

TECHNICAL SPECIFICATIONS FOR FIRE FIGHTING SYSTEM

NAME OF WORK:

CONSTRUCTION OF STUDY HALL BUILDING AT
DHRANGADHRA DIST.SURENDRANAGAR

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A. TECHNICAL SPECIFICATION

A.1 SCOPE OF WORK

The scope of this section consists of is to supply, installation, testing and commissioning and obtain Fire NOC for the fire protection system. The philosophy of the system is as follows:

The Fire Protection System shall comprise the Fire Hydrants System, Fire Sprinkler System and Fire extinguishers for the entire Building.

- Water from the underground RCC Fire Water Storage Tanks.
- Fire Hydrant System both for the external hydrants, the internal landing valves and the hose reels at landings.
- The Hydrant System and the Sprinkler System, under normal conditions, shall be lowest pressurized by means of the electric motor driven Jockey Pump.
- The Sprinkler System shall be provided with an electric motor driven pump set.
- The piping and valve connections shall be done so that the water from the discharge of the Hydrant Pump sets is able to supply water, automatically to the Sprinkler System whenever, the Sprinkler Pump is unable to maintain the pressure or fails and not vice versa.
- The starting and stopping of the Jockey pump shall be automatic based on the pressure switches at preset low and high pressure.
- The electric motor driven common for hydrant and sprinkler Pump starts automatically at a preset pressure by means of a pressure switch. As soon as the Hydrant Pump starts, the Jockey Pump Stops.
- The common Pump for sprinklers and Hydrant, whether electric motor driven or the diesel engine driven shall be stopped only manually.
- Contractor shall ensure that all area in buildings are provided with sprinklers.
- Contractor shall ensure Hydro Testing for the complete system.
- Getting Approvals/ Fire NOC from Local Authority.

After completion of installation, necessary submission drawings shall be prepared by the contractor and submitted to the relevant authorities. The scope of this tender includes the responsibility of obtaining the approval for the installation from the fire department and other relevant departments and obtaining the required No Objection Certificate (NOC).

- The contractor shall display near each staircase landing at floor levels, framed floor plan clearly showing the locations of all landing valves, hose reels, hand appliances, as well as the DO's and DON'T's for the personnel and the exit direction in case of an emergency.

A.2 PIPE WORK

A.2.1 GENERAL REQUIREMENTS

All materials shall be of the best quality conforming to the specifications and subject to the approval of the Consultants.

Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.

Pipes shall be securely fixed to walls and ceilings by suitable clamps and supports (galvanized after fabrication) at intervals specified. Only approved type of anchor fasteners shall be used for RCC slabs and walls / floors etc.

Valves and other appurtenances shall be so located that they are easily accessible for operations, repairs and maintenance.

Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workman like manner.

Pipe accessories such as gauges, meters, control devices, etc. shall have the same working pressure rating as the associated pipe work. All pipe work shall be free from burrs, rust and scale and shall be cleaned before installation. All personnel engaged on welding operations must possess a certificate of competence issued by an acceptable / recognized authority.

A.2.2 PIPING

Pipes of following types are to be used:

GI pipelines up to 150 mm diameter shall be as per IS: 1239, Part-I (heavy grade) while pipelines above 150 mm diameter shall be as per I.S:3589.

MS pipes as per IS: 1239 heavy grade suitably lagged on the outside to prevent soil corrosion. MS pipes buried below ground shall also be suitably covered with wrapping material.

All pipe clamps and supports shall be fabricated from MS steel sections and shall be factory galvanized before use at site. Welding of galvanized clamps and supports shall not be permitted.

Pipes shall be hung by means of expandable anchor fastener of approved make and design. The hangers and clamps shall be fastened by means of galvanized nuts and bolts. The size/diameter of the anchor fastener and the clamps shall be suitable to carry the weight of water filled pipe and dead load normally encountered.

Hangers and supports shall be thoroughly galvanized after fabrication. The selection and design of the hanger & support shall be capable of carrying the sum of all concurrently acting loads. They shall be designed to provide the required supporting effects and allow pipeline movements as necessary. All guides, anchor braces, dampener, expansion joint and structural steel to be attached to the building/structure trenches etc. shall be provided. Hangers and components for all piping shall be approved by the Consultants.

The piping system shall be tested for leakages at **2 times the operating pressure or 1.5 time shut-off pressure**, whichever is highest including testing for water hammer effects.

Flanged joints shall be used for connections for vessels, equipment, flanged valves and also on two straight lengths of pipelines of strategic points to facilitate erection and subsequent maintenance work.

For pipes underground installation the pipes shall be buried at least one meter below ground level and shall have 230 mm x 230 mm masonry or concrete supports at least 300 mm high at 3m intervals. Masonry work to have plain cement concrete foundation (1 cement: 4 coarse sand: 8 stone aggregate) of size 380x380x75 thick resting on firm soil.

Mains below ground level shall be supported at regular intervals not exceeding 3.0 metres and shall be laid at least 2.0 meter away from the building.

A.2.3 PIPING INSTALLATION & SUPPORT

Tender drawings indicate schematically the size and location of pipes. The Contractor, on the award of the work, shall prepare detailed working drawings, showing the cross-sections, longitudinal sections, details of fittings, locations of isolating and control valves, drain and air valves, and all pipe supports. He must keep in view the specific openings in buildings and other structure through which pipes are designed to pass.

Piping shall be properly supported on, or suspended from, on stands, clamps, hangers as specified and as required. The Contractor shall adequately design all the brackets, saddles, anchor, clamps and hangers, and be responsible for their structural stability.

Pipe work and fittings shall be supported by hangers or brackets so as to permit free expansion and contraction. Risers shall be supported at each floor with Galvanised steel clamps. To permit free movement of common piping support shall be from a common hanger bar fabricated from Galvanised steel sections.

Pipe hangers shall be provided at the following maximum spacing:

Table 1. Pipe hanger spacing

SR. NO.	PIPE DIA.	HANGER ROD DIA.	SPACING BETWEEN SUPPORTS
1	Upto 25 mm	6 mm	2.0 m
2	25 to 50 mm	6 mm	2.5 m
3	65 to 80 mm	8 mm	2.5 m
4	80 to 100 mm	10 mm	2.5 m
5	125 to 150 mm	10 mm	3.0 m
6	200 to 300 mm	12 mm	3.5 m

The end of the steel rods shall be threaded and not welded to the threaded bolt.

All pipe work shall be carried out in a proper workman like manner, causing minimum disturbance to the existing services, buildings, roads and structure. The entire piping work shall be organized in consultation with other agencies work, so that area can be carried out in one stretch.

Cut-outs in the floor slab for installing the various pipes area are indicated in the drawings. Contractor shall carefully examine the cut-outs provided and clearly point out wherever the cut-outs shown in the drawings, do not meet with the requirements.

Pipe sleeves, larger diameter than pipes, shall be provided wherever pipes pass through walls and slab and annular space filled with fiberglass and finished with retainer rings.

The contractor shall make sure that the clamps, brackets, saddles and hangers provided for pipe supports are adequate or as specified / approved by Consultants. Piping layout shall take due care for expansion and contraction in pipes and include expansion joints where required.

All pipes shall be accurately cut to the required sizes in accordance with relevant BIS codes and burrs removed before laying. Open ends of the piping shall be closed as the pipe is installed to avoid entrance of foreign matter. Where reducers are to be made in horizontal runs, eccentric reducers shall be used for the piping to drain freely. In other locations, concentric reduces may be used.

Automatic air valves shall be provided at all high points in the piping system for venting. All valves shall be of diameter 15 mm pipe sizes and shall be associated with an equal size gate valves. Automatic air valves shall be provided on hot water risers.

Discharge from the air valves shall be piped through a pipe to the nearest drain or sump. All pipes shall be pitched towards drain points.

Pressure gauges shall be provided as shown on the approved drawings. Care shall be taken to protect pressure gauges during pressure testing.

A.2.4 PIPE FITTINGS

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

50 mm diameter and below, Socket welded joints shall be used and fittings shall be of forged steel. For pipes above 50 mm diameter, Butt welded joints shall be used.

Fabricated fittings shall not be permitted for pipes diameters 50mm and below.

Fabricated fittings used on pipe size 65 mm & above shall be fabricated, welded. They shall be inspected by Project Manager/consultant. The welding procedures of the should have been approved by the rules for sprinkler system and applicable to hydrant and sprinkler system. For "T" connection, pipes shall be drilled and reamed. Cutting by gas or electrical welding shall not be permitted.

A.2.5 PROCEDURE FOR WRAPING COATING APPLICATION

- Surface Preparation - The pipe surface shall be cleaned by a wire brush.
- Application of Primer - primer is to be applied on pipes immediately after cleaning. This is to prevent any further accumulation of rust on the pipe. This is a cold applied primer and is applied by brush.
- Application of 4 mm Coating - After the primer is applied on the pipe, it is allowed to dry for about 30 min. till it becomes touch dry. Before adhering the tape to the pipe, it is advisable to gently heat the primer coated pipe by a run of LPG torch. Remove the bottom polyethylene from the tape & then heat bottom surface of the tape by LPG torch or any heat source & start wrapping the tape to the pipe by heating the primer coated pipe & by removing the bottom polyethylene from the tape before wrapping better adhesion between the tape & pipe is obtained. Overlaps are maintained with a minimum of 12.5 mm.
- Coating of weld joints - The tape is applied over the weld joints after the necessary welding & testing methods of the joints is completed. The procedure for application of tape shall be the same as bare pipe procedure. Overlaps on each side of the weld joints shall be 50 mm.

- A final coat of White wash with water based cement paint is done immediately over the entire coated pipe.

A.2.6 JOINTING

A.2.6.1 Welded Joints:

Joints between pipes and fittings shall be made with the pipes and fittings having “V” groove and welded with electrical resistance welding in an approved manner. But welding without “V” groove shall not be permitted.

50 mm diameter and below, Socket welded joints shall be used and fittings shall be of forged steel. For pipes above 50 mm diameter, Butt welded joints shall be used.

A.2.6.2 Flanged joints (65 mm dia and above)

Flanged joints with flanges conforming to IS: 6392 shall be provided on

- Straight runs at intervals not exceeding 25-30m on pipe lines of 50 mm dia and above and as directed by the Project Manager.
- For jointing all types of valves, appurtenances, pumps, connections with other type of pipes, to water tanks and other places necessary and as required for good engineering practice and as shown/noted on the drawings.
- Flanges shall be with GI bolts and nuts and 3mm insertion gasket of natural rubber conforming to IS: 11149.

A.2.6.3 Unions (up to 50 mm dia)

Approved type of dismountable unions shall be provided on pipe lines of 40 mm dia and smaller dia, in locations similar to those specified for flanges.

A.2.7 PAINTING

All Hydrant and Sprinkler pipes shall be painted with post office red colour paint. All pipes shall first be cleaned thoroughly before application of primer coat. After application of primer coat two coats of enamel paint shall be applied. Each coat shall be given minimum 24 hours drying time. No thinners shall be used. Wherever required all pipe headers shall be worded indicating the direction of the pipe and its purpose.

A.2.8 EXCAVATION

Excavation for pipe lines shall be in open trenches to levels and grades shown on the drawings or as required at site. Pipe lines shall be buried with a minimum cover of 1 meter or as shown on drawings.

Wherever required Contractor shall support all trenches or adjoining structures with adequate timber supports, shoring and strutting.

On completion of testing in the presence of the Project Manager and pipe protection, trenches shall be backfilled in 150 mm layers and consolidated.

Contractor shall dispose-off all surplus earth as directed by the Project Manager.

A.2.9 ANCHOR / THRUST BLOCK

Contractor shall provide suitably designed anchor blocks in cement concrete/steel support to cater to the excess thrust due to work hammer and high pressure.

Thrust blocks shall be provided at all bends, tees and such other location as determined by the Project Manager.

Exact location, design, size and mix of the concrete blocks/steel support shall be as shown on the drawings or as directed by the Project Manager prior to execution of work.

A.3 EQUIPMENT, MATERIAL AND WORKMANSHIP

A.3.1 FIRE HYDRANTS

All Fire Equipment's to be Supply and Install as per Relevant IS Codes.

A.3.1.1 EXTERNAL HYDRANTS

- Contractor shall provide external hydrants. The hydrants shall be controlled by a cast iron sluice valve. Hydrants shall have instantaneous type 63mm dia outlets. The hydrants shall be double outlet conforming to IS: 908 with CI duck foot bend and flanged riser or required height to bring the hydrant to correct level above ground.
- Contractor shall provide for each external fire hydrant two numbers of 63mm dia. 15 m long controlled percolation hose pipe with gunmetal male and female instantaneous type couplings machine wound with GI wire (hose to IS:636 type certification) , gunmetal branch pipe with nozzle to IS:903. This shall be measured and paid for separately.
- Each external hydrant hose cabinet shall be provided with a drain in the bottom plate.
- Each external hydrant hose cabinet containing items as above shall also be provided with a nozzle spanner and a Fireman's Axe. This shall be measured and paid for separately.
- Each hose cabinet shall be compulsorily painted with the letters "FIRE HOSE".

A.3.1.2 INTERNAL HYDRANTS

- Contractor shall provide on each landing and other locations as shown on the drawings double headed gunmetal landing valve with 100 mm dia inlet as per IS:5290, with shut off valves having cast iron wheels as shown on the drawings. Landing valve shall have flanged inlet and instantaneous type outlets as shown on the drawings.
- Instantaneous outlets for fire hydrants shall be standard pattern and suitable for fire hoses.
- Contractor shall provide for each internal fire hydrant station two numbers of 63 mm dia. 15 m long rubberized fabric lined hose pipes with gunmetal male and female instantaneous type coupling machine wound with GI wire (hose to IS:636 type 2 and couplings to IS:903 with IS certification), fire hose reel, gunmetal branch pipe with nozzle to IS:903. This shall be measured and paid for separately.
- Contractor shall provide standard fire hose reels of 20mm dia. high pressure rubber hose 36 m long with gunmetal nozzle, all mounted on a circular hose reel of heavy duty mild steel construction having cast iron brackets. Hose reel shall be connected directly to the wet riser with an isolating valve. Hose reel shall conform to IS:884 and shall be mounted vertically. This shall be measured and paid for separately.
- Each internal hydrant hose cabinet shall be provided with a drain in the bottom plate. The drain point shall be lead away to the nearest general drain.

- Each internal hydrant hose cabinet containing items as above shall also be provided with a nozzle spanner and a Fireman's Axe. The cabinet shall be recessed in the wall as directed. This shall be measured and paid for separately.
- Each hose cabinet shall be conspicuously painted with the letters "FIRE HOSE".

A.3.1.3 HOSE REEL

Hose reel shall conform to IS : 884, heavy duty, 20 mm dia length shall be 35 meter long fitted with gun metal chromium plated nozzle, mild steel pressed reel drum which can swing up to 170 degree with wall brackets of cast iron finished with red and black enamel complete.

A.3.1.4 FIRE HOSE

All hose pipes shall be of 63 mm diameter RRL/ CP as required, conforming to IS : 636 or IS : 8423. The hose shall be provided with copper alloy delivery coupling. The hose shall be capable of withstanding a bursting pressure of 35.7 Kg/Sq.cm without undue leakage or sweating. Hose shall be provided with instantaneous spring-lock, type couplings.

A.3.1.5 BRANCH PIPE, NOZZLE

Branch pipes shall be of gun metal with loaded tin bronze ring at the discharge and to receive the nozzle and provided at the other with a loaded tin bronze ring to fit into the instantaneous coupling. Nozzle shall be of spray type of diameter of not less than 16 mm and not more than 25 mm. Nozzle shall be of loaded tin bronze branch pipe and nozzle shall be of instantaneous pattern conforming to Indian Standard - 903.

A.3.1.6 HOSE CABINET

Hose cabinet shall be provided for all internal and external fire hydrants. Hose cabinets shall be fabricated from 16 gauge MS powder coated sheet of fully welded construction with hinged double front door partially glazed (3 mm glass panel) with locking arrangement, stove enamelled fire red paint (shade No. 536 of IS:5) with "FIRE HOSE" written on it prominently (size as given in the schedule of quantities). Cabinet surfaces in contact with the walls shall not be powder coated but instead given two coats of anti-corrosive bitumastic paint.

A.3.1.7 INTERNAL HOSE CABINET

Hose cabinet shall be of glass fronted with hinged door & lock. The cabinet shall be made of 16 gauge thick MS sheet and spray painted to shade No. 536 of IS:5. The hose cabinet shall be of size to accommodate the following:

- Landing Valves (Double headed)
- Hose pipe (2 length of 15 m)
- Hose reel (35 mtr.)
- Branch pipes, nozzles (2 sets)

A.3.1.8 EXTERNAL HOSE CABINET

The hose cabinet shall be of size to accommodate the following:

- Yard hydrant valve
- Hose pipe (2 length of 15 m)

- Branch pipes, nozzles (2 sets)

A.3.2 SPRINKLER SYSTEM

A.3.2.1 GENERAL SPECIFICATION

- The scope of work shall include supply, commissioning, testing of the system as a whole. The sprinkler heads are to be fixed into heavy quality black steel pipes, conforming to IS 1239 or any other approved specification. The size of pipe will vary from 20 mm to 150mm to suit the hydraulics of the system. The System shall conform to CFO Rules for the installation of sprinkler systems in general for 'Ordinary Hazard' category-in respect of design, density and spacing of sprinkler heads.
- Reduction in pipe sizes shall not be made by use of bushings. All piping shall be done by means of welding, screwed & flanged jointing as per codes.
- Due care shall be taken that sprinklers are not applied with paint at the time of applying paint to piping and fittings.
- All control, drain, test and alarm valves shall be provided with signs to identify their purposes, functions, direction of flow the satisfaction of the Consultants.

A.3.2.2 QUARTZOID BULB AUTOMATIC SPRINKLER

- Sprinkler heads shall be made of brass/quartzoid bulb sufficiently strong, in comparison to withstand any pressure, surge or hammer likely to occur in the system. The yoke & body shall be made of high quality gun metal brass with arms streamlined to ensure minimum interference with the spread of water. The deflector of suitable design shall be fitted to give even distribution of water over the area commanded by the sprinkler.
- The bulb shall contain a liquid having a freezing point below any natural climatic figure and a high coefficient of expansion. The temperature rating of the sprinkler shall be stamped on the deflector & the colour of the liquid filled in the bulb shall be according to the temperature rating as per NFPA standard. The sprinkler heads shall be of type & quality approved by the local fire brigade authority. The inlet shall be screwed.
- The sprinklers shall have 15mm nominal size of the orifice for ordinary hazard.
- The orifice size shall be marked on the body or the deflector of the sprinkler.
- Metal guards for protection of sprinkler against accidental or mechanical damage shall be provided as desired by the Project Manager.
- Contractor shall submit detailed submittal and discharge spray pattern for the Sprinkler for the approval of consultant.

A.3.2.3 OPERATING TEMPERATURE

The Operating temperature at which the quartzoid bulb of the sprinkler head shall actuate, shall be 68 degree C or as specifically mentioned by Local CFO.

A.3.2.4 SPRINKLER INSTALLATION

- Sprinkler heads shall be located in positions shown on the drawings. While slight relocation may result from building construction features or interference from other services, the maximum spacing between sprinkler heads and coverage area shall not exceed those stipulated in the NFPA.
- Allowance shall be made for such relocations within a radius of 1500 mm of the indicated positions without additional cost. The Fire Protection Services Trade shall co-ordinate with the ceiling Trade to set out the sprinkler locations to suit the site location of the unit grid. In

general, all sprinklers shall be located at the center of the ceiling unit and a provision of about 10% more sprinklers and pipe work than required in TAC and NFPA Rules shall be included in this sub-contract. Chrome plated wire mesh guards shall be used to protect the sprinkler heads which are liable to accidental or mechanical (at no extra cost) damage.

A.3.2.5 FLOW REQUIREMENTS

- The flow requirement for sprinkler heads shall be specifically approved for the designated area of installation.

A.3.2.6 ORIFICE PLATES

- For restricting pressure at lower levels in the sprinkler system, orifice plates of appropriate sizes shall be fitted at different floor levels, at the branching points from Riser Main.
- The Diameter of such orifice shall not be less than 50% of the dia of pipe into which it is to be fitted, which shall not be less than 50mm dia. These orifice plates must be of stainless steel with plain central hole without burrs, and the thickness shall be 3mm for pipe size up to 80 mm, 6 mm for pipes from 80 to 125 mm dia and 9 mm for pipes greater than 125 mm dia. Such orifice plate must have a projecting identification tag.
- The orifice plate shall fitted not less than two pipe internal diameters downstream of the outlet from any elbow or brand.
- Contractor shall submit the design and identify location on drawing before installation.

A.3.2.7 INSTALLATION CONTROL VALVES

- Each installation shall be provided with a set of installation control valves comprising:-
- An Alarm Valve.
- A Water Motor Alarm & Gong.
- Installation valves shall be installed on the sprinkler circuits as shown on the drawings.
- Contractor shall submit detailed shop drawings showing the exact location, details of installation of the valves/alarm in all respects.
- Installation valve shall comprise of a cast iron body with gunmetal trim, and double seated clapper check valves, pressure gauges, test valve and orifice assembly and drain valve with pressure gauges, turbine water gong including all accessories necessary and required and as supplied by original equipment manufacturer and required for full and satisfactory performance of the system. A cast iron isolation valve with lock and chain at the inlet of the installation valve shall be provided.

A.3.2.8 INSPECTION AND TEST VALVE ASSEMBLY

- Inspection and testing of the automatic starting of the sprinkler system shall be done by providing an assembly consisting of gunmetal valves, gunmetal sight glass, bye-pass valve and orifice assembly as per approved drawing.

A.3.2.9 FLOW SWITCH

- Flow switch shall have a paddle made of flexible and sturdy material of the width to fit within the pipe bore. The terminal box shall be mounted over the paddle/ pipe through a connecting socket. The Switch shall be potential free in either NO or NC position as required. The switch shall be able to trip and make / break contact on the operation of a single sprinkler head. The terminal box shall have connections for wiring to the Annunciation Panel. The flow switch shall

have connections for wiring the seat shall be of S.S to the Annunciation Panel. The flow switch shall have IP: 55 protections.

A.3.2.10 THE MAIN STOP VALVE

- These shall be of cast iron body of requisite size. When closed, these will shut off supply of water to the installation.
- A location plate must be fixed on the outside or an external wall, as near to the main stop valve as possible, bearing the following words on raised letters or other approved type letter.

A.3.2.11 SPRINKLER STOP VALVE IN SIDE

- The word 'sprinkler stop valve' shall be in letters of at least 35mm and the word "INSIDE" at least 25mm in height. The words shall be painted white on black background.
- All stop valves shall be right handed i.e. they shall be so constructed that in order to shut the valve the spindle shall turn from left to right. There shall be an indicator which will show whether the valve is open or shut.

A.3.3 SYSTEM DRAINAGE

The system shall be provided with suitable drainage arrangement with drain valves complete with all accessories.

- Sprinkler pipes shall be so installed that the system can be thoroughly drained. As far as possible all pipes shall be arranged to drain to the installation drain valve as shown in the drawing for ordinary hazard system.
- In the case of basement & other areas where sprinkler pipe-work is below the installation drain valve & in other trapped points in the system, auxiliary valves of the following sizes shall be provided.
- 20 mm valves for pipes up to 50mm dia.
- 25 mm valves for 80mm dia pipe.
- 50 mm valves for pipes larger than 80mm dia.

A.3.4 VALVES

A.3.4.1 SLUICE VALVES

Sluice valves shall be double flanged valves with cast iron body. The spindle, wall seat and wedge nuts shall be of bronze. They shall generally have non-rising spindle and shall be of the particular duty and design called for.

The valves shall be supplied with suitable flanges, non-corrosive bolts and asbestos fibre gaskets. Sluice valves shall conform to Indian Standard IS: 780-1969 and IS: 2906.

A.3.4.2 BUTTERFLY VALVE

A.3.4.3 The butterfly valve shall be suitable for waterworks and rated for 300 P.S.I

The body shall be of cast iron to IS: 210 in circular shape and of high strength to take the water pressure. The disc shall be heavy duty cast iron with anti-corrosive epoxy or nickel coating.

The valve seat shall be of high grade elastomeric or nitrile rubber. The valve in closed position shall have complete contact between the seat and the disc throughout the perimeter. The elastomeric rubber shall have a long life and shall not give away on continuous applied water pressure. The shaft shall be EN 8 grade carbon steel.

The valve shall be fitted between two flanges on either side of pipe flanges. The valve edge rubber shall be projected outside such that they are wedged within the pipe flanges to prevent leakages.

A.3.4.4 VALVE CHAMBERS

Provision of suitable brick masonry chambers in cement mortar 1:5 (1 cement: 5 coarse sand) on cement concrete foundations 150 mm thick 1:5:10 mix (1 cement: 5 fine sand: 10 graded stone aggregate 20 mm nominal size) with 15 mm thick cement plaster inside and outside finished with a plaster inside and outside finished with a floated coat of neat cement inside with cast iron surface box approved by fire brigade including excavation, back-filling complete shall be made.

A.3.4.5 BALL VALVE

The ball valve shall be made forged brass and suitable for test pressure of pipe line. The valve shall be internally threaded to receive pipe connections.

The ball shall be made from brass and machined to perfect round shape and subsequently chrome plated. The seat of the valve body-bonnet gasket and gland packing shall be of Teflon.

The handle shall be provided with PVC jacket. The handle shall also indicate the direction of 'open' and 'closed' situations. The gap between the ball and the Teflon packing shall be sealed to prevent water seeping.

The handle shall also be provided with a lug to keep the movement of the ball valve within 90°. The lever shall be operated smoothly and without application of any unnecessary force.

A.3.4.6 GUN METAL VALVES

Gun metal Valves shall be used for smaller dia pipes, and for threaded connections. The Valves shall bear certification as per IS:778

The body and bonnet shall be of gun metal to IS:318. The stem gland and gland nut shall be of forged brass to IS:6912. The hand wheel shall be of cast iron to IS:210.

The Hand wheel shall be of high quality finish to avoid hand abrasions. Movement shall also be easy. The spindle shall be non-rising type.

A.3.4.7 NON-RETURN VALVE

Non-Return valves shall be cast iron double flanged with cast iron body and gunmetal internal parts conforming to IS:5312.

A.3.4.8 PRESSURE RELIEF VALVE

Each System shall be provided with a Pressure Relief Valves. The Valve shall be spring actuated and set to operate as per field requirement. The Valve shall be constructed of bronze and provided with an open discharge orifice for releasing the water. The Valve shall be open lift type.

A.3.5 PRESSURE SWITCH

The pressure switches shall be employed for starting and shutting down operation of pumps automatically, dictated by line pressure. The Pressure Switch shall be diaphragm type. The housing shall be die cast aluminium, with SS 316 movement, pressure element and socket. The set pressure shall be adjustable.

The Switch shall be suitable for consistent and repeated operations without change in values. It shall be provided with IP: 55 water and environment protection.

A.3.6 PRESSURE GAUGE

Pressure gauge shall be provided near all individual connections of the hydrant system with isolation valves and near each flow switch assembly of the sprinkler system. Pressure gauge shall be 50 mm dia gunmetal bourdon type with gunmetal isolation ball valve, tapping and connecting pipe and nipple. The gauge shall be installed at appropriate height for easy readability.

A.3.7 AIR VESSEL

The air vessel shall be provided to compensate for slight loss of pressure in the system and to provide an air cushion for counter-acting pressure, surges, whenever the pumping sets come into operation. Air vessel shall conform to IS: 3844. It shall be normally half full of water, when the system is in normal operation. Air vessel shall be fabricated with 8 mm thick M.S. plate with dished ends and suitable supporting legs. It shall be provided with one 100 mm dia flanged connection from pump, one 25 mm drain with valve, one water level gauge and 25 mm sockets for pressure switches. The air vessel shall be tested to pressure for 12 hours at 2 times the operating pressure or 1.5 times the shut-off.

A.3.8 AIR CUSHION TANK

Every wet riser shall be provided with an air cushion tank at its top most point. The air cushion shall be provided with an automatic air release cock, 20 mm dia drain pipe, drain valve and shut off valve.

A.3.9 FIRE BRIGADE CONNECTION

The storage tank shall be provided with a 150 mm fire brigade pumping connection. This connection shall not be taken directly into the side of the storage tank, but arranged to discharge not less than 150 mm above the top edge of the tank such that the water flow can be seen. The connection shall be fitted with stop valve in a position approved by the Project Manager. An overflow connection discharging to a drain point shall be provided from the storage tank.

The fire brigade connection shall be fitted with four numbers of 63mm instantaneous inlets in a glass fronted wall box at a suitable position at street level, so located as to make the inlets accessible from the outside of the building. The size of the wall box shall be adequate to allow hose to be connected to the inlets, even if the door cannot be opened and the glass has to be broken. Each box shall have fall of 25mm towards the front at its base and shall be glassed with wired glass with "FIRE BRIGADE INLET" painted on the inner face of the glass in 50 mm size block letter. Each such box shall be provided with a steel hammer with chain for breaking the glass.

In addition to the emergency fire brigade connection to the storage tank, a 150mm common connection shall be taken from the four 63mm instantaneous inlets direct to hydrant main so that the fire brigade may pump to the hydrants in the event of the hydrant pumps being out of commission. The connection shall be fitted with a sluice valve and reflux valve. Location of this valve shall be as per the approval of the Project Manager. Two way collecting head with two numbers 63 mm instantaneous type inlets shall be connected to the sprinkler header. All other details shall be as described above.

A.3.9.1 FIRE EXTINGUISHERS

A.4

A.4.1 SCOPE

Work under this section shall consist of furnishing all labour, materials, appliances and equipment necessary and required to install fire extinguishing as per relevant specification of various authorities.

Without restricting to the generality of the foregoing, the work shall consist of the following:

Installation of fully charged and tested fire extinguishing appliances of as required and specified in the drawings and schedule of rates.

All Fire Extinguishers, Clean agent , Fire Suppression system to be Supply and Install as per Relevant IS Codes.

A.4.2 GENERAL REQUIREMENTS

Extinguishers shall be installed in easily accessible locations with the brackets fixed to the wall by suitable anchor fasteners.

Each appliance shall be provided with an inspection card indicating the date of inspection, testing, change of charge and other relevant data.

A.4.3 ABC - DRY POWDER EXTINGUISHER

The Extinguisher shall be filled with ABC grade 40, Mono Ammonium Phosphate 40% from any approved manufacturer (IS approved).

It shall be operated upright, with a squeeze grip valve to control discharge. The plunger neck shall have a safety clip, fitted with a pin, to prevent accidental discharge. It shall be pressurised with Dry Nitrogen, as expellant. The Nitrogen to be charged at a pressure of 15 Kg/cm²

Body shall be of mild steel conforming to relevant IS Standards. The neck ring shall be also mild steel and welded to the body. The discharge valve body, shall be forged brass or leaded bronze, while the spindle, spring and siphon tube shall be of brass. The nozzle shall be of brass, while the hose shall be braided nylon. The body shall be cylindrical in shape, with the dish and dome welded to it. Sufficient space for Nitrogen gas shall be provided inside the body, above the powder filling.

The Neck Ring shall be externally threaded - the threading portion being 1.6 cm. The filler opening in the neck ring shall not less than 50 mm. Discharge nozzle shall be screwed to the hose. The design of the nozzle shall meet the performance requirement, so as to discharge at least 85% of contents up to a throw of 4 mtrs, continuously, at least for 15 seconds. The hose, forming part of discharge nozzle,

shall be 500 mm long, with 10 mm dia internally for 5 Kg capacity and 12 mm for 10 Kg capacity. It shall have a pressure gauge fitted to the valve assembly or the cylinder to indicate pressure available inside. The extinguisher shall be treated with anti-corrosive paint, and it shall be labelled with words ABC 2.5 cm long, within a triangle of 5 cm on each face. The extinguisher body and valve assembly shall withstand internal pressure of 30 Kg/cm² for a minimum period of 2 minutes. The pressure gauge shall be imported and suited for the purpose.

A.4.4 CARBON DIOXIDE EXTINGUISHER

The Carbon Dioxide Extinguisher shall be IS Approved.

The body shall be constructed of seamless tube conforming to IS: 7285 and having a convex dome and flat base. Its diameter shall be maximum 140 mm, and the overall height shall not exceed 720 mm.

The discharge mechanism shall be through a control valve. The internal siphon tube shall be of copper aluminium conforming to relevant specifications.

Hose Pipe shall be high pressure braided Rubber hose with a minimum burst pressure of 140 Kg/cm² and shall be approximately 1.0 meter in length having internal dia of 10 mm. The discharge horn shall be of high quality unbreakable plastic with gradually expanding shape, to convert liquid carbon dioxide into gas form. The hand grip of Discharge horn shall be insulated with Rubber of appropriate thickness.

The gas shall be conforming to IS: 307 and shall be stored at about 85 Kg/cm². The expansion ratio between stored liquid carbon dioxide to expanded gas shall be 1:9 times and the total discharge time (effective) shall be minimum 10 seconds and maximum 25 seconds.

The extinguisher shall fulfill the following test pressures:

- Cylinder: 236 Kg/cm²
- Control Valve: 125 Kg/cm²
- Burst Pressure of Hose: 140 Kg/cm² minimum

It shall be an Upright type. The cylinder, including the control valve and high pressure Discharge Hose must comply with relevant Statutory Regulations, and be approved by Chief Controller of Explosives, Nagpur and also bear IS marking. The Extinguisher including components shall be IS marked.

A.5 FIRE PUMPS AND EQUIPMENTS

A.5.1 SCOPE

Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install electrically operated and diesel driven pumps and as required by drawings and specified hereinafter or given in the schedule of rates.

- Electrically operated pumps with motors and diesel engine driven pumps with diesel engine, common base plates, coupling, coupling guard and accessories.
- Automatic starting system with all accessories, wiring and connections and pressure switches.
- Motor control centre.
- Annunciation system with all accessories wiring and connections.
- Pressure gauges with isolation valves and piping, bleed and block valves.
- Suction strainers and accessories.

- Vibration eliminator pads and foundation bolts.
- Leak-off drain shall be led to the nearest floor drain.

A.5.2 GENERAL REQUIREMENTS

Pumps shall be installed true to levels on suitable concrete foundations. Base plate shall be firmly fixed by properly grouted foundation bolts.

Pumps and motors shall be truly aligned by suitably instruments. Record of such alignment shall be furnished to the Project Manager.

All pump connections shall be standard flanged type with number of bolts as per relevant standard requirement for the working pressure. Companion flanges shall be provided with the pumps.

Manufacturers' instructions regarding installation, connections and commissioning shall be strictly followed.

Contractor shall provide necessary test certificates, type test certificates, performance curves and NPSH curves of the pumps from the manufacturer when called for. The contractor shall provide facilities to the Project Manager & Consultant for inspection of equipment during manufacturing and also to witness various tests at the manufacturer's works without any cost to the Project Manager or Consultant.

Seismic isolation and clamping for each pump and flexible connection on the suction as well as the discharge side shall be provided.

The contractor shall submit with this tender a list of recommended spare parts for three years of normal operation and quote the prices for the same as a separate submittal / annexure.

A.5.3 ELECTRIC FIRE PUMP(Item 103)

A.5.3.1 General

The electric fire pump shall be suitable for automatic operation complete with necessary electric motor and automatic starting gear, suitable for operation on 415 volts, 3 phase, 50 Hz. A.C. system. Both the motor and the pump shall be assembled on a common base plate, fabricated M.S. channel type or cast iron type.

Drive: The pump shall be direct driven by means of a flexible coupling. Coupling guard shall also be provided.

A.5.3.2 FIRE PUMP

The fire pump shall be horizontally mounted multistage, centrifugal type. It shall have a capacity to deliver as specified in drawings, and developing adequate head so as to ensure a minimum pressure of 3.5 Kg/Sq.cm at the highest and the farthest outlet.

The pump shall be capable of giving a discharge of not less than 150 per cent of the rated discharge, at a head of not less than 65 per cent of the rated head. The shut off head shall be within 120 per cent of the rated head.

The pump casing shall be of cast iron and parts like impeller, shaft sleeve, wearing ring etc. shall be of non-corrosive metal like bronze/brass/gun metal. The shaft shall be of stainless steel. Provision of mechanical seal shall also be made.

Bearings of the pump shall be effectively sealed to prevent loss of lubricant or entry of dust or water. The pump shall be provided with a plate indicating the suction lift, delivery head, discharge, speed and number of stages. The pump casing shall be designed to withstand 1.5 times the working pressure.

Provision of Jockey Pump shall be made. The pump shall be vertical SS type and of detail as in schedule of quantity. Contractor shall verify that the capacity of the Jockey pump shall not be less than 3% (Minimum 180 LPM) and not more than 10% of the installed pump capacity.

A.5.3.3 Motor

The motor shall be squirrel cage A.C. induction type suitable for operation on 415 volts 3 phase 50 Hz. system. The motor shall be totally enclosed fan cooled type conforming to protection clause IP 55. The class of insulation shall be F. The synchronous speed shall be 2900 RPM as specified. The motor shall be rated for continuous duty and shall have a horse power rating necessary to drive the pump at 150 per cent of its rated discharge with at least 65 per cent rated head. The motor shall conform to I.S.325-1978.

A.5.3.4 Motor Starter

The motor starter shall be as per detail in MCC. The unit shall include suitable current transformer and ammeter of suitable range on one line to indicate the current. The starter shall not incorporate under voltage, no voltage trip overload or SPP.

The starter assembly shall be suitably integrated in the power and control panel for the wet riser system & sprinkler system.

A.5.4 DIESEL ENGINE FIRE PUMP

A.5.4.1 General

The diesel pump set shall be suitable for automatic operation complete with necessary automatic starting gear, for starting on wet battery system and shall be complete with all accessories. Both engine and pump shall be assembled on a common base plate.

A.5.4.2 Drive

The pump shall be only direct driven by means of a flexible coupling. Coupling guard shall also be provided. The speed shall be 1500 RPM as specified.

A.5.4.3 Fire Pump

The fire pump shall be horizontally mounted centrifugal. It shall have a capacity to deliver as specified, and developing adequate head so as to ensure a minimum pressure of 3.5 Kg/Sq.cm at the highest and the farthest outlet. The pump shall be capable of giving a discharge of not less than 150% of the rated discharge at a head of not less than 65% of the rated head. The shut off head shall be within 120% of the rated head.

The pump casing shall be of cast iron to grade FG 200 to IS 210 and parts like impeller, shaft sleeves, wearing-ring etc. shall be of non-corrosive metal like bronze/brass/gun metal. The shaft shall be stainless steel. Provision of mechanical seal shall also be made.

The pump casing shall be designed to withstand 1.5 times the working pressure.

Bearing of pump shall be effectively sealed to prevent loss of lubricant or entry of dust or water.

A.5.4.4 Diesel Engine

Engine Rating - The engine shall be cold starting type without the necessity of preliminary heating of the engine cylinders or combustion chamber (for example, by wicks, cartridge, heater, plugs etc.). The engine shall be multi cylinder/vertical 4 stroke cycle, air cooled, diesel engine, developing suitable HP at the operating speed specified to drive the fire pump. Continuous capacity available for the load shall be exclusive of the power requirement of auxiliaries of the diesel engine, and the after correction for altitude, ambient temperature and humidity for the specified environmental conditions. This shall be at least 20% greater than the maximum HP required to drive the pump at its duty point. It shall also be capable of driving the pump at 150% of the rated discharge at 65% of rated head. The engine shall be capable of continuous non-stop operation for 8 hours and major overhaul shall not be required before 3000 hours of operation. The engine shall have 10% overload capacity for one hour in any period of 12 hours continuous run. The engine shall accept full load within 15 seconds from the receipt of signal to start. The diesel engine shall conform to BS 649/IS 1601/IS 10002, all amended up to date.

1. Engine Accessories - The engine shall be complete with the following accessories:-

- Fly wheel dynamically balanced.
- Direct coupling for pump and coupling guard.
- Corrosion Resistor.
- Air cleaner.
- Fuel service tank support, and fuel oil filter with necessary pipe work.
- Elect. starting battery (2X24 v).
- Exhaust silencer with necessary pipe work.
- Governor.
- Instrument panel housing all the gauges, including Tachometer, hour meter and starting switch with key (for manual starting).
- Necessary safety controls.

2. Fuel System - The fuel shall be gravity fed from the engine fuel tank to the engine driven fuel pump. The engine fuel tank shall be mounted either over or adjacent to the engine itself or suitably wall mounted on bracket. The fuel filter shall be suitably located to permit easy servicing.

All fuel tubing to the engine shall be with copper, with flexible hose connections where required. Plastic tubing shall not be permitted.

The fuel tank shall be of welded steel construction 3 mm. thick and of capacity sufficient to allow the engine to run on full load for at least 8 hours. The tank shall be complete with necessary wall mounted supports, level indicator inlet, outlet, overflow connections and drain plug and piping to the engine fuel tank.

3. Lubricating Oil System- Forced feed Lub. Oil system shall be employed for positive lubrication. Necessary Lub. oil filters shall be provided, located suitably for convenient servicing.

4. Starting System- The starting system shall comprise necessary batteries (2x24v), 24 volts starter motor of adequate capacity and axle type gear to match with the toothed ring on the

fly wheel. Bi metallic relay protection to protect starting motor from excessively long cranking runs suitably integrated with engine protection system shall be included within the scope of the work. The capacity of the battery shall be suitable for meeting the needs of the starting system.

The battery capacity shall be adequate for 10 consecutive starts without recharging with cold engine under full compression. The scope shall cover all cabling, terminals, initial charging etc.

5. **Exhaust System** - The exhaust system shall be complete with silencer suitable for outdoor installation and silencer piping including bends and accessories needed for a run of 15 metre from the engine manifold. (Adjustment rates for extra lengths shall also be given). The total back pressure shall not exceed the engine manufacture's recommendation. The exhaust piping shall be suitably supported.
6. **Engine shut down mechanism** - This shall be auto/ manually operated and shall return automatically to the starting position after use.
7. **Governing System** - The engine shall be provided with an adjustable governor to control the engine speed within 5% of its rated speed under all conditions of load up to full load. The governor shall be set to maintain rated pump speed at maximum pump load.
8. **Engine Instrumentation** - Engine instrumentation shall include the following:-
 - Lub. oil pressure gauge.
 - Lub. oil temperature gauge.
 - Water pressure gauge.
 - Water temperature gauge.
 - Tachometer.
 - Hour meter.

The instrumentation panel shall be suitably resident mounted on the engine.

Engine Protection Devices- Following engine protection and automatic shutdown facilities shall be provided:-

- Low lub. oil pressure.
 - High cooling water temp.
 - High lub. oil temperature.
 - Over speed shut down.
9. **Pipe Work** - All pipe lines with fittings and accessories required shall be provided for fuel oil, lub. oil and exhaust systems, copper piping of adequate sizes, shall be used for Lub. oil and fuel oil. M.S. piping will be permitted for exhaust.
 10. **Anti-Vibration Mounting**- Suitable vibration mounting duly approved by Project Manager shall be employed for mounting the unit so as to minimize transmission of vibration to the structure. The isolation efficiency achievable shall be clearly indicated.
 11. **Battery Charger** - Necessary float and boost charger shall be incorporated in the control section of the power and control panel, to keep the battery in trim condition. Voltmeter to indicate the state of charge of the batteries shall be provided.

A.5.5 PUMP SETS

On the main fire sprinkler and hydrant headers near pump sets a 150 mm dia by-pass valve located in an accessible location shall be provided along with a rate of flow meter calibrated in 1 pm and able to read 200% of the rated pump capacity. The delivery shall be connected to the fire tank.

Each and every pump set assembly shall be provided with suction valve (only for positive suction head), discharge valve, non-return valve and 150 mm dia Bourdon type pressure gauge with isolation valve.

A.5.6 FLEXIBLE CONNECTORS

On all suction and delivery lines double flanged reinforced neoprene flexible pipe connectors shall be provided. Connectors should be suitable for maximum working pressure of each pipe line.

A.5.7 INTERLOCKING

The following inter-locking between the main fire pumps, the jockey pump and the diesel engine driven pump. Only one category of pumps will work at a time i.e. either jockey pump or main fire pumps (wet riser and sprinkler) or diesel driven pump.

A.5.8 ANNUNCIATION PANEL

One electronic annunciation panel fully wired with visual display and audible alarm unit shall be provided to indicate:

- Flow condition in any flow switch indicating the area of distress and fire alarm.
- Starting and stopping of each hydrant pump.
- Starting and stopping of each jockey pump.
- Starting and stopping of each sprinkler pump.
- Failure of Hydrant / Sprinkler pump to start.
- High level in fire water storage tank compartment.
- Low level in fire water storage tank compartment.
- Low level in HSD day tank of the fire pump.

The panel shall be factory fabricated, wired and tested. All details shall be submitted with the tender.

The annunciation panel shall be located in the security office / reception on the ground floor or as instructed by the Project Manager.

A.5.9 VIBRATION ISOLATION

The pump set shall be mounted on channels and 150 mm thick inertia block spring and ribbed neoprene vibration isolation mounting shall support the inertia block onto a 100 mm thick concrete plinths.

A.6 ELECTRICAL WORKS FOR FIRE PROTECTION SYSTEM

This section comprises of fabrication, supply, erection, testing and commissioning of Motor Control Centre, wiring and earthing of all equipment, components and accessories, shall be in accordance to "Technical Specifications of Electrical System" as specified in Tender MEP Specifications documents.

A.7 COMMISSIONING & HANDOVER

A.7.1 SCOPE OF WORK

Work under this section shall be executed without any additional cost. The rates quoted in this tender shall be inclusive of the works given in this section.

Contractor shall provide all tools, equipment, metering and testing devices required for the purpose.

On award of work, Contractor shall submit a detailed proposal giving methods of testing and gauging the performance of the equipment to be supplied and installed under this contract.

All tests shall be made in the presence of the Architect or his representative or any inspecting authority. At least five working days' notice in writing shall be given to the inspecting parties before performing any test.

Water flow rates of all equipment and in pipe lines through valves shall be adjusted to design conditions. Complete results of adjustments shall be recorded and submitted.

Contractor shall ensure proper balancing of the hydraulic system and for the pipes / valves installed in his scope of work by regulating the flow rates in the pipe line by valve operation. The contractor shall also provide permanent Tee connection (with plug) in water supply lines for ease of installing pressure gauge, temperature gauge & rotameter. Contractor shall also supply all required pressure gauge, temperature gauge & rotameter for system commissioning and balancing. The balancing shall be to the satisfaction of Consultant / Project Manager.

Three copies of all test results shall be submitted to the Engineer in A4 size sheet paper within two weeks after completion of the tests.

A.7.2 PRECOMMISSIONING

On completion of the installation of all pumps, piping, valves, pipe connections, insulation etc. the Contractor shall proceed as follows:

- Prior to start-up and hydraulic testing, the Contractor shall clean the entire installation including all fittings and pipe work and the like after installation and keep them in a new condition. All pumping systems shall be flushed and drained at least once through to get rid of contaminating materials. All pipes shall be rodded to ensure clearance of debris, cleaning and flushing shall be carried out in sections as the installation becomes completed.
- All strainers shall be inspected and cleaned out or replaced.
- When the entire systems are reasonably clean, a pre-treatment chemical shall be introduced and circulated for at least 8 hours. Warning signs shall be provided at all outlets during pre-treatment. The pre-treatment chemical shall:
 - Remove oil, grease and foreign residue from the pipe work and fittings;
 - Pre-condition the metal surfaces to resist reaction with water or air.
 - Establish an initial protective film;
 - After pre-treatment, the system shall be drained and refilled with fresh water and left until the system is put into operation.
- Details and procedures of the pre-treatment shall be submitted to the Architect for approval.
- Check all clamps, supports and hangers provided for the pipes.
- Fill up pipes with water and apply hydrostatic pressure to the system as given in the relevant section of the specification. If any leakage is found, rectify the same and retest the pipes.

A.7.2.1 FIRE PROTECTION SYSTEM

- Check all hydrant valves by opening and closing: any valve found to be open shall be closed.
- Check all the piping under hydro test.
- Check that all suction and delivery connections are properly made for all pump sets.
- Check rotation of each motor after decoupling and correct the same if required.
- Test run each pump set.

- All pump sets shall be run continuously for 8 hours (if required with temporary piping back to the tank).

A.7.2.2 COMMISSIONING AND TESTING

- Pressurize the fire hydrant system by running the jockey pump and after it attains the shutoff pressure of the pump , then
- Open bypass valve and allow the pressure to drop in the system. Check that the jockey pump cuts-in and cuts-out at the preset pressure. If necessary adjust the pressure switch for the jockey pump. Close by-pass valve.
- Open hydrant valve and allow the water to flow into the fire water tank in order to avoid wastage of water. The main fire pump shall cut-in at the preset pressure and shall not cutout automatically on reaching the normal line pressure. The main fire pump shall stop only by manual push button. However the jockey pump shall cut-out as soon as the main pump starts,
- Switch off the main fire pump and test check the diesel engine driven pump in the same manner as the electrically driven pump,
- When the fire pumps have been checked for satisfactory working on automatic controls, open fire hydrant valves simultaneously and allow the hose pipes to discharge water into the fire tank to avoid wastage.
- Check each landing valve, male and female couplings and branch pipes, for compatibility with each other. Any fitting which is found to be incompatible and do not fit into the other properly shall be replaced by the Contractor. Each landing valve shall also be checked by opening and closing under pressure.
- Check all annunciations by simulating the alarm conditions at site.

A.7.2.3 SPRINKLER SYSTEM

- Start the sprinkler pump and develop the required pressure in the sprinkler pipes.
- Open the test valve to test the automatic starting of the pump. If necessary , make necessary adjustments in the setting of pressure switch. The sprinkler water gong alarm shall also operate when the test valve is open. This operation is to be done for each and every section of the sprinkler system and the alarm for each section (via flow switch) shall be checked for operation.
- After satisfactory operation of the pump the Contractor shall set up mock fire and test the system.
- Check all annunciations by simulating the alarm conditions at site.

A.7.3 STATUTORY AUTHORITIES TESTS AND INSPECTIONS

As and when notified in writing or instructed by the Architect, the Contractor shall submit shop drawing and attend all tests and inspections carried out by Local Fire Authorities, Water Authority and other Statutory Authorities, and shall forthwith execute free of charge any rectification work ordered by the Architect as a result of such tests and inspections where these indicate non-compliance with Statutory Regulations. Some of these tests may take place after the issue of Practical Completion of the Main Contract and the Contractor shall make all allowances in this respect.

The Contractor shall be responsible for the submission of all necessary forms and shop drawings to the Statutory Authorities which shall conform in layout to the latest architectural plans submitted to and kept by these Authorities.

The submission shall comply with the requirements set forth in the current Codes of Practice and circular letters of the Statutory Authorities. The shop drawings to be submitted shall be forwarded to the Architect for checking before submission.

The Contractor shall allow for at least two submissions of complete sets of shop drawings to the Authorities, The Architect may at his discretion instruct the Contractor for additional submissions to the Local Authorities whenever necessary.

The Contractor shall notify the Architect at least seven days in advance of his application for local Authority tests and inspections. On receipt of a confirmed date for test and inspection the Contractor shall inform the Architect without delay.

A.7.4 FINAL ACCEPTANCE TESTS

Following commissioning and inspection of the entire installation, and prior to issue of the Completion Certificate, the Contractor shall carry out final acceptance tests in accordance with a programme to be agreed with the Architect.

Should the results of the acceptance tests show that plant, systems and/or equipment fail to perform to the efficiencies or other performance figures as given in this Specification, the Contractor shall adjust, modify and if necessary replace the equipment without further payment in order that the required performance is obtained.

Where acceptance tests are required by the relevant Authorities having jurisdiction, these tests shall be carried out by the Contractor prior to the issue of Completion Certificate to the acceptance of the Authorities.

A.7.4.1 REJECTION OF INSTALLATION / PLANT

Any item of plant or system or component which fails to comply with the requirements of this Specification in any respect whatsoever at any stage of manufacture, test, erection or on completion at site may be rejected by the Architect either in whole or in part as he considers necessary/appropriate. Adjustment and/or modification work as required by the Architect so as to comply with the Authority's requirements and the intent of the Specification shall be carried out by the Contractor at his own expense and to the satisfaction of the Authority/Architect.

After works have been accepted, the Contractor may be required to carry out assist in carrying out additional performance tests as reasonably required by the Architect/Employer.

A.7.5 HANDOVER

The Contractor shall warrant that all plant, materials and equipment supplied and all workmanship performed by him to be free from defects of whatsoever nature before handover to the Owner.

All testing and commissioning shall be done by the Contractor to the entire satisfaction of the Owner's site representative and all testing and commissioning documents shall be handed over to the Owner's site representative.

The Contractor shall also hand over all maintenance and operation manuals, all certificates and all other documentation as per the terms of the contract to the Owner's site representative.

A.7.6 CHECK LIST FOR COMMISSIONING

- Check all hydrant & other valves by opening and closing. Any valve found to be open shall be closed.
- Check all clamps, supports and hangers provided for the pipes.
- All the pump sets shall be run continuously for 30 minutes (with temporary piping back to tank from the nearest hydrant, using canvas hose pipes).
- Fire Hydrant System - Pressurize the fire hydrant system by running the jockey pump and after it attains the 10
- Operate booster pump continuously for 30 minutes with piping back to underground tanks from the hydrant nearest to plant room.
- Check each landing valve, male and female couplings and branch pipes, for compatibility with each other. Any fitting which is found to be incompatible and do not fit into the other properly shall be replaced by the Contractor. Each landing valve shall also be checked by opening and closing under pressure.

B. TECHNICAL DATA SHEETS

Table 2. DATA SHEET FOR FIRE PUMPS(Datasheet to be filled by vendor)

SR. NO.	DESCRIPTION	DIESEL PUMP	MAIN ELEC. PUMP	BOOSTER PUMP	JOCKEY
1	Manufacturer & Model.				
2	Type				
3	Capacity (LPM)				
4	Head (m)				
5	Efficiency (%)				
6	Pump (RPM)				
7	B.H.P.				
8	Motor (HP)				
9	Motor Make				
10	Power Supply				
11	Motor efficiency and class of insulation.				
12	Full load current (Amps)				
13	Starting current (Amps)				
14	Locked rotor current on full load (Amps)				
15	Impeller material				
16	Type of water seals.				

17	Vibration isolation				
18	Operating weight (Kg)				
19	Overall dimensions (M)(Lx W x H)				