufacturer name with contact address,

telephone, Fax, E-Mail etc

:

1.02

Overall dimension (L x B x W) :

1.03

Approximate Weight :

1.04

System Voltage :

1.05

Capacitor Rating :

1.06

No. of units :

1.07

Capacitor Rated Voltage :

1.07 Capacitor Type :

1.08 Type of internal connection :

1.09 Whether the capacitor is capable to improve the power factor of the motor at pump duty point load condition to 0.98

: Yes/No

1.10 Type of connection with motor :

1.11 Rated current :

1.12 Cooling system :

1.13 Dielectric :

1.14 Whether external HRC fuses provided and ratings

:

1.15 Type of installation :

1.16 Whether discharging resistance have been provided

:

1.17 Standard to which conform :

2.00 REACTORS

2.01 Make :

2.02 Rating :

2.03 Type of installation :

2.04 Cooling system :

2.05 Type of connection with capacitor: :

2.05 Type of connection with capacitor: :

4.0 415 V 2 Incomer & 1 Bus Coupler Multi panel PDB at Sub Station.

4.1 The PDB is required to provide power to the auxiliary load and Main Lighting Distribution Board at the Sub-station and Pump House.

4.2 The PDB shall be suitable for 415 V ± 10%, 50 Hz ± 5%, 3 phase, 4 wire supply system. The incoming power shall be provided from the secondary side of the transformer through suitable size of cables.

4.3 The PDB shall be 2 mm CRCA sheet steel enclosed, floor mounted type, self-supporting, fully compartmentalized, 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.

4.4 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.

4.5 It shall have rear access and the cable termination arrangement shall be provided at the rear of the respective feeder modules. For incomers, extended busbars 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.

4.6 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 MCCB connected with the secondary side of the transformer

4.7 The bus bar for the PDB shall be TPN type, 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 630 A for phases and 300 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.

4.8 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 MCCB shall receive 1 No. 1.1 KV grade 3½ core 300 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.

4.9 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.

4.10 Feeder details with mounted components

The feeder details are as under:

4.11 630A incoming feeders 2 nos. each comprising of following components:

i) 415 V, 3 pole, 630 A, 50 KA MCCB fitted with microprocessor-based O/L, short circuit, earth fault (Adjustable) and Shunt Trip Release. 1 no

ii) 96 sq mm, 0 – 630A Ammeter with selector switch
1 No.

iii) 96 sq mm, 0 – 500 V Voltmeter with selector switch
1 No.

iv) Current Transformer of ratio 630 / 5A, Class: 1.0, 10 VA
3 Nos.

v) Red, Yellow, Blue phase indicating lamp
3 Nos.

vi) MCCB ON / OFF / TRIP Indicating Lamp
3 Nos.

.12 630A Bus coupler feeder one (1) number comprising of following components:

i) 415 V, 3 pole, 630 A, 50 KA MCCB without release
1 No.

ii) Bus Coupler ON / OFF Indicating Lamp
2 Nos.

4.13 MCCB / MCB feeder 17 Nos. of following rating

i) a) 32/63 A TPN MCCB with Microprocessor based O/C & E/F releases 30 Nos.

(Adjustable O/L)

b) ON / OFF / Trip Indicating Lamp (For eachfeeder)
As Req.

ii) a) 100 A TPN MCCB with Microprocessor based O/C & E/F releases 2 Nos.

(Adjustable O/L)

b) ON / OFF / Trip Indicating Lamp (For eachfeeder) as req.

ii) 16 A TPN MCB 6 Nos.

5.0 CONTROL DESK AND INSTRUMENT PANEL

5.1 General

For remote operation of motors and other feeders with all controls, indication and annunciation, one Control Desk and Instrument Panel shall be provided. The Control Desk shall be installed at the control room of pump house.

The control desk shall be made of 2mm thick CRCA sheet steel floor mounted, dust and vermin proof and suitable for indoor installation in tropicalised climate. The degree of protection for the control desk shall be IP-54. The Control Desk surfaces shall be degreased, derusted, pickled and phosphated to remove all grease, dust and dust particles and provide flawless smooth surface. After sheet

treatment the Control Desk surface shall be applied with Powder coating finish paint of shade RAL 7032.

The Control Desk shall have two distinct surface, one vertical and one inclined horizontal. The vertical surface shall be provided with Annunciator, Meters, Instruments, mimic diagram etc. while the horizontal surface shall be fitted with control / selector switches, push button for actuators, indicating lamps etc. The horizontal surface shall be designed such that operating/control devices are placed suitably and within the easy operational reach of the operator.

The Control Desk shall generally comprise but not limited to the following:

ON VERTICAL FACE

a)	Digital Pressure Indicator (for pump individual delivery & manifold **)**	-	**As reqd.**
b)	**Digital Valve Position Indicator (for Butterfly Valves)**	-	**As reqd.**
c)	**Digital Water Level Indicator (forIG water level)**	-	**1 No.**
d)	**Digital Flow rate indicator, totaliser and recorder**	-	**1 Set**
e)	**Multifunction meters type ELITE 445 or equivalent (forHT PDB Incomers, HT PDB cum MCC incomers & 33 KV Incomers)**	-	**5 Nos.**
f)	**96 sq mm (0 – 36 KV), (0 – 8000 V) & (0 – 500 V) Voltmeter for Incomer of 33 KV Panel, HT PDB, HT PDB cum MCC, Bus PT Panels and Incomers of 415V PDB**	-	**As reqd.**
g)	**96 sq mm Ammeter (for all feeders of HT PDB, HT PDB cum MCC except Bus Coupler & Bus PT), 33 KV Feeders and Incomers of 415 V PDB**	-	**As reqd.**
h)	**Centrally located Microprocessor based Alarm Annunciator (adequate number of window) with LED illuminated annunciator, solid state hooter for audio alarm, test, accept, reset push buttons etc.** The annunciator shall be complete with all accessories as required to detect the fault signal of different parameters of the system	-	**As reqd.**
i)	**Glass Fibre illuminated Mimic Panel by LED depicting all P & I and electrical scheme as per system requirement**	-	**1 Set**
j)	**Digital Clock**	-	**1 No.**

All fault indication shall be on translucent plastic windows and these shall be clearly visible when the indicating LEDs are lighted.

The annunciator shall be provided with the following engraved facia :

i) **HT Feeder Trip for over current & earth fault (for all feeders) / (over voltage / voltage unbalance for capacitor feeder & Incomer / under voltage for Motor feeders) of HT PDB cum MCC and 33 KV Panels**

ii) **PDB Feeder Trip for over current & earth fault (for incomers)**

iii) **Motor winding temperature high alarm & trip for all motors**

iv) **Motor Bearing temperature (DE& NDE) high alarm & trip for all motors**

v) **Pump Bearing temperature (DE& NDE) high alarm & trip for all pumps**

vi) **water Level low (alarm)**

vii) **water Level low Low (trip)**

viii) **water Level high (alarm)**

ix) **AC failure**

x) **Bell for alarm signals**

xi) **Hooter for trip signals**

Apart from above annunciation windows all other annunciation as are required and developed during detail engineering stage are to be provided with atleast 6 nos. spare windows.

ON HORIZONTAL FACE

a) **Trip – Neutral – Close spring return type heavy duty breaker control switch (for all feeders of HT PDB, HTPDB cum MCC, 11KV Feeders and other feeders) - As reqd.**

b) **Open – Close – Off Push Button for valve actuators - As reqd.**

c) **Clustered type indicating lamps for the following indication**

- i) **AC Supply ON - 1 No.**
- ii) **DC Fail - 1 No.**
- iii) **ON – OFF – Trip (for all feeders of HT PDB cum MCC and other feeders if applicable) - As reqd.**
- iv) **ON – OFF for capacitor - As reqd.**

v)	**Valve Full Open – Valve Full Close – Valve Running – Feeder OFF**	-	**As reqd.**
d)	**Test – Accept – Reset Push Button**	-	**3 Nos.**
e)	**Voltmeter Selector Switch**	-	**As reqd.**
f)	**Ammeter Selector Switch**	-	**As reqd.**

6) CABLE (SUBSTATION AND PUMPING STATION) :

All HT and M.V. power cables shall be with XLPE insulation, stranded aluminium / copper conductor and armoured

6.01 HT &M.V. Cables and Jointing

All HT and M.V. Cables shall be 33 KV (E) / 11 KV (E) / 1.1 KV grade XLPE insulated and armoured of Al / Cu. conductor 3 core / 3½ / 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 1000 mm 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.

6.02 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.

6.03 Signal Cable

The signal cable shall be PVC insulated 650 / 1100 V grade screened and with stranded copper conductor of appropriate no. of cores as per scheme requirement. Minimum 2 cores shall be kept as spare in all circuits.

6.04 Data Sheet for Cables

HT & M.V. Cables

i) Make

ii) Voltage grade & type

iii) Size

Control cable

i) Make

ii) Voltage grade & type

v) Size

Screened signal cable

i) Make

ii) Voltage grade & type

iii) Size

7) VALVES AND SPECIALS

7.01 **Delivery side of pumps**

The delivery side of each pump shall be provided with 1 no. Electrical Actuator operated butterfly valve, 1 no. non-return valve with external damping arrangement, 1 no. Dismantling joint & short pieces wherever required. The diameter of the valves and joints shall as per technical offer.

7.02 **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 potable water to maintain the flow unidirectional. The valve shall be maintenance free, leak proof and shall have low life cycle cost. The PN rating of valves shall be 1.6.

The non return valve shall be single door and double flanged, conventional non slam design with external dashpot arrangement(as per decision of EIC) . The body, door, cover shall be of ductile iron (Gr. GGG 40). The seat and body shall withstand fluid pressure of 16kg / cm^2 and 24 kg / cm^2 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/ mm^2.

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

7.021 Material or construction & other specifications of Non Return Valve shall preferably be as follows:

Fluid to be Handled	:	Clear Water
Pressure Rating	:	PN 1.6
Design Temperature	:	45 Deg. C
Design Standard	:	IS 5312 (Part – I) / 84
Type of Disc	:	Single Disc (Swing Type)
Closure Characteristic	:	Non – Slamming

Seating Faces	:	Metal to Metal
End Connection	:	IS 1538 / 93 (Table – 4 & 6), Flat Face
Operation	:	Self
Installation	:	Horizontal
By Pass arrangement	:	Yes
Dashpot	:	External

Material of Construction		
Body, Cover	:	Ductile Iron GGG 40
Disc with Hinge	:	Ductile Iron GGG 40
Body Seat Ring	:	L.T.B. to IS 318 Gr.2
Disc Face Ring	:	L.T.B. to IS 318 Gr.2
Hinge Pin	:	H.T.B. to IS 320 Gr. HT 2
Air Release Plug	:	Carbon Steel

Plug / Retainer	:	Carbon Steel
Gasket	:	Rubber, IS 638, Type: B
Bolts / Studs & Nuts	:	Carbon Steel, IS 1367/67 CI 4.6& 4.0
Shaft	:	SS 410

Testing			**Inspection**
Testing Standard : IS 5312(Part-I)/84			Hydro Test : Witness & Test Report
Hydro Body : 24 Kg / Sq. Cm			Visual : Witness & Test Report
Hydro Seat : 16 Kg / Sq. Cm			Material Test : Test Report
Quantity			**Note**
Size (NB)	Qty.	Location	

As per BOQ	As per BOQ		1. Valves shall have free acting, quick opening non-slam closure characteristic 2. Reinforcing ribs are provided on body, cover & disc. 3. Flow direction mark shall be Cast Integrally on the body to indicate the Direction of flow 4. Valves shall be painted with one coat of Red oxide primer & Two coats of Epoxy Paint 5. Marking: Brand / Size / PN – Rating / Heat No. & Arrow Mark Sl. No.

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.

NON – RETURN VALVE DATA SHEET

1.01	Make	:
1.02	Size	:
1.03	Quantity offered	:
1.04	Type	:
1.05	Test standard, test pressure & duration of test	:
1.05.1	Body	:
1.05.2	Seat	:
1.06	Surface protection	:
1.07	Whether damping arrangement provided or not	:
1.08	Whether by pass arrangement provided or not	:
1.09	Face to face distance	:
2.00	Material of Construction	:
2.01	Body	:
2.02	Seat	:
2.03	Disc	:
2.04	Door Face Ring	:
2.05	Bearing Block	:
2.06	Disk shaft	:

2.07	Disk Seat	:
2.08	Hinge pin, plug, fasteners	:

7.03 Butterfly Valve

The butterfly valves shall be DIDF, PN 1.60, conforming to IS 13095 of 1996 / BS 5155. The seat pressure shall be 16 kg/cm^2 and body pressure shall be 24 kg/cm^2. 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 90º 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, IP 68 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.

Material of construction & other specifications of Butterfly Valve shall preferably be as follows:

Fluid to be Handled	:	Clear Potable Water
Pressure Rating	:	PN 1.6
Design Temperature	:	(-) 10^0 C to 65^0 C
Design Standard	:	IS 13095 / 91
Service application	:	Tight shut-off
Type	:	Double Flanged Quarter Turn
Disc Type	:	Double eccentric
Seal (Nitrile rubber)	:	Mounted on disc
End Connection	:	Flanged ends to IS 1538/93 (Table-4 & 6), Flat Face
Operation	:	Actuator operated
Installation	:	Horizontal

Material of Construction		
Body, End Cover & Gland Plate	:	Ductile Iron GGG 40
Disc	:	Ductile Iron GGG 40
Shaft	:	SS to AISI 410
Body Seat	:	Nickel weld overlay micro finished
Bearing	:	G.M. / Teflon
Disc Seal	:	Nitrile Rubber (Shore Hardness 55' – 65'A)
Packing	:	Rubber "O" Ring
Internal Fasteners & Clamping Ring	:	SS to AISI 304
External Fasteners	:	Carbon Steel, IS 1367 CI 4.6 & 4.0
Hand Wheel	:	Fabricated Steel
Worm Gear Unit	:	Manufacturer standard
Actuator	:	Yes

Testing (as per IS 13095 /91)			Inspection		
Hydro Body	: 24 Kg / Sq. Cm for 5 min		Hydro Test	:	Witness & Test Report
Hydro Seat	: 16 Kg / Sq. Cm for 2 min		Visual	:	Witness & Test Report
Disc Test	: 16 Kg / Sq. Cm for 5 min		Material Test	:	Test Report
Quantity			**Note**		
Size (NB)	Qty.	Location			
As per BOQ	As per BOQ				

MOTORISED BUTTERFLY VALVE DATA SHEET

1.1 Make :

1.2 Size :

1.3 Quantity offered :

1.4 Type :

1.5	Test pressure & duration of test	:
1.6	Material of Construction	
1.6.1	Body	:
1.6.2	Body seat	:
1.6.3	Seat Ring	:
1.6.4	Disk	:
1.6.5	Bonnet	:
1.6.6	Spindle	:
1.6.7	Disc nut	:
1.6.8	Gasket	:
1.6.9	Bolts & Nuts	:
1.6.10	Gland packing	:
1.6.11	Gland	:
1.6.12	Spindle Nut	:
1.6.13	Handle wheel	:
1.6.14	Thrust plate	:
1.6.15	Cover	:
1.6.16	Face Rings	:
1.6.17	Yoke	:
1.7	Face to Face Distance	:

ELECTRICAL ACTUATOR

4. The actuator motor for the Butterfly valves 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.

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

vii. torque limit switches for 'open' and 'close'
viii. 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.

z) 415V ± 10% 3 phase, 50 Hz, AC motor.

aa) Reduction gearing arrangement.

bb) Torque & limit switch mechanism.

cc) Valve position indicator.

dd) Arrangements for pick up signals for displaying the % opening of the valves in the suitable meters to be placed on control desk.

ee) Remote operation facility with selector switch and local control console.

ff) The hand wheel with clutch mechanism for manual operation. The manual operation shall be automatically declutched when actuator motors in operation.

gg) 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.

DATA SHEET

1.1 Make

1.2 Type

1.3 Rating of Motors

1.4 Whether provided with limit & Torque Switches, if so, torque limit

1.5 Protection Group (IP)

1.6 Whether suitable for outdoor & temporary submergence duty/indoor type

1.7 Whether equipped with suitable component & termination arrangement for transmitting signals for displaying valve opening % indicating in the valve opening indication meters.

1.8 I.S. Standard to which it conforms

8.0) M.S. DISMANTLING JOINT ASSEMBLY AT DELIVERY RISING MAIN

One M. S. dismantling joint of suitable diameter is to be fixed along with the Flow meter & BFV on the delivery rising mainfor the ease of dismantling andfitting of Flow meter during maintenance and to relieve the pipe line stresses. The expansionrange for each of the dismantling joint shall be minimum 40 – 50 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.

The datasheet for the same is as follows-

DATA SHEET

XXXVII. Joint Size

XXXVIII. Pipe thickness

XXXIX. Maximum length

XL. Minimum length

XLI. O.D.

XLII. P.C.D.

XLIII. Thickness

XLIV. Flange size

XLV. Flange thickness

XLVI. Stud Nos.

XLVII. Stud dia.

XLVIII. Rubber Gasket

M.S. PUDDLE COLLAR / PLATE

1.1 Collar size

1.2 O.D.

1.3 I.D.

1.4 Thickness of the Collar

1.5 Number of Hooks

9.0) PUMP DELIVERY SIDE PIPING AND COMMON DELIVERY MANIFOLD

The pump individual delivery side piping, valves and dismantling joints shall be of such diameter as per Technical offer.

One dismantling joint of respective diameter is to be fixed along with the Butterfly Valve & NRV on the individual delivery pipe line of each pump within a suitable distance on individual pump delivery pipe line..

The pipes shall be made up of M.S. 12 mm thick plates for individual delivery line & 12 mm thick plate for Common Delivery manifolds, 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'sof the individual pumpdelivery 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 tenderer should also provide the necessary arrangements to encounter the horizontal back thrust if any and the details as per the pump manufacture's recommendation shall be clearly indicated in the layout drawing.

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 manifolds within the Pump House and on the River Bank shall have blank flange / Dish end on both sides with adequate stiffening (as applicable). The length of the manifold shall be extended upto a suitable length. There shall be two nos. identical delivery mains (MS 12 mm thickness) from the Common Delivery Manifold in the Pump House and the same shall run over the Gangway over the river and upto the Common Delivery Manifold on the River Bank. This manifold shall be of identical diameter as inside Pump House (MS 12 mm thickness) of suitable length. From this CDM the rising main shall deliver the required water as per Sketch attached.

Each Delivery Man over the Gangway shall be provided with one no. 100 mm dia air release valve (double throat) one no. 100 mm dia. Sluice Valve (wash-out) and one no. NRV 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).

10.0) FLOW SENSOR

There shall be one number of Full-bore Electromagnetic flow meter on the rising main as per sketch attached. The flow meter 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 Clear 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 400 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 ± 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 date sheet for flow sensor is as follows.

The flow meter will be full bore electromagnetic type should be capable to handle flow of Clear Potable Water.

Type:- Pulsed DC electromagnetic.

Accuracy:- ± 0.5 % of measure value.

Repeatability:- ± 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 to IS 1538

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 Length as per site condition

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 PDB at a maximum 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.

Data Sheet of Flow Sensor

1.1 Make

1.2 Type

1.3 Model No.

1.4 Flow range

1.5 Accuracy

1.6 Display system

1.7 Relays

1.8 Power supply

1.9 Sensitivity

1.10 Details of cabling

1.11 Physical specification

1.12 Details of transmitter including installations details

1.13 Working temperature

1.14 Details of microprocessor if any

11.0) Flow meter/ Flow sensor or Flow Tube fixing chamber

For fixing of Flow Tube at the rising main , leak proof chamber with rung - ladder of dimension 2.5M x 1.5M x 2.5M (approx)is to be constructed if required as per site condition.

12.00 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

12.1 A.C. Input

a) Voltage	:	415 V, ± 10%
b) Phase	:	3 Phase, 4 Wire
c) Frequency	:	50 Hz ± 6%
d) Combined voltage & frequency variation within	:	± 10%
e) System earthing	:	Solidly earthed

12.2 Float and Boost Battery Charger

12.2.1 Charger – I (Float Charger – SCR Control)

a) Output Voltage : 110 – 125 V DC [steplessly 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 : ± 1%

f) Ripple voltage : 1% RMS

12.2.2 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 ± 1%

f) Ripple voltage 1% RMS

g) Commencement & termination of boost charging Automatic / Manual

12.3 Protection

a) Snubber across each device

b) Phase failure / sequence reversal

c) Soft start with current limiting (intrinsic feature of trigger PCB)

12.4 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

12.5 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.

12.6 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

12.7 DCDB Outgoing Feeder

a) 2 P, 16 A DC MCB - 6 Nos.

12.8 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 find wire mesh

12.A) RADAR TYPE LEVEL MONITORING SYSTEM

12.01 The radar level transmitter shall be equipped with K- band (25 GHZ) pulseradar level transmitter for continuous monitoring of sump level and a hand held programmer. The 25 GHZ frequency shall create a narrow focused beam allowing for a smaller horn antenna and decreasing sensitivity to obstruction.

12.02 The transmitter 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 10 Mtr. with provision of ALARM function of the operating pumps at HWL & LWL and Trip function at LLWL.

12.03 The transmitter shall have ingress protection of IP 67 / 68. Mounting arrangement shall be included in the scope of work.

12.04 The cable connection between transmitter and the controller (to be mounted on the Control Desk) shall be carried out by PVC wire 0.5sq mm copper conductor shielded screened cable and the same shall preferably run in a grounded metal

conduit. The controller shall have communication ports with Modbus protocol so as to communicate the field data for interfacing with SCADA in future.

12.05 The signal output shall be 4 – 20 mA and accuracy level shall be ±0.25%.

12.06 The field (hand held) programmer shall be compatible with the transmitter. The transmitter / controller shall have memory backed up by in-built battery. All displays shall be back-lit LED type.

12.07 Auxiliary AC / DC power supply, if required, shall be provided with the system.

13.0) DISMANTLING JOINT FOR INDIVIDUAL DELIVERY

One dismantling joint of respective diameter is to be fixed along with the Butterfly Valve & NRV on the individual delivery pipe line of each pump within a suitable distance on individual pump delivery pipe line..

14.0) EARTHING (FOR SUBSTATION & PUMPING STATION)

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 100 mm wide and 10 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 Earthing should not be less than 3 meters.

15.0) LIGHTING SYSTEM (SUBSTATION AND PUMPING STATION)

15.01 Luminaries

The scope includes indoor lighting of pump house and substation building. Industrial Medium bay luminaries with Metal 250W / 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 Control Room, lighting should be provided with LED T/L with decorative 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.

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).

15.02 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.

15.03 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.

15.04 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.

15.05 The above stated distribution board shall be fed from independent switch fuse unit / MCB located in the PDB.

15.06 440 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.

15.07 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.	Fluorescent fitting	2 nos. 1 core -1.5 mm² copper & 1 no. Earth wire of1.0 mm² copper
2.	HPSV fitting	2 nos. 1 core -1.5 mm² copper & 1 no. Earth wire of 1.0 mm² copper
3.	Flood light fitting	2 nos. 1 core -2.5 mm² copper & 1 no. Earth wire of 1.0 mm² copper
4.	Receptacle-5A	2 nos. 1 core -2.5 mm² copper & 1 no. Earth wire of 1.0 mm² copper
5.	Receptacle-15A	2 nos – 1 core-4 mm² copper & 1 no Earth wire of 1.0 mm² copper

16.0) Ventilation and Fire fighting :

16.01 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 including all other accessories as required.

g) 3 - phase 450 dia, 1000 / 1500 r.p.m. (Syn) or as applicable Exhaust fans including proper louvers, duct work, rain cowl and bird protection screen ----- As required for the Pump House .

h) 300 dia, 1000 / 1500 r.p.m. (Syn), Exhaust fans including proper louvers, duct work, rain cowl and bird protection screen ----- As required for the Sub-station

i) Wall mounting type control panel for ventilation system ----- 2 Sets

e) 18" Pedestal fan with regulator and all other accessories ---4 Nos.

16.02 Fire fighting: The pump house and substation building shall be provided with the following:

a) ABC type Portable type fire extinguisher (2 Kg Capacity) 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.

17.0) Pressure transducer / Pressure Sensor with Local Display

vii. The pressure transducer / pressure sensor shall be used to indicate, record the

a. individual pump discharge line water pressure, manifold line pressure. The recording instrument unit (indicator unit) shall be mounted in the control desk cum instrument panel.

viii. The transducer / sensor shall be field mounting type **with local display** and most reliable. It shall have protection for surge and over voltage in both positive and reverse polarity. The pressure port shall be from stainless steel and shall be 100% leak proof.

ix. The accuracy of the sensors/ transducers shall be ± 0.25% full scale

x. It shall have output signal option of 4 -20 mA and shall have requisite power supply.

a. The enclosure shall be with required length of interconnecting cable so that the same can be fed to a recorder/ indicator unit located in central control desk. If for transmission of such signal, any signal conditioner and or any signal booster is necessary, the same shall be incorporated within the offered cost.

xi. The entire process connection is the responsibility of the contractor and the offered

a. Rate shall include all such field requirements like watertight joint box, additional cable length etc to complete the job in all respect.

xii. The scope of this itemized job is all inclusive of SITC of complete transducer/ sensor Sets (field mountable) including recorder units (desk mountable) with all associated signal transmission cabling (specified elsewhere) works in one length including all other accessories within the offered cost for the specific item.

18.0) Pressure Gauge (Dial Type)

18.01 The individual discharge line pressure gauge (6" dial) shall be 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 ±1%. The full-scale range shall be from 0 -16 Kg / Sq.cm. The pressure gauge shall have 3-way cock and fitting.

19.00 MECHANICAL HOIST

SPECIFICATION Type : Triple spur gear chain pulley block.

Brand: Indef- M / Raja

Capacity: 3 ton.

Test load capacity : 4.5 ton

Number of fall for load chain : 1

Design: As per IS:3832

Operation: Manual through hand chain.

MOC (load chain) : Grade 80 alloy steel for load chain.

Height of lift: as per site requirement.

Effort on hand chain to raise at full working load : 36 Kgs. for hoisting

Velocity ratio : 135:1

Headroom of chain pulley block fitted with gear trolley : 750 mm approx.

Major Scope of Work

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

Sl. No.	Description	Qty	Unit
1	REPAIRING AND RENOVATION WORK OF ALAM HOUSE UNDER 14 MGD WTP WITHIN DURGAPUR MUNICIPAL CORPORATION.	1	Job
2	REPAIRING AND RENOVATION WORK OF ANNEX BUILDING UNDER 14 MGD WTP WITHIN DURGAPUR MUNICIPAL CORPORATION	1	Job
3	REPAIRING AND RENOVATION WORK OF CHLORINE HOUSE UNDER 14 MGD WTP WITHIN DURGAPUR MUNICIPAL CORPORATION.	1	Job
4	REPAIRING AND RENOVATION WORK OF FILTER HOUSE UNDER 14 MGD WTP WITHIN DURGAPUR MUNICIPAL CORPORATION.	1	Job
5	REPAIRING AND RENOVATION WORK OF ALAM HOUSE-2 UNDER 14 MGD WTP WITHIN DURGAPUR MUNICIPAL CORPORATION.	1	Job

6	REPAIRING AND RENOVATION WORK OF HIGH LIFT ROOM UNDER 14 MGD WTP WITHIN DURGAPUR MUNICIPAL CORPORATION.	1	Job
7	REPAIRING AND RENOVATION WORK OF BOUNDARY WALL,REPAIR SECURITY ROOM AND SHADE OF SLUDGE POND UNDER 14 MGD WTP WITHIN DURGAPUR MUNICIPAL CORPORATION.	1	Job
8	REPAIRING AND RENOVATION WORK OF RAW WATER PUMP HOUSE UNDER 14 MGD WTP WITHIN DURGAPUR MUNICIPAL CORPORATION.	1	Job
9	REPAIRING AND RENOVATION WORK OF SUB STATION BUILDING UNDER 14 MGD WTP WITHIN DURGAPUR MUNICIPAL CORPORATION.	1	Job
10	CONSTRUCTION OF BOUNDARY WALL AND CONCRETE ROAD UNDER 14 MGD WTP WITHIN DURGAPUR MUNICIPAL CORPORATION.	1	Job
11	REPAIRING AND RENOVATION WORK OF CONTROL ROOM UNDER 14 MGD WTP WITHIN DURGAPUR MUNICIPAL CORPORATION	1	Job
12	CONSTRUCTION OF OVER HEAD RESERVOIR (Capacity 900 cum, Staging height 20.00 mtr)AT 15 MGD WTP WITHIN DURGAPUR MUNICIPAL CORPORATION (The Sub soil Investigation will be executed by the Agency and the construction will be followed by the Departmental drawing and design)	1	Job
	Raw Water Pumping Station & Substation at Angadpur 14MGD WTP		
13	800 M3 / hr, 13 Mtr head, 980 rpm HSC pump with accessories	6	No

14	45 KW, 415V, 1000 rpm (syn) TEFC, IE2 Horizontal foot mounted Motor	6	No
15	NB 350 PN 1.0 DIDF Sluice Valve with rising spindle	6	No
16	NB 300 PN 1.0 DIDF Actuator operated Butterfly valve	6	No
17	NB 300 PN 1.0 DIDF Non Return Valve	6	NO
18	DN 900 PN 1.0 actuator Butterfly Valve	1	NO
19	A) DN 600 PN 1.0 actuator Butterfly Valve	2	NO
	B) NB 300 PN 1.0 DIDF Sluice valve	6	NO
20	Sump pump for dewatering	2	NO
21	Pressure Gauge and Compound Gauge with accessories	12	NO
22	Radar type level monitoring system for sump	1	NO
23	415 V Multi panel PDB cum MCC at Pump House	1	NO
24	415 V Multi Panel PDB at Sub-station	1	NO
25	11 KV 4 Panel VCB Switchboard at Substation	1	NO

26	Dismantling, Removal, loading, unloading, Transportation of 2 no1000 KVA 11 / 0.433 KV ONAN Transformer from Angadpur CWPS to Angadpur Substation, re-erection, testing & commissioning including oil filtration including dismantling and shifting of 1 no each 630 KVA &500KVA transformers from Piyala substation to Angadpur store.	1	Job
27	110 V, 100 Ah Maintenance free Battery, Battery Charger & DCDB at Substation	1	NO
28	Cables		
i)	11 KV (UE) grade 3 C X 300 mm2 XLPE Armoured Aluminium	1	Lot
ii)	1.1 KV grade 3.5 C x 300 mm2 XLPE Armoured Aluminium	1	Lot
iii)	1.1 KV grade 3.5 C x 240 mm2 XLPE Armoured Aluminium	1	Lot
iv)	1.1 KV grade 3.5 C x 185 mm2 XLPE Armoured Aluminium	1	Lot
v)	1.1 KV grade 3.5 C x 95 mm2 XLPE Armoured Aluminium	1	Lot
vi)	1.1 KV grade 3 C x 95 mm2 XLPE Armoured Aluminium	1	Lot
vii)	1.1 KV grade 4C x 16 mm2 (CU) stranded XLPE Armoured	1	Lot
viii)	1.1 KV grade 4C x 6 mm2 (CU) stranded XLPE Armoured	1	Lot
ix)	1.1 KV grade 3C x 6 mm2 (CU) stranded XLPE Armoured	1	Lot
x)	1.1 KV grade 3C x 2.5 mm2 (CU) stranded XLPE Armoured	1	Lot
xi)	1.1 KV grade 12C x 2.5 mm2 (CU) stranded XLPE Armoured	1	Lot
xii)	500 V grade 4C x 0.75 mm2 (CU) stranded PVC insulated shielded Armoured screened cable for instrumentation	1	Lot

29	Earthing system of Substation and Pump House	1	Job
30	Lightning protection system of Pump House / Substation	1	Job
31	Ventilation system of Pump House	1	Job
32	Illumination system of the Pump House / Substation	1	Job
33	MS Structural materials for equipment supports and other fabrication work	1	Job
34	Fire Extinguishers & Fire Buckets etc	1	Job
35	Misc. items viz. Rubber Mats, Shock Treatment Chart, Glow sign board etc. at Substation / Pump house	1	Job
36	Painting of equipment / material at Substation and Pump House	1	Job
37	Pre-commissioning test of equipment at Substation and Pump House	1	Job
38	High Pressure Test / Medium Pressure Test at Sub-station / Pump House	1	Job
39	Commissioning of the system at Substation / Pump House	1	Job
40	Trial Run and maintenance of the renovated system at Substation / Pump House for 1 Month	1	Job
	All treatment processing Machinery & allied Accessories of Electro- Mechanical Work At 14MGD WTP		
41	Replacement of penstock/SLUICE gates (2 Nos) including bar screen by new one of intake line and Screen at Sump Section of RWPS with Desilting arrangement all complete in all respect.	1	Job
42a.	Replacement of distribution valve (Diameter: 400 mm) by actuator operated gate valve for backwash feeding line from OHR asper site condition and direction of EIC.	1	job
b.	Supply, Delivery, Installation, Testing & Commissioning of DI Flanged Swing Check Type Non-Return Valve as per IS Flanged drilled for backwash pump, recirculation pump, Sludge pump, supernatant pump for 2 Nos individual set for each items with suitable motors. as per IS: 1538 as per site condition and direction of EIC	1	job

43	Supply, delivery, installation, testing, commissioning of DI double flanged Non-rising spindle manually operated sluice valve as per IS. for backwash pump suction and delivery, recirculation pump suction & delivery, Sludge pump suction & delivery, supernatant pump delivery, desludging valve of clarifier complete in all respect asper site condition and direction of EIC. (2 Nos)	1	job
44	Supply, delivery, installation, testing, commissioning of DI double flanged outside screw rising type electrical actuator operated sluice valve/sluice gate as per IS. Face to face dimension as per PD series (short type), flanged drilled as per IS: 1538 asper site condition and direction of EIC. For CWR Inlet, CWR outlet, Filter house inlet, Filter house outlet, Filter house Air, Filter house backwash, and Filter house outlet.	1	job
45	Replacement of back wash pump motor set as per specification and direction of EIC. (2 Nos.)	1	job
46	Installation of Recirculation pump motor set as per specification and direction of EIC.	1	No.
47	Supply, delivery, installation, testing, commissioning of pre-& post chlorination pump motor set including modified concrete casting & all suction and delivery valves and pipe lines complete in all respect. [Automatic/Manual Gaseous chlorination unit by 6 x 5 kg/hr. auto cum manual with chlorinator accessories chlorine analyser, tonner (900 kg), safety kit and allied accessories all complete with HOT (3 Ton x 3.5 metre lift chain pulley block with geared trolley) crane arrangement.]	1	job
48	Supply, delivery, installation, testing, commissioning of open channel flow meter /totalizer with transmitter, illuminated display, IP68 protection and cable length 100 meter .	1	job
49	Replacement of alum tank filling pump with motor along with base frame coupling guard and companion flange with all pipes and valves etc. as required and as direction of EIC	1	job
50	Supply, delivery, installation, testing, commissioning of 3-ton x 6.5 metre lift chain pulley with gear trolley suitable for existing monorail at recirculation and back wash pump pit, sludge pump house & lagoon, CRW pump house and RWP pump house& chlorine tonner house and alum house.	1	job

51	Dismantling charges of all the existing electro-mechanical equipment like pump, motor, valve, cable pipeline, panel, control console etc. for installation of the new equipment, including painting of whole installation as required and as per direction of EIC	1	job
52	Replacement of filter media by new one for 16 nos. bed at Angadpur filter house. As per specification and direction of EIC.	1	job.
53	Supply, delivery, installation, cable termination and storage of L.T power cable and cotrol cable as per specification, as per rquirement ofsite and direction of EIC. 1.1 KV grade XLPE insulated armoured LT power cable 1.1 KV grade XLPE insulated armoured LT power cable,3.5C X 240 Sq. AL.,3.5C x 95 Sq. AL.,3C x 50 Sq. AL.,3C x 25 Sq. AL.,3C x 16 Sq. AL.,3C x 6 Sq. AL.,4C x 16 AL.,4C x 6 AL.,4C x 2.5 Cu.,3C x 2.5 Cu., 1.1 KV grade XLPE insulated armoured LT control cable 4C X 2.5 Sq.Cu.,5C X 1.5 Sq.Cu.,7C X 1.5 Sq.Cu.,10C x 1.5 Sq.Cu., 0.6 KV grade XLPE insulated armoured screen cable-3C X 1.5 Sq.Cu.	1	job

54	Filter Bed Equipment :-Supply, Delivery, Installation, Testing & Commissioning of Electrical Control Console for Opening / Closing of actuator operated valves with Indicating Lamps, Switch, Internal Electrical wiring, etc. completely suitable for operation of Inlet, Outlet, Wash, Drain & Air Valve with internal wiring for ROF & LOH Indicators and Supply, Delivery, Installation, Testing & Commissioning of Capacitance/Radar/Ultrasonic type Rate of Flow & Loss of Head Indicator complete with all fittings & fixtures suitable for mounting on Filter Control Console complete with necessary pipe fittings & Valves as required and as per direction of EIC.	16	No.
A.	Dismantle of existing Clarriflocculator Bridge and Installation of New Clarriflocculator Bridge including all accessories with all structural MS parts.	2	Sets.
55	Clariflocculator:-Supply, Delivery, Installation, Testing & Commissioning of new Slewing Ring type Central Bearing with Cast Iron Body Forged Carbon Steel Racer, 38 mm dia Steel Ball, Nos. Grouting Bolt & Nut etc. 810mm Base dia, Grouting PCD 760 mm complete with Base Plate fitted with Socket for ClarifloculatorBridgeas including all structural MS parts as per specification and direction of EIC .	2	sets.
56	Supply, Delivery, Installation, Testing & Commissioning of new ClarifierCarriage Drive complete withClariflocculator bridge, Idle Shaft, Driving Shaft, Idle Wheel, Drivingwheel, Plummer Coupling etc. complete with Motor & Gear Box with 11 Nos penstock gate valve as perspecification and direction of EIC.	2	sets.

57	Supply, Delivery, Installation, Testing & Commissioning of Flocculator Driving arrangement including Supply, Delivery, Installation, Testing & Commissioning of new Bevel Gear & Pinion with Slewing Ring type Forged Steel Bearing racer with Crome Steel Ball and Carbon Steel C-45 Pinion with Reduction Gear Box, Coupling and Motor complete as per specification and direction of EIC.	8	sets.
58	Flash Mixer: -Supply, Delivery, Installation, Testing & Commissioning of new Flash Mixer unit complete with Turbine type SS 304 Flash Mixing Paddle, Base Frame, Bearing Housing, Motor, Reduction Gear Box Coupling, GM guide bush Supporting Channel for 2 Nos complete set with all required SS 304 Bolt Nut washers.	1	job.
59	Alum Agitator: -Supply, Delivery, Installation, Testing & Commissioning of new SS 304Agitator (6 nos) for Alum Preparation Tank complete with Base Frame Motor,Reduction Gear Box, Coupling, Bearing Housing, SS 304 Shaft and Impeller,Reduction Gear Box with flexible coupling including dosing indicator etc as per specification anddirection of EIC.	1	job.
60	Repairing and renovation of Rate of Flow Controller system of the gradual increase in Loss of Head in the Filter Bed complete with Double Beat Outlet Control Valve Rate Setter, Orifice. Out Let Control gear fittings, Float Raising Gear, Controller Float and Filter Float	1	job.

61	Blower: -Supply, Delivery, Installation, Testing & Commissioning of new Rotary twin Lobe air blower (2050m3/hr) with suitable rating Motor. Common base Frame, SuctionFilter, SafetyValve, V-Belts-Belt Guard , SuctionSilencer, DischargeSilencer, NRV,Pressure Gauge with Isolation Valve &Syphon, All Fixing Nuts &Bolts, Driveand Driven Pulleys, InterconnectingPiping, Set of Foundation Bolts, Anti-Vibration Pads , Gasket etc. as per site condition and direction of EIC.	2	sets.
62	Supply, Delivery, Installation, Testing & Commissioning of 415 V, 3 phases 4 wire, 50 HZ, LT PDB for Valve Actuator at Angadpur Filter bed Area as per Tender specification and direction of EIC.	1	job.
63	Supply, Delivery, Installation, Testing & Commissioning of 415 V, 3 phases 4 wire LT PDB at annex building for catering power demand for the followings. A) LT panel for 2 nos. chemical house B) LT MCC outdoor type for clarifier C) LT PMCC for supernatant pumps D) LT PMCC for sludge pump house. E) LT panels for laboratory house F) LT Panel for Filter Bed. G) LT Panel for 2 Nos. Annexe Building. as per Tender specification and direction of EIC.	1	job
64	N.B.-All panel work are inclusive of arrangement of earthing system with supply of required materials.	1	lot.

65	Total replacement of pipes and specials for sludge pump, back wash pump, airline, waste water line, inlet line etc. as deemed fit for the system of 16 Nos filter bed as per direction of EIC.	1	job
66	Supply, installation and commissioning of specto photometer, TDS meter, incubator, 2 No Computer set with printer, PH Meter, Jar Test Apparaters, Analytical Balance, Hot plates. etc for laboratory of WTP as per direction of EIC.	1	job
	All Electro- Mechanical Equipment of clear water pumping station & substation at Angadpur WTP under DMC		
67	1500 M3 / hr, 55 Mtr head, 1500 rpm (syn) HSC pump with accessories Model 12 LN 17 A for Piyala Supply	3	No
68	924 M3 / hr, 25 Mtr head, 1500 rpm (syn) HSC pump with accessories Model 10/12 ALE (MK-1) for Industrial Supply	2	No
69	144 M3 / hr, 36 Mtr head, 1500 rpm (syn) HSC pump with accessories Model SCP-100 – 360 – HA [Equivalent to 100 / 125 BST] for Angadpur OHR supply	2	No
70	160 M3 / hr, 30 Mtr head, 1500 rpm (syn) HSC pump with accessories Model SCP-100 – 360 – HA for back wash OHR supply	2	No
71	Mono Block Dewatering pump 2 0. No 75 KW 3 M3 / hr, 6Mtr. Head	5	No
72	225 M3 / hr, 15 Mtr. head, 1500 rpm (syn) Vertical sump pump with 5000 mm column length for Sludge Pump House	2	No
73	350 KW, 11KV, 1500 rpm (syn) CACA Motor for Pump Sl. No. 67 above	3	No
74	110 KW, 415V, 1500 rpm (syn) TEFC, IE2 Motor for Pump Sl. No. 68 above	2	No
75	30 KW, 415V, 1500 rpm (syn) TEFC, IE2 Motor for Pump Sl. No. 69 above	2	No
76	22 KW, 415V, 1500 rpm (syn) TEFC, IE2 Motor for Pump Sl. No. 70 above	4	No

77	18.5 KW, 415V, 1500 rpm (syn) TEFC, IE2 Motor for Pump Sl. No. 72 above	2	No
78	NB 500 PN 1.0 DIDF Sluice Valve with rising spindle for suction side of pump at Sl. No. 67 above	3	No
79	NB 400 PN 1.0 DIDF Actuator operated Butterfly valve for delivery side of pump at Sl. No. 67 & 68 above	5	No
80	NB 400 PN 1.0 DIDF Non Return Valve for delivery side of pump at Sl. No. 67 & 68 above	5	No
81	NB 450 PN 1.0 DIDF Sluice Valve with rising spindle for suction side of pump at Sl. No. 68 above	2	No
82	NB 200 PN 1.0 DIDF Sluice Valve with rising spindle for suction side of pump at Sl. No. 69 & 70 above	4	No
83	NB 150 PN 1.0 DIDF Actuator operated Butterfly valve for delivery side of pump at Sl. No. 69 & 70 above	4	No
84	NB 150 PN 1.0 DIDF Non-Return Valve for delivery side of pump at Sl. No 69 & 70 above	4	No
85	NB 200 PN 1.0 DIDF Actuator operated Butterfly valve for delivery side of pump at Sl. No. 72 above	2	No
86	NB 200 PN 1.0 DIDF Non-Return Valve for delivery side of pump at Sl. No. 72 above	2	No
87	NB 900 PN 1.0 DIDF Actuator operated Butterfly valve for common header of Piyala Supply	1	No
88	NB 400 PN 1.0 DIDF Actuator operated Butterfly valve for common header of Industrial Supply	1	No
89	NB 150 PN 1.0 DIDF Actuator operated Butterfly valve for common header of Angadpur OHR Supply	1	No
90	Suitable dia. Air Release Valve on Common Header of pumps at Sl. No. 67, 68, 69&70 above	4	No
91	Pressure Gauge and Compound Gauge	18	No
92	Pressure Transmitter ((0 – 10 Kg / CM2)	4	No
93	Radar type level monitoring system for CWR/Sump	1	No
94.a	400 NB Electro-magnetic flow meters with totalizer	1	No

b.	Suitable dia. Electro-magnetic flow meters for Piyala Supply and Angadpur OHR	2	No
95	Modification in the existing 11 KV 3 Panel VCB Switchboard with incorporation of protective and auxiliary relays and associated control wiring	1	No
96	11 KV 8 Panel VCB Switchboard	1	No
97	Suitable rated capacitor Reactor for Motor under Sl. No. 73 above	2	No
98	415 V Multi panel PDB cum MCC for Pump House	1	No
99	415 V ACDB and 110 V DCDB at Pump House	1	No
100	Cables		
i)	11 KV (UE) grade 3 C X 300 mm2 XLPE Armoured Aluminium	1	Lot
ii)	1.1 KV grade 3.5 C x 240 mm2 XLPE Armoured Aluminium	1	Lot
iii)	1.1 KV grade 3.5 C x 50 mm2 XLPE Armoured Aluminium	1	Lot
iv)	1.1 KV grade 3 C x 150 mm2 XLPE Armoured Aluminium	1	Lot
v)	1.1 KV grade 3 C x 95 mm2 XLPE Armoured Aluminium	1	Lot
vi)	1.1 KV grade 3 C x 50 mm2 XLPE Armoured Aluminium	1	Lot
vii)	1.1 KV grade 3C x 2.5 mm2 (CU) stranded XLPE Armoured	1	Lot
viii)	1.1 KV grade 12C x 2.5 mm2 (CU) stranded XLPE Armoured	1	Lot
ix)	1.1 KV grade 3 C x 6 mm2 (CU) stranded XLPE Armoured	1	Lot
x)	500 V grade 3/4C x 0.75 mm2 (CU) stranded PVC insulated shielded Armoured screened cable for instrumentation	1	Lot
xi)	500 V grade suitable triad 1.0 mm2 (CU) screened cable for instrumentation	1	Lot
101	Earthing system of Substation and Pump House	1	Job
102	Lightning protection system of Pump House and Substation	1	Job
103	Ventilation system of Pump House	1	Job

104	Illumination system of the Pump House and Substation	1	Job
105	MS Structural materials for equipment supports and other fabrication work	1	Job
106	Fire Extinguishers & Fire Buckets etc	1	Job
107	Misc. items viz. Rubber Mats, Shock Treatment Chart, Glow sign board etc. at Substation / Pump house	1	Job
108	Painting of equipment / material at Substation / Pump House	1	Job
109	Construction of RCC Pump-Motor Foundation	1	Job
i)	3500 mm X 1200 mm X 1500 mm (approx) for 350 KW Pump – Motor	1	Job
ii)	2000 mm X 1200 mm X 1200 mm (approx) for 110 KW Pump – Motor	1	Job
iii)	Modification of existing suction & delivery line of above pump sets	1	Job
iv)	Modification of Structural platform to suite site condition	1	Job
110	Pre-commissioning test of equipment at Substation / Pump House	1	Job
111	High Pressure Test / Medium Pressure Test at Sub-station / Pump House	1	Job
112	Commissioning of the system at Substation / Pump House	1	Job
113	Trial Run and maintenance of the renovated system at Substation / Pump House for 1 Month	1	Job
	14MGD Piyala Boosting Station & Substation		
114	1550 M3 / hr, 55 Mtr head, 1500 rpm (syn) VT pump with accessories Model: WVT–37–24, 2 Stage [Equivalent to RD 24TC	2	No
115	851.7 M3 / hr, 56 Mtr head, 1500 rpm (syn) VT pump with accessories Model: WVT–33–18, 2 Stage [Equivalent to E18 TC]	2	No
116	632 M3 / hr, 69 Mtr head, 1500 rpm (syn) VT pump with accessories Model: WVT–34–16, 2 Stage [Equivalent to HM 16 TC]	2	No

117	350 KW, 11KV, 1500 rpm (syn) TEFC Motor for Pump at Sl. No. 114 above	2	No
118	200 KW, 11KV, 1500 rpm (syn) TEFC Motor for Pump at Sl. No. 115&116 above	4	No
119	NB 500 PN 1.0 DIDF Actuator operated Butterfly valve for pump at Sl. No. 114 above	2	No
120	NB 500 PN 1.0 NRVat Sl. No. 114 above	2	No
121	NB 350 PN 1.0 DIDF Actuator operated Butterfly valve for pump at Sl. No. 115&116 above	4	No
122	NB 350 PN 1.0 DIDF Non Return Valve for pump at Sl. No. 115&116 above	4	No
123	NB 700 PN 1.0 DIDF Actuator operated Butterfly valve for Distribution line	1	No
124	NB 700 PN 1.0 DIDF Non – Return Valve in distribution line	1	No
125	NB 450 PN 1.0 DIDF Actuator operated Butterfly valve for Distribution line	2	No
126	NB 300 PN 1.0 DIDF Actuator operated Butterfly valve for Distribution line	1	No
127	NB 150 PN 1.0 DIDF Actuator operated Butterfly valve for Distribution line	1	No
128	NB 250 PN 1.0 DIDF Actuator operated Butterfly valve for Distribution line	1	No
129	NB 450 PN 1.0 DIDF Gate Valve with actuator	1	No
130	Suitable dia. Air Release Valve	10	No
131	600 NB PN 1.0 Electro-magnetic flow meter with totaliser	2	No
132	450 NB PN 1.0 Electro-magnetic flow meter with totaliser	1	No
133	400 NB PN 1.0 Electro-magnetic flow meter with totaliser	1	No
134	250 NB PN 1.0 Electro-magnetic flow meter with totaliser	1	No
135	150 NB PN 1.0 Electro-magnetic flow meter with totaliser	1	No

136	MS Dismantling Joint		
i)	500 mm dia.	2	No
ii)	350 mm dia.	4	No
iii)	450 mm dia.	1	No
iv)	700 mm dia.	1	No
v)	250 mm dia.	1	No
vi)	150 mm dia.	1	No
vii)	600 mm dia.	2	No
137	Portable dewatering pump set of suitable capacity	1	No
138	Pressure Gauge (0 – 10 Kg / CM^2) with accessories	10	No
139	Pressure Transmitter ((0 – 10 Kg / CM2)	10	No
140	Radar type level monitoring system for CWR/Sump	1	No
141	AC Distribution Board& DCDB at Pump House	1	No
142	11 KV 12 Panel VCB Switchboard	1	No
143	Suitable rated Capacitor – Reactors for Motors under Sl. No. 4 & 5 above	3	No
144	110 V 100 Ah Maintenance free Battery, Battery Charger / DCDB	1	No
145	415 V Switchboard at Sub-station	1	No
146	Remote Control Desk & Instrument Panel at Pump House	1	No
147	Cables		
i)	11 KV (UE) grade 3 C X 300 mm2 XLPE Armoured Aluminium	1	Lot
ii)	1.1 KV grade 3.5 C x 240 mm2 XLPE Armoured Aluminium	1	Lot
iii)	1.1 KV grade 3.5 C x 50 mm2 XLPE Armoured Aluminium	1	Lot

iv)	1.1 KV grade 3C x 2.5 mm2 (CU) stranded XLPE Armoured	1	Lot
v)	1.1 KV grade 5C x 2.5 mm2 (CU) stranded XLPE Armoured	1	Lot
vi)	1.1 KV grade 7C x 2.5 mm2 (CU) stranded XLPE Armoured	1	Lot
vii)	1.1 KV grade 12C x 2.5 mm2 (CU) stranded XLPE Armoured	1	Lot
viii)	1.1 KV grade 4 C x 16 mm2 (CU) stranded XLPE Armoured	1	Lot
ix)	1.1 KV grade 4C x 6 mm^2 (CU) stranded XLPE Armoured	1	Lot
x)	1.1 KV grade 3C x 6 mm2 (CU) stranded XLPE Armoured	1	Lot
xi)	500 V grade 3C x 0.75 mm2 (CU) stranded XLPE Armoured screened cable	1	Lot
xii)	500 V grade suitable triad 1.0 mm2 (CU) screened cable	1	Lot
148	Earthing system of Substation and Pump House	1	Lot
149	Lightning protection system of Pump House / Substation	1	Lot
150	Ventilation system of Pump House	1	Lot
151	Illumination system of the Pump House / Substation	1	Lot
152	MS Structural materials for equipment supports and other fabrication work	1	Job
153	Fire Extinguishers & Fire Buckets etc	1	Job
154	Misc. items viz. Rubber Mats, Shock Treatment Chart, Glow sign board etc. at Substation / Pump house	1	Job
155	Dismantling, Removal, loading, unloading, Transportation of 2 Nos. 400 KVA 11 / 0.433 KV Dry type Transformer from Angadpur Substation to Piyala Substation, re-erection, replacement of Temp. Scanner of both the transformer, testing & commissioning	1	Job
156	Modification of internal portion of Substation Building to accommodate HT equipment	1	Job
157	Painting of equipment / material at Substation / Pump House	1	Job

158	Supply, installation, testing, commissioning of 3 TON capacity Hoist on existing monorail.	1	Job
159	Pre-commissioning test of equipment at Substation and Pump House	1	Job
160	High Pressure Test / Medium Pressure Test at Sub-station and Pump House and approval of DOE, Govt. Of West Bengal	1	Job
161	Commissioning of the system at Substation and Pump House	1	Job
162	Trial Run and maintenance of the renovated system at Substation and Pump House for 1 Month	1	Job
163	**Five (5)** years operation and maintenance works with Operator, security, gardening arrangement including supply items (viz: Alam, Chlorine, Bleaching, Electrical Tools & Tackles, Torch, Duster, Soap, Gum Boot, Rain coat, Umbrella, Hand gloves etc.) disposing of sludge on Turnkey basis at the Piyala Boosting Station & Angadpur 14 MGD WTP	1	Job.

7/6/24

The Superintending Engineer,
West Circle, M.E. Directorate,