

**GOVERNMENT OF WEST BENGAL**  
**OFFICE OF THE SUPERINTENDING ENGINEER, WEST CIRCLE**  
**MUNICIPAL ENGINEERING DIRECTORATE**  
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Memo No. :- MED/SE(W)/ 745 /W-268/2022

Dated:-23.02.2023

**CORRIGENDUM**

**Sub: - Surveying, investigation, Planning, Designing, Construction and commissioning of 24.97/42.24/53.09 ML Collector well, 17.62 /30.00/37.71MLD infiltration gallery, Foot-way bridge, with pumping station on turnkey basis at Damra, Kalajhoria & Bhutaburi within Asansol Municipal Corporation under AMRUT 2.0.**

Ref: - i) Notice Inviting e-Tender No: 05/06/07of SE (WC)/MED/2022-23.

- ii) Tender ID No- a) 2023\_MAD\_456197\_1  
b) 2023\_MAD\_461341\_1  
c) 2023\_MAD\_463339\_1

In the aforesaid Quotation following changes are made:-

1. Please read Superintending Engineer, West Circle, MED in place of Secretary, Asansol Municipal Corporation as Employer/authority wherever mentioned in the NieB.
2. Please read Executive Engineer, (E/M), MED in place of E/M, KMDA wherever mentioned in the NieB.
3. EMD to be Rs.5,00,000.00 in place of Rs.25,00,000.00 (Balance EMD @ 2% contract value beyond Rs.5,00,000.00 to be deposited at the time of agreement)
4. Annexure- IV for vendor list of E/M work to be omitted.
5. Please read "Hydraulic survey to be done by the concerned bidder and same to be correlated with the inhouse investigated report and final decision will be taken by the TIA" as mentioned in the Annexure-VI.
6. Floor level of Pump house & Sub-station building will be 1.50meter above the H.F.L. H.F.L data will be provided the TIA.
7. Please read design discharge for Infiltration Gallery is 1160.00 cum/hr. in place of 1506.625 m3 / hour for Damra IG, wherever mentioned in the NieB.

8. The work as mentioned in the scope of work in Turnkey nature job. Any work which is not mentioned in the scope of work but is required to complete the job within the limit of contract, the same has to be done by the bidder without any extra claim. So, the participating bidder should survey the site properly before making any offer
9. For lying of Pipe line, please read as Supply & lying including all specials & valves is the scope of the work of bidder.
10. Agency's whole responsibility is to ensure that the require quantum of the water should available from the structure and for this extensive survey work to be done in all respect.
11. If there is any contradiction between any clauses of the NieB, decision of the Superintending Engineer, West Circle, MED will be final.
12. Clause 3.0 regarding scope of work to be replaced as

### 3.0 SCOPE OF WORK

The Bid is a design-cum-execution Bid on turnkey basis. The Bidder is advised to go through the documents meticulously. In case of any doubt about any data the Bidder may seek clarification before the Bid Inviting Authority by uploading 48-hour prior of the Pre bid meeting and clarification of the same will be discussed in pre bid meeting and will be uploaded later on.

The Bid comprises of following major works. The works includes surveying, Planning, design, drawing and construction of civil& E/M works including supply, carriage of all materials with foundation for the various units of Collector well, Infiltration Gallery, Walkway bridge, Sub-station Building along with other allied works.. The scope also includes Trial Run and testing commissioning the Plant for three months, after successful Commissioning, operating and maintaining 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 accept rising main.

All survey work (hydraulic, geo-technical and general), designs, drawing will be in the scope of the bidder/contractor. These are (hydraulic, geo-technical and general) to be submitted to EIC after duly vetted from IIT, Khargpur/ Jadavpur University/ IEST Shibpur. However final approval will be given by the undersigned.

Sl. No.	Name of the work	Approx quantity
01.	<p><b>COLLECTOR WELL:-</b>surveying, Planning, design, drawing and construction of Civil, Electrical and Mechanical works including supply, carriage of all materials with foundation for the various units of Collector well. The RCC central radial collector well will be the storage capacity with a detention time of 5 minutes for the demand of 24.97 MLD (Damra IG) for ultimate year, internal dia. will be designed by agency (minimum 10.0 meter so that all the pumps &amp; other accessories accommodate), bottom of collector well should stay stable soil strata as per the soil investigation report to collect water from the formation Infiltration gallery to collector well.</p>	01 Items
1.01	<p>Investigation of bed deposit along three sections at 200 meter apart at proposed location at river bed of Damodar, hydraulic parameters (radius of influence and hydraulic conductivity) of sub surface profile, design of infiltration gallery considering least saturated depth of water of 8.00 to 9.00 meter (as per investigation report) in river deposit on continuous pumping from gallery to CWR, scour depth etc. Detail design along with drawing of Infiltration gallery, pumping system to harvest 17.62 + 5 % overloading (Damra IG) of sub surface water by 16 hours pump running per day by each infiltration gallery from river of Damodar. The Minimum Level of top of Infiltration gallery will be 8.00 to 9.00 meter (as per investigation report) below the river bed.</p>	02 rows. (2 pipes in each row)
1.02	<p>Construction of temporary approach road with supply of stone boulder (two layers of boulder 300 mm thickness) rolling the same including spreading and consolidating brick bats 200 mm thick, morrum 75 mm thick, placing necessary Hume pipe for under pass flowing water of river to facilitate movement of construction equipment / materials from river bank to gallery site path way for transporting materials from river bank up to construction site as per requirement of agency.</p>	1 items
1.03	<p>Suitable round type platform 1.00 meter width inside the collector well including stair from each platform to other and fixed at top &amp; bottom of collector well.</p>	3 Layer

1.04	Suitable inclined type M.S. ladder from the top of the outsider platform of the collector well to the river bed including suitable support at top, middle & bottom of well.	1 No.
1.05	Requisite no. & dia. of inlet hole with paddle collar Including supplying and fixing of sluice valve, as required ISI marked as per IS: 14846 with test certificate with necessary extended spindle, Plummer block, head stock with gear arrangement, spacer with anchor bolt etc. to operate from inspection gallery just after pump platform.	1 Items
1.06	Construction of pump house building upon intake well having good architectural view including machine foundation for pumps and motors will be constructed on the collector well pumping station on the river Damodar as per direction of EIC. The height of the pumping station is to be designed in such a manner that the no obstetrical will be allowed for repair maintenance of the vertical pump motor unit. The design of Collector well has to be made on the basis of the Static load of pump house as prescribed and dynamic loading pattern thereof, taking into account of the vibration both horizontally and vertically that will be generated due to operation of each pump motor set as well as parallel operation of the pumping unit. Also bidder will be planning and designing for one Cantilever will be constructed by the bidder over the well of adequate width(if any) so that sufficient place will be made for incorporated of Pump-Motor, MCC Panel, extra round of Cable, and Manifold pipe line.	1 No.
02.	<b>INFILTRATION GALLERY:-</b> Construction of infiltration gallery of capacity 17.62 MLD(+5%) (Damra IG) by 10 mm thick SS 304 by "V" groove slotted strainer pipe of required diameter (not less than 500 mm) & length (not less than 4 x 190 meter = 760.00 meter, for Damra IG) designed by bidder. The 10 mm thick "V" grooves SS 304 pipes of requisite dia. And length as noted above. On every meter length of pipes with "V" groove slotted holes of required nos. slotted holes of size 75 mm X 2.5 mm, is made in required nos. rows so that opening will not less than 30 to 35% of area.	02 rows. (2 pipes in each rows)
2.01	Execution of an infiltration gallery with supply, fitting, fixing of 10 mm	1 items.

	thick SS 304 by “V” groove slotted strainer pipe of required diameter (not less than 500 mm) & length (not less than 4 x 190 meter = 760.00 meter, Damra IG) designed by bidder, including with necessary SS 304 flange joint and nut, bolt, gasket. On every meter length of pipes with slotted holes size 75 mm X 2.5 mm in each row is made in required nos. rows so that opening will not less than 30 to 35% of area.	
2.02	The gallery pipe top SI should be at least 8.00 to 9.00 meter (as provision of sand depth) below existing river bed level near Collector well and should be placed after over pumping for development of formation. Open excavation of sand including sand stone, rock; debris etc. as is necessary up to a depth of at least 9.50 to 10.50 meter (as provision of sand depth) from bed level with excavator, sand pump, grab etc. and grading the bottom of trench to lay the strainer pipe at a slope of 1: 500 (around) towards well under the supervision of divers. Placing the pebble from top of water level along the gallery at under and above strainer as per design & drawing submitted by bidder duly approved. The slots of the strainer should be cleaned and joining of flange joints should be done by divers. The depth of gallery should be mentioned in the drawing by the bidder is a binding criteria after necessary investigation has to be done. Localized rock, debris etc under water have to be cleared to complete the gallery as per drawing and direction of E.I.C. to achieve required yield with sand & turbid free (upto permissible limit) water from the gallery to well during the month of end. To achieve the said yield, necessary increase of gallery depth/length, may be considered during execution without any additional cost.	Required length & diameter as per design by bidder
2.03	Stone boulder sausage work on top of gallery after carrying it up to galleries site as per drawing of boulder size more than 200 mm. with 0.800 meter depth and 5.00 meter width and 4 mm thick G.I. wire net of 150 x 150 mm opening along with studs.	1 item
2.04	Providing pea gravel as per IS: 8419 1977 for gallery bottom and outer periphery as per IS and free from foreign materials especially	1 item

	<p>iron bearing materials of size to support the sand above gallery. Gravel size should be so as to eliminate sand in gallery water (sieve analysis report and supporting document from authentic book / literature is to be produced). Arrangement of stacked measurement by Engineer in Charge should be done for packing Pea gravel minimum 1000 mm thick surrounding the pipe. Filtering medium near pipe line - 38 mm pea gravels.</p> <p>2nd layer- 38 to 19 mm pea gravels.</p> <p>3rd layer - 12 to 6 mm pea gravels.</p> <p>4th layer - Course sand passing through a sieve of 3.35 mm size and retained on a sieve 1.70 mm size.</p> <p>5th layer: - Fine sand retained on 70 micron sieve and passing through 1.70 mm sieve.</p>	
2.05	Back filling of sand on top of gallery from excavated bed material as shown in drawing.	1 item
03.	<b>COLLECTOR WELL FOOTWAY BRIDGE :-</b> Construction of 3320 mm wide suitable foot way structural steel bridge including surveying, planning, design, drawing and construction of civil, electrical and mechanical works with joist and angle frame including supply, carriage of all materials with foundation for the various units of from river bank to collector well providing and installing the following items and calculating the following loads. (Approx length 400.00 meter for Damra IG) which may vary as per site condition. Length may vary upto (-)10%but beyond that rate to be deducted as per the prevailing SoR as per decision Superintending Engineer, West Circle, MED.	1 item
3.01	Suitable double column 30.00 meter (Max.) centre to centre with tie-brassier 3.00 meter centre to centre difference for support of foot way bridge. For every column foundation will be R.C.C. Piling with one pair column (as designed by Bidder.) above well / pile cap. (as designed by Bidder).	1 item
3.02	Supplying, Laying and fabricating of 10 mm thick 2 X 450 mm dia. M.S. Pipe line (TATA / SAIL/JINDAL make) on both sides of foot way bridge including all necessary different types of valves and	1 item

	accessories all complete (as per design). MS Common manifold of 500 mm dia to be constructed at starting point of foot way bridge at bank of river as per direction of EIC and after that Supply & laying of K9 DI pipe(600mm dia) including all specials & valves etc. approx. 200.00 mtr upto existing GLR including restoration all complete as per direction of EIC. Length may vary upto (-)10%but beyond that rate to be deducted as per the prevailing SoR as per decision of Superintending Engineer, West Circle, MED.	
3.03	Tub line should be as per Railway Line of IRCR 60 (60 LBS) section and suitable for running of tub for transportation of materials from river bank to collector well. (Approx length 400.00 meter may vary as per site requirement).	1 item
3.04	2 Nos. cable on each side of 400 sq mm 3 / 3.5 core aluminium armoured cable on both side of pipe line by suitable U clamp on the vertical / side frame (Length will be from Substation building PDB Panel to Intake well MCC Panel. .(For details please refer section I & J)	4 Nos. cable
04.	Planning, Design, Construction of retaining wall / Boulder Sausage (2 X 30.00 meter) on in the river bank on both side of foot way bridge 1.00 meter high (From FGL) boundary wall with RCC Column, tie beam and lintels frame structure and fencing with barbed wire 600 mm height over boundary wall, one no. big gate (6000 mm width) and one no. small gate of 1200 mm width, approach road by RCC pavement, drain, Filling & Land development of Whole Premises up to HFL with ramming, compacting, levelling, and finishing complete in all respect as per approved drawing and direction of E.I.C.	1 item
05.	Collector well internal illumination, yard lighting including necessary conceal wiring.	1 item
06.	Vertical Turbine pump: Motor discharge 580.00 cum per hour for Damra IG at the head 27 meter finally calculated by the bidder after proper survey. 2 Nos. working and 1 Nos. Stand by.(For details please refer section I & J)	3 Nos.
07.	L.T. PDB panel and power Factor Panel at Substation & MCC Panel	1 Set

	at Intake well:.(For details please refer section I & J)	
08.	Digital flow and discharge meter of 500 mm dia for calculate the discharge in sec, minute, hour, day, month and total discharge of water as per direction of E.I.C. (For details please refer section I & J)	1 Set
09.	Planning, Design, Construction of Sub-Station building on ground floor 8 nos. room 5.00-meter x 5.00-meter size 1) 1 No. for WBSEDCL Switch Gear room, 2) 1 No. for H.T. VCB Panel room, 3) 1 nos. for Transformer room, 4-5) 2 Nos. for PDB Panel & APFC Panel Room, 6-7) 1 No. operator room and 1 No. office room with toilet facility by porcelain tiles on wall, vitrified tiles flooring, wall putty finishing. (For E/M details please refer section I & J)	1 item
10.	Supply and installation of HT substation (For details please refer section I & J)	1 item
11.	Operation & maintenance: (Sl. No. 18) Operation and maintenance including supply of all accessories (except electricity bill) of the same for a period of 60 (Sixty) months after the completion of specified period of Successful Trial Run 3 moths. The work is of maintenance in nature, the Defect Liability Period of the work shall be Sixty months from the actual date of completion of the work i.e. after three months Trial Run.	5 Years

**A) COLLECTOR WELL FILTER WATER PUMPING STATION: (24.97 MLD DEMAND FOR 30 YEARS )**

i) The Bid includes Survey, investigation, Planning, Design, Supply, Erection, Fabrication, Operation & maintenance of Collector well filter water Pumping Station, Supplying, Laying and fabricating of M.S. Pipe line (TATA / SAIL /JINDALmake) on both sides of foot way bridge 450 mm dia. from Collector well to MS manifold pipe line at the starting point of foot way bridge along with supply and fixing of 450 mm dia Butterfly valve, approved make expansion joint and 600 mm dia DI pipe line with 500 mm dia discharge flow meter from 500 mm dia MS manifold line to existing Clear Water Reservoir of Damra for Asansol area including all necessary different types of valves (one no non Return Valve) and accessories all complete up to ground level reservoir of high lift pump house.



ii) The total work includes design, supply, fitting, fixing, commissioning trial run (for three months) and thereafter operation and maintenance of (5) five years for the pumping machinery, motors etc. and allied equipment's including proper engagement of operating personnel. The essential prerequisite of the operation and maintenance work is to maintain uninterrupted water supply from the pumping station to ground level reservoir.

iii) The Bidder has to submit in due course the specific size and capacity of all machineries & equipment offered along with data related to static & dynamic loads in different operating conditions. The size of all the equipment's should be so selected to match with the civil works.

iv) The vibration & noise should be within the acceptable limit as per I.S. or as per existing norms for all equipment's.

v) The dimension and centreline of pedestals for supporting the Pumps as well as the valves should strictly be in line for both Civil & electromechanical works.

vi) The centre-to-centre distance of the pumps, Clearance from wall for pumps should be as per I.S specifications.

vii) The installation of all electrical equipment should be strictly as per I.E. Rules and as per IS specification.

viii) The minimum distance from the pump centre to centre is to be maintained in such a manner so that no vortex formation takes place in the entry of pump i.e. the flow should be maintained streamlined at the entry point of pump. The minimum distance of the pump motor centre line to wall of the pumping station will be maintained in such a fashion that no obstetrical is to be found at the time of maintenance.

ix) The Bidder has to submit parallel operation curves for pumps & the same is to be matched with the system resistance curve of the delivery grid to the Ground Level Reservoir. Pump head selection should be done after surveying of details rising main pipe line by supplying, laying of 2 X 450 mm dia. (400.00 meter long) spiral mild welded 12 mm thick M.S. rising main on both side of footway bridge from Collector well to MS manifold

pipe line at the starting point of foot way bridge including all necessary valves and specials up to the water ground level reservoir. Family curves for individual and multiple operations at all possible consequences depending upon the variation in % opening of the butter fly valves are to be submitted.

x) The total capacity of the pumping station will be 1160.00 cum/hour (Damra IG) at head (supplied by the bidder after surveying the site condition) Meter with operation of two pumps for clear water supply (Running hours of 16 Hrs. / day) would yield to a supply of approx. 17.62MLD (+5%) for Damra IG as per present requirement. One pump will be kept stand by at any point of time. The pumps & Motors must be of continuous duty and vertical execution type.

The individual pump delivery pipelines should be connected to a common delivery manifold placed inside / outside of the pump house which will be connected with the rising main placing with butterfly valve, a temper proof kinetic air release valve and full bore type flow meter. The delivery pipes lines connected with the common delivery line below the 45 degree.

The suction bell mouth of the vertical turbine pumping unit should be placed in such a manner that no eddy and starvation occurred when pumping operation will put to operation at lowest flood level.

xi) The Bidder has to consider all butter fly valves electrical actuator control, NRV, dismantling joints in individual pump delivery pipe lines as per detail technical specification.

xii) The puddle collars/wall casting needed to be fixed into the wall for entry & exit of delivery pipelines are also to be considered (if required).

xiii) The Bidder must work out the natural frequency analysis for the structural work and the same should be verified with the RPM & critical speed of the rotating equipment's to eliminate any chance of vibration.

(xiv) All the cabling work required to operate the equipment at Collector well pumping station will be drawn from the LT PDB panel of the HT substation near the HT substation. Power cable of all sizes must be 11 KV grade 4 nos aluminium armoured 3 / 3.5 core 400 sq mm XLPE / PVC cable for all electrical component.

**(B) COLLECTOR WELLL PUMPING STATION AND WALK WAY:**

i) Designing, drawing and construction of intake walkway with pump house building having good architectural view including machine foundation for pumps and motors will be constructed on the collector well pumping station on the river Damodar as per Bid drawing. The height of the pumping station is to be designed in such a manner that the no obstetrical will be allowed for repair maintenance of the vertical pump motor unit.

ii) One electrically operated crane 5.0 MT of sufficient capacities shall have to be provided to handle pump and motor sets for repairing and maintenance purpose in the pump house. In order to accommodate control panel room equipment / appliances will be housed at a level of pumps floor. The common delivery line with valves unit is to be placed opposite to the entry of the pump house as well as in front of the control panel for easy movement of the operator. The control panel room shall have to be covered by wooden glass frame room.

ii) Designing, drawing and construction of Collector Well Structural Steel bridge is to be made minimum 3.320 meter width of Structural steel bridge supported on R.C.C column & Foundation (25 mm and 40 mm dia) all along and 450 mm dia. including all necessary different types of valves and accessories all complete up to the ground level reservoir, supply & laying of 4 Nos. (2 Nos. on each side) aluminium armoured cable 400 sq mm 3 / 3.5 core cable and two nos. earthing GI (25 mm X 6 mm) strip, illumination system, aviation lighting arrangement and lightening arrestor with separate earthing arrangement.

iii) The design of Collector well has to be made on the basis of the Static load of pump house as prescribed and dynamic loading pattern thereof, taking into account of the vibration both horizontally and vertically that will be generated due to operation of each pump motor set as well as parallel operation of the pumping unit. Also bidder will be planning and designing for one Cantilever will be constructed by the bidder over the well

of 1.50 meter width so that sufficient place will be made for incorporated of Pump-Motor, MCC Panel, extra round of Cable, and Manifold pipe line.

iv) The Bidder, whose Bid is accepted in the Course will have to furnish details of the design of the pump house and Collector well in all level duly incorporating the requirement of the pump manufacturer.

**(C) COLLECTOR WELL L.T. PANEL AND SOFT STARTER:-**

The design and drawing of HT VCB Panel, Transformer, Cable, LT PDB, APFC and MCC panel will be submitted by the bidder work will be started after approval by Chief Engineer, KMDA (E/M) and E.E. (ME. Dte) E/M submitted by agency.

(D) Supplying, Laying and fabricating of M.S. Pipe line on both sides of foot way bridge 450 mm dia. including all necessary different types of valves and accessories all complete from common manifold length 2 X 450 meter (approx) and 600 mm dia DI pipe line from common manifold line to ground level reservoir proposed High lift pump house (approx length 200 meter) after supplying and installation all types of sluice valve, non-return valve, pressure release valve and air release valves along with valve chamber construction. . air release valves will have to be provided by the bidder. Digital discharge meter and flow meter will be provided by the agency at the out late of collector well pump house.

E) Retaining wall / Boulder Sausage work: - Both sides (2 X 30.00 Meter approx) of connecting portion of foot Way Bridge will be protected by a RCC retaining wall / Boulder Sausage work up to FGL and above it 1.8 m RCC retaining. Boundary wall, approach road, surface dressing, beatification and gardening will be under bidder scope. A steel gate of width not less than 6.00 m will be provided for entrance. All internal roads will be of 4.0 m RCC (M20 grade) of 150 mm thickness & Minimum 0.12% Reinforcement over compacted and consolidated soil. All roads will be covered by designer paver block of thickness not less than 60 mm.

## 5.0 LIMIT OF CONTRACT:

The limit of contract starts from construction of collector well, Infiltration Gallery, Structural bridge, Sub-station Building with pumping station including arrangement and installation of vertical turbine pumping unit with electro-mechanical works for Sub-station Building and Supply & laying of clear water delivery line (600mm dia DI K9) with valves arrangement up to the ground level reservoir including road restoration work, pipe crossing (if any) etc. and interconnected with Supplying, Laying and fabricating of spiral welded mild steel M.S. Pipe line on both sides of foot way bridge 450 mm dia. including all necessary different types of valves and accessories all complete which will be bidder's scope

A full bore digital discharge meter and flow meter with valve chamber at outlet of the collector well of pumping station will be in the bidder scope. The LT sources of Electric Power would be taken from High Lift LT panel room. Necessary arrangements to connect the cables of appropriate size with full satisfaction of Engineer in Charge are within the limit of this work. The excavation of cables trenches, laying the cables within boundary of intake jetty pumping station units, covering the cable trenches, insert plates, cable trays etc. also includes under this contract.

It is the responsibility of the contractor to make good or reconstruct the part or whole of a structure if gets damaged or demolished / crushed / settled down due to water thrust or similar external reasons or faulty design at his own cost. Faulty Design submitted by the contractor even if accepted by the department will not relieve the contractor from above responsibility. Contractor will be considered total responsible for any accident caused due to negligence on his part/poor workmanship/faulty design.

Contractor has liberty to go for design mix for achieving Rich concrete having minimum cement content as stipulated in I.S. code or go for variation if so required at the subject to the satisfaction & permission of E.I.C. The same is also applicable when contractor opt to adopt alternative methodology for facilitating any construction work

13.0 Clause 57.0 to be read as below

**57.0 PAYMENT**

<b>Sl. No.</b>	<b>TERMS OF PAYMENT : ITEM WISE BREAK UP</b>	
1	<u>Construction of Collector Well:-</u> Planning, designing and construction of Collector well, with pumping station on the top of collector well in the River Damodar considering bid documents as per approval from competent authority and direction of EIC. (A = 20% of BOQ item no. 1)	
	<i>Break up :</i>	
A.	On placing of cutting edge and completion of 50% below river bed level including supply fixing of 6 Nos. Sluice valve, paddle collar etc.	20% of A
B.	On Completion up to bed level and bottom plugging.	20% of A
C.	On completion up to deck level slab casting	20% of A
D.	On completion of superstructure up to roof casting.	20% of A
E.	On completion of all mechanical works i.e. inside three layer platform, Electrically operated crane including frame structure for crane and outside cantilever path way, inside stair, outside stair all complete.	15% of A
F.	On completion coloring of concrete and plaster work, painting the frame structure, lift, stair, inside platform, outside stair all complete.	5% of A
	Total =	100% of A
2	<u>Foot Way Bridge Pier and Intake jetty footway bridge:-</u> Planning, designing and construction of Pile foundation of Foot way bridge pier / column, and intake jetty footway bridge by joist and angle frame structure on River Damodar. (B = 20% of BOQ item No. 1)	
A.	Foundation up to River Bed Level of all Pier	20% of B
B.	Column up to deck (i.e. frame structure) Level of all Pier	10% of B
C.	Fabrication and placing of Joist, angle and U Chanel frame structure	30% of B
D.	Construction of deck slab and fixing the same on frame structure	10% of B
E.	Supply, fixing and fabrication of 450 mm dia. 10 mm thick M.S. Pipe, Valves, cables, tub line including tub and all necessary fittings on both	20% of B

	side of footway bridge.	
F.	Painting of total Piers, M.S. bridge , M.S. Pipe, valves, deck slabs etc.	10% of B
	Total =	100% of B
3	<u>Vertical turbine Pump-Motor:-</u> Supply delivery installation of 3 nos. vertical turbine pumping units 580 cum discharge at head 27.00 meter approx with its motor, column pipes, inside collector well L.T. cable, L. T Panel, soft Starter and column pipes with its all other allied job such as Common delivery main, Non Return Valve, actuator control butterfly valves, full bored type flow meter, etc. complete in all respect considering bid documents as per approval from competent authority and direction of EIC. (C = 10% of BOQ Item No. 1)	
A.	Supply of 3 Nos. V.T. Pump & Motors.	30%
B.	Installation of VT Pumps with column pipes and commissioning the same.	15%
C.	Supply of L.T. Panel, Soft Starter, internal cable, Materials for earthing arrangement all other materials.	20%
D.	Installation of L.T. Panel, Soft Starter, internal cable, earthing arrangement and commissioning the same.	20%
E.	Supply, fixing and fabrication of M.S. Manifold line, actuator control butterfly valve, full bored type digital flow meter etc. all complete.	15%
D	After successful trial run of the plant.	10%
	Total =	100%
4.	Planning, Design, Construction of Substation building on ground floor, 8 nos. room 5.00 meter x 5.00 meter size 1) 1 No. for WBSEDCL room, 2) 1 No. for H.T. VCB Panel room, 3) 1 nos. for Transformer room, 4-5) 2 Nos. for PDB Panel room and APFC Panel Room 6-7) 1 No. operator room and 1 No. office room (decorative type room) with vitrified tiles flooring, wall putty finishing wall and toilet facility by porcelain tiles on wall including all E/M works.(D = 15% of BOQ Item No. 1)	
A	Construction of all Structural work complete in all respect	40% of D
B	All finishing work completion of inside of building, outside campus in all respect.	10% of D
C	Supply & Installation of E/M works	40% of D
D	After successful trial run of the plant.	10% of D
	Total	100% of D
5.	<u>Electrical Wiring and Lighting arrangement:-</u> Electrical wiring and lighting arrangement including supply delivery & erection of illumination fittings fixture, aviation lamp fittings,	

	exhaust fan. Ceiling fan, lightening arrestor with its wiring and earthing arrangement of inside of building, outside campus, foot way bridge and collector well, pumping station all complete by suitable Led light as per direction of E.I.C. complete in all respect considering bid documents as per approval from competent authority and direction of EIC (E = 1% of BOQ Item No. 1)	
	Break up :	
A	Supply of all Electro-Mechanical equipments required to complete the item.	50% of E
B	Installation of LED light fittings (indoor & outdoor), Ceiling fan, Exhaust fan, other lighting arrangement and any other work required to complete the item in all respect.	40% of E
C	After successful trial run of the plant.	10% of E
	Total =	100% of E
6.	<u>Infiltration gallery:-</u> Construction of requisite dia. and suitable length (required length as per designed by the bidder) Infiltration gallery including surveying, investigation Planning, design, drawing and construction of Civil, Electrical and Mechanical works including supply, carriage of all materials with foundation for the various units of Infiltration gallery of collector well and provision of following accessories. (F = 30% of BOQ Item No. 1).	
A.	Supply of Slotted pipe including fabricated flange, man machineries etc.	30 % of F
B.	On 50% completion of excavation of trench and laying of MS strainer pipe, Packing suitable size gravels and back filling the same with different graded sand.	20% of F
C.	On rest 50% completion of excavation of trench and laying of MS strainer pipe, Packing suitable size gravels and back filling the same with different graded sand.	20% of F
D.	On completion of bouldering with netting arrangement and sausage work.	20 % of F
E.	After 3 months from trial run	10% of F
	Total =	100% of F
7	<u>Supply &amp; Laying of 600mm dia DI(K9) pipe with specials, fittings &amp; valves including permanent road restoration works as per direction of E.I.C(G = 2% of BOQ Item No. 1).</u>	
A	<u>On completion all the works</u>	<u>100%</u>



8	Planning, Design, Construction of retaining wall / Boulder Sausage (2 X 30.00 meter) on in the river bank on both side of foot way bridge 1.00 meter high (From FGL) boundary wall with RCC Column, tie beam and lintels frame structure and fencing with barbed wire 600 mm height over boundary wall, one no. big gate (6000 mm width) and one no. small gate of 1200 mm width, approach road by RCC pavement, drain, Filling & Land development of Whole Premises up to HFL with ramming, compacting, levelling, and finishing complete in all respect as per approved drawing and direction of E.I.C.. (H = 2% of BOQ Item No. 1)	
A	Construction of RCC retaining wall / Boulder Sausage work	15% of G
B	1.5 M Masonry boundary wall over Retaining wall & steel gate	45% of G
C	Barbed fencing over boundary wall	10% of G
D	Filling & land development up to FGL	10% of G
E	4.0 m wide internal road	10% of G
F	After successful trial run of the plant.	10% of G
	Total =	100% of G
9.	Operation & maintenance: (Sl. No. 9) Operation and maintenance including supply of all accessories of the same for a period of 60 (Sixty) months after the completion of specified period of Successful Trial Run 3 moths. (I = 100% of operation & maintenance cost BOQ item No. 2)	
	Break up :	
A.	On completion of running at the end of 1 <sup>st</sup> year	20% of H
B.	On completion of running at the end of 2 <sup>nd</sup> year	20% of H
C.	On completion of running at the end of 3 <sup>rd</sup> year	20% of H
D.	On completion of running at the end of 4 <sup>th</sup> year	20% of H
E.	On completion of running at the end of 5 <sup>th</sup> year	20% of H
	Total =	100% of H
Note		
A	<i>The above payment breakup is indicative only. Concerned Superintending Engineer, MED may modify If necessary.</i>	

	<p><i>Operation &amp; maintenance: Operation and maintenance including supply of all accessories of the same for a period of 60 (Sixty) months after the completion of specified period of Successful Trial Run 3 months.</i></p> <p><i>the Defect Liability Period of the Original work shall be Sixty months from the actual date of completion of the work i.e. after three months Trial Run.</i></p> <p>.</p> <p><i>The Maintenance and operation cost as per BOQ item No. 2 shall be refunded after satisfactory completion of work per annum basis for 5 years.</i></p> <p><i>(iii) S.D. Money shall be refunded as per relevant prevailing G.O</i></p>
B	<i>The total amount to be quoted &amp; uploaded by the bidder in .xls format of BOQ under Financial document will be as per the clause 57 of section C.</i>
C	<i>The items which is not covered here but required for successful completion of the project in all respect are to be considered by the bidder while quoting their rates in uploaded BOQ.</i>

14.0 Section-I, J, K L & M to be replaced as:

### **SECTION -I**

#### **1.0. VERTICAL TURBINE (VT) PUMP**

##### **1.0 Vertical Wet Pit Pumps**

- 1.1 The pump shall be of vertical wet pit type with mixed flow impeller. Pump shall be placed vertically submerged in the wet pit and mounted on the top of the CWR floor. The pump shall be self service water lubricated type. Self lubricated type guide bearings are to be provided at suitable position of the shafts and shall not be more than 1.5M (approximately) apart. Since this service water may carry minor solid particles, the guide bearings shall have suitable passages within them to expel/pass these minor solid particles by self working pressure, and the same will not stick inside the bearings deteriorating them. The specific gravity of River Water shall be considered as 1.00 M ( Max. ).
- 1.2 The pump battery shall contain suitable no pump sets out of which each pump shall deliver 100 % of the demand and also the system shall have minimum 50% stand-by Pumps.
- 1.3 Pump shall be vertically driven with shaft directly & flexibly coupled with adequate rating, V1, SCIM. The pump rotational speed shall not be more than 1500 rpm (syn).

- 1.4 The pumps shall be of non-pull out type. The individual pump discharge lines shall run over the main operating floor and shall be connected with the common delivery manifold. The pump discharge head/motor stool /sole plate shall be rigidly grouted on the Pump floor. The foundation plan and foundation pockets required to be kept with the civil construction, and the successful bidder on receipt of the order shall furnish the pump-motor foundation plan authenticated by the OEM. The said foundation will take care and encounter the horizontal back thrust as may be generated during start/stop of the same (at shutoff condition may be considered).
- 1.5 The pump impeller shall be securely held on the pump shaft as per provision of the pump manufacturer's design so as to prevent sliding of the impeller along the shaft during operation.
- 1.6 The pumps shall be of having a fairly steep H-Q curve. The tenderer shall furnish the evaluated specific speed of the pump at the specific trim at duty point. The pump H-Q characteristics curves shall be stable all throughout. There shall be a margin of at-least 25% in between the run-out flow and the duty point flow.
- 1.7 The pump efficiency shall be reasonably high. The head-discharge-efficiency-KW absorbed-NPSHR shall be guaranteed without any tolerance at the duty point working at river water level condition mentioned in the Obligatory Data.
- The tenderer shall have to confirm the maximum power absorbed by the pump on the entire range starting from the shut-off to run-out without any positive tolerance
- 1.8 The suspension length of the pump assembly shall be such that it can safely work at the lowest low level condition considering worst of (i) the NPSHR of the offered pump at the maximum water discharge condition on the entire operating range & (ii) minimum submergence requirement. It shall have one suitable basket type strainer preventing entry of foreign particle and of any solid in the pump.
- 1.9 The vertical column pipe assembly shall be of suitable dia fabricated from adequately mm thick MS plate, flanged type, and anti-corrosive epoxy painted both inside and outside. The column piping shall be of individual length not more than 1.5 M each for effective and easy handling.

## 1.10 Omitted

- 1.11 The total suspension length including the bottom basket strainer if any, shall be fixed by the tenderer considering the minimum submergence requirement working at the lowest low level, the required bottom clearance at the indicated level etc. The total suspension length, as has been considered in the offer backed by technical justification shall be placed with the technical offer.
- 1.12 The pump assembly shall be provided with suitable anti-friction roller thrust bearing, non-reverse ratchet assembly, bowl bearing, suction bell bearing, shaft sleeves including sleeve at gland packing point, seal ring/ wearing ring, provision for impeller adjustment nut, double throat air-valve at column vent point and other important features as provided by the manufacturer. Suitable motor stool, motor sole plate with facility of pulling out the column and bowl assembly through it, anchoring bolts, nuts, washers, fixing bolts all complete are to be provided..
- 1.13 The pump rotating assembly shall be statically and dynamically accurately balanced. The impeller balancing shall be within the grade G- 6.4 as per IS:11723. No hole or any piece being welded/bolted on the pump impeller for balancing shall be allowed. The shaft should be ground all over and perfectly aligned. Special care should be taken that the entire pump assembly does not experience vibration beyond the permissible limit as per IS:11724, of such class roto-dynamic unit while in operation even in worst operating condition at any combination.
- 1.14 The pump motor shall be considered as a single unit and the vibration limit should be within the limit specified in above IS.
- 1.15 The noise level shall be within the permissible limit of IS: 12065. The thrust bearing shall be designed in such a manner to be worked safely on any working condition even at the respective shut off.
- 1.16 The pump shall also withstand the condition of any back flow on it.
- 1.17 The static and dynamic loading of the pump motor assembly with other allied components shall be clearly indicated.
- 1.18 The pump shall be capable of continuous operation. The pump shaft, line shaft shall be accurately sized. Replaceable sleeves are to be provided at desired point. The Stuffing box shall be self-sealed design provided with packing ring and preferably with Split type gland.
- 1.19 The impeller of the offered pump shall not be either on the lowest trim or the highest trim of the same pump family offered.
- 1.20 The wetted portion of the pump shall have a proper finish. The pump shall have a minimum efficiency of 80% at duty point. Pumps offered with lesser efficiency at duty point shall not be accepted.

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

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

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

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

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

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

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

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

Air-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 theMOCOother 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    | : | SS-410  |

Assembly(nuts/bolts/fastenersetc.)

- k) Column pipes : MS, fabricated from adequately thick steel plate with anti-corrosive epoxy painted both inside and outside after proper surface finish

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

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

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

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

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

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

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

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

The NPSHR test as per IS:9137 for at least one pump as per the manufacturer choice of the department at various discharge conditions including duty point shall be conducted by the

manufacturer and test report shall be submitted. The duration of the performance tests of all pumps shall be not less than 2 / 3 hours each, during which the temperature, noise, vibrations shall be monitored and tested.

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

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

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

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

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

### 1.31 **Hydraulic test at shop**

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

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

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



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

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

### **1.36 Performance test at shop**

1.36.1 Each pump shall have to be tested to determine the performance curves of the pumps. These tests are to be conducted, in presence of Employer or his representative, as per the requirements of the Hydraulic Institute Standard/ASME Power Test Code PTE8.2/BS-599/I.S.S., latest edition/ relevant universally accepted codes.

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

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

### **1.37 PERFORMANCE GUARANTEE, TOLERANCE AND PENALTIES**

#### **1.37.1 Performance Guarantee and Tolerance**

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

#### **1.38 Rectification of Deficient Performance**

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

efficiency shall be acceptable only with penalty. Variation more than (–) 3% will render the pump liable for rejection.

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

### 1.39 **CLEANING, PROTECTION AND PAINTING**

#### 1.39.1 **Cleaning before shipment**

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

#### 1.39.2 **Painting**

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

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

#### 1.39.3 **Packing for shipment**

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

### 1.40 **TESTS AND INSPECTION**

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

### 1.50 **SPARE PARTS**

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

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

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

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

List of spare parts

- i) Rotating unit:3 Nos.
- ii) TNC switch: 3 Nos.
- iii) Tr.Feeder relay:2 nos.
- iv) Bearing:02 sets
- v) Indicating Lamp” 10 nos+15 nos.
- vi) Contractor: 2 nos

1.60 **DRAWINGS, CURVES & INFORMATION REQUIRED**

- 1.60.1 Characteristic curves of pumps showing effective head, pump input power, efficiency, submergence/NPSH, against capacity ranging from shut off condition to at least 125% of rated capacity alongwith a tentative General Arrangement Drawing showing relevant details shall be submitted with the offer.
- 1.60.2 The successful bidder shall furnish the following drawings/data for Employer's approval after award of the contract.
- 1.60.3 All data furnished during bidding stage shall be treated as final and binding on the Contractor if, however, any, minor change is essential during detail design stage for any improvement in the system, such changes shall be carried out only after obtaining approval of the Employer.
- 1.60.4 The G.D2 values of the impeller of the pump and Rotor of the motor at 1500 R.P.M. (syn.) are to be furnished.

1.51 **INSTRUCTION MANUALS**

- a) The instruction manual shall present the following basic categories of information in a comprehensive manner prepared for use by operating and/or maintenance personnel :
- i) Instruction of Erection
  - ii) Instruction for pre-commissioning check up, operation, abnormal conditions, maintenance and repair.
  - iii) Write up on Controls and interlocks provided, if any
  - iv) Recommended inspection points and periods of inspections.
  - v) Schedule of preventive maintenance.
  - vi) Ordering information for all replacement parts.
  - vii) Recommendation for type of lubricants, lubricating points, frequency of lubrication and lubricant changing schedule.
  - viii) Trouble Shooting Procedure.

- b) The information shall be organized in a logical and orderly sequence. A general description of the equipment including significant technical characteristics shall be included to familiarize operating and maintenance personnel with the equipment.
- c) Necessary drawings and/or other illustrations shall be included or copies of appropriate final drawings shall be bound in the manual. Test, adjustment and calibration information as appropriate shall be included and shall be identified to the specific equipment. Safety and other warning notices and installations, maintenance and operating cautions shall be emphasized.
- d) A parts list shall be included showing part nomenclature, manufacture's part number and/or other information necessary for accurate identification and ordering of replacement parts.
- e) Instruction manual shall be securely bound in durable folder.
- f) If a standard manual is furnished covering more than the specific equipment purchased, the applicable model (or other identification) number, parts number and other information for the specific equipment purchased shall be clearly identified and highlighted. Sectional drawing to suitable scale and characteristic curves for the particular equipment supplied must be included in the Instruction manual.

13.00.00 **PROPOSAL DATA**

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

**DATA SHEET / CHECK LIST OF THE PUMPS BEING OFFERED**

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

1.00.00 **GENERAL**

- 1.01.00 Manufacturer :
- 1.02.00 Model No. :
- 1.03.00 Type of Pump :
- 1.04.00 Non Pullout : Yes/No
- 1.05.00 Impeller Type : Closed/Semi open/Open
- 1.06.00 No. of Pumps offered :
- 1.07.00 Efficiency of Pump at duty condition :  
for solo operation
- 1.08.00 Efficiency of Pump at duty condition :  
in parallel operation

	:	
2.00.00	<b>PERFORMANCES</b>	
2.01.01	Guaranteed capacity - M <sup>3</sup> /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	<b>PUMP NPSHR</b>	
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	<b>FLEXIBLE JOINTS AND SHAFT</b>	
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	<b>THRUST BEARING</b>	
4.00.01	Type	:
4.00.02	Whether separate thrust bearing for pump motor provided or not	:
4.00.03	Method of lubrication	
4.00.04	Whether the thrust bearing is capable for worst loading of both phases	:
4.00.05	Axial thrust at duty point (kg) approx	:
4.00.06	Whether thrust bearing temperature detector provided	:
5.00.01	Are the pumps suitable for parallel operation	:
5.00.02	Whether non-Reserve Ratchet is provided in pump or not	:
5.00.03	Type of lubrication for pump	:
5.00.04	Whether pre lubrication arrangement provided	
6.00.00	<b>EXPECTED LIVES UNDER NORMAL OPERATION AND MAINTENANCE</b>	
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 :

**2.0 MOTORS**

**2.01.00 SCOPE**

2.01.01 This specification covers the general requirements of the drive motors.

2.01.02 Motor shall be furnished in accordance with both this general specification and the  
accompanying driven equipment specification.

2.01.03 In case of any discrepancy, the driven equipment specification shall govern.

**2.02.00 STANDARDS**

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

**2.03.00 TECHNICAL SPECIFICATION FOR DRIVE MOTORS**

- 2.03.01 The drive electrical motors shall be of squirrel cage induction type vertical axis to suit the size of the pump and shall be able to drive the pump. The rating of the motor shall be minimum 75KW & 1500 RPM (Syn), 415V  $\pm$  10%, 3 Phase, 50 Hz  $\pm$  5%,
- 2.03.02 The motor shall be designed for Star / Delta starting arrangements. The motor starting current shall be guided by IS 12615.
- 2.03.03 All the motors shall be rated for continuous duty operation (duty : S1) IE2. However, due to the operational schedule of the pumping station, the pump motor unit may demand for 8/10 start and stop in a day with a minimum time gap of 20 minutes for one stop after prolonged operation and restart the same. The motor shall also be capable of one immediate hot restart and three equally 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 feels 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 to 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 directions.
- 2.03.10 The insulation of the stator winding of the motor shall be of Class-F but the heat exchanging arrangement shall be such that the temperature rise is limited to that of Class-B as IS:325 over the ambient temperature. The ambient temperature may be considered as 45°C and the relative humidity may vary from 80% to 100%.
- 2.03.11 The rotor of the motor should be sturdy in construction so as to ensure trouble free operation as indicated in relevant clause without any rotor bar fracture inside or outside the rotor slots or rotor bar end brazing failure or development of cracks in the brazed joint of the rotor bar with shorting ring. The rotor bar of the rotor shall be 99.99% electrolyte grade Cu and shall be well machined, insulated tightly placed and evenly press fitted inside the rotor slots, the later being broached to have smooth finish. The rotor shall be slotted end ring design. The rotor bars in the form of temple bars shall be used. Proper brazing materials shall be used.
- The rotor shall be dynamically balanced with all the fans and with key in the shaft extension.



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

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

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

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

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

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

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

otable in steps of 90°. The main terminal box should be suitable for 2 nos. 3 core, 1.1 KV grade, 120 sq.mm. Aluminium conductor, armoured, XLPE Cable. The terminal boxes shall be with removable cover with access to connection. No compound shall be used in the terminal box for easy handling. The motor terminal boxes shall be furnished with suitable cable lugs and double compression brass glands to match with the cable size. The terminals shall be clearly identified by phase markings and termination indication corresponding to direction of rotation.

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

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

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

- 2.03.14 The rating plate of the motor should contain, the minimum information as indicated in the relevant IS. Apart from the same, the information as indicated in relevant clause as well as the temperature rise in °C under rated condition, method of measurement, degree of protection shall be furnished.

- 2.03.15 The successful tenderer should furnish the motor load-efficiency curve, torque-speed curve load-power factor curve, thermal withstand curve (hot and cold), current-speed curve and current-time curve.

- 2.03.16 The dimensional drawing of the offered motor, terminal box drawings, load data, GD2 value of the drive unit and the driven unit shall be furnished to the EIC for approval.
- 2.03.17 Apart from the standard accessories provided by the motor manufacturer and those accessories mentioned in preceding paras, one local lock switch is to be provided with each motor having proper connection with the motor connecting switchgear so that the motor breaker can not be closed when the lock switch is in operation. The motor shall also be provided with suitable lifting lugs eye bolts having adequate provision for lifting installation.
- 2.03.18 The motor shall be provided with RTD's and BTD's for alarm and trip ( for rating 75 KW and above). The leads shall be brought out to a separate terminal box.
- 2.03.19 The routine tests as per IS:325 shall be conducted to each motor. Temperature rise test are to be conducted on at least one motor of each rating. The motor vibration tests shall be conducted mounting the motor on the shop motor stool. All the above tests are to conducted at the manufacturer's shop in presence of the departmental representatives. Apart from the shop testing, normal field testing are to be carried out during installation, pre-commissioning and commissioning. All necessary arrangements for the tests are to be made by the contractor.
- 2.03.20 Motors upto 5 KW shall be of DOL starting and beyond 5 KW shall be Star-Delta Starting

#### **CHECK LIST OF THE MOTORS BEING OFFERED**

- 1.01.00 Manufacturer of the Motor
- 1.02.00 Rates output in KW
- 1.03.00 No of Poles
- 1.04.00 Speed
- 1.05.00 Nos. offered
- 1.06.00 Type of duty & duty designation (as per IS 325)
- 1.07.00 Whether the motor is capable for operation after one hot restart and/or three equispace hourly restarts.
- 1.08.00 Supply conditions
- 1.08.01 Rated voltage (Volts)

- 1.08.02 Allowable variation in voltage (%)
- 1.08.03 Frequency (Hz)
- 1.08.04 Allowable variation in frequency considered
- 1.09.00 No. of phase
- 1.10.00 Stator connection
- 1.11.00 Currents
  - 1.11.01 Full load current
  - 1.11.02 No load current
  - 1.11.03 Starting current % of full load current
- 1.12.00 Efficiency at 100% & 75% load
- 1.13.00 Power factor at 100% & 75% load
- 1.14.02 No load power factor
- 1.15.00 Method of starting
- 1.16.00 Starting torque (% of full load torque)
- 1.17.00 Maximum torque (% of full load torque)
- 1.18.00 Acceleration time (sec.) from dead stop to full load speed
  - 1.19.00 With 100% terminal voltage
  - 1.20.00 With 85% terminal voltage
- 1.21.00 Safe stall time - cold/hot
- 1.22.00 Class of insulation
- 1.23.00 Ref Ambient (temperature EC)
- 1.24.00 Temperature rise in (EC) by resistance method & class which limited
- 1.25.00 Type of enclosure

- 1.26.00 Degree of protection
- 1.27.00 Installation
- 1.28.00 Shaft orientation & mounting
- 1.29.00 Space heaters - No proposed
  - 1.29.01 Number
  - 1.29.02 Rating (Watts)
  - 1.29.03 Voltage, Phase, Frequency
- 1.30.00 Whether separate terminal box provided for
- 1.31.00 Bearings
  - 1.31.01 Driving end
  - 1.32.02 Non-driving end
  - 1.32.03 Anticipated life (hours)
- 1.33.00 Recommended lubricant
- 1.34.00 Whether separate lubricant nipple provided
- 1.35.00 Interval of lubrication (hours)
- 1.36.00 Whether winding temperature detectors & bearing temperature detector provided  
( Rating 132 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<sup>2</sup>)

1.41.00 GD2 value of load to motor shaft (kg M<sup>2</sup>)

1.42.00 Painting

1.43.00 Earth terminal & lifting lug provided (Y/N)

1.44.00 Technical leaflets/literatures provided or not

**2.00.00 TESTS**

2.01.00 Upon completion, each motor shall be subjected to standard routine tests as per I.S. In addition, type test (Temperature rise ) of at least 1 no. motors as per choice of the customer, shall be performed. Further any special tests called for in the driven equipment specification shall be performed. The manufacturer/tenderer has to bear all expenses for such testing to witness the tests for max. two representatives of EIC to the 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 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.

**4.00.00 DRAWINGS, DATA & MANUALS**

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

4.01.00 Along with the bid :

Individual motor data as per Check List

4.02.00 After Award of the Contract for Approval :

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

## VALVES AND SPECIALS

### 11.01.01 Delivery side of pumps

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

### 11.01.02 Non Return Valve

The non return valve as mentioned here in before shall be manufactured conforming to IS: 5312 (Part-I) / equivalent international standard. The valves will be used for handling **Clear** water and to maintain unidirectional flow. The valve shall be maintenance free, leak proof and shall have low life cycle cost. The PN rating of valves shall be PN 1.0.

The non return valve shall be single door, Ductile Iron, double flanged, conventional non slam design. The body, door, cover shall be of ductile iron (Gr. GGG 40). The seat and body shall withstand fluid pressure of 10kg / cm<sup>2</sup> and 15 kg / cm<sup>2</sup> 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<sup>2</sup>.

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

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

### 11.02.01 Butterfly Valve

The butterfly valves shall be DIDF, PN 1.0, conforming to IS 13095 of 1996 / BS 5155. The seat pressure shall be 10 kg/cm<sup>2</sup> and body pressure shall be 15 kg/cm<sup>2</sup>. The valve shall operate smoothly & steadily in both direction, free from flow induced vibrations. The butterfly valve shall be double flanged, double eccentric design. The body, disc materials shall be of ductile iron (Gr. GGG 40). It should provide tight shut

off closures & shall be suitable for frequent operation as well as from throttled duty conditions. The valve disk should rotate 90° from full open to full close. The valve disk shall be solid streamlined slab design, and to have minimum head loss. The seat ring shall be of stainless steel (SS) with micro finished nickel / Monel overlay. The seating shall preferably be integral. The disc seal shall be of elastomeric EPDM. The EPDM seal on the disc must be of easy replaceable type with the facility of replacement at site. The shaft bearings shall be medium free, steel backed PTFE / bronze and suitable for maximum axial thrust imposed by the shaft during testing and in service. The fasteners shall be of SS 304.. The valve shall have suitable and adequate capacity of gear box actuator with hand wheel and indicating pointer. The gear box actuator unit shall be of so sealed type with necessary attachments such that external water do not enter the gear box housing to spoil the mechanism. The gear box shall be directly coupled to electrical actuators. The electrical actuators shall be complete with motor starter with reversing control gear, mechanical indication showing the amount of valve opening and shall have the following components.

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

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

#### **11.02.02 ELECTRICAL ACTUATOR**

1. The actuator motor for the BFV shall be suitable for use on 415  $\pm$  10% Volts, 3 phase, 50 HZ power supply and shall have high torque and low inertia squirrel cage motor having minimum class F insulated, 15 minutes rated and shall be with temperature sensing protection by a thermostat / thermistor directly embedded in all phases of the stator winding.
2. The actuator motor shall be provided with complete environmental protection during prolonged period of inactivity to prevent condensation and must have IP 68 degree of protection for continuous submergence.
3. The actuator motor must have high starting torque and it shall be suitable for 60 Starts / hour. The actuator gear box assembly shall be of the totally enclosed oil bath lubricated type and shall be suitable for operation at any angle.

4 The actuator assembly shall have a mechanically independent hand wheel drive for emergency manual operation of the valve by declutching the actuator motor drive by integral lever or otherwise. The drive shall be restored to power drive mechanism automatically on starting of the actuator motor.

5 The actuator assembly shall be provided with following limit switches

- i. torque limit switches for 'open' and 'close'
- ii. Position limit switches

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

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

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

The electrical actuators shall have the following components.

- a) 415V  $\pm$  12.5% 3 phase, 50 Hz, AC motor.
- b) Reduction gearing arrangement.
- c) Torque & limit switch mechanism.
- d) Valve position indicator.



- e) Arrangements for pick up signals for displaying the % opening of the valves in the suitable meters to be placed on control desk.
- f) Remote operation facility with selector switch and local control console.
- g) The hand wheel with clutch mechanism for manual operation. The manual operation shall be automatically declutched when actuator motors in operation.
- h) Motors shall be of outdoor construction, IP 68 protection group suitable for continuous submergence.

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

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

One M. S. dismantling joint of suitable diameter is to be fixed in each of the individual delivery and one no along with the Flow meter & BFV on the water delivery main for the ease of dismantling and fitting of Flow meter during maintenance and to relieve the pipe line stresses. The expansion range for each of the dismantling joint shall be minimum 40 mm. The M. S. dismantling joint shall be complete with long stud (SS 304) holding arrangements with split flange matching with the site requirement. The hydrostatic test pressure of the DJ shall be 10 kg/cm<sup>2</sup>. One leak proof concrete chamber if required as per site condition is to be constructed. The Dimension of the Chamber would however depend on the final alignment and level of the site condition

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

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

The pipes shall be made up of M.S. 8 mm thick plates for individual delivery line and Common Delivery manifold, painted both inside and outside by anticorrosive epoxy paints. The pipes shall be of welded joints and shall consist of necessary companion flanges so as to connect the piping with the DJ, NRV, BFV's of the individual pump delivery branch. The pump individual delivery side piping shall be connected to be common delivery manifold as per the layout. Necessary gaskets of suitable thickness shall have to be provided to all flange joints complete with all necessary nuts, bolts, washers etc. The length shall be ascertained from the layout and from the dimensions of the valves/specials.

The common delivery manifold shall of such diameter as per the Technical offer. The manifold shall be fabricated from 8mm thick MS plates. The common manifold shall have blank flange / Dish end on one side with adequate stiffening ( as applicable) and

the other side would be extended from the centre line of the last pump to install one each Dismantling Joint, Butterfly valve, Air Release Valve and further as required to install one Full bore Electromagnetic flow meter. The length of the manifold must be extended at least one meter on one side after the interconnections with the delivery pipe lines from the pumps at the one extreme end and in the other end it will be extended up to the specified length.

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

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

#### **19.00 Pressure Gauge (Dial Type):**

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

The bourdon tube shall be of SS 316. The gauge shall have cast aluminium weather proof case and casing shall be black stove enameled. The accuracy shall be of  $\pm 1\%$ . The full scale range shall be from 0 -10 Kg / Sq.cm. The pressure gauge shall have 3 way cock and fitting.

#### **4.0 TRANSFORMER**

There will be total two (2) number of transformers, each having a capacity of 400 KVA.

The voltage rating of the Transformer shall be 11 KV /433V

Normally the specification of all the transformers are, 11 / 0.433 KV with neutral brought out, 3 ph, 50 c/s, Dyn 11 vector group, shall be supplied and installed by the contractor. Each of the transformers should be equipped with:

- i) Conservator with drain valves and oil gauge.
- ii) Silica gel breather
- iii) Bidirectional rollers
- iv) PRV with contact.
- v) Oil filter valve
- vi) Transformer tank drain valve, one upper and one lower.

- vii) Earthing terminals – 2 nos.
- viii) Air relieve plugs
- ix) Rating and diagram plate
- x) Bucholz's relay with Alarm and Trip
- xi) OTI with Alarm and Trip contacts
- xii) WTI with Alarm and Trip contacts
- xiii) MOG with contact
- xiv) Marshalling box with contacts of Bucholz, OTI, WTI, MOG & PRV duly wired up to the terminal block

Transformers will be wound with 99.99% electrolytic grade copper wires / flat and the H.T. sides of the transformer will be fitted with OFF circuit tap changing device with a range of +5% to -10% in step of 2½%.

Primary side (H.T.) terminal box shall be suitable for terminating one no. 11 KV grade, 300 sq. mm, Al. conductor 3 core XLPE insulated cable complete with sealing and armour clamping gland.

Secondary (L.T.) terminal box shall be suitable for terminating 1.1 KV grade, 300 sq. Mm as required, Al. conductor 4 core XLPE insulated cable complete with sealing and armour clamping gland.

Transformers shall be supplied in fully oil filled condition. Transformers should be manufactured according to latest I.S.S. Manufacturers' test shall be carried out in presence of the representative of M.E.Dte. and a test certificate to be submitted. Temperature rise of the transformer shall not exceed 50 / 75°C over oil / winding and also comply with IS 1180 & IS 2026 Latest version, as applicable only in so far as they are applicable.

- 4.1 Two nos. 400 KVA 11 KV / 0.433 KV, DYN 11, ONAN, Distribution Transformer to be manufactured, shop tested, supplied, erected, tested & commissioned generally in conformity with latest revision of IS.
- 4.2 The transformers shall be of the latest design & the transformers shall be suitable for indoor installation. The transformer shall be suitable for operation at full rated power on all tapings without exceeding the following temperature rise. Winding temperature rise - 75 ° C over ambient of 45° C.

- 4.3 The transformer shall be double copper wound and having CRGO silicon steel made core built up with class 'A' insulation, designed and constructed with particular reference to tropical conditions.
- 4.4 The transformer shall be designed to be capable of withstanding, without injury, the thermal and mechanical stress of short-circuits between phases or between phase and earth at the terminals of any winding with full voltage applied across the other winding. The transformers shall be capable of withstanding specified through fault currents for 2 seconds.
- 4.5 The transformers shall operate with minimum noise and vibration. The cores, enclosure / protective housings and other structural parts shall be properly constructed and windings properly braced so that the mechanical vibration is kept to the minimum, thus reducing the noise. The core-coil assembly shall be fixed in such a manner that no shifting or deformation occur during shipment or installation.
- 4.6 The transformer shall be designed for minimum losses as per I.S.1180 guidelines. All mechanism shall be of stainless steel, brass, gunmetal or other suitable material to prevent sticking due to rust or corrosion. If any temporary fitting is fixed to the enclosure / protective housing of a transformer for transporting / handling purposes, these shall be identified as well as instructions and illustrated drawings shall be furnished to facilitate their removal at site after erection.
- 4.7 The transformer shall have off-circuit tap changer in H.T. winding in steps of 2.5% for range (+)5% to (-) 10 %.
- 4.8 Neutral terminal of star connected winding of each transformer shall be designed for the highest over current that can flow through the terminal. The neutral terminal shall in the LV cable terminal box. The transformer also shall have one additional brought out neutral which is intended to be directly connected to earth permanently.

4.9 The transformer shall be generally conformity with latest revision of IS: 11171-1985 (reaffirmed-2001) and IEC: 726 (1982). Ref standard IS 2026 (Part-I to PartII) IS 10028 (PII) IS 1180 etc. shall be applicable only in so far as they are applicable.

#### 4.10 Transformer Fittings

The transformer shall be fitted with all standard and special fittings and accessories as per IS and CBIP Standard and shall include but not being limited to the following:

- a) Rating, diagram and tap connection plates
- b) Terminal marking plate
- c) Earthing terminal - 2 nos.
- d) Lifting lugs, jacking pads and haulage lugs / holes
- e) Winding temperature indicator with Alarm & Trip contacts.
- f) Oil temperature indicator with Alarm & Trip contacts.
- g) Buchholz's relay with Alarm and Trip contacts.
- h) PRV with Trip contact.
- i) MOG with contact
- j) Externally operated Off-circuit tap switch with position indicator
- k) Cable terminal boxes (both HV & LV side)
- l) Bi-directional wheels with locking and bolting devices

4.11 Each transformer shall be provided with a stainless steel rating plate fitted in a visible position showing the followings.

- a. Kind of transformer
- b. Ref to IS standard
- c. Manufacturer's name
- d. Manufacturer's serial number
- e. Year of manufacture

- f. Number of phases
- g. Rated KVA
- h. Rated frequency
- i. Rated voltage
- j. Rated current
- k. Connection symbol
- l. Percentage impedance voltage at rated current
- m. Type of cooling
- n. Total mass in Kg.
- o. Quantity of Oil.
- p. Percentage Impedance.

#### 4.12 Transformer losses

Transformer losses shall be guided by the I.S.1180 guideline.

#### 4.13 Following shop tests shall be carried out on the transformer along with the other tests in presence of departmental representative –

- a) Measurement of winding resistance.
- b) Measurement of voltage ratio and check on voltage vector relationship.
- c) Measurement of impedance voltage/ short circuit impedance on principal tapping and load loss.
- d) Measurement of no load loss and current.
- e) Measurement of insulation resistance

#### 4.14 TECHNICAL PARTICULARS OF THE TRANSFORMER

Type	:	Indoor
Nature of cooling	:	ONAN
No. of phases	:	3 (three)
Winding connection & vector group	:	DYn-11
Rated frequency	:	50 cycles/sec.
Rated KVA	:	400 KVA
Rated primary voltage	:	11 KV
Rated secondary voltage	:	0.433 KV
Method of system earthing	:	Secondary solidly grounded
Tap-Changer	:	Off-circuit Tap-changer (OCTC) (+) 5% to (-) 10%
Tapings	:	in steps of 2.5%
HV side terminal arrangements for terminating cable.	:	Cable end box on HV side suitable 11 KV grade 3 core 300 sq.mm. XLPE

LV side terminal arrangements: Secondary (L.T.) terminal box shall be suitable for terminating 1.1 KV grade, 300 sq. mm as required, Al. conductor 3.5 core XLPE insulated cable complete with sealing and armour clamping gland.

### 3.0 HTPDB

- 3.1. The HT PDB shall be multi panel switch board suitable for indoor installation and shall operate at 11 KV $\pm$ 10%, 3 $\phi$ , 50 Hz  $\pm$  5% AC earthed system. The Switchboard shall comprise of the following
- I) Incomer panel – 1 no
  - II) Outgoing transformer feeder panel – 2 nos.
- 3.2. The switch gear shall be indoor, metal clad, floor mounted, horizontal isolation and horizontal draw out type and shall be suitable for trouble free and continuous operation at

11 KV  $\pm$  10%, 3 phases, 3 wire, 50 Hz  $\pm$  5%, grounded system. The switch gear will be located in a hot, humid and tropical atmosphere.

Design and construction shall be such so as to allow extension at either ends. The base channel frame of the switch gear along with all hardware shall be within the scope of the contract.

The switch gear enclosure shall conform to the degree of protection IP-4X. The minimum thickness of sheet used shall be 2 mm except the gland plate where the sheet thickness shall be 3 mm.

The switch gear assembly shall comprise a continuous dead front, line up of free standing, vertical cubicles. Each cubical shall have front hinged door with latches and a removable back cover. All covers and doors shall be provided with neoprene gaskets.

Circuit breakers, instrument transformer, bus bars, cable chamber etc. shall be housed in separate compartments.

- 3.3 The Switch gear shall be fully wired at the factory to ensure proper functioning of indications, control, protection, transfer and inter-locking scheme.

Fuse & links shall be provided to permit individual circuit isolation without disturbing other circuits. All spare contacts of relays, switches and other devices shall be wired up-to terminal blocks.

Wiring shall be done with flexible, 1.1KV grade PVC insulated switchboard wires with stranded copper conductors of 2.5 sq. mm for control and current circuits and 1.5 sq. mm for voltage circuits.

Each wire shall be identified with both ends with permanent marker bearing wire number as per contractor's wiring diagram.

Wire termination shall be made with crimping type connectors with insulating sleeves.

Not more than two wires shall be connected to any terminal. At least 25% spare terminal shall be furnished in the terminal block.

- 3.4 Switch gear shall be designed for cable entry from bottom. Sufficient space shall be provided for ease of termination and connection.

Power cables shall be XLPE insulated, armoured, overall PVC sheathed with stranded aluminum conductors.

Control cables shall be XLPE insulated, armoured, overall PVC sheathed with 2.5 sq. mm stranded copper conductors.

All provisions and accessories shall be furnished for termination and connection of cables, including removable gland plates (3 mm thick), cable supports, crimping type tinned copper / aluminum lugs, brass compression glands with washers and terminal blocks.



- 3.5 The main buses and connections shall be of high conductivity electrolyte grade copper, sized for specific current rating with maximum temperature rise limited to 90°C. Bus-bars and connection shall be fully insulated for working voltage with adequate phase / ground clearance. Insulating sleeves for bus bars and cast resin shrouds for joints shall be provided.

All buses and connections shall be supported and braced to withstand stress due to maximum short circuit current and also to take care of any thermal expansion.

Bus-bars shall be color coded for easy identification and the bus-bar chamber shall be provided with inter panel barrier with epoxy cast seal-off bushings through which the buses will pass through so as to prevent fire from one panel to other.

- 3.6 A copper ground bus, rated to carry maximum fault current for 3 secs., shall extend for full length of the switchgear. The ground bus shall be provided with two bolt drilling with GI bolts, nuts and washers at each end to receive GI flat of adequate sizes to withstand earth fault current.

CT & VT secondary neutrals shall be earthed through removable links so that earth of the one circuit may be removed without disturbing the others.

Each stationery unit shall be directly connected to the ground bus.

- 3.7 The circuit breaker shall be vacuum type triple pole 800 Amps, 25 KA for 3 secs., horizontal draw out, horizontal isolation having Service / Test / Isolated position with positive indication for each position. The V.C.B. shall have 220 V AC motorized spring charged trip free mechanism and mounted on a carriage complete with self contained manually operated fully interlocked, raising and lowering mechanism with integral earthing / earthing truck. The operating mechanism shall normally be operated from remote electrical control but arrangement should also be made for local electrical control. Mechanical device shall also be provided on the breaker for manually tripping and closing. Each set of the circuit breaker shall have the following features:

- a) 1 set mechanical ON & OFF indicator.
- b) 1 rear entry cable box with glands suitable for 11 KV grade XLPE cable.
- c) 1 set of indicating lamp ON / OFF / TRIP / SPRING CHARGED / TRIP 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 and closing coil rated for 110 V DC.
- f) 1 space heater with ON & OFF switch
- g) 15A / 15A 3 Pin Plug Socket
- h) In – panel lighting with control switch
- i) Space heater for each Switchgear panel
- j) 240 V AC Alarm Bell & Buzzar for non – trip fault & trip with provision for alarm cancellation ( common )
- k) Auxiliary switches with required contact.
- l) 1 suitable label

In addition, 1 no resin cast and draw out type PT shall be provided suitable for 3 phase, 3 wire 5 limb 50 Hz system with a ratio of 11 KV /  $110 / \sqrt{3}$  /  $110 / \sqrt{3}$  volts, 100 VA, class 1.0

/ 3 P. Symmetrical breaking capacity of the circuit breaker shall be 25 KA and making capacity shall be 62KA. The short time rating of the circuit breaker shall be 25 KA for 3 secs.

The circuit breaker shall be capable of carrying rated current at 45°C ambient temperature without derating.

3.8 The feeder details of the Multi panel HT PDB shall be as under:

A) Incoming feeder Panel: 1 No. ( 800 A )

- |       |   |   |                     |
|-------|---|---|---------------------|
| i)    | 96 sq mm ( 0 – 12 KV ) Voltmeter with Selector Switch   | - | 1 Set               |
| ii)   | 96 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<br>( 3 Nos. ) |
| vi)   | Microprocessor based draw out directional combined IDMTL over current & earth fault relay type P127 or equivalent | - | 1 No.               |
| vii)  | Over voltage relay type VAGM 22 with timer (For three phase monitoring)   | - | 2 Nos.              |
| 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                                  | - | 1 No.               |

445 or equivalent

xi)	Power Factor Meter	-	1 No.
xii)	KW Meter	-	1 No
xiii)	8 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	-	2 Nos.

- ix ) Auxiliary relay type VAA – 23 or equivalent - 1 No.
- x) 8 Channel alarm annunciator & Indicating Lamps - 1 Set

C) Common for all above feeders:

- i) Anti – pumping relay

3.9. Following power supplies shall be arranged to switch-gear.

AC Supply: 220V AC from MCC cum PDB to the switch-gear panels

DC Supply: 110V DC supply in each panel by duplicate feeders shall be made available from the station battery bank / Battery Charger / DCDB stated elsewhere. Hooking up with the station switchgear and other equipments is within the scope of the contractor and shall be done through cables.

- 3.10. All equipment, accessories and wiring shall have fungus protection. Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent the entrance of insects. All surfaces shall be sand blasted, pickled and grounded as required to produce a smooth, clean surface free of scale, grease and rust. After cleaning, the surfaces shall be given a phosphate coating followed by two coats of high quality primer and stove after each coat.

The switch gear shall be finished in RAL 7032 with two coats of epoxy paints

3.11 Notwithstanding whatever mentioned elsewhere in the document, following tests shall include but not necessarily limited to the following:

- (a) Operation under simulated service condition to ensure accuracy of wiring, correctness of control scheme and proper functioning of the equipment.
- (b) All wiring and current carrying part shall be given appropriate high voltage test.
- (c) Primary current and voltage shall be applied to all instrument transformers.
- (d) Routine test shall be carried out on all equipment such as circuit breakers, instruments, transformers, relays and meters.

All tests shall be performed in presence of owner's representative.

Certified copies of all the tests carried out at the manufacturer's premises shall be furnished in three copies.

## 5.0 Technical Specification OF 415 V, 2 Incomer & 1 Bus Coupler PDB at Substation

- 5.1 The PDB is required to provide power to the Pump House MCC cum PDB and auxiliary load at the Sub-station
- 5.2 The PDB shall be suitable for 415 V  $\pm$  10%, 50 Hz  $\pm$  5%, 3 phase, 4 wire supply system. The incoming power shall be provided from the secondary side of transformers.
- 5.3 The PDB shall be 2 mm CRCA sheet steel enclosed, floor mounted type, self supporting, fully compartmentalised, dust & vermin proof, cubicle pattern, non-draw out and modular in construction. It shall be finished painted with powder coated paint after necessary chemical treatment for rust free surfaces and application of anti rust chemical coating. The base frame of the panel shall be made of ISMC – 75 channel.
- 5.4 The PDB shall be dead front type with concealed type hinged doors at front and bolted covers at the rear. All hinged doors shall be interlocked with the respective switchgears such that the same cannot be opened while the feeder is ON.
- 5.5 It shall have rear access and the cable termination arrangement shall be provided at the rear of the respective feeder modules. For incomers, extended 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.
- 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 1000 A for phases and 500 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 core 300 sq mm XLPE insulated armoured aluminium cable as required. The control wiring of the panel shall be done with 1100 V grade PVC insulated 2.5 sq mm flexible copper wire with copper lugs and ferrule marking at each end.

All hinged door shall be earthed with flexible copper wire.

5.9 A continuous earth bus of size 50 x 8 mm and made of aluminium shall run throughout the length of the panel with drilled holes at the end for connecting the same with the station earth bus bar.

5.10 Feeder details with mounted components

The feeder details are as under:

5.11 800A incoming feeders 2 nos. each comprising of following components:

- |      |  |        |
|------|--|--------|
| i)   | 415 V, 4 pole, 800A, 50 KA electrically operated drawout 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  | 3 Nos. |
| vii) | CB ON / OFF / TRIP / Spring Charged Indicating Lamp  | 4      |
|      | Nos.   |        |

- viii) TNC Breaker Control Switch 1 No.
- ix) Local / Remote Selector Switch 1 No.

5.12 800 A Bus coupler feeder one (1) number comprising of following components:

- i) 415 V, 4 Pole, 800 A, 50 KA electrically operated drawout 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, 630A, 50 KA electrically operated drawout type MCCB/ACB with microprocessor based O/L, S/C, E/F & shunt trip release 1 No
- ii) 96 sq mm, suitably scaled Ammeter with cramped scale 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<br>Nos. | 4     |
| v)  | TNC Breaker Control Switch                                  | 1 No. |
| vi) | Local / Remote Selector Switch                              | 1 No. |

5.14 MCCB / MCB feeder 7 Nos. of following rating

- |       |  |         |
|-------|--|---------|
| i) a) | 32 / 63A TPN MCCB with Microprocessor based O/C & E/F releases<br>(Adjustable O/L) rated upto 50 <sup>0</sup> C without duration | 5 Nos.  |
| b)    | ON / OFF / Trip Indicating Lamp (For each feeder)  | 15 Nos. |

- |     |             |   |
|-----|-------------|---|
| ii) | 32 A DP MCB | 3 |
|-----|-------------|---|
- Nos.

5.15 Technical Specification of Air Circuit Breaker ( ACB )

The ACB shall be rated as specified elsewhere at 50<sup>0</sup> 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

## **6. AUTOMATIC POWER FACTOR IMPROVEMENT CAPACITORS**

### **6.1 Multi – Stage Automatic Power Factor Improvement Capacitor Bank (APFC Panel)**

There will be two number of APFC panels connected with the two bus sections of the PDB each of which shall have the capacity individually for compensation of the total loads. The APFC panel shall be indoor type, totally enclosed, metal clad, dust free and vermin proof, free standing, floor mounted type and integral to the PDB. The panel shall be made from 14 SWG. MS Sheet steel chemically treated with application of red oxide primer & 2 coats of synthetic enamel paint of approved colour shade. The capacitors shall be of APP type. The capacitors shall conform to IS 2834 of latest amendments.

The panel would be of suitable capacity with 3 phase and neutral with 415 V, TPN, suitable rated, 50 KA MCCB fitted with microprocessor based O/L, Short Circuit, Earth Fault (Adjustable), as Incomer.

The main and earth bus bar should be of appropriate size made of electrolytic grade 'Aluminium'. The panel shall be complete in all respect with adequate stages and rating of capacitor bank to generate the required KVAR at 525 V as per requirement to improve P.F. as near as 0.98 for each section of the Bus. The capacitors should come into line automatically with certain time delay for which contactors / relays / timers should be used. Suitable current transformer and potential transformer is to be used. There shall be also provision for manual push button operation in addition to the auto mode. Switches with HRC fuses should be provided for each current circuit. P.F. meters in incoming & outgoing are to be placed alongwith one ammeter for displaying the improvement in P.F. achieved. The panel should be with all interconnection complete. The control wiring should be with 2.5 sq mm 'Cu' single core conductor of 1.1 KV grade cable.

### **7.0 415 V Multi panel MCC cum PDB(A) at Pump House**

7.1 The MCC cum PDB is required to provide power to the Pump Motors, auxiliary load and Main Lighting Distribution Board at Pump House.

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

7.3 The MCC cum PDB shall be 2 mm CRCA sheet steel enclosed, floor mounted type, self supporting, fully compartmentalised, dust & vermin proof, cubicle pattern, non-draw out and modular in construction. It shall be finished painted with powder coated paint after necessary chemical treatment for rust free surfaces and application of anti rust chemical coating. The base frame of the panel shall be made of ISMC – 75 channel.

7.4 The MCC cum PDB shall be dead front type with concealed type hinged doors at front and bolted covers at the rear. All hinged doors shall be interlocked with the respective switchgears such that the same cannot be opened while the feeder is ON.

7.5 It shall have rear access and the cable termination arrangement shall be provided at the rear of the respective feeder modules. For incomers, extended 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.

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 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.

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 core 300 sq mm XLPE insulated armoured aluminium cable. The control wiring of the panel shall be done with 1100 V grade PVCinsulated 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, 630A, 50 KA ACB with O/L, S/C, E/F &shunt trip release	1
	No	
ii)	96 sq mm, suitably scaled Ammeter with cramped scale &selector switch	1 No.
iii)	96 sq mm, 0 – 500 V Voltmeter with selector switch	1 No.
iv)	Current Transformer of suitable ratio & 5A secondary, Class: 1.0, 15 VA	3 Nos.
v)	Current Transformer of suitable ratio & 5A secondary, Class: 5P10, 10 VA	3
	Nos.	
vi)	Red, Yellow, Blue phase indicating lamp	3 Nos.
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.	

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

i)	415 V, 3 Pole, 630 A, 50 KA electrically operated drawout
----	---

MCCB/ACB without release.  
1 No.

ii)	TNC Breaker Control Switch No.	1
iii)	Local / Remote Selector Switch No.	1
iv)	Bus Coupler ON / OFF / Spring Charged Indicating Lamp	3

Nos.

7.12 75KW Star – Delta Starter Motor feeders , each comprising of following components  
:Type 2 coordination should have to be followed.

( Number of feeders shall be no. of Pump sets installed 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<sup>0</sup> 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.

7.13 MCCB / MCB feeder of following rating

- i) a) 32 A TPN MCCB with Microprocessor based O/C & E/F releases 8 Nos.  
(Adjustable O/L) rated upto 50<sup>0</sup> C without duration
- b) 63 A TPN MCCB with Microprocessor based O/C & E/F releases 2 Nos.  
(Adjustable O/L) rated upto 50<sup>0</sup> C without deration
- c) ON / OFF / Trip Indicating Lamp (For each feeder) 48 Nos.
- ii) 16 A DP MCB 3 Nos.

7.14 The incomer of PDB cum MCC shall be MCCB for accumulated load upto 150 KW and ACB for accumulated load beyond 150 KW

**8.00 TECHNICAL SPECIFICATION FOR CONTROL DESK AND INSTRUMENT PANEL**

**8.01 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 in the 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 ( for Sump water level )  | - | 1 No.    |
| d) | Digital Flow rate indicator, totaliser and recorder for each group of pump  | - | As reqd  |
| e) | Multifunction meters ( for H.T. PDB incomer & Incomers of PDB at Substation and MCC cum PDB ) type ELITE 445 or equivalent  | - | 5 Nos.   |
| f) | 96 sq mm ( 0 – 12.0 KV ) & ( 0 – 500 V ) Voltmeter for Incomer of H.T. PDB, Incomers of PDB at Substation and MCC cum PDB   | - | 5 Nos.   |
| g) | 96 sq mm Ammeter ( for all feeders of H.T. PDB, Incomers of PDB at Substation and MCC cum PDB & all installed motor feeders )   | - | 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. | - | As reqd. |
|    | The annunciator shall be complete with all accessories as required to detect the fault signal of different parameters of the system   |   |          |
| 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 Incomer / under voltage for Motor feeders ) of MCC cum PDB
- ii) M.V. Feeder Trip for over current & earth fault ( for all ACB feeders )
- iii) Transformer Feeder-I Oil Temperature high alarm & trip
- iv) Transformer Feeder-II Oil Temperature high alarm & trip
- v) Transformer Feeder-I Winding Temperature high alarm & trip
- vi) Transformer Feeder-II Winding Temperature high alarm & trip
- vii) Transformer Feeder-I Buchholz alarm
- viii) Transformer Feeder-II Buchholz alarm
- ix) Transformer Feeder-I PRV trip
- x) Transformer Feeder-II PRV trip
  
- xi) Motor winding temperature high alarm & trip
- xii) Motor Bearing temperature ( DE & NDE ) high alarm & trip
- xiii) water Level low ( alarm )
- xiv) water Level low / low ( trip )
- xv) r water Level high ( alarm )
- xvi) AC failure
- xvii) Bell for alarm signals
- xviii) 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 at least 6 nos. spare windows.

#### ON HORIZONTAL FACE

- |      |   |   |          |
|------|---|---|----------|
| a)   | Trip – Neutral – Close spring return type heavy duty breaker control switch (for all feeders of H.T. PDB and other ACB 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, ACB feeders and motor feeders of MCC cum PDB )                                     | - | 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   | - | 3 Nos.   |
| f)   | Ammeter Selector Switch   | - | As reqd. |

### 9.00 Battery & Battery Charging Equipment

There shall be one battery bank along with float and boost charger. The battery bank shall be Exide make 110 V Sealed Maintenance free VRLA battery with UPST type 55 nos. 2 volt 100Ah cells.

Inter row connectors / inter tier connectors shall be provided where necessary. Suitable battery stand complete with cell number plate shall be provided.



The three phase float and boost battery charger with integral DCDB shall be housed in a floor mounting type steel enclosure with adequate ventilation for natural air cooling. The broad specification of the float and boost charger with DCDB is as under :

Battery: 110 V, 100 AH SMF VRLA ( 2 V x 55 Nos. )

Load : 10 A DC, Boost: 15 A DC

#### 9.1 A.C. Input

- a) Voltage : 415 V,  $\pm 10\%$
- b) Phase : 3 Phase, 4 Wire
- c) Frequency : 50 Hz  $\pm 6\%$
- d) Combined voltage & frequency variation within :  $\pm 10\%$
- e) System earthing : Solidly earthed

#### 9.2 Float and Boost Battery Charger

##### 9.2.1 Charger – I ( Float Charger – SCR Control )

- a) Output Voltage : 110 – 125 V DC [ 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 :  $\pm 1\%$
- f) Ripple voltage : 1% RMS

##### 9.2.2 Charger – II ( Boost cum Float Charger – SCR Control )

- |  |  |
|--|--|
| a) Output Voltage                                  | Boost : 110 – 127 V DC [ steplessly adjustable ]<br>Em. Float: 110 V – 125 V DC [ steplessly adjustable] |
| b) Output current                                  | Boost: 15 A D.C.<br>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<br>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 fine wire mesh

## **10.00 CABLE:**

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

### **10.01 HT &M.V. Cables and Jointing**

All HT and M.V. Cables shall be 11 KV ( E ) / 1.1 KV grade XLPE insulated and armoured of Al / Cu. conductor 3 core / 3½ / 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 500 mm width x 750 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.

### **10.02 Control cable and jointing**

All Control cables shall be XLPE insulated of 1100 volts grade multi strand copper conductor and armoured of suitable size. The control cable should be terminated with proper sockets, glands etc. At least 2 cores shall be kept as spare in all control circuits.

## **FLOW SENSOR**

There shall be one number of Full bore Electromagnetic flow meter on the common delivery manifold. The flow meters is to be installed and commissioned for measuring the instant flow rates as well as the total flow for a period of time of the station passing throughout the common manifold. The flow rates shall be indicated in m<sup>3</sup>/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 50 mtr. away from the transmitter installation point on the pipe line. Amplification of signals, if necessary, are to be incorporated. The flow meter must be capable of measuring velocity of water upto 3 m / sec with accuracy of ± 0.5%. Flow sensitivity must be ± 0.3 m/s at any flow rate. The linearity of the instrument shall be 0.1% of

scale. The sensor must have enclosure of class IP-68. The tenderer shall clearly indicate the position of flow sensor. The data sheet for flow sensor is as follows.

The flow meter will be full bore electromagnetic type should be capable to handle flow of Clear Water.

Type:- Pulsed DC electromagnetic.

Accuracy:-  $\pm 0.5$  % of measure value.

Repeatability:-  $\pm 0.2$  %

Size of flow meter:- As per designed diameter of the common delivery manifold.

Sensor type:- In line full bore electromagnetic.

Process connection:- Flanged type.

Weather protection class:- IP68 NEMA 6 P or as per the specified by EIC.

Minimum conductivity:- 20 us/cm

Full scale velocity:- 1 to 5 m/sec.

Process temperature:- 50 °C max.

Process pressure:- 10 Bar max.

Electrodes:- SS 316 L/ SS 316.

Coil housing :- SS304

Flange MOC:- Carbon steel .

Flow sensor tube:- SS304

Cable between sensor and transmitter:- Copper cable of single Length as required as per site condition between sensor and transmitter.

Flow transmitter:- Microprocessor based, wall mounted.

Type of display of transmitter:- Display should be LCD or LED type and the size should be suitable for making it visible from at least 6m distance.

Out put:- 4-20 mA DC

Power supply :- 240 V AC 50 Hz and shall be supplied from the MCC cum PDB at a approximate distance of 50 m.

Input:- From flow tube

Web server:- The flow meter should be compatible for connection with web server for remote facility display facility.

Protection class :- IP 68.

Calibration shall be accredited according to ISO/IEC 17025.

### **13.00 Flow meter/ Flow sensor or Flow Tube fixing chamber**

For fixing of Flow Tube at the delivery manifold, leak proof chamber of adequate dimension is to be constructed if required as per site condition with a rung-ladder of suitable length for getting down.

### **RADAR TYPE LEVEL MONITORING SYSTEM**

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.

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.

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

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.

The signal output shall be 4 – 20 mA and accuracy level shall be  $\pm 0.25\%$ .

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.

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

### **EARTHING**

The total installation shall be effectively earthed by providing a ring main earthing. Each earthing set shall consist of one G.I. pipe of not less than 2" dia and 10' length. The electrode shall be buried below the ground upto the depth of moist earth which shall not be less than 8'-0" from ground level and must be 6'-0" away from any building

structure. The bottom portion of the electrodes shall be properly perforated and one cast iron cap properly screwed of approved type and design and shall be fitted on the top of the electrode, connection leads to the earth bus inside the station. After fixing and drawing out of the earth leads, the top portion of the earth, electrode upto 1 ft. shall be properly brick pitched and shall be fitted with water proof bituminous compound. The connecting lead shall be GI strip 75 x 8 mm and shall be laid at a depth of not less than 600 mm from ground level. The leads shall be connected to GI earth bus bar inside the pumping station by means of proper welds. The nos. of individual earthing connected to the Earth bus should such that after installation the earth resistance of the system must be well below one ohm.

One GI bus bar 75mm wide and 8 mm thick shall be provided so that the frames of all electric motors, switch gears, transformers and other electrical accessories and installation shall be connected to this station earth bus by two separate GI strip of adequate dimension. All metallic cover frames, equipments, installation etc. shall be earthed to the full satisfaction of Engineer-in-charge and the Govt. Electrical Inspector.

The earthing and bonding shall be according to the I.E. Rules 1956 with ammendment of 1990. All non current carrying metal parts associated with H.V. installation shall be effectively earthed to the grounding system to achieve:

- a) Limit the touch and step potential to tolerable values;
- b) Limit the ground potential rise to tolerable values so as to prevent danger due to transfer of potential through ground, earth wires, cable sheath etc.
- c) Maintain the resistance of the earth connection to such a value as to make operation of the protective device effective.

The same must be approved by the Govt. Electrical Inspector and shall pass the statutory tests.

The successful tenderer shall have to submit the detailed and fully dimensioned drawing of the whole electrical system showing the proper earthing duly approved by the Govt. Electrical Inspector before commencement of the actual installation work.

The distance between each individual Earth Pits should not be less than 3 meters.

## **16.00 LIGHTING SYSTEM**

### **16.01 Luminaries**

The scope includes indoor lighting of pump house, substation building, Annex area and reasonable area lighting around the Pump House and Substation Building. Industrial Medium bay luminaries with LED 150W lamps are to be provided in a row alternatively in the beams at each of the pump house ceiling. Motor/ Operating floor lighting should be provided with LED T/L industrial type fixtures and to be fixed on the wall at a level above the lintel. The positions are to be finalized as per requirement and direction of the E.I.C. The illumination level would be 150 Lux.

The SubstationRoom lighting should be provided with LED T/L type fixtures with reflectors tentatively 2X18W with watt cool day light type (Brilliant White). Illumination level would be 200-250 Lux.

In the corridors, toilet, LED T/L with are to be provided to generate an illumination level of 150 Lux.

Area illumination level 100 LUX with suitable LED fittings.

All the entrance/exists of pump house shall be provided with LED down lighter or bracket mounted fittings with LED lamps of minimum 45 W as per site condition ( minimum 90W for unloading bay entrance).

**16.02 WIRING**

All wiring installation work must be as per relevant I.S. with proper distribution network, M.C.B. are to be used in distribution boxes and there must be colour segregation for power/netural/ground wires.

16.03 In strategic locations of the substation building / pump house, adequate number of 415 / 240 volt TPN / SPN MCB Distribution board shall be placed with multiple ways of different current rating (MCB ) along with a incoming switch from where power to be fed to different switch board.

16.04. Individual switch board shall comprise of multiple number of switch (6/10 Amps rated) as the case may be, which shall be used for switching 'ON' and "OFF' operation of the lights / fans / receptacles etc. The individual switch board shall be double door design so as to cover up the switch / regulator etc i.e. switches / regulator etc shall be accessible on opening the door cover.

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

16.06 440 volt, 15 Amps and 240 volts/15 Amps socket outlet shall be provided where ever required and power shall be taken from the individual way of the distribution board.

16.07 The minimum required size of the conductor for internal distribution point wiring shall be as follows:

Sl. No	Type of fitting /wiring	Minimum size of wire
1.	LED Fluorescent	2 nos. 1 core -1.5 mm <sup>2</sup> copper & 1 no. Earth wire of 1.0 mm <sup>2</sup> copper
2.	LED Flood light fitting	2 nos. 1 core -2.5 mm <sup>2</sup> copper & 1 no. Earth wire of 1.0 mm <sup>2</sup> copper



3. Receptacle-5A 2 nos. 1 core -2.5 mm<sup>2</sup> copper & 1 no. Earth wire of  
1.0 mm<sup>2</sup> copper
4. Receptacle-15A 2 nos – 1 core-4 mm<sup>2</sup> copper & 1 no Earth wire of  
1.0 mm<sup>2</sup> copper

## **17.00 Ventilation & Fire fighting System:**

- 17.01 Ventilation: The entire pump house including all electrical rooms and the Sub Station Rooms shall have proper ventilation arrangement. The scope shall include the supply and fixing of following equipments complete with GI conduit wiring / armoured cable including all other accessories as required.
- a) 3 - phase suitable Exhaust fans including proper louvers, duct work, rain cowl and bird protection screen ----- As required for the Pump House to ensure 10 Air changes/Hr..
  - b) Single phase suitable Exhaust fans including proper louvers, duct work, rain cowl and bird protection screen ----- As required for all the rooms of Sub Station as per the direction of EIC.
  - c) Wall mounting type control panel for exhaust fan and others ----- 2 Sets, one each for pump House and substation.
  - e) 18" Pedestal fan with regulator and all other accessories --- 3 Nos.
- 17.02 Fire Extinguisher
- a) ABC type Portable type fire extinguisher consisting of welded cylinder, squeeze lever discharge valve, internal discharge tube, discharge nozzle suspension bracket, duly charged and pressurized with ISI marked.
  - b) ABC stored pressure type fire extinguisher 5 Kg capacity with discharge hose and nozzle and consisting of welded cylinder, squeeze lever discharge valve, internal discharge tube, discharge nozzle suspension bracket, duly charged and pressurized with ISI marked.
  - c) Dry type fire extinguisher 5 Kg capacity with discharge hose and nozzle and consisting of welded cylinder, squeeze lever discharge valve, internal discharge tube, discharge nozzle suspension bracket, duly charged and pressurized with ISI marked.
  - d) Fire buckets (9 litre capacity) made from 24 SWG GI Sheet including wall mounting bracket and filling of sand.

## **18.00 Pressure transducer / Pressure Sensor**

- i. The pressure transducer / pressure sensor shall be used to indicate the 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 and most reliable. The pressure port shall be from stainless steel and shall be 100% leak proof.
- iii. The accuracy of the sensors/ transducers shall be  $\pm 0.25\%$  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.

## **20.00 OVERHEAD CRANE**

### **20.1 Manually Operated Travelling Crane**

The EOT. Crane will be minimum 5 M.T. capacity Electrically Operated Travelling Crane (E.O.T.) with a lift from the operating floor level and up to the level above the installed motors. The long travel & the Cross Travel along with height of lift of the crane shall be finalised after freezing of the Pump House layout drawing. Suitable type of Crain rails, girders and all other accessories as necessary for installation and operation of the crane are to be designed & provided by the contractor within the lump

sum quoted amount. The two travels of the main hoists i.e Long, Cross and the hoisting operation shall be manually operated. The buffers must be spring loaded operation.

The EOT Crane should be tested at manufacturer's works / site as per relevant IS. The same may be witnessed by the EIC. The Contractor has to arrange for such testing at his own cost.

## **SECTION -J**

### **List of Vendors**

<b>Sl. No.</b>	<b>Equipment</b>	<b>Make</b>
01.00	Pump	Kirloskar / Mather & Platt / WPIL Ltd.
02.00	Motor	Siemens / ABB / Marathon /Crompton
03.00	Control Desk/ MV Switchboard / MCC cum PDB	Siemens / Sellwin / ABB/Schneider / PCE Projects/ Bhartiya Cutler Hammer / RNR / ECS
04.00	ACB/MCCB	L&T / Siemens / ABB / Schneider
05.00	Fuse Switch Unit	L&T / Siemens / ABB / Schneider
06.00	Breaker control switch	Kaycee / Recom / Alstom
07.00 BCH	Relays	Schneider / ABB / ER/ Siemens(Reyrolle) /
08.00	Contactors	L&T/ Siemens / ABB / Schneider
09.00	Meters	AE / IMP / Enercon/ Secure
10.00	Cable :	
10.01	HT &LT Cable	Gloster / Polycab / Havells / UCL
10.02	Control / Signal Cable	Gloster / Polycab / Havells / UCL
11.00	Pressure Transmitters	Siemens / ABB / Honeywell / Micro System
12.00	Digital Indicators	Micro System / Mecoc

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, Indicator, Totaliser	Krohne / Endress Hauser/ ABB/Siemens
16.00	Control Fuses	GE/Siemens
17.00	Current Transformer	Kappa/JAWS / Schneider
18.00	Capacitor	Unistar / L&T / Epcos
19.00	Butterfly Valves, Non-Return Valve& Sluice Valve	VAG/ IVC / Kirloskar / Fluidtech/IVI
20.00	Valve Actuators	Rotork / Auma
21.00	Gauges	Bell/Taylor's/H. Guru
22.00	Fire Extinguishers	Surex / Minimax / Cease Fire / Fire Shield
23.00	Submersible Sump Pump	KSB / Calama / Kirloskar
24.00	Air Conditioner	Carrier / LG / Voltas
25.00	Lighting system	
26.01	Light Fitting	Philips / Bajaj/C.G/KLITE
26.02	Wire	Finolex / KDK / Havells
26.03	Switches	Anchor / Havells / Cab
27.00	Ventilation System / System /	P.N. Chakraborty & Co. / Universal Air PASCO
28.00	Exhaust Fan / Ventilation Fan	Alstom / EPC / Pasco / Marathon
29.00	Crane	Surekha / Pilcare / India Engineering & ImplementsCo.
30.00	H.T. Switchgear	Siemens / Schneider/ ABB /PASCAL
31.00	Power Transformer	Schneider / KEC/ Voltamp (Vadodara) / GE
32.00	Battery	Exide
33.00	Battery Charger	Caldyne / Electro Service

Superintending Engineer, West Circle  
Municipal Engineering Directorate.

Technical Specification /Scope of Work for Major E/M Equipments for Damra IG

SI No	Description of Item	Qty	Unit
1	Supply, Delivery , Installation, Testing & commissioning of 580 M3/hr 27 M head Vertical Turbine Pump –Motor Set with all other accessories with 75 KW, 4 Pole, 415 V, IE2 Motor.	3	Set
2	Supply, Delivery & Installation of MS pipes and special, expander / reducer with accessories on Common Delivery Manifold.	1	Lot
3	Supply, Delivery , Installation,Testing & commissioning of valves complete with fixtures.		
3.a	350 mm dia. Actuator operated Butterfly Valve.	3	no.
3.b	500mm dia. Actuator operated Butterfly Valve.	1	No.
3.c	350 mm dia. Non-Return Valve.	3	no.
4	Supply, Delivery , Installation,Testing & commissioning of MS Dismantling Joint.		
4.a	500 mm dia. Dismantling Joint	1	No.
4.b	350 mm dia. Dismantling Joint.	3	no.
5	Supply, Delivery , Installation,Testing & commissioning of 500mm dia full bore Electro-magnetic Flow Meter with Indicator & Totaliser	1	no.
6	Radar Type Level Monitoring System for IG Water Level	1	Set
7	Supply,installation, Testing & comissioning of 11 KV, 800 Amps, 25 KA 3 Panel VCB Switchboard	1	Set
8	Supply,installation, Testing & comissioning of 400 KVA, 11/0.433 KV Dyn11 ONAN Transformer	2	no.

9	Supply,installation, Testing & comissioning of 415 V PDB with APFC panel at Substation	1	Set
10	Supply,installation, Testing & comissioning of 415 V MCC cum PDB at Pump House.	1	Set
11	Supply,installation, Testing & comissioning of Remote Control Desk and Instrument Panel	1	Set
12	Supply,installation, Testing & comissioning of 110 V DC 100 Ah with 55 cells sealed maintenance free battery with float and boost charger cum DCDB as per specification	1	Set
13	Supply,installation, Testing & comissioning of Exhaust /ventilation system in the Substation and Pump House.(J)	1	Lot
14	Supply, Delivery , Installation,Testing & commissioning of HT, LT and Control Cable		
14.1	From WBSEDCL Summation Panel to 11 KV VCB Incomer and from 11 KV VCB Outgoing ( 2 nos. ) to 2 nos. 400 KVA Transformer, 11 KV grade 3 core 300 sq mm, Aluminium, XLPE insulated, Armoured cable.	1	Lot
14.2	From 400 KVA Transformer secondary to Incomers of 415 V PDB at Substation and from outgoing of 415 V PDB to Incomer of 415 V MCC cum PDB at Pump House. 1.1 KV grade 3½ core 300 sq mm,2 Run, XLPE insulated, Aluminium, Armoured cable	1	Lot
14.3	From 415 V MCC cum PDB to 2 ( two ) nos. motor terminals each with 2 x 3 core, 120 sq mm, XLPE insulated Aluminium, Armoured cable	1	Lot
14.4	1.1 KV grade 4 core 4 sq mm & 4 core 2.5 sq mm ( Cu) stranded cable for Battery charger, DCDB AT Substation / Lighting Distribution Board, Exhaust fan , valve actuators, AC & DC supply	1	Lot

14.5	Control cable for HT & LT feeder control and indication 12 Core 2.5 sq , 7 Core 2.5 sq mm , 5 Core 2.5 sq mm , 3 Core 2.5 sq mm ( Cu ), stranded XLPE insulated armoured cable	1	Lot
15	End termination(J)		
a	HT cable	1	lot
b	1.1 KV grade (Al) conductor cable	1	lot
c	1.1 KV grade(Cu) conductor power & control cable	1	Lot
16	Supply, Installation, testing& commissioning of earthing system for substation & pump house equipment including lightning protection.(J)	1	lot
17	Supply, Delivery , installation , Testing & commissioning of Fire Extinguisher, fire buckets ,rubber mats, glow sign board etc.. (J)	1	lot
18	Supply, Delivery & installation of MS materials for cable tray / rack, panel support, valve support, fabricated stairs etc.	1	job
19	supply, installation, testing& commissioning of illumination system of the pump house, substation and Yard. (J)	1	item
20	Supply, Delivery& installation of 5 Ton EOT Crane with all allied equipment	1	job
21	Supply Delivery & Installation of pressure transmitter 0-10kg/cm2 as per Specification & direction of E.I.C	4	no
22	Dehydration of Transformer oil, High pressure Testing on all HT equipment and medium pressure testing on 415 V equipment including charges of Govt. Electrical Inspector.	1	item
23	Supply, Delivery& Installation of Pressure Gauge as per T.S & Direction of E.I.C	4	no

24	Performing of all short of test including complying with reminded measure.	1	job
25	Charges for DG Set / Temporary power connection from WBSEDCL for construction purpose (J).	1	item
26	Synchronizing and offload onload trail run & commissioning the entire system.	1	job
27	Operation & maintenance of the complete substation and pump house for a period of 5 years.	60	month

Note: The scope of work of E/M is indicative not exhaustive and will be finalized in detailed design.

Vendor List for construction material to be read as

### **CONSTRUCTION MATERIALS**

1	Cement (Premium Grade)	ACC / ULTRATECH / AMBUJA / JSW
2	Reinforcing Steel -	TATA / SAIL/RINL/JSW/JSPL
3	Structural Steel -	SAIL / JINDAL / TATA
4	Plasticiser / Water Proofing Compound -	SIKA / CICO/ DR. FIX IT
5	Stone chips -	PAKUR / CHANDIL/PANCHAMI VARIETY
B	<b>EQUIPMENT, VALVES, PIPES &amp; FITTINGS</b>	
1	G. I. Pipe -	TATA/JINDAL /BANSAL
2	M.S Pipes	SAIL / TATA/JINDAL
5	UPVC Pipe -	EMCO / ORIPLAST / LONG LAST / SUPREME / SIMPLEX
		CALCUTTA SPUN PIPES &



7	NP2 & NP3 Concrete Pipe -	INDUSTRIES, ARAVINDA SPUN PIPES INDUSTRIES, BHAGIRATHI ENGINEERING
8	Rubber Gasket -	POPULAR RUBBER PRODUCTS / DURABLE POLYMER PRODUCTS (P) LTD/PAUL RUBBER INDUSTRIES.
9	D.I.D.F. Pipe and Fittings -	ELECTRO STEEL CASTING LTD./ KEJRIWAL CASTING / KISWOK
10	DI SPECIALS -	ELECTRO STEEL CASTING LTD./ KEJRIWAL CASTING / KISWOK

Note: All other materials beyond the approved list will be approved by the Superintending Engineer, West Circle, MED

*Kml*  
20/02/23  
Superintending Engineer, West Circle  
Municipal Engineering Directorate  
Superintending Engineer  
West Circle, M.E. Dte., Burdwan  
Date: 20/02/23  
Govt. of West Bengal

Memo No. :- MED/SE(W)/745<sup>(1-15)</sup> /W-268/2022

Copy Forwarded for information and for favour of wide circulation to:

1. The Hon'ble Mayor, Asansol Municipal Corporation,
2. The District Magistrate, Paschim Bardhaman.
3. The Commissioner, Asansol Municipal Corporation,
4. The State Mission Director AMRUT, ILGUS Bhawan, HC Block, Sector-III, Saltlake, Kol106.
5. The Secretary, Asansol Municipal Corporation,
6. The Chief Engineer, M.E.Dte., Bikash Bhawan, Saltlake, Kol-106.
7. The Chief Engineer KMDA (E/M), Unnayan Bhawan, Saltlake Kolkata,
8. The Chief Engineer, Asansol Municipal Corporation.
9. The Superintendent Engineer KMDA (E/M), Saltlake Kolkata
10. The Executive Engineer, M.E.Dte. Asansol Division.
11. The Executive Engineer (E/M), M. E. Dte., Kolkata,
12. The Divisional Accountant, Municipal Engineering Directorate, Asansol Division
13. The Finance officer, Asansol Municipal Corporation.
14. The Office Notice Board of Superintending Engineer, West Circle, for wide circulation.
15. The Guard File.

*Kml*  
20/02/23  
Superintending Engineer, West Circle  
Municipal Engineering Directorate  
Superintending Engineer  
West Circle, M.E. Dte., Burdwan  
Dept. of UD & MA  
Govt. of West Bengal