

M/s HLL Infra Tech Services Ltd. (HITES)

(Subsidiary of HLL Lifecare Ltd., A Government of India Enterprise)

TENDER

for

SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF AUTOMATIC FIRE SPRINKLER SYSTEM IN GROUND AND FIRST FLOOR AT SOPD BLOCK AT JIPMER, PUDUCHERRY

Volume- III

Technical Specification

Tender No: HITES/CHN/18-19/003

Dated: 20th June 2018



HLL INFRA TECH SERVICES LTD.

HLL Bhavan, 26/4, Second floor
Tambaram - Velachery Road
Pallikaranai, Chennai- 600100
Ph: +91-44-22460058

INDEX

TECHNICAL SPECIFICATIONS

Chapter	TITLE	Page No.
A.	Technical Specifications - Fire Fighting	1
B.	List of Approved Makes	27

CHAPTER A

TECHNICAL SPECIFICATIONS - FIRE FIGHTING

1. FIRE FIGHTING WORKS- FIRE PROTECTIONS

1.1. SCOPE OF WORK

The scope of work covers the supply, installation, testing & commissioning of Fire Fighting Wet Riser /Hydrant (Internal & External)& Sprinkler system proposed for the Building. It will be the responsibility of the Contractor to get all approval and completion certificate from the Local Fire Department without which the work will not be taken over by the HITES. Fee payable to the local bodies for such activities shall also be borne by the HITES on production of receipts for money paid and the all other expenses barring the fee will be borne by the contractor.

1.2. TENDER DRAWINGS

For guidance of the bidder, drawings (schematic/floor fire fighting layout/external fire layout etc.) are 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.

1.3. SHOP DRAWINGS

The contractor shall prepare and furnish all shop drawings in quadruplicate 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 and as per site conditions. The manufacturing of equipment shall be commenced only after the shop drawings/GA Drawings 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.

1.4. COMPLETION / AS BUILT DRAWINGS

On completion of the work and before issuance of certificate of virtual completion, the contractor shall submit to the Engineer. General layout drawings, drawn at approved scale indicating layout of pump house piping and its accessories "As installed". These drawings shall in particular give the following:

- a. General layout of pump house
- b. Panels and other equipment location and sizes etc.
- c. Fire fighting floor layout indicating internal hydrants, sprinklers complete with pipe dia. ,pipe spacing interval etc.
- d. Complete schematic as installed.
- e. Location of External Hydrants, 2-way/4-way fire brigade inlet connection, Earth pipes, route of earthing conductors etc.
- f. Route of all cables and pipes run along with detail sizes and mode of installation.

1.5. 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 equipment installed.
- b. Test certificates
- c. History sheets of the equipments
- d. Catalogues/Brochures
- e. Operation and maintenance manuals
- f. List of recommended spares and consumables
- g. Reconciliation statement
- h. All approvals including technical approvals and sanctions
- i. NoC from Fire authority before commencement of execution & after completion of entire work etc.

1.6. SANCTION/ APPROVALS FROM STATUTORY AUTHORITIES/ LOCAL FIRE AUTHORITY

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

- a. Submission of working drawing
- b. Obtaining the approval of drawings
- c. Arranging inspection of site by officials of the Authority
- d. Obtaining the final no objection/ completion certificate after submitting required documents.
- e. Any other statutory approvals required.

1.7. 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.

1.8. MAKE OF MATERIALS

Only approved makes as mentioned in our approved make list of tender documents of material shall be used. The contractor shall get the samples of required items approved from the HITES or project in charge engineer before commencing the supply.

1.9. MANUFACTURER INSTRUCTION

Any specific instruction furnished by manufacture covering the points not mentioned in technical specifications of the tender shall be brought to the notice of project incharge engineer in writing for further instructions in this regard at the time of tendering.

1.10. MATERIAL TESTING

The project incharge engineer 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.

1.11. INSPECTION AND TESTING

- a. All equipment shall be inspected and tested as per an agreed Quality Assurance Plan before the same is packed and dispatched from the contractor's works. The contractor shall carry out tests 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. No extra shall be paid for these.
- c. The project incharge engineer 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.

1.12. 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 (one year after completion & handing over).
- 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.

1.13. 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.

- a. Any defective material or equipment supplied by the contractor.
- b. 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 FOR WET RISER SYSTEM

2.1. SCOPE

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

2.2. GENERAL

The wet riser 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 Wet Riser system shall be of black steel conforming to IS: 1239 (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 I.S. 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 thread 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	300 mm
Dia of flange	→ 200 mm	220 mm	285 mm	340 mm	445 mm
Dia of bolt	→ 16 mm	16 mm	16 mm	16 mm	16 mm
No. of hole	→ 4 mm	4 mm	8 mm	8 mm	12 mm

2.6. PIPE PROTECTION

- 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.
- 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.
- Pipe passing through structural members will be provided with M.S. pipes.

2.7. PIPE SUPPORTS

All pipe clamps and supports shall be galvanised steel. When fabricated from M.S. steel sections, the supports shall be factory galvanised before use at site. Welding of galvanised 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 fastener 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.

PIPE SPACING TABLE

	Pipes & Position	<----- Pipe commercial dia. -----> ----->							
	Vertical								
	GI /MS								
	CI Pipes IS 1729/3989			<----- 3 m -----> ----->					
	CI Heavy Duty IS 1536			<----- 3.6 m -----> ----->					
	uPVC SWR Systems								
	uPVC Water								

	Supply								
	Polybutyl ene	<--- As per manufacturer's Reccomendations -----> ----->							
	Horizontal								
	GI /MS								
	CI Pipes IS 1729/398 9			<----- 3 m ----->					
	CI Heavy Duty IS 1536								
	uPVC SWR Systems								

2.8. ORIFICE FLANGES

Contractor shall provide orifice flanges fabricated from 6 mm thick Brass plates on the branch lines feeding different zones/ floors so as to allow required flow of water at 3.5 Kg/ sq.cm. Pressure. The contractor shall furnish design for these orifice flanges.

2.9. AIR VESSEL AND AIR RELEASE VALVE

Air vessel on top of each wet riser/ sprinkler piping shall be installed before execution for approval fabricated out of at least 8 mm thick steel to withstand the pressure, with dished ends and supporting legs. This shall be of 250 mm dia and 1 m high. This shall be completed with necessary flange connection to the wet riser/ sprinkler piping and air release valve with necessary piping to meet the functional requirement of the system. The air vessel shall be of continuous welded construction and painted with red Colour. This shall be tested for twice the working pressure.

2.10. VALVES, GAUGES AND ORIFICE PLATES

Butter-fly, Sluice valves and NRV above 65 mm shall be of cast iron body .They shall conform to type PN 1.6 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.

Non-return valves shall be of cast iron body. They shall be swing type conforming to Class 1 of IS: 5312 and should haveNitrile Rubber/EPDM SealThey shall be swing check type in horizontal runs and lift check type in vertical runs of piping.

Pressure gauge of suitable range shall be installed on the discharge side of each pump vacuum gauge shall be provided on suction side for pumps with negative suction. The dial size shall be 250 mm. The gauges shall have brass cocks.

Orifice plates shall be made of 6mm thicknessBrass materialto 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.

2.11. EXTERNAL YARD HYDRANTS

External yard hydrants shall be of 'Stand Post' type conforming to IS: 908 and comprise stand post for single or double(as per specified in boq) outlet, duck foot bend, flange riser and single headed brass/ gunmetal or (as specified in BOQ) valve conforming type A/ type-B as per BoQ and conforming to IS: 5290.

The stand post column shall be of cast iron, cast in one piece, conforming to grade 20 of IS: 210 or M.S. pipe. The internal diameter at the top shall be at least 80 mm.

The outlet shall be angled towards ground, with instantaneous spring lock type gunmetal female coupling of 63 mm dia. For connecting to hose pipe.

2.12. INTERNAL HYDRANTS

The internal hydrant outlet shall comprise double-headed double outlet or as per B.O.Q. gunmetal or SS landing valve' conforming to type A as per BoQ and conforming to IS: 5290. Separate valves one on each of the two heads shall form part of the landing valve construction.

A brass cap with chain is provided on one head of the outlet which will have an instantaneous pattern female coupling for connection to the hose pipe. The landing valve shall be fitted to a tee connection on the wet riser at the landing.

2.13. FIRST AID HOSE REEL EQUIPMENT

First aid hose reel equipment shall comprise reel hose guide fixing bracket, hose tubing globe valve, stopcock and nozzle. This shall conform to IS: 884. The hose tubing shall conform to IS: 1532.

The hose tubing shall be 20 mm dia and 36 m long. The gunmetal / brass nozzle and globe valve shall be of 25 mm size.

The fixing brackets shall be of swinging type. Operating instructions shall be engraved on the assembly.

2.14. HOSE PIPES, BRANCH PIPES AND NOZZLES

Hose pipes:- Hose pipes shall be rubber lined woven jacketed 63 mm in diameter and 15 m long. They shall conform to controlled percolation type comply with IS:8423 or type A (reinforced rubber lined) of IS: 636 . The hose shall be sufficiently flexible and capable of being rolled.

Each run of hose pipe shall be complete with necessary coupling at the ends of match with the landing valve or with another run of hose pipe or with Branch pipe.

The coupling shall be of instantaneous spring lock type.

Branch pipe: - Branch pipe shall be of copper, gunmetal or aluminum alloy 63 mm dia and be complete with male instantaneous spring lock type coupling for connection to the hose pipe. The branch pipe shall be externally threaded to receive the nozzle.

Nozzle: - The nozzle shall be of copper or gunmetal, 20 mm in internal diameter. The screw threads at the inlet connection shall match with the threading on the branch pipe. The inlet end shall have a hexagonal head to facilitate screwing of the nozzle on to the branch pipe with the nozzle spanner.

End couplings, branch pipes, and nozzles shall conform to IS: 903. Each hydrant point will be provided with two hoses of 15 m each and one gunmetal branch pipe.

2.15. HOSE CABINET

The hose cabinet to accommodate the hosepipes, branch pipe nozzle and the hydrant outlets shall be fabricated from 1.5 mm thick sheet steel. In case of internal hydrants, this shall accommodate the hose reel equipment also. This shall have lockable, center opening glazed doors.

The scope of work includes provision of masonry or steel frame structure, as specified for installation. The hose cabinet shall be painted red stove enameled.

2.16. 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, sprinkler system and individual wet risers as specified.

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.

It should be provided with M.S. enclosure fabricated from 1.5 mm thick M.S. sheet, front glass locking arrangement supported on M.S. structural members, painting with two coats of postal red enamel.

3. ELECTRIC DRIVE, HORIZONTAL FIRE PUMPS

3.1. SCOPE OF WORK

- a. Work under this section shall consist of furnishing all labour, materials, equipments and appliance necessary and required to completely install electrically operated pumps as required by the drawings and specified hereinafter or given in the schedule of quantities.
- b. Without restricting to the generality of the foregoing, the pumps and ancillary and accessories.
 1. Electrically operated pumps with motors, base plates and accessories.
 2. Alarm system with all accessories wiring and connections.
 3. Pressure gauges with isolation valves and piping bleed and block valves.
 4. M.S. pipes, valves, suction strainers, delivery headers and accessories.
 5. Foundations, vibration eliminator pads and foundation bolts.

3.2. QUALITY CONTROL

These shall comply with the IS codes as specified.

3.3. SUBMISSIONS

- a. Product Manuals
- b. Hydraulic Details

3.4. STORAGE

These shall be stored as delivered in original packing.

4. FIRE, SPRINKLER AND JOCKEY PUMPS

4.1. PUMPING SETS

- a. Pumping sets shall be multi stage horizontal split casing centrifugal Pump having single outlet with cast iron body and bronze dynamically balanced impellers. Connecting shaft shall be stainless steel with bronze sleeve and grease- lubricated bearings.
- b. Pumps shall be connected to the drive by means of spacer type love joy couplings, which shall be individually balanced.
- c. The coupling joining the prime movers with the pump shall be provided with a sheet metal guard.
- d. Pumps shall be provided with approved type of mechanical seals.
- e. Pumps shall be capable of delivering not less than 150% of the rated capacity of water at a head of not less than 65% of the rated head. The shut off head shall not exceed 120% of the rated head.
- f. The pump shall meet the requirements of the Tariff Advisory Committee and N.B.C. and N.F.P.A. and the unit shall be design proven in fire protection services.

4.2. ELECTRIC DRIVE

- a. Electrically driven pumps shall be provided with totally enclosed fan ventilated induction motors of efficiency rating IE-3. For fire pumps the motors should be rated not to draw starting current more than 3 times normal running current.
- b. Motors for fire protection pumps shall be at least equivalent to the horse power required to drive the pump at 150% of its rated discharge and shall be designed for continuous full load duty and shall be design proven in similar service.
- c. Motors shall be wound for class F insulation and winding shall be vacuum impregnated with heat and moisture resistant varnish glass fiber insulated.
- d. Motors for fire pumps shall meet all requirements and specifications of the Tariff Advisory Committee. and N.B.C. and N.F.P.A.
- e. Motors shall be suitable for 415 volts, 3 phase 50 cycles A/c supply and shall be designed for 38 deg. C ambient temperature. Motors shall conform to I.S. 325.
- f. Motors shall be designed for two-start system.
- g. Motors shall be capable of handling the required starting torque of the pumps.
- h. Contractor shall provide inbuilt heating arrangements for the motors for main pumps to ensure that motor windings shall remain dry.
- i. Speed of the motors shall be compatible with the speed of the pump.

4.3. AIR VESSEL

- a. Provide one air vessel fabricated from 10 mm M.S. plate with dished ends and suitable supporting legs. Air vessel shall be provided with a 100 mm dia flanged connection from pump, one 25 mm dia drain with valve, one gunmetal water level gauge and 15 mm sockets for pressure switches. The vessel shall be 450 mm dia x 2000 mm high and tested to 20 kg/ sq. cm pressure.
- b. The fire pumps shall operate on drop of pressure in the mains as given below. The pump operating sequence shall be arranged in a manner to start the pump automatically but should be stopped manually by starter push buttons only.

4.4. VIBRATION ELIMINATORS

Provide on all suction and delivery lines double flanged reinforced neoprene flexible pipe connectors. Connectors should be suitable for a working pressure of each pump

and tested to the test pressure given in the relevant head. Length of the connector shall be as per manufacturer's details.

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.
- 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 and performance charts with NPSH requirement of the pumps from the manufacturer. The contractor shall provide facilities to the Engineer-in-charge or their authorized representative for inspection of equipment during manufacturing and also to witness various tests at the manufacturer's works without any cost to the HITES.
- f. Each pump shall be provided with a 150 mm dia pressure, isolation cock and connecting piping, bleed and block valve.
- g. Provide vibration eliminating pad and connectors for each pump.

The contractor shall submit with this tender a list of recommended spare parts for two years of normal operation and quote the prices for the same.

5. DIESEL DRIVE, HORIZONTAL FIRE PUMPS

5.1. SCOPE OF WORK

- a. Work under this section shall consist of furnishing all labour, materials, equipments and appliances necessary and required to completely install diesel driven pumps as required by the drawings, specified hereinafter or given in the schedule of quantities.
- b. Without restricting to the generality of the foregoing, the pumps and ancillary equipment shall include the following:
 1. Diesel driven pumps with motors, base plates and accessories.
 2. Alarm system with all accessories, wiring and connections.
 3. Pressure gauges with isolation valves and piping bleed and block valves.
 4. M.S. pipes, valves, suction strainers, delivery headers and accessories.
 5. Foundations, vibration eliminator pads and foundation bolts.

5.2. QUALITY CONTROL

- a. These shall comply with the IS codes as specified.

1. SUBMISSIONS

- a. Product Manuals
- b. Hydraulic Details

2. STORAGE

- a. These shall be stored as delivered in original packing.

6. FIRE, SPRINKLER AND JOCKEY PUMPS

6.1. PUMPING SETS

- a. Pumping sets shall be multi stage horizontal split casing centrifugal pump having single outlet with cast iron body and bronze dynamically balanced impellers. Connecting shaft shall be stainless steel with bronze sleeve and grease-lubricated bearings.
- b. Pumps shall be connected to the drive by means of spacer type love joy couplings, which shall be individually balanced dynamically and statically.
- c. The coupling joining the prime movers with the pump shall be provided with a sheet metal guard.
- d. Pumps shall be provided with approved type of mechanical seals.
- e. Pumps shall be capable of delivering not less than 150% of the rated capacity of water at a head of not less than 65% of the rated head. The shut off head shall not exceed 120% of the rated head.
- f. The pump shall meet the requirements of the Tariff Advisory Committee and the unit shall be design proven in fire protection services.

6.2. DIESEL ENGINE

- a. Diesel engine shall be of multi cylinders (4/6 as per site requirements) with individual head assemblies. The engine shall be water-cooled and shall include heat exchanger/radiator cooled and connecting piping, strainer, isolating and pressure reducing valves, bye-pass line complete in all respects.
- b. Engine shall be direct injection type with low noise and exhaust emission levels.
- c. The speed of the engine shall match the pump speed for direct drive.
- d. The engine shall be capable of being started without the use of wicks, cartridge heater, plugs or either at engine room temperature of 7 deg. C and shall take full load within 15 seconds from the receipt of the signal to start.
- e. The Engine shall efficiently operate at 38 deg. C ambient temperature at 50 m above mean sea level.
- f. Noise level of the engine shall not exceed 105 DBA (free field sound pressure) at 3 m distance.
- g. The engine shall be self starting type up to 4 deg. C and shall be provided with one 24 V heavy duty DC battery, starter, cut-out, battery leads complete in all respects. One additional spare battery shall be provided. The battery shall have a capacity of 180 to 200 ampere hours and 640 amps cold cranking amperage.
- h. Provided a battery recharger of 10 to 15 amperes capacity with trickle and booster charging facility and regulator.
- i. Annunciation panel shall be suitable for working on 24 volts D.C. Arrangement for starting shall be automatic on receiving the signal but shutting off shall be manual.
- j. The engine shall be provided with an oil bath or dry type air cleaner as per manufacturer's design.
- k. Engine shall be suitable for running on high speed diesel oil.

- l. The system shall be provided with a control panel with push button starting arrangement also and wired to operate the engine on a differential pressure gauge.
- m. The entire system shall be mounted on a common structural base plate with ant vibration mountings and flexible connections on the suction and delivery piping.
- n. Provide one fully mounted and supported day oil tank fabricated from 5mm thick M.S. sheet electrically welded with a capacity of 200 Litres. Provide level indicating gauge glass on the day oil tank and low fuel indication of the control panel.
- o. Provide one exhaust pipe with suitable muffler (residential type) to discharge the engine gases to outside open air as per site conditions.
- p. Provide all accessories fittings and fixtures necessary and required for a complete operating engine set.
- q. Contractor shall indicate special requirements, if any, for the ventilation of the pump room.

6.3. OPERATING CONDITIONS FOR JOCKEY ,ELECTRIC& DIESEL PUMPS

- a. Jockey pump shall start automatically when the Water Pressure in the System falls to a pre-set value (about 0.35 Kg/cm² below normal system pressure)and shut down when the system pressure reaches the set value. Both Limits shall be adjustable.
- b. Main Electric Fire Pump shall operate on account of sudden pressure loss. So, long as Main Electric Fire Pump is working, other Fire Pumps will not operate. The Pump shall start when the water pressure falls to a pre-set value in the system (about 1Kg/cm²)
- c. The Diesel Fire Pump will start on sudden pressure loss, only in case supply to main electric Fire Pump is not available or within a pre-set time the main Electric Fire Pump fails to start or fails during operation. No other pump will be working when Diesel Engine fire Pump is in operation. Audio-Visual Alarm shall be available to indicate failure of Main Electric Fire Pump.
- d. A three attempts starting facility will be provided for diesel Pump.
- e. If within a pre-set time, the stand-by pump also fails to start or fails to develop pressure, the standby pump shall also be shut down and locked out. An audio visual alarm indication shall be given at the Control Panel.
- f. 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.
- g. Only one pump will be working at a time. In manual mode, more than one Pump can be started.
- h. Water Level in UG and Terrace Tanks shall be monitored and in case of low water level, pumps connected with the tank shall not operate (even on manual mode) or stop operation as the case may be. An audio-visual alarm shall be given at the Control Panel.

6.4. VIBRATION ELIMINATORS

- a. Provide on all suction and delivery lines double flanged reinforced neoprene flexible pipe connectors. Connectors should be suitable for a working pressure of each pump and tested to the test pressure given in the relevant head. Length of the connector shall be as per manufacturer's details.

6.5. 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.
- b. Pumps and motors shall be truly aligned by suitable instruments.
- c. All pump connections shall be standard flanged type with appropriate number of bolts. In case of nonstandard 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 and performance charts with NPSH requirement of the pumps from the manufacturer. The contractor shall provide facilities to the Engineer-in-charge or their authorized representative of inspection of equipment during manufacturing and also to witness various tests at the manufacturer's works without any cost to the CLIENT/ HITES.
- f. Each pump shall be provided with a 150 mm dia pressure gauge, isolation cock and connecting piping, bleed and block valve.
- g. Provide vibration eliminating pad and connectors for each pump.
- h. The contractor shall submit with this tender a list of recommended spare parts for two years of normal operation and quote the prices for the same.

7. ELECTRICAL INSTALLATIONS

i. SCOPE:

The scope of this section comprises of fabrication, supply, erection, testing and commissioning of electric control panels, wiring and earthing of all pump room equipment, components and accessories, including supply, installation and wiring of remote control-cum-indicating light panel.

ii. GENERAL:

Work shall be carried out in accordance with the Specifications, Local Rules, Indian Electricity Act 1910 as amended up to date, and rules issued thereunder, Regulations of the Fire Insurance Company and relevant BIS Code of Practice.

7.1. 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.

7.2. CABLE LAYING:

Cable shall be laid generally in accordance with BIS Code of Practice. 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.

7.3. 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 1.5 mm² PVC insulated stranded soft drawn copper conductor wires drawn through conduit to be provided for connecting equipment and control panels. For additional details pertaining to Wire Sizes, Refer the Electrical Works Specifications under the relevant Head.

Power wiring cabling shall be of the following sizes:

- i. Upto 5 HP motors/5 KW heaters:- 3 x 4 mm² Cu conductor wires.
- ii. From 6 HP to 10 HP motors / 6 KW to 7.5 KW heaters. : - 6 mm² Cu conductor wires.
- iii. From 12.5 HP to 15 HP motors:- 2 Nos. 3 x 6 mm² Cu conductor wires.
- iv. From 20 HP to 25 HP motors:- 2 Nos. 3 x 10 mm² Al conductor armoured cables.
- v. From 30 HP to 35 HP motors:- 3 x 16 mm² Al conductor armoured cables.
- vi. From 40 HP to 50 HP motors:- 2 Nos. 3 x 25 mm² Al conductor armoured cables.
- vii. From 60 HP to 75 HP motors. :- 2 Nos. 3 x 50 mm² Al conductor armoured cables.
- viii. 100 HP motors. :- 1 No. 3 x 150 mm² Al conductor armoured cables.

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.

	TYPE OF STARTER	CONTACTOR CURRENT CAPACITY	OVERLOAD RELAY RANGE
5 HP Motors	DOL	16 amps	6-10 amps
7.5HP Motors	DOL	16 amps	10-16 amps
10 HP Motors	DOL	32 amps	13-21 amps
12.5HP Motors	Star Delta	16 amps	10-16 amps
15 HP Motors	Star Delta	25 amps	10-16 amps
20 HP Motors	Star Delta	32 amps	13-21 amps

25 HP Motors	Star Delta	32 amps	13-21 amps
30 HP Motors	Star Delta	40 amps	20-32 amps
35 HP Motors	Star Delta	40 amps	20-32 amps
40 HP Motors	Star Delta	40 amps	28-42 amps
45 HP Motors	Star Delta	63 amps	28-42 amps
50 HP Motors	Star Delta	63 amps	28-42 amps
60 HP Motors	Soft Starter	125 amps	45-70amps
75 HP Motors	-DO-	125 amps	90-150 amps
100 HP Motors	-DO-	200 amps	CT operated Relay

7.4. Earthing:

For Earthing details, Refer the Electrical Works Specifications under the relevant Head.

7.5. 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.

7.6. 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.

7.7. 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.

7.8. 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.
2. **Measurement of Electrical Control Panels:** Panels shall be counted as number of units. Quoted rates shall include as lump sum (NOT measurable lengths) for all internal wiring, power wiring and earthing connections from the control panel to the starter and to the motor, control wiring for inter-locking, power and control wiring for automatic and safety controls, and control wiring for remote start/stop as well as indication as per the specifications. The quoted rate for panel shall also include all accessories, switchgear, fuses, contactors, indicating meters and lights as per the specifications.

7.9. ELECTRIC FIRE PUMP SECTION: -

This section shall incorporate the following facilities.

- i. TP &N Moulded case circuit breaker
- ii. Control system components and equipment such as relays, contractors, and timers etc. for automatic operation.
- iii. Starter unit, current transformer and ammeter
- iv. Indication lamps, their fuses, terminal block, push button, control and selector switches etc. as required.
- v. Pump lock out devices due to faults or abnormalities as specified.
- vi. Visual/ audio alarms, indications and communications facility as specified.
- vii. Necessary inter-connection control and power cable work, cable glands, lungs and internal wiring and connections.

7.10. ENGINESECTION: -

The engine section shall incorporate the following facilities.

- a. Control system components and equipment such as relays, contractors, and timers etc. for automatic operation.
- b. Instruments, indicator lamps, fuses, terminal blocks, push buttons, control and selector switches etc. as are required.
- c. Engine shut down and block out devices due to faults or abnormalities as specified.
- d. Visual/ audio alarm indication and enunciator facility as specified.
- e. Inter- connection control and power cable work, cable glands, lungs, all internal wiring and connection etc.

7.11. AUXILIARYPUMP SECTION: -

Each of the auxiliary pump section for priming pump shall incorporate the following:

- a. TP&N Moulded case circuit breaker
- b. Control system components such as relays, timers, contractors etc. as are necessary for functional requirements.
- c. Starter unit, current transformer and ammeter

- d. Indication lamps, fuses, terminal blocks, push buttons selector, switch etc. as required.
- e. Inter-connections, power and control cable work, cable plants lugs, internal wiring and connections.
- f. Low water level alarm for terrace tank, where provided.

7.12. CONTROLSECTION: -

This section shall incorporate the following:

- a. Control components integrating the various sections, so as to satisfy the functional requirements.
- b. Battery charger unit with boost/ float charge facility with voltmeter, capable of independently charging 1 set of battery at a time.
- c. Visual/ audio alarms not covered in individual sections.
- d. Lamps healthy test facility.
- e. Instruments, indicating lamps, push buttons, fuse terminal blocks etc. as are required.
- f. Test facility to stimulate operation of hydrants.

7.13. OTHER CONTROL COMPONENTS

7.13.1. Pressure Switches:

Pressure switches shall be provided for switching on and off the jockey pump at present pressures and also for switching of the fire pump at priest pressure. Being the main component for initiating the signal for the operation of the pumps, the pressure switches shall be totally reliable, sturdy in construction and of long life. The pressure settings shall be adjustable.

7.13.2. Low water level indication and switch:

To prevent the dry running of the fire pumps due emptying of the static tank, water level indication and switch shall be provided. This shall trip the electric motor or stop the diesel engine, as the case may be when the water level goes below a present level. This shall also furnish a distinct low water level audiovisual alarm. This should indicate the level of water at different stages is the power and control panel.

7.13.3. Power Supply for Controls:

In order ensure that the control systems remains operational at all times, the control system shall be designed for 24V DC operation, fed from 24 V wet battery. This shall be independent of the starting battery for the engine i.e., battery shall remain trickle charged at the times from the common battery, charges at the control section.

7.14. MAINTENANCE MANUAL

- i. On completion of the entire work and successful commissioning, contractor shall hand over four copies of maintenance manuals of all equipment installed by him.
- ii. Maintenance manuals shall include information relating to make, model Number, year of manufacture for all electrical and mechanical equipment with names of local suppliers or manufacturers' agents.

7.15. MEASUREMENTS

- i. Pumping sets, air vessel, switchboard cubicle, pressure switch, fire alarm shall be measured by number and shall include all items necessary and required and given in the specifications.
- ii. Earthing shall be measured as a lump sum item.
- iii. Earthing tape will be linear measurement.
- iv. Cabling shall be measured per linear meter from switchboard to each motor and shall include all items necessary and required and given in the specifications.

8. INSTALLATION AND TESTING

8.1. SCOPE

This section covers the requirements of installation of the various components of the wet riser 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 carried 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 of work.

- i. Cement concrete (1:2:4 Mix) foundation for all pump sets
- ii. Vibration isolation arrangement for all pump sets
- iii. Filling up the hole in flooring with cement concrete, after laying the wet riser pipes
- iv. Necessary supports and clamps for wet riser pump room
- v. Necessary supports and camps for wet riser plumbing the building
- vi. Supporting bracket/ frame work for the fuel oil tank of the engine
- vii. Excavation of the earth, consolidation and refilling after laying of wet riser piping in ground.
- viii. Provision of necessary brick base or intermediate support as required in approved manner in case of soils which are not strong enough to support the pipes, thereby likely to cause 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 specified.
- xiii. Cutting and making good the damages for the installation work of the riser system
- xiv. All the required control piping, exhaust piping from engine to outside, oil piping for fuel oil and lubricating oil for the engine, drain piping from the pumps to the drain point in the pump room, overflow piping from priming tank to the sump. The piping work shall include all necessary fittings, valve and accessories for effective functional requirements.
- xv. Inter-connecting cable work with controls, control panel, batteries etc. including battery leads.

- xvi. 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.

Each MS pipe 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.

Where external hydrants below ground level are specifically indicated in tender specifications, there shall be enclosed in masonry trenches of size 75sqcm and 8cm above ground level. The hydrant shall be within 8cm from the top of the enclosure.

Necessary facility for draining the rise pipe shall be provided at ground floor level with 50mm size sluice valve.

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

Valve chambers shall be of 1sqm in size, with cover.

8.2. HOSES AND HOSE CABINET

All hoses shall be numbered and a record submitted with completion plane. The number and length shall be easily recognizable on each hose pipe.

External hose boxes shall be installed such that the hose is not exposed to sun rays.

8.3. 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.

8.4. 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, any fee payable to the local bodies for such activities shall also be borne by the CLIENT/ HITES on production of receipts for money paid and the other expenses will be borne by the contractor.

8.5. PIPE WORK ASSOCIATED WITH DIESEL ENGINE

Pipe works for fuel system, lube oil system and exhaust system shall be complete with all required supports, clamps, hangers etc. for a complete work.

Fuel feed is by gravity and the fuel tank shall be located at least 60cm above the fuel injection pump.

Fuel pipe of copper shall not be soldered but brazed or welded.

No valves or cocks shall be provided in the fuel feed line to engine from the fuel tank.

Precautions shall be taken to prevent any air locks in any part of the fuel system. No air relief cock shall be permitted and where inescapable, screwed plugs shall be provided for the purpose.

The installation of the fuel supply system shall be such that a completely primed condition is maintained, free from air lock.

Filters shall be provided in fuel oil and lube oil circuits allocations that are easily accessible for maintenance.

8.6. WET RISER PIPE WORK

The suction line for each pump shall be independent.

No sluice valve shall be provided in Suction line, where the pump is located above the water level in the sump foot valve and strainer shall however be provided.

Butterfly or Sluice valve shall be provided in situation line, where the pump is located below the water level in the sump, strainer at the suction end shall be provided.

Each external (yard) hydrant shall be controlled by a Butterfly or sluice valve at ground level.

Butterfly or Sluice valves shall be kept in open position and the scope of work includes provision of necessary leather strap and pad lock so as to prevent unauthorized closing of valve.

The installation work includes provision of all clamps, supports, anchors etc.

Spacing between vertical supports shall not exceed 1.5m and horizontally at 2m up to 50mm and 1.5m for higher diameters. Clamps shall be provided on either side of the tee joints for internal hydrants. Necessary anchors/ thrust pads shall be provided as approved at locations of bends, tees etc. as required within the scope of work.

Under ground pipes of the wet riser system shall be laid 1m below ground level and at least 2m away from the face of the buildings. The run of piping shall be preferably along roads and footpaths and shall not be under buildings. Where specifically indicated to cross buildings, these shall be laid in masonry trenches with removable covers, with cut off valves at the entry and exit points.

9. TECHNICAL SPECIFICATIONS FOR SPRINKLER SYSTEM

9.1. SPRINKLER HEADS

a. Sprinkler heads shall be of quartzoid bulb type with bulb, valve assembly yoke and the deflector. The sprinklers shall be of approved make and type.

b. Types

i. Conventional Pattern

The sprinklers shall be designed to produce a spherical type of discharge with a portion of water being thrown upwards to the ceiling. The sprinklers shall be suitable for erection in upright position or pendant position.

ii. Spray Pattern

The spray type sprinkler shall produce a hemispherical discharge below the plane of the deflector.

iii. Ceiling (flush) Pattern

These shall be designed for use with concealed pipe work. These shall be installed pendant with plate or base flush to the ceiling with below the ceiling.

iv. Side Wall Sprinklers

These shall be designed for installation along with the walls of room close to the ceiling. The discharge pattern shall be similar to one quarter of sphere with a small proportion discharging on the wall behind the sprinklers.

c. Constructions

- i. Bulb:- Bulb shall be made of corrosion free material strong enough to with stand any water pressure likely to occur in the system. The bulb shall shatter when the temperature of the surrounding air reaches a predetermined level.
- ii. Valve Assembly: - Water passage of the sprinkler shall be closed by a valve assembly of flexible construction. The valve assembly shall be held in position by the quartzoid bulb. The assembly be stable and shall withstand pressure surges or external vibration without displacement.
- iii. Yoke: - The yoke shall be made of high quality gun metal. The arms of yoke shall be so designed as to avoid interference with discharge of water from the deflector. The sprinkler body shall be coated with an approved anti-corrosive treatment if the same is toused in corrosive conditions.
- iv. Deflector: - The deflector shall be suitable for either upright or pendent erection. The deflector shall be designed to give an even distribution of water over the area protected by each sprinkler.

d. Colour Code

The following color code shall be adopted for classification of sprinkler according to nominal temperature ratings:

Sprinkler Temperature Rating	Color of the Bulb
57 deg. C	Orange
68 deg. C	Red
79 deg. C	Yellow
93 deg. C	Green
141 deg. C	Blue
182 deg. C	Violet/ Mauve
204/260 deg. C	Black

e. Size of Sprinklers Orifices

The following sizes of sprinklers shall be selected for various classes or hazards.

Extra light hazard	10/15 mm nominal bore
Ordinary light hazard	15 mm nominal bore
Extra high hazard systems	30 sprinklers

f. Stock of replacement sprinkler

The following spare sprinklers shall be supplied along with the system.

Extra high hazard systems	6 sprinklers
Ordinary hazard systems	24 sprinklers
Extra high hazard systems	36 sprinklers

g. Temperature Rating

For normal conditions in temperature climates rating of 68/74 deg. C shall be used. However the temperature rating shall be as closed as possible to, but not less than 30 deg. C above the highest anticipated temperature conditions.

9.2. PIPES AND FITTINGS

a. Pipes

- i. Pipes for wet riser system shall be Black Steel conforming to IS: 1239 (Heavy Class).
- ii. Fittings for black steel pipes shall be malleable iron suitable for welding or approved type cast iron fittings with tapered screwed threads.

b. Jointing

Joint for black steel pipes and fittings shall be metal to metal tapered thread or welded joints. A small amount of red lead may be used for lubrication and rust prevention in threaded joints.

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.

c. Pipe Protection

- i. 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.
- ii. Pipes in chase or buried underground shall be painted with two coats of hot bitumen, wrapped with bituminous Hessian cloth and finished with one coat of hot bitumen paint.

d. Pipe Supports

All pipes shall be adequately supported from ceiling or walls from existing inserts by structural clamps fabricated from M.S. structurals e.g. rods, channels, angles and flats. All clamps shall be painted with one coat of red and two coats of black enamel paint. Where inserts are not provided, the contractor shall provide anchor fasteners.

e. Orifice Flanges

Contractor shall provide orifice flanges fabricated from 6mm thick Brass plates on the branch lines feeding different zones/ floors so as allow required flow of water at 3.5 kg/sq.mm pressure. The contractor shall furnish design for these orifice flanges.

f. Valves

Butterfly or Sluice valves of size 80mm and above shall be double-flanged cast iron conforming to IS: 780.

Check valve shall be of cast iron double flanged conforming to IS: 5312.

Valves on pipes 65mm and below shall be heavy pattern gunmetal valves with cast iron wheel seat tested to 20 kg/ sq.mm pressure. Valves shall conform to IS: 778.

g. Air Valves

25mm dia screwed inlet cast iron single acting air valves on all high points in the system or as shown on drawings.

h. Drain Valves

50 m dia black steel pipe conforming to IS: 1239 heavy class with 50 mm gunmetal full way valve for draining water in the system in low pockets.

9.3. INSTALLATION CONTROL VALVE:-

Installation control valves shall comprise of the following.

- a. One main stop valve of full way pattern with gunmetal pointer to indicate where open/ shut
- b. One automatic alarm valve, fitted with handle and cover.
- c. One hydraulic alarm motor and gong for sounding a continuous alarm upon out-break of fire.
- d. One combined waste and testing valve including 5 mtr of tubing and fittings
- e. Alarm stop valve
- f. Strainer
- g. Drain plug
- h. Padlock & strap
- i. Wall box for installation of valve

9.4 PUMP SETS: - Same as wet riser & Hydrant System specification.

9.5 ANNUNCIATION SPRINKLER PANEL

The equipment for control panel should be compact neatly wired and enclosed in a suitable 2 mm M.S. sheet that is suitably treated against corrosion. The control panel should be painted with enamel paint. The panel shall consist of:

- a. Panel should be made in a module of 20 zones e.g. each module will have audible and visual indications and will monitor the circuit conditions. With 24v DC battery.

A.C. Power Supply

Fault and Fire indication lamp

Alarm acknowledgment push buttons

- b. The circuits provided in the control panel for each zone shall indicate the following conditions:
 - i. Open Circuit in zone wiring
 - ii. Short Circuit in zone wiring
 - iii. Normal conditions
 - iv. Power failure
 - v. Low battery
- c. The Automatic annunciation panel shall suitable for operation on 24V DC and shall be provided with power supply unit suitable to operate on A.C. mains of 230 V with a variation of 10%. The system shall be so designed that in case of failure of A.C. main supply it shall automatically change over to battery supply.
- d. Suitable protection may be provided against charging of the battery over and above the specified values.

9.6 BATTERY UNIT

- i. The system shall be powered by lead acid storage stationery complete with automatic dual rate charger boost and trick operating from 220 V, 50 Hz, single phase, mains supply. The battery capacity should be adequate for operation of the system connected to it for at least 24 hours in the non-alarm state followed by 30 minutes operation of all sounders and other connected equipments after a power (mains) failure.

- ii. The automatic charger should operate at the boost charge when the battery terminal voltage is less than about 2.1 V 20 per cell, and operate at a trickle charge rate of 100 to 200 AH, when the battery terminal voltage exceeded about 2.25 per cell.
- iii. The power unit should have the following.
 - a. Voltmeter 0-03 V
 - b. Ammeter of suitable range
 - c. Indicator lights for mains
 - d. Indicator lights for DC output
- iv. The preferred nominal DC voltage shall be 24 V and shall preferably be isolated. (If and isolated supply is provided a line earthing indicator should also be provided).
- v. The DC system and the detection and sounder circuits shall be protected against their attaining a voltage to earth exceeding 50V.
- vi. The connection to the 220 V, 50 Hz, single phase system shall be through a three pin plug socket especially provided for the connection to the annunciation panel. This connection should in addition utilized for earthing all non-current carrying metal parts of the sprinkler system, except those that are either doubly insulate or mounted at a height exceeding 2.2 meters.
- vii. The battery unit shall be housed in a steel cabinet at least 2 mm thick suitably painted with two coats of Post Office Red, Enamel necessary vent holes should be provided for proper ventilation.

10. PRESSURE GAUGES

Bourden type pressure gauges with Isolation Valves and Brass Stop Cock conforming to IS/ BS specifications shall provided at the following locations.

- a. Just above alarm valve
- b. Just below alarm valve, on the installation stop valve
- c. One pressure gauge on delivery side of each pump
- d. One Pressure Gauge, part of Pressure vessel installation.
- e. On the Common Delivery Header of Fire Pumps, one on either side of the Non Return Valve.
- f. On the Wet Riser in every Fire Hose Cabinet Shaft.

11. INSTALLATION OF PIPING

A. Below ground piping: -Under ground piping should be installed in masonry trenches with cover or reinforced concrete. The pipe work shall be supported at regular intervals of 2.5m with masonry or RCC supports. Wherever pipes pass through roads/ pavements shall be protected against corrosion with two coats of bituminous painting and wrapped with pypkote or bitumen Hessian cloth and finish with one coat of hot bitumen paint.

B. Above Ground Piping: -

a. All above ground piping shall be installed on suitable to pipe hangers/ supports as required. The hangers shall be made of MS angles, channels, channels etc. and painted to the required finish (with suitable synthetic enamel paint). The spacing supports shall be as follows.

- | | | |
|------|-----------------------|-----------|
| i. | 25 mm - 50 mm dia. | 1.5mtr. |
| ii. | 65mm – 100mm dia. | 1.75 mtr. |
| iii. | Above 100mm | 2 mtr. |
| iv. | Vertical Piping _____ | 3 mtr. |

b. Piping shall be so installed that the system can be thoroughly drained. All the pipes shall be arranged to drain to the installation drain valve. In case of basement and other areas where the pipe work, is below the installation drain valve / auxiliary valves of the following sizes shall be provided.

- i. 20 mm dia valve for pipes up to 50mm dia
- ii. 25 mm dia valve for 65 mm dia pipes
- iii. 32 mm dia valves for pipes larger than 65 mm dia

c. Piping shall be screwed type up to 50 mm dia. Welding of joints will be allowed for pipes of 65mm mm of larger diameters.

12. PRESSURE TESTING OF PIPES

During laying of pipes, the same shall be subjected to 10 Kg/cm² hydraulic pressure for a period of 24 hrs , in sections. After completion of the work, all valves/fittings shall be installed in position and entire system shall be tested for 24 Hrs. at a pressure of 10 Kg/cm². The drop of pressure up to 0.5 Kg/cm² shall be accepted. The pressure Testing may be carried out by means of Electric Driven Pump or Manually operated Test Pump.

All leaks and defects in different joints, noticed during the testing and before commissioning shall satisfaction of engineer.

Testing of fittings/ equipments shall be carried out either at site or at works in the presence of a representative of the engineer. Test certificates shall also be furnished by the contractor.

The automatic operation of the system and alarms for the various functional requirements, as laid down in this specification, shall be satisfactory carried out in the presence of Engineer-in-charge.

13. STANDARDS AND CODES

1. IS 1648 Code of practice for fire safety of building (general) fire fighting equipment and maintenance.
2. IS 3844 Code of practice for installation of internal fire hydrant in multistory buildings
3. IS 2217 Recommendations for providing first aid and firefighting arrangement in public buildings.
4. IS 2190 Code of practice for selection, installation and maintenance of portable first aid fire appliances.
5. National Building Code Part IV- firefighting
6. IS 5290 External fire hydrants
7. IS 5290 Internal landing valves
8. IS 904 2 & 3 way suction collecting heads
9. IS 884 First aid hose reel
10. IS 5132 High pressure rubber pipe

11. IS 1537	C.I. Double flanged pipes
12. IS 1538	C.I. Double flanged fittings
13. IS 780	C.I. Sluice valves and gunmetal valves
14. IS 6234	Specifications for Water type (stored pressure) fire extinguisher.
15. IS 2873/2171	Specifications for fire extinguisher of Carbon-di-oxide & Dry powder type.

ADDITIONAL WORKS IN STAFF QUARTERS AT JIPMER, PUDUCHERRY

CHAPTER B

List of Approved Makes of Materials

S. No.	Details of Materials / Equipment	Manufacturer's Name
1.	Fire / Sprinkler Main Pump / Jockey	Kirloskar KSB Wilo - Mather & Platt Grundfos
2.	G.I. / M.S. Pipes (IS : 1239 / IS : 3589)	Jindal,ZENITH Prakash Tata Steel
3.	Standard M.S. Fittings	Seamless Fittings Pipeline Products
4.	DI / CI / Forged Steel Fittings	Jainsons Industries VS SS Fittings BM Fittings
5.	Double / Single Headed Landing Valve	New Age, Leader Safeguard Minimax
6.	Fire Hose	CRC Jayashree New Age Padmini Safeguard
7.	First Aid Hose Reel (LPCB Approved)	New Age Padmini Safeguard Minimax
8.	Branch Pipe	New Age Safeguard Minimax
9.	Fireman Axe	New Age Safeguard Minimax
10.	Installation Control Valve	Tyco,Audco,Leader Viking Victaulic
11.	Fire Extinguishers	Alert - Tyco Minimax Safe fire Safeguard
12.	Water Flow Switch	Honeywell Rapid Control System Sensor Spray Safe
13.	Pipe clamp & supports	Chilly

		Euroclamp Kanwal
14.	GM / Forged Brass Valves	Danfoss, Newage RB Honeywell Zoloto
15.	Butterfly Valve/ check valve	Audco, Newage Danfoss Honeywell
16.	Air Release Valve	Arco, TBS,cimbrío OR RB Zoloto
17.	Anti-Vibration Mounting & Flexible Connections	Cori Dunlop Flexionics Kanwal Industrial Corporation Resistoflex
18.	Pressure Gauge	Emerald,HD,Waree Fiebig H Guru Wika
19.	Welding Rods	ADOR Esab Advani
20.	Fastener	Fisher Hilti
21.	Flexible hose for sprinkler	New Age,Tyco
22.	Sprinkler Head	HD, Tyco, Reliable, Fireshape

Note:-

1.	The Contractor shall procure and submit to the Engineer-in-Charge, samples of various materials for all the works, for approval. Nothing extra shall be payable on this account.
2.	The contractor will use one of the approved makes as approved by the HITES / Engineer -in-charge.
3.	In case of different quality / pattern of same make, the pattern/ quality shall be approved by the HITES / Engineer – in – charge.
4.	All the items included in the list or otherwise to be used in the work should conform to CPWD and relevant BIS specifications / relevant codes, as applicable.
5.	If any item is missing in the above list, its make will be decided by the HITES./ Engineer – in-charge.
6.	If any major equipment is using a small component of make other than that given as a standard component with the equipment, the same shall be accepted.
7.	Similar Makes for the same items may be used for all the subheads.

END OF VOLUME - III