

**SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF  
FIRE FIGHTING SYSTEM AND GETTING NOC FROM FIRE AND  
SAFETY AUTHORITIES FOR URBAN HEALTH CENTRE,  
AT JIPMER PUDUCHERRY**

**Volume- III  
TECHNICAL SPECIFICATION**

**Tender No: HLL/IDD/CHN/19-20/030  
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## **TECHNICAL SPECIFICATION:**

### **Common Points:**

Contractor should submit the shop drawing for all the works within 10 days of receipt of work order / LOA, to the Engineer – in - charge and should get prior approvals before executing any type of works along with coordination layout. The contractor should not deviate from the approved drawing at any point of time, in case of deviation while executing proper authorization should be obtained before proceeding further. Decision of HLL stands final.

The contractor should follow the following procedures:

**1. MAR** – Material Approval Request (Before procurement of any materials the contractor should submit MAR request along with necessary supporting documents to HITES Engineers and the makes should be as per list of approved makes specified in the tender document. Any materials procured without approval will be rejected at any point of time)

**2. Sample Tag** – After obtaining MAR, the contractor should submit sample tag along with samples (detailed specification can be submitted instead of samples for materials with high procurement values)

**3. MIR** – Material Inspection Request – After supplying of materials at site, the contractor should submit MIR request for verification of materials (the materials should be as per approved MAR and sample tag). Items deviating against authorized MIR will be rejected at any point of time.

**4. IR – Inspection Request** – The contractor should submit Inspection request on day to day basis for inspecting the works carried out.

**5. Billing** – Billing should be as based on the actuals executed at site and the contractor should submit the bills based on HLL billing format along with supporting documents (Dc copy, bill invoice, MAR, Sample tag, MIR, test reports, etc) for the items claimed in the respective bill. 3 sets of original bill and 2 sets of copy should be submitted.

**6.** All document formats pertaining to the work should be of HLL formats and the same can be issued on request.

**7.** 3rd party testes through NABL aggregated labs should be carried out for the necessary items executed at site by the contractor as per the direction of HLL without any additional costs.

**8.** 5 sets of following documents should be submitted during completion/ handing over of the project

- **As built drawings (Hard & Soft copy),**
- **Inventory list**
- **Warranty certificates**
- **Statutory approvals, if any**
- **Manuals**

**9.** Spares, keys or any other components related to the equipment/ materials installed should be handed over with a list along with separate tags.

**10.** Hindrance register should be maintained at site.

**11.** All the debris, remaining should be cleared from the same and disposed within campus lead not more than 4 KM. And the completion certificate will be issued only after clearing the site and making it good.

**12.** Installation, Testing & Commissioning report for all the works should be provided as per HLL formats.

**Hot work permit:**

Hot work permit must be obtained prior to the starting of work from concern department of JIPMER.

**Supervision:**

Contractor shall depute their team of engineers for the supervision of installation, testing, commissioning & handing over at site of work. List of Engineers along with their bio data should be submitted to project office before commencement of the works. And the team should maintain records of daily progress and report the same to HITES Engineers on regular basis. Prior permission for the works carried should be obtained from HLL. All the Engineers should be available at the site during execution of work until handing over without fail.

**1. Mechanical Engineer (HVAC & FPS)** -Degree holder – 1 no. with min 5 years' experience or Diploma Holders – 02 no's with min 8 years' experience.

**Security & Storage:**

The contractor is responsible for storage & security of all the materials, equipment, piping, wiring and all related accessories till the time of handing over to the customer.

**Power & Water:**

The contractor should make his own arrangement for electricity & water.

**Working Hours & Damages of existing property:**

As the work is being executed in already constructed building, at mostcare should be taken during execution of works. Damages caused to the existing property should be rectified at own risk and cost with war foot basis. Time Schedule for the works to be carried should be submitted prior to the work.

**Labour camp:**

Labour camp will not be allowed inside the campus and the contractor should take sole responsibility for workers stay outside the campus. Workers should not use any type of alcohol/smoking related items inside the campus.

**Co-ordination with Other Agencies**

The contractor shall co-ordinate with all other agencies involved in the building work so that the building work is not hampered due to delay in his work.

**Structural Alterations to Buildings**

- (i) No structural member in the building shall be damaged/altered, without prior approval from the competent authority through the Engineer-in-charge.
- (ii) Structural provisions like openings, cutouts, if any, provided by the department for the work, shall be used. Where these require modifications, or where fresh provisions are required to be made, such contingent works shall be carried out by the contractor at his cost.
- (iii) All such openings in floors / walls provided by the Department shall be closed by the contractor after installing the cables/ conduits/ rising mains etc. as the case may be, by any suitable means as approved by the Engineer-in-charge without any extra payment.
- (iv) All chases required in connection with the electrical works shall be provided made good by the contractor at his own cost to the original architectural finish of the buildings.

**Coordination Layout:**

Coordination layout must be submitted along with the shop drawings and approval must be obtained before execution of works.

**MAINTENANCE DURING DEFECT LIABILITY PERIOD****Complaints**

The contractor shall receive calls for any and all problems experienced in the operation of the system under this contract, attend to these within 10 hours of receiving the complaints and shall take steps to immediately correct any deficiencies that may exist.

**Repairs**

All equipment that requires repairing shall be immediately serviced and repaired. Since the period of Mechanical Maintenance runs concurrently with the defects liability period, all replacement parts and labour shall be supplied promptly free-of charge to the Owner.

**TECHNICAL SPECIFICATIONS -FIRE FIGHTING SYSTEM****1. FIRE FIGHTING WORKS- FIRE PROTECTIONS-GENERAL**

Scope of work shall include design, engineering, supply, installation, Testing, commissioning & getting approvals from various inspection authorities and obtaining No objection certificate (NOC) from Fire and safety authorities for firefighting system. All material shall be of conforming to relevant IS specifications wherever exists and subject to approval of Engineer in charge. The fire fighting shall be carried out strictly as per NBC -2016.

**TENDER DRAWINGS**

For guidance of the bidder, drawing (Schematic Fire Fighting Layout) is enclosed with these tender documents. These drawings are broadly indicative of the work to be carried out. The contractor on award of work will furnish detailed stage-wise working drawings as required in advance for approval of Engineer and get the same approved by Local Fire Authority/other statutory bodies. No claim whatsoever shall be admissible on account of changes that may be introduced by the Engineer/ Local Fire Authority.

## **SHOP DRAWINGS/TECHNICAL DATA SHEETS**

The contractor shall prepare and furnish all shop drawings including floor plans & Terrace, Schematic Fire Fighting Layout/External Fire Layout showing sprinklers, Fire Hydrants/First Aid Hose, Zonal Control Valves, Extinguishers, Signages, Terrace layout with OHT & Terrace pump, detectors, panels, etc. at no extra cost for approval by the Engineer before commencing fabrication/ manufacture of the equipment. Such shop drawings shall be based on the Architectural drawings/Tender Drawings and requirements laid down in the specifications, Design Basis Report and as per site conditions. The manufacturing of equipment shall be commenced only after the shop drawings/GA Drawings/ technical data sheet along with pump curves are approved in writing by the Engineer. Such drawings shall be co-ordinated with other services work. These shop drawings will be approved by HITES which will be considered as base for execution of fire fighting work.

## **COMPLETION / AS BUILT DRAWINGS**

On completion of the work and before issuance of certificate of virtual completion, the contractor shall submit to the Engineer –in-Charge, General layout drawings, drawn at approved scale indicating layout of pump house piping and its accessories –As installed. As built drawings shall be prepared taking approved shop drawings as base & incorporating all changes/ modifications as per site conditions. These drawings shall include the following:-

- a. General Layout of Pump House including all details mentioned in clause 1.2.
- b. Panels and other equipment/accessories location and their dimensions etc.
- c. Fire fighting floor layout including terrace indicating internal hydrants, sprinklers complete with pipe dia. , pipe spacing interval etc.
- d. Complete schematic as installed.
- e. UG Sumps, Location of External Hydrants, 2-way/4-way fire brigade inlet connection, Draw out connection, Earth pipes, route of earthing conductors etc.
- f. Route of all cables and pipes run along with detail sizes and mode of installation.

## **DRAWINGS & DOCUMENTS**

The contractor shall submit to the Engineer, the following documents on completion of the work and before issuance of virtual completion.

- a. Warranty for required equipment installed like Pumps, Panels etc.
- b. As Built Drawings
- c. Material Test Certificates
- d. Catalogues/Brochures
- e. Operation and Maintenance Manuals
- f. List of recommended spares and consumables
- g. All approvals including technical approvals and sanctions
- h. NOC from Fire authority before commencement of execution & after completion of entire work etc.

## **SANCTION/ APPROVALS FROM STATUTORY AUTHORITIES/ LOCAL FIRE AUTHORITY**

The contractor shall be fully responsible and shall carry out following activities:-

- a. Preparation & submission of working drawings

- b. Obtaining the approval of drawings
- c. Arranging inspection of site by officials of the Authority
- d. Obtaining the Pre No Objection certificate, final No objection/ completion certificate after submitting required documents.
- e. Any other statutory approvals required.

## **MANUFACTURING**

The responsibility for ensuring the manufacture of the equipment as per the specifications shall be solely that of the contractor. The contractor shall be responsible for selection of materials as per agreed specifications after obtaining proper approval.

## **MAKE OF MATERIALS/MANUFACTURER'S INSTRUCTION**

Only approved makes as mentioned in our approved make list of tender documents of material shall be used. The Contractor shall furnish Technical data sheets / GA drawings of all items before placing P.O. The contractor shall get the samples of required items approved from the HITES as conveyed by E-I-C before commencing the supply. In case of any discrepancy/anomalies wrt specifications, prior intimation from Contractor to E-I-C to be given. Final decision lies with HITES for according approvals.

Any specific instruction furnished by manufacturer covering the points not mentioned in technical specifications of the tender shall be brought to the notice of E-I-C in writing for further instructions in this regard at appropriate time.

## **MATERIAL TESTING**

The E-I-C shall have full power to get any material of work to be tested by an independent agency at contractor's expense in order to prove the soundness and adequacy.

## **INSPECTION AND TESTING**

- a. The contractor shall carry out tests if any as specified/ directed by engineer.
- b. Contractor shall perform all such tests as may be necessary to meet requirements of Local Authorities, Municipal or other statutory laws/ bye-laws in force. Nothing extra shall be paid for these.
- c. The E-I-C may, at his sole discretion, carry out inspection at different stages during manufacturing and final testing after manufacturing.
- d. Approvals or passing of any inspection by the engineer or his authorized representative shall not, however, prejudice the right of the engineer to reject the plan if it does not comply with the specification when erected or give complete satisfaction in service.

## **TRAINING OF DEPARTMENT PERSONNEL**

- a. The contractor shall train the CLIENT/ HITES's personnel to become proficient in operating the equipment installed. Training shall be done before the expiry of the defects liability period.
- b. The period of training shall be adequate and mutually agreed upon by the Engineer and contractor.
- c. The CLIENT/ HITES's personnel shall also be trained for routine maintenance work

and lubrication, overhauling, adjustments, testing, minor repairs and replacement.  
d. Nothing extra shall be paid to the contractor for training CLIENT/ HITES's personnel.

## **PERFORMANCE GUARANTEE**

At the close of the work and before issue of final certificate of virtual completion by the engineer, the contractor shall furnish written guarantee indemnifying the CLIENT/ HITES against defective materials and workmanship for a period of one year after completion and handing over. The contractor shall hold himself fully responsible for reinstallation or replace free of cost to the CLIENT/ HITES.

c. Any defective material or equipment supplied by the contractor.

d. Any material or equipment supplied by the CLIENT/ HITES which is proved to be damaged or destroyed as a result of defective workmanship by the contractor.

## **2. PIPING**

### **2.1. SCOPE**

This section covers the details of requirement of piping used in system, including the associated auxiliary equipment.

### **2.2. GENERAL**

The system shall remain pressurized at all times during operation, and as such the piping work shall be carried out to withstand the same.

### **2.3. PIPES AND FITTINGS**

Pipes and fittings means tees, elbows, couplings, flanges, reducers etc. and all such connecting devices that are needed to complete the piping work in its totality.

Screwed fittings shall be approved type malleable or cast iron with reinforced ring on all edges of the fittings suitable for screwed joints.

Forged steel fittings of approved type with "V" groove for welded joints.

Fabricated fittings shall be not being permitted for pipe diameters 50 mm and below. When used, they shall be fabricated, welded and inspected in workshops whose welding procedures have been approved by the TAC as per TAC rule 4102 for sprinkler system and applicable to hydrant and sprinkler System under the supervision of Engineer-In-Charge. For "T" connections, pipes shall be drilled and reamed. Cutting by gas or electrical welding will not be accepted.

Pipes for system shall be of black steel MS conforming to IS: 1239/3589 (Heavy Class/ Class C).

Fittings for black steel pipes shall be malleable iron suitable for welding or tapered screwed threads.

### **2.4. JOINTING**

#### **2.4.1. Screwed (50 mm dia pipes and below)**

Joint for black steel pipes and fittings shall be metal to metal thread joints. A small amount of red lead may be used for lubrication and rust prevention. Joints shall not be welded or caulked.

#### **2.4.2. Welded (65 mm dia and above)**

Joints between M.S. pipes and fittings shall be made with the pipes and fittings having "V" groove and welded with electrical resistance welding in an approved manner. Butt

welded joints are not acceptable.

#### **2.4.3. Flanged**

Flanged joints shall be provided on:

- a. Straight runs not exceeding 30 m on pipe lines 80 mm dia and above.
- b. Both ends of any fabricated fittings e.g. bend tees etc. of 65 mm dia or larger diameter.
- c. For jointing all types of valves, appurtenances, pumps, connections with other type of pipes, to water tanks and other places necessary and required as per good engineering practice.
- d. Flanges shall be as per Table 17 of IS-6392. with appropriate number of G.I. nuts and bolts, 3 mm insertion neoprene gasket complete.

#### **2.4.4. Unions**

Approved type of dismountable unions on pipes lines 65 mm and below in similar places as specified for flanges. Joint for black steel pipes and fittings shall be metal to screw grid up to 50 mm dia and above 65 mm dia welded joints. A small amount of red lead may be used for lubrication and rust prevention in threaded joints. Hold tight will be use for threaded pipes joint.

All the welding shall be radiographic ally tested. Joints between MS pipes, valves and other appurtenances, pumps etc. shall be made with M.S. flanges with appropriate number of bolts. Flanged joints shall be made with 3mm thick insertion rubber gasket.

#### **2.5. DIA OF FLANGE AND HOLE CONFORMING IS:**

Size of pipe 80 mm 100 mm 150 mm 200 mm

Dia of flange 200 mm 220 mm 285 mm 340 mm

Flange thickness 20mm 20mm 22mm 24mm

Dia of bolt 16 mm 16 mm 16 mm 16 mm

No. of hole 4 mm 4 mm 8 mm 8 mm

#### **2.6. PIPE PROTECTION**

- a. All pipes above ground and in exposed locations shall be painted with one coat of red oxide primer and two or more coats of synthetic enamel paint of approved shade.
- b. Pipes in chase or buried underground shall be painted with two coats of hot bitumen, wrapped with bituminous pypkote or Hessian cloth and finished with one coat of hot bitumen paint without any additional cost.
- c. Pipe passing through structural members will be provided with M.S. pipes.

#### **2.7. PIPE SUPPORTS**

All pipe clamps and supports shall be galvanized mild steel. When fabricated from M.S. steel sections, the supports shall be factory galvanized before use at site. Welding of galvanized clamps and supports will not be permitted.

Pipes shall be hung by means of expandable anchor fastener of approved make and design (Dash Fastners or equivalent). The hangers and clamps shall be fastened by means of galvanised nuts and bolts. The size/diameter of the anchor fastner and the clamp shall be suitable to carry the weight of water filled pipe and dead load normally encountered. For pipe spacing, the stringent of the IS Code- clause no. 10.3.10, table -11 & below mentioned table should be opted.



## **2.8. VALVES, GAUGES**

Butter-fly, Sluice valves and NRV above 65 mm shall be of cast iron body .They shall conform to type PN 16 of IS: 13095,780. Valve wheels shall be of right hand type and have an arrowhead engraved or cast thereon the direction for turning open and closing.

Butterfly valves of various dia. as per requirements shall be of wafer type, conforming to PN-16 rating with SS disc. It shall be lever operated. The rubber lining shall be integrally molded with EPDM/Nitrile rubber. The O-ring shall be made of nitrile rubber. The lever shall be made preferably of carbon steel.

The test pressure of Shell- 24 Bar, Seat:17.6 bar & maximum working pressure-16 bar, maximum working temperature :90 degree Celsius. In case of any discrepancies between manufacturer's standards & above specified values, these parameters shall be in compliance with relevant IS codes.

Non-return valves/ Dual plate check valve of various dia. as per requirements shall be of cast iron body. It should have Nitrile Rubber/EPDM Seal & Disc of stainless steel. They shall be swing check type/wafer type in horizontal runs and lift check type in vertical runs of piping. It should be of min. PN-16 rating. Test Pressure (Hydrostatic) :Shell: 24.50 kg, Seat:16 kg/sqcm, maximum operating temperature- 80 degree C. In case of any discrepancies between manufacturer's standards & above specified values, these parameters shall be in compliance with relevant IS codes.

Sluice valve shall be of CI construction. The seat shall be of bronze. Hand Wheel shall be of cast iron. It should be of min. PN-16 rating.

The ball valve of various dia. shall be of forged brass construction & shall have screwed female ends. It shall be lever operated with quarter turn & shall be provided with forged brass hard chrome plated ball. It shall be complete with premium quality PTFE gland packing & seating. The ball valve shall be with chrome finish wherever required. Test Pressure (Hydrostatic): Shell: 25 kg, Seat:16 kg/sqcm, maximum operating temperature-220 degree C. In case of any discrepancies between manufacturer's standards & above specified values, these parameters shall be in compliance with relevant IS codes.

Pressure gauge (Bourdon Type) shall be of suitable range with SS 304/316 Construction, case of 150/100mm diameter. The gauges shall have brass cocks. The accuracy range of pressure gauge shall be in the range of +- 0.5 % to 1%. It shall conform to IP 67 protection. The dial shall be Aluminium white background with black letters. The windows shall be made of plain & toughend glass. The suitability of pressure gauge shall be in the temperature range of (-) 20 degree Celsius to 60 degree Celsius. The gear mechanism shall be of SS 304 & the connection material shall be of SS-316 L. Pointer shall be of black aluminium. It shall be complete with all accessories such as siphon, gauge cock, snobbier& needle valve etc. Pressure range shall be between 0 to 20 kg/sqcm.

Double flanged MS pot strainers of required dia. with M.S. body and SS 40-grade mesh strainer, PN 16 shall be provided either at tank suction line or at individual pump suction line.

Orifice plates shall be made of 6mm thickness Brass material to reduce pressure on individual hydrants to operating pressure of 3.5-kg/ sq.cm. Design of the same shall be given by the contractor as per location and pressure condition of each hydrant.

## **2.9. EXTERNAL YARD HYDRANTS**

The outlet shall be angled towards ground, with instantaneous spring lock type gunmetal female coupling of 63 mm dia. for connecting to hose pipe. It shall be with ISI marked with Sl. No. clearly mentioned. The landing valve shall be of oblique pattern shall be complete with GI twist release chain with cap. The manufacturer's name & trademark along with year of manufacture & other details like size & type shall, be clearly mentioned. Valves shall be provided with one coat of primer & subsequently painted with 2 coats of red paint with shade no. 536 conforming to IS 5. The paint shall conform to IS 2932. Hand Wheel shall be painted black. It shall be BIS approved.

In case of any discrepancies between manufacturer's standards & above specified values, these parameters shall be in compliance with relevant IS codes. RRL Hose pipe shall be controlled percolating (CP) type, ISI marked (IS:8423), 63 mm dia x 15 m long (2 Nos.) complete with instantaneous type gunmetal 63 mm dia ISI marked Male & Female couplings (IS:903) bound and riveted to hose pipe with copper rivets and 1.5 mm copper wire.

External Hydrant post shall also include standard short size 63mm dia. gunmetal branch pipe with gun metal nozzle of 20 mm nominal bore outlet with instantaneous type 63 mm dia coupling complete & confirming to IS:903. M.S. fire hose weather proof cabinet (750x600x250mm approx.) made out of 16 gauge M.S. sheet capable of accommodating landing valve, hose pipes, fittings & accessories. The box shall have a front glass door with lock and key arrangement & shall be painted with one coat of primer & two coat of finished stove enamelled post office red colour paint & "FIRE HOSE" written on front.

## **2.10. INTERNAL HYDRANTS**

The landing valve shall be of oblique pattern shall be complete with GI twist release chain with cap. The manufacturer's name & trademark along with year of manufacture & other details like size & type shall, be clearly mentioned. Valves shall be provided with one coat of primer & subsequently painted with 2 coats of red paint with shade no. 536 conforming to IS 5. The paint shall conform to IS 2932. Hand Wheel shall be painted black. It shall be BIS approved. Blank caps shall be made of gun metal. Hydrostatic pressure test shall be carried out at 21 kg/sqcm for 2.5 mins. The flow test shall be at 7 kg/sqcm at 900 lpm. The water tightness seat test shall be at 14 kg/sqcm. In case of any discrepancies between manufacturer's standards & above specified values, these parameters shall be in compliance with relevant IS codes. RRL Hose pipe shall be non-percolating type, ISI marked (IS:8423), 63 mm dia x 15 m long (2 Nos.) complete with instantaneous type gunmetal 63 mm dia ISI marked Male & Female couplings (IS:903) bound and riveted to hose pipe with copper rivets and 1.5 mm copper wire. Bursting pressure not less than 22 Kg/Sqcm. External Hydrant post shall also include standard short size 63mm dia. gunmetal branch pipe with gun metal nozzle of 20 mm nominal bore outlet with instantaneous type 63 mm dia coupling complete & confirming to IS:903. Internal hydrant shall be with fireman axe with heavy rubber handle. Swing type First Aid hose reel in red colour with 36 mts long and 20 mm dia heavy duty rubber water hose, 20 mm dia globe valve stop cock, terminating with G.M. coupling & nozzle of 5mm outlet with shut off valve confirming to IS 8090 - 1976 complete with drum and brackets for fixing on wall, bolts & nuts conforming to IS:884-1969 complete as required to be provided. MS door made up of 16 gauge MS Sheet capable of accommodating fire hose reel, landing valve, hose pipes, fittings, 1 No. CO2 & 1 No. Dry powder type portable fire

extinguishers & accessories. The door shall have a front glass with lock and key arrangement & shall be painted with one coat of primer & two coat of finished stove enameled post office red colour paint & "FIRE HOSE" written on front.

(Approx. size of door: 2100 mm Height, Width of Door as per Shaft size)

### **2.11. FIRE BRIGADE INLET CONNECTIONS/ DRAW OFF CONNECTION**

One set of 2/4 ways collector head Fire Brigade connection shall be provided at under ground tank, Ring Main, Sprinkler system and individual wet risers as specified conforming to IS 904.

The inlet to the wet riser sprinkler header shall be with 150 mm dia butterfly or sluice valve and non-return valve. The scope shall include necessary reducers, tees bends and special fittings as required.

Fire brigade inlet connection (fire department connection) consisting of 2 Nos. 63 mm dia instantaneous inlet arranged on a 50 mm dia header, 1 No. 150 mm diameter sluice valve, with in built Non-return valve.

## **3. ELECTRIC DRIVE, HORIZONTAL FIRE PUMPS**

Without restricting to the generality of the foregoing, the pumps and ancillary and accessories.

- i. Electrically operated pumps with motors, base plates and accessories.
- ii. Alarm system with all accessories wiring and connections.
- iii. Pressure gauges with isolation valves and piping bleed and block valves.
- iv. M.S. pipes, valves, suction strainers, delivery headers and accessories.
- v. Foundations, vibration eliminator pads and foundation bolts.

### **3.1. QUALITY CONTROL**

These shall comply with the IS codes as specified.

### **3.2. SUBMISSIONS**

- a. Product Manuals
- b. Hydraulic Details

### **3.3. STORAGE**

These shall be stored as delivered in original packing.

## **4. FIRE PUMPS**

### **4.1. PUMPING SETS**

- a. All pumps shall be of suitable capacity & head to meet the requirements of NBC 2016 .
- b. The coupling joining the prime movers with the pump shall be provided with a sheet metal guard. Pump and motor engine shall be mounted on a common base plate fabricated from MS section.
- c. Pumps shall be provided with approved type of mechanical seals.
- d. The pump shall meet the requirements of N.B.C. 2016 and N.F.P.A. and the unit shall be design proven in fire protection services.
- e. Speed of the motors shall be compatible with the speed of the pump.
- f. Suitable PCC/RCC foundation with plaster, Antivibration arrangement of cushy foot mounting for all pumps needs to be provided without any additional cost.

#### **4.5. INSTALLATION**

- a. Pumps shall be installed true to level on suitable concrete foundations. Base plate shall be firmly fixed by foundation bolts properly grouted in the concrete foundations. Angle iron shall be provided on the edge of foundation without any additional cost.
- b. Pumps and motors shall be truly aligned by suitable instruments.
- c. All pumps connections shall be standard flanged type with appropriate number of bolts. In case of non-standard flanges companion flanges shall be provided with the pumps.
- d. Manufacturer's instructions regarding installation, connections and commissioning shall be followed with respect to all pumps and accessories.
- e. Contractor shall provide necessary test certificates.
- g. Provide vibration eliminating pad and connectors for each pump.
- h. A minimum clearance of 1M around the pumps shall be provided.
- i. The Terrace Pump will start on sudden pressure loss of pressure only when both the Fire Pumps have either failed to start or exhausted water.

#### **5. ELECTRICAL INSTALLATIONS**

##### **5.1. POWER AND CONTROL PANEL AND OTHER CONTROL COMPONENTS**

For Fire Fighting Panel & Control Panel, specifications under Technical Specifications for LT Panel under Electrification shall be followed. Power /Control cable of various sizes shall be XLPE insulated & PVC sheathed.

##### **5.2. CABLE LAYING:**

Cable shall be laid generally in accordance with CPWD Specifications ( Electrical) External & Internal amended upto date . Cables shall be laid on 14 gauge perforated MS sheet cable trays and cable drops/risers shall be fixed to ladder type cable trays fabricated out of steel angle. Access to all cables shall be provided to allow cable withdrawal/ replacement in the future. Where more than one cable is running, proper spacing shall be provided to minimize the loss in current carrying capacity. Cables shall be suitably supported with Galvanized saddles when run on walls/trays. When buried, they shall be laid in 350 mm wide and 750 mm deep trench and shall be covered with 250 mm thick layer of soft sifted sand & protected with bricks, tiles. Special care shall be taken to ensure that the cables are not damaged at bends. The radius of bend of the cables when installed shall not be less than 12 times the diameter of cable 1.1 KV cable shall be buried 600 mm below ground level. For additional details pertaining to Cable Laying, Refer the Electrical Works Specifications under the relevant Head.

##### **5.3. WIRE SIZES:**

For all Single phase/ Three phase wiring, 1100 volts grade PVC insulated copper conductor wires shall be used. The equipment inside plant room and AHU room shall be connected to the control panel by means of insulated aluminum conductor wires of adequate size. An isolator shall be provided near each motor/equipment wherever the motor/equipment is separated from the supply panel through a partition barrier or through ceiling construction. PVC insulated single strand aluminum conductor wires shall be used inside the control panel for connecting different components and all the wires inside the control panel shall be neatly dressed and plastic beads shall be provided at both the ends for easy identification in control wiring.

The minimum size of control wiring shall be IS marked 2C/5C x 1.5 mm<sup>2</sup> PVC insulated stranded soft drawn copper conductor wires drawn through conduit to be provided for connecting equipment and control panels.

Power wiring cabling shall be of the following sizes:

- i. Upto 5 HP motors :- 3.5C x 6 mm<sup>2</sup> Al conductor wires or meeting functional requirement
- ii. Above 5HP upto to 15 HP motors :- 1 No. 3.5C x 10 mm<sup>2</sup> Al conductor wires or meeting functional requirement
- iii. From 20 HP to 25 HP motors :- 2 Nos. 3.5C x 25 mm<sup>2</sup> Al conductor armoured cables or meeting functional requirement
- iv. From 60 HP to 75 HP motors. :- 2 Nos. 3.5C x 50 mm<sup>2</sup> Al conductor armoured cables or meeting functional requirement
- v. 100 HP motors. :- 2 No. 3.5C x 100 mm<sup>2</sup> Al conductor armoured cables or meeting functional requirement.

All the switches, contactors, push button stations, indicating lamps shall be distinctly marked with a small description of the service installed. The following capacity contactors and overload relays shall be provided for different capacity motors.

The motor starter shall conform to IS 1822 as amended upto date.

#### **5.4. EARTHING:**

For Earthing details, Refer the CPWD Electrical Works Specifications 2013 and electrical specification.

#### **5.5. DRAWINGS:**

Shop drawings for control panels and wiring of equipment showing the route of conduit/ cable shall be submitted by the contractor for approval of Engineer-in-Charge before starting the fabrication of panel and starting the work. On completion, four sets of complete "As-installed" drawings incorporating all details like, conduits routes, number of wires in conduit, location of panels, switches, junction/pull boxes and cables route etc. shall be furnished by the Contractor.

#### **5.6. TESTING:**

Before commissioning of the equipment, the entire electrical installation shall be tested in accordance with relevant BIS Codes and test report furnished by a qualified and authorized person. The entire electrical installation shall be got approved by Electrical Inspector and a certificate from Electrical Inspector shall be submitted. All tests shall be carried out in the presence of Supervisor.

#### **5.7. PAINTING:**

All sheet steel work shall undergo a process of degreasing, thorough cleaning, and painting with a high corrosion resistant primer. All panels shall then be backed in an oven. The finishing treatment shall be by application of synthetic enamel paint of approved shade.

## **5.8. LABEL AND TAGS:**

Engraved PVC labels shall be provided on all incoming and outgoing feeders switches. Circuit diagram showing the arrangements of the circuit inside the control panel shall be pasted on inside of the panel and covered with transparent plastic sheet. All cables terminations at panels and at equipments shall be provided with tags as approved by Project Manager.

1. All panels to have provision for padlocking and all MCCB's/ MCB's to have provision for locking in off position.

## **6. FIRE SIGNAGES:-**

Various types of signage are proposed in the complex as per NBC 2016 Part -4. At every floor near Lift landing diagram showing stairways shall be provided mentioning instructions - 'IN CASE OF FIRE USE STAIRS UNLESS INSTRUCTED OTHERWISE'. The signage shall be above call button in Lift Lobby. Floor Signage indicating Exit path will be provided in each floor within the staircase. The Numerical shall be Bold Type of minimum 75 MM height. Each corridor of every floor will have directional signage indicating Fire Escape route. Fire related signages shall be printed on Photoluminescent U1000 aluminium sheet of 1.0 mm (+-10%)/Acrylic Board containing Lumigen II as base chemical, covered under UV stablized coating and of appropriate size including fixing on wall, door, ceiling etc. with proper clamps, hangers, cleats, anchor fasteners etc. complete in all respects. Text shall be double sided or single sided as per requirements.

## **7. INSTALLATION , TESTING AND COMMISSIONING**

### **7.1. SCOPE**

This section covers the requirements of installation of the various components of the system.

A survey of the site of the work shall be made by the contractor before preparation of the detailed drawings for submission to the department for approval. The installation shall be carrier out strictly in accordance with the approved drawing.

The scope of installation work shall include the following, where or not expressly mentioned in the schedule or work.

- i. Cement concrete (1:2:4 Mix) foundation for all pump sets. Iron Angle framing around the Pump foundation (at the edges/periphery) to protect it from chipping/damage etc.
- ii. Vibration isolation arrangement for all pump sets
- iii. Filling up the hole in flooring with cement concrete, after laying the pipes
- iv. Necessary supports and clamps for pipes in ground
- v. Necessary supports and camps for pipes in the building
- vi. Excavation of the earth, consolidation and refilling after laying of piping in ground.
- vii. Provision of necessary brick base or intermediate support as required in approved manner in case of soils which are no strong enough to support the pipes, thereby likely to case different settlement.
- ix. Necessary anchor block of ample dimensions in 1:2:4 cement concrete at all bends, tee connections, foot of the wet riser, and other places as required to stand the pressure thrust in pipes.
- x. Necessary masonry work/ steel work for supporting hose cabinets near external (yard) hydrants.
- xi. Valve chambers of approved design with external (yard) hydrant.
- xii. Ground level hydrants of approved design, where specifies.

- xiii. Cutting and making good the damages for the installation work of the system.
- xiv. Orifice plates at individual hydrants as required.

Where provision of MS pipe shall below ground become inescapable, it shall be protected from soil corrosion by two coats of bitumen painting and wrapped with bituminous Hessian cloth and finish with hot bitumen paint without any additional cost.

Each MS pipe if required shall be subjected to hydraulic pressure test before installation, in presence of the Engineer or his authorized representative.

External (yard) hydrants shall be located at least 2m away from the face of the buildings but not more than 15m and be accessible. Distance between the two hydrants should not be more than 45 metre.

Landing Valve of Internal hydrant at each floor shall be located at about 1m above floor level.

## 7.2. PAINTING

Painting of the entire wet riser piping over the ground shall be done with anticorrosive primer and 2 coats of approved paint. The color shall be red to shade No. 536 of IS: 5, Paint shall conform to IS:2932.

The pumps and engine shall be painted after installation with a coat of approved paint to similar shade as per original supply.

## 7.3. APPROVAL BY LOCAL BODIES

It shall be the responsibility of the contractor to obtain the approval of drawings and to get the installation inspected and approved by the concerned authorities as may be necessary as per local by-laws (Pre & Final NOC).

List of Approved Makes - FIRE FIGHTING WORKS		
1.	Air Release Valve/Air Cushion Tank	Zoloto/Advance/Leader/Audco/Castle
2.	Alarm valve & Hydraulic (Alarm motor with coupling)	HD fire protect/TYCO/VIKING/Newage
3.	Alternator	Stamford/ Lorey Somer/ Kirloskar/ Toyo Denki/ AVK
4.	Ammeter/ Voltmeter/ PF/ kW/ Hz/ meter /Energy Meter/ Multimeter	As per respective electrical make list
5.	Anchor Fastener	Fischer / Hilti or equivalent
6.	Ball Valves	L&T/ Audco /Zoloto/ Advance/Emerald/ KSB
7.	Battery	Exide/ AMCO /Amararaja/ Panasonic
8.	Butt welded fitting (UL Listed) & accessories	V.S. Forge/True Forge / DRP-M

9.	Butterfly valves	L&T/ Audco/ Zoloto / Advance/ KSB
10.	Cable lugs and glands	Dowel/ Johnson/ Gripwell/ Comex/ Hex/ Comet
11.	Cables	L&T/ Gloster/ Havells/ Polycab / Finolex/ RR Kable/ KEI/ Batra henlay
12.	Check Valve/Foot Valve/Sluice Valve/ NRV	L&T/Audco / Zoloto Advance/KSB
13.	Control / Potential / Current Transformer	ABB/ Siemens/ Kirloskar/ Voltamp/ Areva/ Schneider
14.	Deluge valve/ Solenoid valve/ Spray nozzle	HD / Tyco/Viking
15.	Diesel engine driven pump	Ashok Leyland/ Cummins/ Perkins/ WIL0-Mather & Platt/ Kirloskar/Armstrong Fluid Technology
16.	ELCB	Hager/ Havells/ Legrand/ L&T/ Schneider/ ABB/ Siemens
17.	Epoxy Paint	ICI Dulux/ Nerolac / Cico / Sikka / BASF / Berger / Pidilite
18.	Fire Buckets	Safex / Minimax/Cease Fire/Peter Autokit
19.	Fire Extinguisher	Minimax / Newage/ Eversafe/ Tyco –Johnsons Control
20.	Fire Hydrant Valves/ Fire RRL Hose Pipes / Fire Hose Reels/ Fire Man's Axe/ Gun metal short branch pipe/ 2/ 3/4 FB inlet/ draw Out connection/Hose Box/ Hose reel drum /Nozzle/ blank Caps & Chains / Coupling	Ceasefire / Newage /Minimax/HD/Tyco
21.	Fire Pumps	Mather&Platt(WILO)/Grundfos/Kirloskar/Xylem – ITT/ Armstrong Fluid Technology
22.	Electrical Motors	ABB/ Siemens/Kirloskar/C&G/BALDOR
23.	Flow Meter	Scientific Equipments(p) Ltd./System Sensor or equivalent
24.	Flow switch	Potter / Rapid flow/Danfoss/Viking/Belimo/Honeywell
25.	Foot Valve (Cast iron/ Gunmetal)	Kirloskar / Zoloto/Advance/L&T



26.	Forged steel fitting & accessories	V.S.Forge/True Forge / DRP-M
27.	GI clamps	Chilly/Hilti or equivalent
28.	GI / MS Pipes	Tata / Jindal- Hissar/ SAIL
29.	Gunmetal Valves (Globe Valves)	Audco / Zoloto Advance/L&T
30.	Over Load Relays	ABB/ L&T/ Siemens/ Schnieder
31.	Pipe coat material (pipe protection)	Pypcoat / Makphalt / Safex
32.	Pipe Hangers/ Clamps/Supports	Chilly/ GMGR /CAMRY/Hilti
33.	Power/auxiliary Contactors	Siemens/ L&T/ Schneider/ ABB
34.	Pressure Gauge	Fiebig/ H.GURU/HD/BRC
35.	Pressure Switch	Indfoss/ Switzer/ Danfoss/Honeywell
36.	Push Buttons/ Indicating lamps LED	Siemens/ L&T/ ABB/ Schneider/ C&S/ Teknik
37.	Solenoid valve/ Spray nozzle	HD / Tyco/Danfoss/ Honeywell
38.	Sprinkler Heads (Sidewall/ Upright/ Pendant)	Grinnel- Tyco / Viking / HD
39.	Steel flexible extension	Eversafe /Newage/Tyco/Viking
40.	Vibration Eliminator	Resistoflex / D'wren / Kanwal
41.	Weld Electrodes	Advani/ ESAB/ L&T/Victor
42.	Pot strainer	Emerald/ VTM/ Rapid Cool
43.	Y- Strainer	Zoloto/Audco /Emerald/Advance

44.	Rubber Bellows	Resistoflex/Easyflex/Kanwal
45.	Fire Suppression System/Gas Flooding Sytem	Tyco/Newage/Minimax/Viking
46.	Clean Agent Fire Extinguisher	Kanex/Tyco/Newage/SVS Buildwell/Minimax/Lifeguard/Ceasefire
<b>List of Approved Makes - FIRE ALARM SYSTEM</b>		
Note: All fire alarm components/ Panels shall be UL listed & confirm to NFPA standards.		
1.	Control Cable	RR Cable/ Bonton/ Havells/ Polycab/ Finolex
2.	Intelligent Addressable Fire Alarm Panel/Detectors/ Hooters/ Manual Call Point UL Listed/ Talkback/ Control Module/ Monitor Module/ Control relay Module/ Short Ckt. Isolator/	Honeywell-Notifier/ Siemens/ Schneider/ Bosch/ GE Edwards/Tyco
3.	Intelligent Addressable Fire Alarm System	Honeywell-Notifier/ Siemens/ Schneider/ Bosch/ GE Edwards/Tyco
4.	Response Indicator	Morlay/Seimens Finder/ GE Edwards/ Honeywell-Notifier
5.	Fire Survival Cable	Bonton/ Skytone/ Fusion Polymers/KEI
6.	Fire Annunciation Panel	Minilec/ Honeywell-Notifier/ Siemens/ Tyco -Simplex
7.	Panic Button	Eureka Forbes/ Fire Pro / Tyco
8.	Photo Chromatic Switch	Bajaj/ Wipro/Phillips/L&T
9.	Splitter Box	Shyam Antenna/ CAT vision or equivalent
10.	Termination Control Cable	Dowell's/ Elemex/ Wago/ Phoenix

**END OF VOLUME - III**