

# RAJKOT MUNICIPAL CORPORATION

e - Tender No. RMC/WMU/CZ/2025-26/01(Retender)



**CONSTRUCTION OF 24.19 ML CAPACITY RCC GROUND SERVICE RESERVOIR, PUMPING STATION WITH ALL ELECTRICAL-MECHANICAL WORK AND 3 ML CAPACITY 24.0 MT. STAGING HEIGHT RCC ESR AND OTHER MISCELLANEOUS WORK INCLUDING COMPREHENSIVE OPERATION & MAINTENANCE FOR 2 YEARS AT MADHAPAR IN RMC AREA**

## Volume-II Technical Specifications & Drawings



<b>Milestone Dates for e-tendering is as under</b>		
1.	Downloading of e-Tender documents	01/07/2025 To 18/07/2025 up to 17:00 Hrs.
2.	Pre-bid meeting	05/07/2025 at 11:30 hrs. Onwards at Central Zone office RMC
3.	Online submission of e - Tender	18/07/2025 up to 18:00 Hrs.
4.	Physical submission of EMD, Tender fee and other document required as per Financial and Experience criteria by Regd. Post. A.D. / Speed Post (By Indian Post Department only)	Up to 28/07/2025 18:00 Hrs.
5.	Opening of online primary bid(Technical bid)	29/07/2025 at 11:00 Hours onwards
6.	Verification of submitted documents (EMD, e - Tender fee, etc.)	30/07/2025 at 11:00 Hours onwards
7.	Agency to remain present in person along with original documents for verification	31/07/2025 between 11:00 to 18:00 Hours
8.	Opening of online Commercial Bid (Price Bid) for Technically qualified bidders only	02/08/2025 at 11:00 Hours onwards (If Possible)
9.	Bid Validity	120(One Hundred Twenty)Calendar Days
For further details, pre-qualification criteria etc. visit <a href="http://www.rmc.nprocure.com">www.rmc.nprocure.com</a>		

**2025-26**  
**ADD. CITY ENGINEER (I/C)**  
**WATER MANAGEMENT UNIT**  
**RAJKOT MUNICIPAL CORPORATION**  
**DR. AMBEDKAR BHAVAN,**  
**DHEBARBHAI ROAD, RAJKOT**

## **:: TECHNICAL SPECIFICATIONS ::**

### **A. GENERAL**

#### **1. SCOPE OF CONTRACT :**

The scope of work under this Single Responsibility Contract includes construction of all works as described in subsequent paras to achieve the objective to construct Water distribution station and ESR with Electrical Mechanical work & Miscellaneous work as per good and acceptable engineering practices and workmanship manner.

The R.L. of ground level is as indicated in enclosed survey map for indicative reference of bidder. All levels are shown in R.L with respect to GTS benchmark. The scope also includes level survey & geotechnical survey of plot to derive soil bearing capacity, strata classification and details of water table etc. However, bidders to note that all tender drawings and data are indicative for bidder's guidance only and RMC shall not be held responsible for the correctness of same and bidder shall be responsible to obtain all required data on their own prior to bidding.

The site is having highly undulating ground levels on site, (bidder to refer contour survey / carry out site visit) and bidder shall note that required dewatering / diversion work as required as per site condition is included in the scope of bidder in order to smoothly carry out the construction activities at site without affecting the progress / time of completion of project.

#### **2.2 MAJOR COMPONENT OF WORK**

The major scope of work for this work shall be as under :

- Inter Connection between existing Chlorination Tank to proposed Sump by providing and laying MS pipe of 711 mm dia. With inside lining and outside coating as mentioned in Schedule B with specials and Providing and fixing sluice valve with expansion bellows, valve chamber, thrust block etc. complete.
- Construction of 241.9 Lac litre capacity underground sump and pump house. **(The construction of underground sump and pump house shall be strictly as per GAD attached in the tender). The structural design of underground sump and pump house shall be as per latest IS Revision. structures shall be designed for uplift in empty conditions with no live load. Water table to be considered up to ground level while designing the structure for uplift. Rock anchors shall be allowed to resist the uplift pressure for which no extra payment shall be made.**
- The RCC Underground sump shall be in RCC M-30 grade concrete.
- Even though its mentioned in Point no 4 of Volume-III Price bid, The reinforcement shall be CRS type TMT Fe-500 only no TMT bar shall be allowed in water retaining structure.

- 100 mm thick P C C levelling course in M -15, Refilling the pit with proper soil and disposing of the surplus stuff at all lead including 20 mm thick cement plaster in CM 1:2 With approved water proofing compound to all over inside container (i.e. walls, base, top slab/dome bottom etc. all) including all types of labour and material charges of lowering, laying, erecting / hosting and jointing of pipe assembly to inlet, outlet overflow, washout and bye pass arrangement as per hydraulic design Providing and fixing accessories, CI Manhole frame and cover water level indicator, adequate cowl type ventilators or lantern type ventilator with stainless steel jail RCC chambers for valves Providing and applying three coats of cement paint/snowcem to the out side face of structure It also includes satisfactory water tightness test as per relevant IS code and painting name of scheme and capacity on the tank as per direction of engineer in charge.
- DI pipes and special shall only be used if type IS not specified in tender.
- The rate shall include cost of dewatering during excavation making all arrangement when water table meets Within depth
- RCC railing shall be provided along the RCC staircase inside the sump.
- RCC staircase/RCC Steps should be provided from GL to sump top slab.
- Appearance of structure should be aesthetically good looking acceptable to authority
- Pump house shall be RCC Frame structure in M 25 grade concrete with Kota Stone flooring, Door, Window with mosquito net, China mosaic tiles on terrace including inside Plastic Paint 2 Coat with Base Coat and Birla Putty and outside Weather shield Exterior Paint 2 Coat with base coat. paint as per approved GAD by RMC and as directed by engineer in charge.
- Outside plaster shall be 20 mm thick sand faced plaster in two coats (first coat 12 mm thick in cement mortar 1:3 and second coat 8 mm thick in cement mortar 1:2)
- Inside Plaster shall be 15 mm thick in cement mortar 1:3 in pump house or any other building in the headwork
- Construction of HT Room (Min. 5 mt. x 5 mt.) and Security cabin (Min. 3 mt. x 3 mt.), office 5 m. x 3 m. in RCC Frame structure in M 25 grade concrete with Kota stone flooring, Aluminium Extruded Door/ Window Section with inside inside Plastic Paint 2 Coat with Base Coat and Birla Putty and outside Weather shield Exterior Paint 2 Coat with base coat. with China mosaic on terrace with all electrical wiring and fixtures as per approved GAD and as directed by Engineer in charge.
- Construction of Transformer yard and D. G. Set, Chlorination Shed, Scrubber Otta etc., in RCC M 25 grade concrete. Corrugated sheet for ceiling work with Iron purline and ridge with oil paint should be provided above foundation.
- Construction of toilet block (Min. Size 6.0 mt. x 3.0 mt.) in RCC frame structure in M 25 grade concrete with all necessary plumbing items and 1000 litre HDPE storage tank above toilet block and inspection chamber as per requirement.
- Construction of 3.0 ML ESR with 24 mt St. Height in RCC M-30 grade concrete shall be on RCC shaft type only. No other type of ESR structural design shall be permitted. From Sump to ESR the rising main line shall be of Both Side Flange ended DI pipe K-9 Grade with relevant fixing materials

- In head work all RCC / steel structural design shall be as per Seismic Zone – IV
- In head work campus excavation for all lines shall be upto to 2.0 mt. depth with minimum 200 mm thickness sand bedding. As per ISI 3370 minimum grade of PCC in water tank structure shall be in M-20.
- All scour chambers shall be design for easy removal of silt from GSR. GSR top shall be covered with IPS as per IS.
- Design and construction of 30 Lit. capacity 24 m. st. ht. ESR with inlet, outlet, overflow & washout MS pipe as per Schedule B with valve, valve chamber, flowmeter chamber, bypass line etc. complete. GAD attached.
- All inside surfaces of ESR shaft and inside bottom of vessel shall be applied appropriate plaster and color as per relevant BIS. Also top surface of top slab of ESR shall be covered with IPS as per relevant BIS.
- In ESR all duct foot band shall be designed with structural support for easy repairing in case of water leakages.
- ESR central shaft shall be designed and extended up to terrace of ESR.
- Agency shall have to install standard brand 24 x 7 working, equipped with the latest technology – 4k high resolution , motion detection , nigh vision type 3 nos of camera with recording facilities of 3 month storage, during whole construction period. The camera shall have facility for 24 x 7 live telecast broadcasting.
- In all scour chamber there shall be provision of flange ended close plate after valve.
- Inside ESR shaft well there shall be provision of well finished PCC type 150 mm thick bottom flooring.
- ESR supply main line shall have provision of bye pass line with same dia of additional valve with DJ before flow meter for easy maintenance work.
- ESR wash line shall be connected with GSR scour open trench up to the nearest water way or storm water connection.
- All sump shall need to provide air vent window individually in each sump top cover slab.
- Agency shall have to provide decent – detailed model of Madhapar head works to keep that model in office.
- The design, development and implementation of head works construction shall be very ideal and of top quality of workmanship.
- Design Conditions for Elevated Service Reservoir.
  - (i) The foundation depth shall be minimum 4 (Four) meter or up to hard rock strata whichever is more.
  - (ii) In case of supporting structure as a shaft, the minimum diameter of the shaft shall be 12 mt. and tolerance limit in the diameter will be  $\pm 0.5\%$ . The thickness of the shaft shall not be less than 350 mm and grade of concrete for shaft and foundation shall be M-30.
  - (iii) The minimum thickness of components of container will be as under:
    - a) Bottom dome 300 mm
    - b) Conical dome 600 mm
    - c) Cylindrical wall 300 mm
    - d) Top dome 200 mm
- Construction of compound wall with retaining wall in M-30 grade concrete, gate, transformer yard with wire fencing, D G set, foundation, toilet block (GAD attached), scrubber otta, chlorination system shed & other miscellaneous work at Madhapar Head work.
- READY MIX CONCRETE shall be allowed from locally available plant, approved by PMC consultants & Engineer in charge with submission of necessary documents of quality control.

- The outside plaster will be from the top of raft upto top of GSR
- Plinth protection to be provided in all buildings / structures as required (Along with ESR / GSR). No extra cost will be paid. All the building shall be provided with 1000mm wide plinth protection of 75 mm thick CC 1:2:4 laid over 150 mm consolidated rubble soling.
- SS pipe railing is not required above GSR even if height is more than 1.5 m. Contractor to quote accordingly.
- The compartment wall of GSR will be paid extra as per actual quantity executed at site during execution.
- Bypass system for the outflow supply pipe of ESR shall be provided.
- An expansion bellow of 900 mm NB / 300 mm length should be provided as per requirement.

**LIST OF APPROVED VENDORS FOR CIVIL WORKS:**

<b>ITEMS</b>	<b>Approved Brands / Quality</b>													
CEMENT	Ultra Tech, Ambuja, ACC, Sanghi, Siddhi, Hathi, TATA													
Steel	CRS Fe 500 or higher grade steel procured from approved manufacturer like TISCO [TATA] , SAIL, VIZAG , Electrotherm, JSW , Essar													
TILES	Somany, Kajaria, Jonson, Asian , Simpolo, Varmora													
Plastic Paint	Dulux / Asian													
EXTERIOR WEATHER PROOF EMULSION PAINT	Dulux /Asian													
Oil Paint	Dulux /Asian / Jotun/ Indigo/ Global													
SANITARY WARE	Cera / Hindware / Parryware/ Kohler/ jaguar/ Simpolo													
CAST IRON PIPES and FITTINGS.	TATA, SAIL, ESSAR , ESPAT AND JINDAL [JSW], RATNAMANI													
CAST IRON Gate Valve/ SLUICE / BUTTER FLY VALVES/Air Valve i.e. all type of valve.	[PROCURE OF ANY OF BRAND, VALVE SHALL BE WITH ISI MARK ONLY] <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>KIRLOSHKAR</td></tr> <tr><td>Fouress Engineering (India)</td></tr> <tr><td>VAG Valves (India) Private Limited</td></tr> <tr><td>Bharat Engineering Works, Dhrangadhra</td></tr> <tr><td>K.P. Mondal- Hawrah</td></tr> <tr><td>Jupiter Engineering Co- Hawrah</td></tr> <tr><td>HAWA ENGINEERS LTD- Ahmedabad</td></tr> <tr><td>Veelson Valves Pvt. Ltd.- Jalandhar</td></tr> <tr><td>Sachdeva Metal Works- Jalandhar</td></tr> <tr><td>G M ENGINEERING PVT. LTD.- Rajkot</td></tr> <tr><td>Zoloto Industries, Jalandhar</td></tr> <tr><td>R &amp; D MULTIPES PVT. LTD. (Plant- 2 , Valsad)</td></tr> <tr><td>G. M. Dalui &amp; Sons Pvt. Ltd-</td></tr> </table>	KIRLOSHKAR	Fouress Engineering (India)	VAG Valves (India) Private Limited	Bharat Engineering Works, Dhrangadhra	K.P. Mondal- Hawrah	Jupiter Engineering Co- Hawrah	HAWA ENGINEERS LTD- Ahmedabad	Veelson Valves Pvt. Ltd.- Jalandhar	Sachdeva Metal Works- Jalandhar	G M ENGINEERING PVT. LTD.- Rajkot	Zoloto Industries, Jalandhar	R & D MULTIPES PVT. LTD. (Plant- 2 , Valsad)	G. M. Dalui & Sons Pvt. Ltd-
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<b>ITEMS</b>	<b>Approved Brands / Quality</b>
	Howrah SSPR Valve Manufacturing Private Limited, Howrah Perfect Valves Pvt. Ltd. Jalandhar
MS PIPES & SPECIALS	SAIL, ESSAR , ESPAT AND JINDAL [JSW], WELSPUN,RATNAMANI
D.I. DF PIPE K-9 TYPE WITH SPECIALS AND FITTINGS OF K - 9/K-12 TYPE	JINDAL, ELECTROTHERM, , TATA, ESL Steel ltd, Welspun D.I. Pipes Ltd
P.V.C. PIPES AND FITTING (UPVC/CPVC)	Finolex, Supreme, Jain, ,Ashirwad, Astral, Dutron
CHROMIUM PLATED WATER SUPPLY FITTINGS	ESSCO, Crown, Metro, Prince Jaguar, SUNT, Leader, Ebco
GALVANIZED PIPE	'B' class Zenith, Ambica, Tata
GALVANIZED FITTINGS	'R' Brand, NVR, Unik, Sun
C.I. MANHOLE COVER	Manish, Sil, NECO,RISHI
PLUMBING FIXTURES	Jaguar / Cera/Hindware/Simpolo
PVC WATER TANK (100% VIRGIN PVC)	Syntex / Aqua / National
ALUMINIUM SHEETS AND ACCESSORIES	Jindal, Hindalco, Banko
ALUMINIUM EXTRUDED DOOR/WINDOW SECTION	Indal, Jindal, Ajin India, Aldowin, Alumilite
ALUMINIUM HARDWARE	Rajdoot, Belu, Diamond, Glider
M.S. ANGLE SECTION	Any I.S.I. BRAND
WATER PROOFING MATERIALS	Zycosil, Dr. Fixit, Polychem SIKKA FORCEROCK,Mapie, or as directed by engineer in charge
Electro Magnetic Flow Meter	ABB, E+H, Krohne Marshall, Siemens, Yokogawa , Arohi, Itron

**Notes:**

- A) The contractor shall produce samples of the materials for approval of the RMC/PMC. The materials of the makes out of the above as approved by the RMC/PMC shall be used on the work. Consultant/RMC/PMC member has not abide to give any reason for rejection of any brand from the above list and its decision will be consider as final.
- B) In respect of materials for which approved makes are not specified above, these will be of makes to be decided by the Consultant/RMC / PMC.
- C) The agency has to use item/material mentioned in the list above. But in exceptional cases, other alternate brand/company shall be allowed after prior approval of Consultant/RMC/PMC

In addition to above the contractor should strictly follow the following instructions.

1. RMC will not allow any deviation in any level of GSR & ESR.
2. If any additional soil is excavated then the contractor should refill the same with compacted soil / PCC / concrete as directed by Engineer in charge without any extra payment.

3. The capacity of ESR is to be written on the container of the ESR.
  4. The Contractor should provide concealed pipe line for CCTV installation.
  5. The Contractor should complete total station survey, soil investigation, preparation and approval of GAD & Structural design and drawing with completion of labour colony within 1 month after getting work order.
  6. The progress report (physical with photographs) should be submitted to RMC in hard and soft copy.
  7. The Contractor should provide drone survey and photography / videography during foundations stone laying ceremony & inauguration ceremony.
  8. The provision of generator set should be kept by contractor at site (24 x 7).
- Construction of compound wall with 2.1 mt. AVERAGE height above FGL as per specifications with inside and outside plaster with painting as per requirement.

Scope for Electro-Mechanical-Instrumentation works for **Construction of Water Distribution Station (WDS) at Madhapar of RMC** shall include Supply, Erection/ Installation at site, Testing and Commissioning of various Equipment of Mechanical/ piping, Electrical and Instrumentation works as specified here below and in the SOQ and shall be complete in all respects as per Tender specifications at Proposed Pump house. The bidder shall note that the scope shall also include any other work or item/material as required to complete the work in all respects for the supply and for satisfactory installation, testing, commissioning and satisfactory operation of specified equipment/ pumping station.

Scope shall include inspection of equipment as applicable as per tender specifications at manufacturers' works by Third Party Inspection (TPI) agency and Client's Representative(s). Expenses incurred towards the inspection like commercial fees, To and Fro charges, lodging and boarding etc., delivery of equipment at site or store as instructed by Engineer-in-charge, unloading and storage at site etc. shall be borne by contractor.

Scope of work shall include submission of Technical Datasheet duly filled in for major equipment in the format given in Tender Technical Specifications at the time of Drawings/Documents approval.

**The scope of Mechanical work shall include but not limited to the following:**

Supply, Installation, Testing & Commissioning (SITC) of 5 Nos. (3W + 2S) Vertical Turbine Pump-Motor Sets having capacity of 800 m<sup>3</sup>/hr and 45 m bowl head coupled with electric drive / motor along with all required accessories like gland drain piping/arrangement, coupling, foundation bolts & nuts, etc. complete as per Tender specification, SOQ & Drawings.

Supply of pump spares for above VT Pump shall be supplied as under.  
Pump Shaft, Spiders, Bowl Assembly etc. (Qty.: 1 set)

SITC of CI/DI DF Electric Actuator operated resilient seat type Sluice valve of PN 1.0 at delivery of each pump along with all required accessories and hardware as per Tender specification, SOQ & Drawings.

SITC of CI/DI DF Manually operated resilient seat type Sluice valve with extended spindle & head stock of PN 1.0 at each scour pipe along with all required accessories and hardware as per Tender specification, SOQ & Drawings.

SITC of CI/DI DF Manually operated resilient seat type Sluice valve of PN 1.0 at header drain line along with all required accessories and hardware as per Tender specification, SOQ & Drawings.

SITC of CI/DI DF Electric Actuator operated resilient seat type Sluice valve with extended spindle and head stock of PN 1.0 at compartment wall & at suction compartment inlet along with all required accessories and hardware as per Tender specification, SOQ & Drawings.

SITC of CI/ DI DF Non Return Valve of PN 1.0 at delivery of each VT pumps along with all required accessories and hardware as per Tender specification, SOQ & Drawings.

SITC of CI/DI DF Electric Actuator gear operated Butterfly Valve of PN 1.0 at common header line after flowmeter along with all required accessories and hardware as per Tender specification, SOQ & Drawings.

SITC of CI/DI DF Temper proof Flanged Air valve of PN 1.0 along with isolation sluice valve at common header line after BFV along with all required accessories and hardware as per Tender specification, SOQ & Drawings.

SITC of S.S. Metallic Expansion Bellows of PN 1.0 at Delivery of each VT pumps, at common Header Pipe near BFV near Flow meter, 2 Nos. at ESR O/L line near Flow meter along with all required accessories, hardware and as per Tender specification, SOQ & Drawings.

SITC of S.S. Metallic Expansion Bellows of PN 1.0 at each Sump Inlet line near Flow meter along with all required accessories, hardware and as per Tender specification, SOQ.

Supply, Cutting, Fabrication, Welding, and Installation & Testing of MS pipes and Fittings for each pump delivery, header line and as required for required to connect header with RM, any other to complete the work in all respects as per Tender specification, SOQ & Drawings.

Supply & Installation of MS Flanges of PN 1.0 as required for delivery of each pump and each header to connect with RM and any other to complete the work in all respects as per Tender specification & SOQ.

SITC of C.I. double flanged puddle pipe along with crimping flange at sump compartment wall etc. as per tender specification and SOQ.

SITC of uPVC pipes and fittings suitable for minimum Schedule 40 rating pressure as required with connection complete as per IS & Tender specifications.

SITC of Single girder E.O.T. crane of adequate capacity with electrically operated hoist, trolley and carriage and required motors of suitable

capacity, wire ropes, breaks, etc. for lowering/lifting heavy material at Pump house & Chlorination Room along with all necessary wiring/ cabling, pendant type control station etc. as per Tender specification, SOQ & Drawings.

SITC of 1 no. monorail electric chain hoist with electrically operated trolley of adequate capacity at pump house for loading & unloading for lowering and lifting with all required accessories and hardware as per specifications and tender SOQ.

SITC of Chlorination system each of 10.0 kg/hr. capacity comprising of floor mounted vacuum operated chlorinator along with all required items, piping, accessories, hardware's, chlorine leak detector, safety equipment & testing kit along with associated control panel, entire associated water & chlorine solution piping up to diffusers, Auto Shut Off Chlorine tonner valve system. Automatic Chlorine Leak Absorption System (Chlorine Scrubber System), C type Tray etc. complete in all respects with all required accessories and hardware as per tender specification and SOQ.

Structural steel for Electrical & Mechanical equipment's support on floor / wall / beam / brackets etc. as per tender specification and SOQ.

All under water (wetted) hardware shall be in SS-304 (Nuts, bolts, etc.) and non-wetted hardware shall be G.I.

**Scope for SITC work for Electrical for WDS shall include but not limited to the following:**

As the load demand exceeds 100 kW/125 KVA, it is proposed to go for 11KV HT power supply system.

11KV Power is expected from local Power Supply Company.

Power Supply Company (PSC) will provide their Two pole structure with metering panel in pumping station / plant. From PSC 11kV metering panel / 11kV GOD structure, HT power shall be transmitted through ACSR conductor / HT cables buried underground and terminated at client 11 KV DP structure located in substation (switchyard) of consumer (pumping station / plant).

**Major scope of work for electrical installation shall include the following:**

SITC of 11KV Two Pole Structure / Metering Kiosk with switchyard fencing, gates etc. as per statutory requirement.

SITC of Outdoor type, 11kV motorized One-Way Ring Main Unit (RMU) complete with VCB and FPI as per IS/SOQ & tender.

SITC of 11KV HT Cables along with required termination kits and cable trench etc.as per SOQ & tender. **One spare run of HT cable shall be provided between Outdoor RMU panel to 11KV HT Panel.**

SITC of 11KV Three Breaker (1 I/c & 2 O/g) HT VCB Panel with recommended spare parts along with all required accessories and hardware etc. as per SOQ & tender.

SITC of 2 Nos., 11/0.433kV, ONAN, Dyn-11, Distribution Transformers with **On Load Tap Changer (OLTC) with RTCC panel** along with necessary required foundation work, transformer yard, fencing, gates etc. as per statutory requirements with statutory approval etc. along with complete all required accessories and hardware etc. as per SOQ / tender. Both transformers shall be suitable for Parallel operation as per minimum requirement specified in Tender specification. Transformer Design Philosophy: 2 Nos. transformers in 1 working and 1 stand-by configuration.

SITC of PMCC / Main LT Panel including Starters, Transformer no load losses fixed capacitors for Power factor correction, spare feeders etc. along with complete all required accessories and hardware etc. as per SOQ, tender specification & SLD. Panel dimension/GA shall be as per site condition.

SITC of APFC Panels for power factor correction etc. along with complete all required accessories and hardware etc. as per SOQ, tender specification & SLD.

SITC of PDB, LDB for indoor and outdoor requirements, Power Sockets, Welding Receptacles, etc. as required, along with complete all required accessories and hardware etc. as per SOQ & tender.

SITC of Local Push Button Stations (LCS) for Motors along with complete all required accessories and hardware etc. as per SOQ & tender.

SITC of LT Power and Control Cables with cable end termination and connection etc. along with complete all required accessories and hardware etc. as per SOQ & tender.

SITC of Cable Tray & Cabling System etc. along with complete all required accessories and hardware etc. as per SOQ & tender.

SITC of Earthing system etc. along with complete all required accessories and hardware etc. as per SOQ & tender.

SITC of Internal and External area LED lighting system etc. along with complete all required accessories and hardware etc. as per SOQ & tender. Wiring in the all pumping station buildings / structures shall run through concealed conduit only. Surface conduit are strictly not Permitted. Mains circuit pipe & wiring of all building shall be run separately. Prior to execute the internal lighting work bidder must be approve the drawing of indoor lighting layout with required wiring diagram, Switch board location, light point, fan point etc.

SITC of DG sets rating as per SOQ along with AMF Panel for backup power in case of power failure from grid to ensure the continuous operation of Pumping Station. Diesel for DG set operation for power generating work will be provided by client. Lubricating oil, other consumable (Except

diesel) items/requirements shall be in the scope of contractor. D.G set shall comply with all statutory requirements and applicable norms/provisions of CPCB as prevailing and other relevant authorities.

SITC of Safety Equipment / Accessories as per statutory norms / requirements along with complete all required accessories and hardware etc. as per SOQ & tender.

Chequered plates with supports steel structure works as required for cable trenches in HT rooms, LT rooms, Control rooms etc. rooms along with complete all required accessories and hardware etc. as per SOQ & tender.

Supports / Structural Steel works as required along with complete all required accessories and hardware etc. as per SOQ & tender.

Preparation of various drawings and layouts prior to execution viz. Cable and Cable Tray Layout, Earthing Layout and Lighting/Illumination Layout (indoor/Outdoor).

All miscellaneous work for installation of electrical equipment with making cut out in panel room/pump house wall/slab for erecting of cables entering / out going from room etc. with mini. 100/150mm (as required) GI pipes with fixing, grouting, sealing etc. work and unforeseen / emergency work during installation etc. complete work for all electrical equipment.

Liasoning works for obtaining N.O.C from Electrical Inspector / Statutory authority for Power obtaining & for all Electrical equipment's installation works. Liasoning works shall also include preparing required attested documents & drawing for obtaining NOC & power on behalf of client.

**The scope of Instrumentation works may include but not limited to following.**

SITC of Turbidity at WDS with all mounting accessories for measure the turbidity of supplied water from WDS as per SOQ/Tender.

SITC of FRC cum pH Analyzer at WDS with all mounting accessories for measure the Chlorine and pH of supplied water from WDS as per SOQ/Tender.

SITC of Bourdon Type Pressure gauges with 150 mm dia glycerin filled at each pump discharge line and common header of Pump as per SOQ/Tender.

SITC of Blind Type Pressure Transmitter at delivery line of each Pump to measure pressure of each pump as per SOQ/Tender.

SITC of Display Type Pressure Transmitter at Pump Common header to measure pressure of common header of pump as per SOQ/Tender

SITC of Ultrasonic Level Transmitter at both suction pit of sump for measure the water level of each Sump as per SOQ/Tender.

SITC of Hydrostatic Type Level Transmitter at ESR for measure the water level of ESR as per SOQ/Tender.

SITC of Large LED Display for Level transmitter of Sump and ESR as per SOQ/Tender.

SITC of Float Type Level Switches shall be provided at both suction pit of sump for dry run protection of pump as per SOQ/Tender.

SITC of Float and Board Type Level Indicator shall be provided at 2 nos. Compartment of sump and ESR to measure the water level of sump locally as per SOQ/Tender.

SITC of Full Bore Electromagnetic Flow Meters, at Sump Comp.1 & 2 inlet line to measure the incoming water supply to Sump as per SOQ/Tender.

SITC of Full Bore Electromagnetic Flow Meters, at Pump Common Discharge Header and ESR Outlet, To Transmission supply to measure the water supply of each locations as per SOQ/Tender.

SITC of PLC Panel with minimum I/O module with 10" color touch screen HMI, SMPS, UPS (with 60 minutes battery backup), 4G/5G GPRS Modem with SIM Card for remote data transmission to central SCADA of Client/RMC etc. for auto operation of Pump from WDS PLC/HMI as well as from Central SCADA of Client.

The Scope shall include acquisition of data of WDS, graphics development, Data mapping, Alarm management, logic development, Storage and Screen development etc. for monitoring and control from existing Central SCADA and flow meter to be integrate with flow meter application shall be carried out by successful bidder. Client/RMC shall be responsible to provide necessary support for access in existing Central SCADA to success full bidder for necessary development as described above as per SOQ/Tender.

SITC of CCTV Surveillance System for monitoring inside and outside of pumping station premises in the panel room including fixed bullet IR outdoor type IP ( Internet Protocol) Night vision Camera, NVR along with HDD / storage system, Router broadband connection / SIM card Based Router for remote data transmission of all CCTV systems / camera data to RMC, TV for local viewing, MS clamp for bullet camera and accessories, Power Supply, Cat 6 cable of required pairs, Patch cords and connectors / panel as required, other communication cables as required, PVC conduit with accessories for wiring/cabling as required, fitting, accessories etc. as per SOQ/Tender.

SITC of All in one PC and A4 monochrome printer cum scanner cum Xerox as per SOQ/Tender.

SITC of Instrumentation Cables (Power, Control and Signal), mounting hardware, earthing, cable trays, junction boxes etc., as per site requirement as per SOQ/Tender. .

SITC of Support/Structural Steel works as per actual requirement of site to complete the works in all respect as per SOQ/Tender.

Any other item/accessories/work required for completion of the work/project.

## **OPERATION AND MAINTENANCE**

The bidder has to operate and run the pumping station along with required comprehensive maintenance work and with all accessories etc. The plant is to be operated and maintained on comprehensive basis for Two years with supply of all spares, consumables, lubricants, man power, tool etc. after completion of successful execution, installation, trial run period and commissioning of works.

O and M include monthly charges for SIM card data transmission to existing Central SCADA of Client as required and as directed by Engineer-in-charge.

The contractor shall engage required numbers of skilled operators/technicians, unskilled helper cum security guard per shift for comprehensive O & M as directed by Engineer-in-charge.

The O and M Period shall be commencing after successful completion of trial period of Water Distribution Station (Not from the date of inauguration). O and M period will be considered after successful completion of trial period and on issue of commissioning certificate of proposed water distribution station and O and M payment shall be claimed after performance guarantee test certificate of TPI. The spares, tools and furniture etc. as applicable as per specifications shall be handed over to client on commissioning of project/before start of O and M period.

Bidder / contractor to provide work schedule, work details, major instruction & safety instruction Board as per as per instruction of Engineer-In-Charge of RMC.

Bidder / contractor to provide Daily Operator & Helper Details Board with Name & contact number etc. as per as per instruction of Engineer-In-Charge of RMC.

Bidder / contractor to provide Operator & Helper Dress & I.D. card.

Bidder / contractor to provide Head works / WDS line diagram with required details as per as per instruction of Engineer-In-Charge of RMC.

Bidder / contractor to provide WDS location display board with name, Contactor name, address, contact number etc. required details as per as per instruction of Engineer-In-Charge of RMC.

## **ADDITIONAL SCOPE**

**In addition to the above, following services are also included in the scope of the Contractor for the Proposed Water Distribution Station.**

Construction of pedestal (plinth) for transformers and DG set as per manufacturers' recommendations and actual requirement,

Construction of CC grout blocks for two pole structure, fencing, gate etc.

Alignment, Drilling and grouting of equipment,

Drilling holes, zary work on walls/slabs for pipes and cables (if necessary),

Clamping and supporting of all pipes, Cable tray etc.

Final painting of equipment at site after installation,

Drawings, Operation and Instruction/maintenance Manuals of each equipment- 3 set.

Verifying the existing dimensions as relevant to the Contractors scope,

Excavation, bedding and refilling as per requirement.

Temporary lighting during execution of work at site shall be arranged by contactor.

Making good of the damage done to electro-mechanical installations and civil work and Civil repairing work of the pump house during execution of all Electro-Mechanical Work.

## **2. e-TENDER PRICE:**

The rates quoted in the bill of quantities shall cover everything necessary for the due and complete execution of the work according to the drawings and other condition and stipulations of the contract including specifications of the evident, intend and meaning of all or either of them or according to customary usage and for periodical and final inspection and test and proof of the work in every respect and for measuring, numbering or weighing the same, including setting out and laying or fixing in position and the provision of all materials, power, tools, rammers, labour, tackle, platforms with impervious lapped joints for scaffolding, ranging roads, straight edged, cantering and boxing, wedges, moulds, templates, posts, straight rods, straight edged, cantering and boxing, wedges, moulds, templates, posts, straight rails, boning staves strutting, barriers, fencing lighting pumping apparatus, temporary arrangement for passage of traffic access to premises and continuance to drainage water supply and lighting (if interrupted by contractor's work) temporary sheds, painting, varnishing, polishing establishment for efficient supervision and stating arrangements for the efficient protective of life and property and all requisite plant and machinery of every kind.

The contractor shall keep every portion of the work clear of accumulation from time to time and shall leave every portion of the work clean, clear, perfect and at the conclusion of whole, providing at their own cost all such material implement, appliances and labour as the Engineer in charge may require to prove if it to be so.

**3. COMPLETION SCHEDULE:**

The contract period shall be as prescribed in tender document, from the date of notice to proceed i.e Work Order. The Contractor shall submit his completion schedule and the program of works together with this e-Tender in conformity with completion schedule given in the documents.

**4. Packing and Handling:**

- 4.1. Necessary care shall be taken and required packing shall be provided to avoid damage to pipe barrels and the edges of the pipe ends in transit.
- 4.2. Where the goods are required to be dispatched at Railway risk, special packing as per IRCA rules are absolutely necessary, which would be payable by the contractor himself.
- 4.3. The contractor shall use proper handling equipment or follow suitable standard handling method for **DI pipes & DI Specials** as approved by the Engineer-in-charge to unload the materials at the delivery site to prevent damage to the goods.
- 4.4. The contractor shall take all care for Transportation & supply of HC connections items to be supplied with its standard handling process, stored at site under his store / the delivery site to prevent damage to the goods.

**5. GENERAL TECHNICAL GUIDELINE:**

- 5.1. All the items occurring in the work and as found necessary during actual execution shall be carried out in the best workman like manner as per specifications and the written order of the Engineer in charge
- 5.2. Extra Claim in respect of extra work shall be allowed only if such work is ordered to be carried out in writing by the Engineer in charge
- 5.3. The contractor shall engage a qualified Engineer for the Execution of work who will remain present for all the time on site and will receive instructions and orders from the Engineer in charge or his authorized representative. The instruction and orders given to the contractor representative on site shall be considered as it given to the contractor himself.
- 5.4. The work order book as prescribed shall be maintained on the site of the work by the contractor and the contractor shall sign the orders given by the inspecting offers and shall carry out them properly.
- 5.5. Quantities specified in the e-Tender may vary at the time of actual execution and the contractor shall have no claim for compensation on account of such variation

- 5.6. Unexcavated lengths shall be left wherever required and so directed by the Engineer in charge during the currency of the contract and shall be tackled if required, before completion of work.
- 5.7. Diversion of road, if necessary, shall be provided and maintained during the currency of the contract by the contractor at his cost.
- 5.8. Figured Dimensions of drawing shall supersede measurements by scale, special dimensions or directions in the specifications shall supersede all other dimensions.
- 5.9. All levels are given on drawings and the contractor shall be responsible to take regular level on the approved alignment before actually starting the work. The levels shall be commenced to the G.T.S. levels and shall be got approved from the Engineer in charge.
- 5.10. If the arrangement of temporary drainage is required to be made during any work of this Contract, this shall be made by the Contractor without claiming any extra cost.

## **6. CLASSIFICATION OF STRATA:**

- 6.1. All materials encountered in excavation will be classified in the following groups irrespective of mode of excavating the materials and the decision of the Engineer in charge in this regard shall be final and binding to the contractor.
- 6.2. Soils :  
Soils of all sorts, silt, sand, gravel, soft murrum, stiff clay, kunkar and other soft excavation not covered in the items mentioned here under.
- 6.3. Hard Murrum :  
Hard Materials comprising of all kinds of disintegrated rock or shale or indurate conglomerate interspersed with boulders, weathered and decomposed rock which could be removed with pick, bar, shove, wedges and hammers, though not without some difficulties.
- 6.4. Soft – Rock:  
This shall include all materials which is rock but which does not need blasting and can be removed with a pick bar, wedges, pavement breakers, pneumatic tools etc.
- 6.5. Hard Rock:  
This shall include rock occurring in mass or boulders which need blasting, this will also include rock to be removed by chiseling or any other method where blasting is not permissible.

7. The rates are inclusive of dewatering, if require

- 8.** Regarding water supply for hydro testing, necessary water, power, labour, etc. required for necessary test shall be arranged by the contractor at his own cost.
- 9.** During construction activity, proper care must be taken for labour safety and must follow the provisions of the Labour laws.
- 10.** TMT CRS bars of Fe-500 should be confirming to IS:1786. The approved makes shall be TISCO [TATA] , SAIL, VIZAG , Electrotherm, JSW , Essar or other equivalent make as approved by engineer-in-charge.
- 11.** Cement shall be ordinary Portland cement conforming to IS:269, IS:8112 or IS:12269 for all the works as per the instructions of engineer-in-charge. The approved makes shall be Ultra Tech, Ambuja, ACC, Sanghi, Siddhi, Hathi,TATA or as per IS confirming.
- 12.** Minimum Cement content for the work should be as per attached circular No.RMC/C/Vigi.(Tech)/231 dt. 11/03/2022.
- 13.** Testing of the materials like Brick, Sand, Aggregate, Reinforcement steel, etc. should have to be tested periodically as suggested by the Engineer-in-charge at Government approved material testing Laboratory and testing charges for the same has to be borne by the contractor.
- 14.** In case of any ambiguity found in inspections / drawings etc, the decision of engineer-in-charge shall be final and binding to the contractor.

## **DETAILED SPECIFICATIONS OF MATERIALS**

### **M-1 WATER :**

- 1.1 Water shall not be salty or brackish and shall be clean reasonably clear and free from objectionable quantities of silt and tract of oil and injurious alkalis, salts, organic mater and other deleterious materials which will either weaken the mortar or concrete or cause efflorescence in R.C.C.. The container for transport, storage and handling of water shall be clean. Water shall conform to the standards specified in I.S. 456-2000 (latest revision).
- 1.2 If required by the Engineer-in-charge it shall be tested by comparison with distilled water. Comparison shall be made by means of standard cement tests for soundness, time of setting and mortar strength as specified in I.S. 269-1976. Any indication of unsoundness, change in time of setting of 30 minutes either more or decrease of more than 10 percent in strength of mortar prepared with water sample **when compared with the results** obtained with **mortar prepared with distilled water** shall be sufficient cause **for rejection of water** under test.
- 1.3 Water for curing mortar, concrete or masonry should not be too acidic and also not too alkaline. It shall be free of elements which significantly affect the hydration reaction or otherwise interfere with the hardening of mortar or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces.
- 1.4 Hard and bitter water shall not be used for curing.
- 1.5 Potable water will be generally found suitable for curing mortar for preparing or concrete.

### **M-2 CEMENT :**

- 2.1 Cement shall be Sulphate Resistant Cement conforming to IS : 12330, Ordinary portland cement as per I.S. 269-1976 or Portland slag cement as per I.S.455-1976.
- 2.2 Testing of Cement : It should be specifically noted that the cement brought by the contractor at site of work shall be used after the same is tested at the approved laboratory as per the direction of the Engineer-in-charge. Such approved laboratory may be located at Ahmedaba All the charges for transport and testing of the samples shall have to be borne by the contractor. The frequency of testing of such materials shall be in accordance to the relevant Indian standard as directed by the Engineer-in-charge.

### **M-3 SAND :**

- 3.1 Sand shall be natural sand, clean, well graded, hard strong, durable and gritty particles free from injurious of dust, clay, kankar nodules, soft or flaky particles shale, alkali salts, organic matter, loam, mica or other deleterious substances and shall be got approved from the Engineer-in-charge. The sand shall not contain more than 8 percent of silt as determined by field test. If necessary the sand shall be washed to make it clean.

### 3.2 COARSE SAND :

The fineness modulus of coarse sand shall not be less than 2.5 and shall not exceed 3.0. The sieve analysis of coarse shall be as under:

I. S. Sieve Designation	Percentage by weight passing sieve	I. S. Sieve Designation	Percentage by weight passing through sieve.
4.75 mm	100	600 Micron	30 - 100
2.36 mm	90 - 100	300 Micron	5 - 70
1.18 mm	70 - 100	150 Micron	0 - 50

### 3.3 FINE SAND :

The fineness modulus shall not exceed 1.0. The sieve analysis of fine sand shall be as under :

I. S. Sieve Designation	Percentage by weight passing through sieve	I. S. Sieve Designation	Percentage by weight passing through sieve.
4.75 mm	100	600 Micron	40 - 85
2.36 mm	100	300 Micron	5 - 50
1.18 mm	75 - 100	150 Micron	0 - 10

### M-4 STONE GRIT :

4.1 Grit shall consist of crushed or broken stone and be hard, strong dense, durable, clean, of proper gradation and free from skin or coating likely to prevent proper adhesion of mortar. Grit shall for as possible flaky elongated pieces shall be avoided

It shall generally comply with the provisions of I. S. 383-1970. Unless special stone of particular quarried is mentioned Grit special stone of particular quarries is mentioned Grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer - in - charge. The grit shall have no deleterious reaction with cement.

4.2 The grit shall conform to the following gradation as per sieve analysis:

I. S. Sieve Designation	Percentage passing through sieve	I. S. Sieve Designation	Percentage Passing through sieve
12.50	100%	4.75	0.20%
10.00	85 - 100%	2.36	0.25%

4.3 The crushing strength of grit will be such as to allow the concrete in which it is used to build up the specified strength of concrete.

4.4 The necessary tests for grit shall be carried out as per the requirements of I. S. 2386 (Parts I to VIII) 1963, as per instruction of the Engineer-in-charge. The necessity of test will be decided by the Engineer-in-charge.

**M-5A STONE COARSE AGGREGATE FOR NOMINAL MIX CONCRETE :**

5A.1 Coarse aggregate shall be of machine crushed stone of black trap or equivalent and be hard, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion of mortar.

5A.2 The aggregate shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, Aggregates shall be machine crushed from the best black trap or equivalent hard stone as approve Aggregate shall have no deleterious reaction with cement. The size of the coarse aggregate for plain cement concrete and ordinary reinforced cement concrete shall generally be as per the table given below. However in case of reinforced cement concrete the maximum limit may be restricted to 6 mm less than the minimum lateral clear distance between bars or 6 mm. less than the cover whichever is smaller.

**TABLE**

I.S. Sieve Designation	Percentage Passing for single sized aggregates			I.S. Sieve Designation	Percentage Passing for single sized aggregates of nominal size		
	40 mm	20 mm	16 mm		40 mm	20 mm	16 mm
80 mm	-	-	-	12.5 mm	-	-	-
63 mm	100	-	-	10.0 mm	0.5	0.20	0.30
40 mm	85-100	100	-	4.74 mm	-	0.50	0.50
20 mm	0-20	85-100	100	2.35 mm	-	-	-
16 mm	-	-	-	85-100	-	-	-

NOTE :- The percentage may be varied by the Engineer-in-charge when considered necessary for obtaining better density and strength of concrete.

5A.3 The grading test shall be taken in the beginning and at the charge of source of materials. The necessary tests indicated in I.S. 383-1970 I. S. 456-1978 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner as to prevent the inter mixed on different aggregates. If the aggregates are covered with dust, they shall be washed with water to make them clean.

**M-5B BLACK TRAP OR EQUIVALENT HARD STONE COARSE :**

5B.1 Aggregate for Design Mix concrete : Coarse aggregate shall be of machine crushed stone of black trap or equivalent hard stone and be hard, strong, dense, durable clean and free from skin and coating likely to prevent proper adhesion of mortar.

5B.2 The aggregates shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregates shall be machine crushed from the best, black trap or equivalent hard stones as approve Aggregate shall have no deleterious reaction with cement.

5B.3 The necessary tests indicated in I. S. 383-1970 and I.S.456-1978 shall have to be carried out to ensure the acceptability of the material.

5B.4 If aggregate is covered with dust it shall be washed with water to make it clean.

#### **M-6 CEMENT MORTAR:**

6.1 Water shall conform to specification M-1. Cement shall conform to specification M-2, sand shall conform to M-3.

#### **6.2 Proportion of Mix :**

6.2.1 cement and sand shall be mixed to specified proportion, sand being measured by measuring boxes. The proportion of cement will be by volume on the basis of 50 Kg/bag of cement being equal to 0.0342 cum. The mortar may be hand mixed or machine mixed as directed

#### **6.3 Preparation of Mortar:**

6.3.1 In hand mixed mortar cement and sand in the specified proportions shall be thoroughly mixed dry on a clean impervious platform by turning over at least 3 times or more till a homogeneous mixture of uniform colour is obtained. Mixing platform shall be so arranged that no deleterious extraneous material shall get mixed with mortar or mortar shall flow out. While mixing, the water shall be gradually added and thoroughly mixed to form a stiff plastic mass of uniform colour so that each particle of sand shall be completely covered with a film of wet cement. The water cement ratio shall be adopted as directed

6.3.2 The mortar so prepared shall be used within 30 minutes of adding water. Only such quantity of mortar shall be prepared as can be used within 30 minutes.

#### **M-7 BRICK BATS AGGREGATE :**

7.1 Brick bat aggregate shall be broken from well burnt or slightly over burnt and dense brick. It shall be homogeneous in texture roughly cubical in shape, clean and free from dirt of any other foreign material. The brick bats shall be of 40 mm to 50 mm size unless otherwise specified in the item. The underburnt or overburnt brick bats shall not be allowed

7.2 The brick bats shall be measured by volume by suitable boxes or as directed

**M-8 BRICKS :**

8.1 The bricks shall be hard or machine moulded and made from suitable soils and kiln burnt. They shall be free from cracks and flaws and nodules of free lime. They shall have smooth rectangular faces with sharp corners and shall be of uniform colour.

The bricks shall be moulded with a frog of 100 mm x 40 mm and 10 mm to 20 mm deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 600 mm.

8.2 The size of modular bricks shall be 190 mm x 90 mm.

8.3 The size of the conventional bricks shall be as under :

$$\left( 9'' \times 4\frac{3}{4}'' \times 2\frac{3}{4}'' \right) 225 \times 110 \times 75 \text{ mm.}$$

8.4 Only bricks of one standard size shall be used on one work. The following tolerance shall be permitted in the conventional size adopted in a particular work.

Length : = 1/8" (3.0 mm) Width : = 1/16" (1.50 mm)

Height : = 1/16" (1.50 mm)

8.5 The crushing strength of the bricks shall not be less than 35 Kg/Sq.cm. The average water absorption shall not be more than 20 percent by weight. Necessary tests for crushing strength and water absorption etc. shall be carried out as per I.S. 3495 (Part-I to IV) - 1976.

**M-8A FLY-ASH LIME BRICKS :**

The fly ash lime bricks shall conform to Grade-1 or Grade-2 of IS-3812-1981. The frog of the 80 to 100 mm x 40 mm x 10 to 20 mm size.

The size of modular bricks shall be 190 mm x 90 mm x 90 mm.

The size of conventional brick shall be 225 mm x 110 mm x 75 mm.

Only bricks of one standard size shall be used on one work. The following tolerances shall be permitted in the conventional size adopted in a particular work:

Length : + 3 mm  
Width : + 3 mm  
Height : + 2 mm

The physical characteristic of bricks shall be as follows.

The minimum compressive strength of fly ash lime bricks shall not be less than 75 Kg/Sq.Cm. and the test shall be conform to IS-3495 (Part-I):1992.

The average drying shrinkage of the brick when tested by the method described in IS 4139-1989 being shall not exceed 0.15 percent.

The averages water absorption not more than 20 percentage by mass and the test shall conform to IS-3495 (Part-3):1992.

**M-9 MILD STEEL BARS :**

9.1 Mild steel bars reinforcement for R.C.C. work shall conform to I.S. 432 ( Part-II ) 1966 and shall be tested quality. It shall comply with relevant part of I.S.456-1978.

9.2 All the reinforcement shall be clean and free from dirt, paint, grease, mill scale or loose of thick rust at the time of placing.

9.3 For the purpose of payment the bar shall be measured correct upto 10 mm length and weight payable worked out the rate specified below :

1. 6 mm	0.22 Kg./Rmt.	8.	20 mm	2.47 Kg./Rmt.
2. 8 mm	0.39 Kg./Rmt.	9.	22 mm	2.98 Kg./Rmt.
3. 10 mm	0.62 Kg./Rmt.	10.	25 mm	3.35 Kg./Rmt.
4. 12 mm	0.89 Kg./Rmt.	11.	28 mm	4.83 Kg./Rmt.
5. 14 mm	1.21 Kg./Rmt.	12.	32 mm	6.31 Kg./Rmt.
6. 16 mm	1.58 Kg./Rmt.	13.	36 mm	7.31 Kg./Rmt.
7. 18 mm	2.00 Kg./Rmt.	14.	40 mm	9.86 Kg./Rmt.

**M-10 TMT FE-500 STEEL BARS FOR REINFORCEMENT :**

10.1 Reinforcement bars shall conform to IS-432, IS-226 or IS-1786 and welded wire fabrics to IS : 1566. Only TMT bars for reinforcement in RCC duct shall be used which shall be clean, free from pitting, oil, grease, paint, loose mill scale, rust, dirty dust or any other such substance that will destroy or reduce bon

It permitted by the Engineer-in-charge reinforcement shall be done in accordance with IS-2751 or IS-9147 as applicable.

10.2 Other provision and requirements shall conform to specification No. M-7 for mild steel bars.

**M-11 MILD STEEL BINDING WIRE :**

11.1 The mild steel wire size and quality shall conform to I.S. 280-1972.

11.2 The use of black wire will be permitted for binding reinforcement bars. It shall be free from rust, oil paint grease, loose mill scale or any other undesirable coating which may prevent adhesion of cement mortar.

## **M-12 STRUCTURAL STEEL :**

- 12.1 All structural steel conform to I.S.226 - 1975. The steel shall be free from the defects mentioned in I.S. 226-1975 and shall have a smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength and durability. Rivet bars shall conform to I.S. 1148-1973.
- 12.2 When the steel is supplied by the contractor test certificate of the manufacturers shall be obtained according to I.S. 226-1975 and other relevant Indian Standards.

## **M-13 SHUTTERING :**

- 13.1 The shuttering shall be either of wooden planking of 30 mm. minimum thickness with or without steel lining or of steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical ballies properly cross braced together so as to make the centering rigi In places of bullie props, brick pillar of adequate section built in mud mortar may be use
- 13.2 The form work shall be sufficiently strong and shall have camber, so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration of live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall not permit leakage of cement grout.
- 13.3 If at any stage of work during or after placing concrete in the structure, the form sags or bulges out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequately rigid form work. The complete form work shall be got inspected by and got approved from the Engineer-in-charge, before the reinforcement bars are placed in position.
- 13.4 The props shall consist of bullies having 100 mm minimum diameter measured at mid length and 80 mm at thin end and shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 mm thick and minimum bearing area of 0.10 Sq.m. laid on sufficiently hard base.
- 13.5 Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and easing of shuttering without jerking the concrete.
- 13.6 The timber used in shuttering shall not be so dry as to absorb water from concrete and swell or bulge nor so wet to shrink after erection. The timber shall be properly sawn and planned on the sides and the surface coming in contract with concrete. Wooden form work with metal sheet lining or steel plates stiffened by steel angles shall be permitted
- 13.7 As far as practicable, clamps shall be used to hold the forms together and use of nails and spikes avoided

- 13.8 The surface of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution before the concreting is done. Alternatively coat of raw linseed oil or oil of approved manufacture may be applied in place of soap solution. In case of steel shuttering either soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Under no circumstances black or burnt oil shall be permitted
- 13.9 The shuttering for beams and slabs shall have camber of 4 mm per meter (1 in 250) or as directed by the Engineer-in-charge so as to offset of subsequent deflection for cantilevers the camber at free end shall be 1/50 of the projected length or as directed by the Engineer-in-charge.

**M-14 HARD DRAWN WIRE :**

The Hard drawn steel wire should conforming to IS-432 (Part 2), Hard drawn steel wire shall be manufacture and its chemical composition should be as per para 3.0. The finished wire should be free from defects and finished in a workman like manner. Nominal sizes, Tolerances, Physical requirements are as per IS : 432 (Part-II) latest edition. Hard drawn steel wire should be tested as specified in IS : 432 (Part-II) latest edition.