

**Tender document for**  
**Design, Constructing, Testing, Commissioning of interior furnishing for office space**  
**of GSCL at Guwahati, Assam**  
**VOLUME II - TECHNICAL SPECIFICATIONS**

**PART: B2**  
**FIRE PROTECTION REQUIREMENT**

## **MECHANICAL WORKS**

### **1 SCOPE**

**1.1** The Bidders' scope of work is Design, selection of systems and equipment, supply, installation, Testing and commissioning and taking necessary statutory approvals of complete Fire Protection System

This specification covers the general requirements of Fire Protection System; the fire Protection system comprises pumping system for internal hydrant system for the buildings. Briefly, the fire Protection system shall comprise following:

- (a) Underground fire water tank of capacity as per NBC norms (scope of civil works)
- (b) Pumps as per NBC 2016 part IV table 07
- (c) Hydrant valves, hoses and hose box
- (d) Sprinkler system
- (e) Necessary pipes, valves and fittings.
- (f) Necessary controls and instruments.
- (g) Necessary Electrical works

Fire water shall be exclusively available for firefighting purpose.

**1.2** Following drawings enclosed herewith shall be referred for guidance:

- (a) GSC OFFICE Layout

Bid drawings, specifications and requirements of NBC (Part-IV)/NFPA all form part of the tender. The Bidders scope shall include obtaining necessary statutory approval(s) for the block fire protection. All items required to make the system complete & operational shall be provided, even if not explicitly brought out specifically in these specifications. Pump parameters and fire water tank capacity indicated above are for guidance and are expected to suffice the ultimate building requirements. The equipment supplied shall have approval from any one of these following agency:

- (a) BIS- Bureau of Indian Standards
- (b) UL- Under writers Laboratories

- (c) FM – USA
- (d) LPCB - Loss Prevention Certification Board UK
- (e) NFPA

## **2 APPLICABLE CODES**

The following Indian Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest revision of the codes shall be referred to.

- i. NBC-2016- Fire and life safety (Part 4, Section 1).
- ii. Local by-law.
- iii. Indian Standards.
  - IS:1239 (2004): Steel Tubes, Tubular and Other Wrought. Steel Fittings
  - IS 1239 (Part 2) : 2011. Steel tubes, Tubular and other steel. Fittings
  - IS 3589: Steel Pipes for Water and Sewage (168.3 to 2 540 mm Outsides diameter
  - 780:1984 (R1995) Specification For Sluice Valves
  - IS 5312-(1) 2004 Swing Check Type Reflux (Non-Return]. Valves
  - IS:3624-1987 Specification for pressure and vacuum gauges. (second revision)
  - IS:1520 :1980. Horizontal Centrifugal Pumps
  - IS:9079(2002): Electric Monoset Pumps
  - IS:325(1996): Three-phase induction motors
  - IS:12469(1988): Specification for Pumps for Fire Fighting
  - IS:15683 (2006): Portable fire extinguishers
  - IS 884 (1985): Specification for First-Aid Hose-Reel
  - IS 5290 (1993): Landing Valves--Specification (Third Revision)
  - IS 13039 (2014): External Hydrant Systems
  - IS 908· 1975. Specification for fire hydrant, stand post type. (Second Revision).

## **3 PIPING, FITTING AND BASIC MATERIALS**

### **3.1 GENERAL**

- i. All pipe work, valves and fittings, unless otherwise specified, shall comply with relevant clauses in the NBC (Part-IV)/NFPA regulations.
- ii. Supply, deliver and install all pipe work materials and fittings for the pipe work services installation.
- iii. Pipe work, ancillaries, valves and demountable joints shall be installed for convenient and safe routine maintenance and renewals.
- iv. All pipe work shall be installed with adequate gradients to facilitate draining and venting.
- v. Pipe work shall be run in a neat manner and installed plumb, straight, symmetrical and at right angles to or parallel to adjacent walls.
- vi. All pipe work, fittings and valves shall be free from corrosion, scale and internal obstruction.
- vii. Pipe work ends shall be cut square reamed free from burrs and finished full bore.
- viii. Sufficient unions and flanged joints shall be provided to install and dismantle sections of pipe work, wherever difficulty in dismantling may occur and on straight runs of more than 25m.
- ix. Unions or flanges shall be provided at all valves and equipment for easy dismantling. Connections to coils, pumps, and other equipment shall be made in such a manner as to eliminate undue strains in piping and equipment. Necessary fittings and bends shall be furnished to avoid springing of pipes during assembly.
- x. Care shall be taken in placing unions to allow freedom to spring apart. Unions and flanges shall not be placed in inaccessible positions. Where pipe work is installed in inaccessible places, a union or flange shall be installed, prior to the pipe passing into the wall or floor. Unions shall have two bronze conical seats ground in. Long screw connections will not be accepted.
- xi. Manufacturer's standard fittings shall be used and fabricated fittings will not be accepted without approval.
- xii. Bends and tees shall be of the easy sweep type, except at air vents, drain points and dead legs where square tees shall be used.
- xiii. Prior to any work being "covered up", the installer shall request the Engineer's approval to that part of the installation in question.

- xiv. Pre-fabricated pipe work shall be in accordance with the relevant clauses.

### **3.2 PIPING MATERIALS SCHEDULE**

4.2.1 Pipes  $\leq$  150mm shall comply to IS: 1239 (Class HVY). Pipes  $>$  150mm shall comply to IS: 3589 (6 mm thick). Pipe shall be galvanized. Fittings  $\leq$ 50 NB shall comply to ASTM A105. Fittings  $>$ 50NB shall confirm to ASTM A234 Gr. WPB. Flanges  $\leq$ 150 NB shall be as per ASTM A105 and flanges  $>$ 150 NB shall be as per IS: 2062. Flanges shall be dimensionally as per ANSI B16.5, 150#. All other fittings  $\leq$ 50NB shall be dimensionally as per ANSI B16.11, 3000# and  $>$ 65 NB as per ANSI B16.9. Piping joints shall be socket welded to ANSI B16.11 for sizes  $\leq$ 50NB and butt welded to ANSI B16.25 for  $>$ 50NB. Welded joints shall be radio graphed as per IS requirements.

4.2.2 Above ground pipes shall be coated with 2 coats of red-oxide primer of 25 DFT followed by 2 coats of red paint of 40 DFT. Underground pipes shall be laid 1 m below grade level and wrapped and coated as per IS: 10221. On completion of wrapping and coating it shall be tested by holiday testing.

4.2.3 After erection the entire piping system shall be tested for hydrostatic test pressure equal to 1.5 times the working pressure for a period of 2 hr at the end of which there shall be no loss in pressure. At least 10% of all the welded joints shall be radio graphically tested and half of the joints radio graphed shall be field joints.

## **4 VALVES**

- i. All fire protection water control valves within the building shall be either wedge gate valves with painted iron wheel handles, shall have gland followers in stuffing boxes, and shall be constructed so that they may be repacked while open and under pressure, or slow-closing gear-operated butterfly valves.

- ii. All valves shall have the name of the manufacturer and working pressure cast or stamped on body.
- iii. All fire protection valves are to be IS STANDARDS/NFPA/LOCAL AUTHORITY approved.
- iv. All valves shall be with screwed, flanged, or mechanical coupling ends as required by the piping system in which they are installed.
- v. Valves shall be selected for the working pressure required.
- vi. All isolating valves and control valves shall be provided for the proper and efficient operation and maintenance of the entire systems All valves supplied shall be suitable for the working pressure and test pressure of the various water supply system.
- vii. Furnish all valves and accessory material necessary in the piping whether or not shown on drawings as follows.
- viii. All valves shall be packed with an approved packing and threads shall be coated with oil and graphite. Packing should be replaced when found deteriorated on site.
- ix. Plastic or metal plates (rustless) shall be provided to indicate the open/close status as well as the use of each valve in the pump and tank rooms, and in the town main
- x. All Valves shall be including connecting flanges , gaskets nut bolts as required

## 5.1 **BUTTERFLY VALVE**

- i. Butterfly valves to have cast iron full lug body, stainless steel stem with bronze bushings and aluminium bronze disc, valve shall be confirming to IS: 13095.
- ii. The stem journals will be a multiple seal design providing for completely independent seals. The stem disc assembly will be such that the need for pins, screws or bolts is not required. Positive stem retention to be provided to permit removal of handle or actuator while under full operating pressure.
- iii. The valve seats to consist of replaceable neoprene or equivalent material.
- iv. Valves to size 150mm to be supplied with multi-position handles; size 200mm and above to be supplied with enclosed worm gear
- v. Valve body to be full-lug pattern to comply with and be compatible with flanges of appropriate pressure rating. No semi-lug valves are acceptable.

- vi. Working pressure shall be 150% greater than the system pressure and of minimum PN10 whichever is greater.

## **5.2 GATE VALVE**

- i. The valve shall confirm to IS 14846 and shall be of Cast iron body and wedge, spindle of SS conforming to BS 970, Gr.304 S11 and bronze internals. Ends shall be drilled to ANSI 16.5.
- ii. Gate valve, in smaller sizes ( $\leq 50$ NB), shall be all bronze and confirming to IS:778 with screwed ends.
- iii. Working pressure shall be 150% greater than the system pressure and of minimum PN10 whichever is greater.

## **5.3 SWING TYPE CHECK VALVE**

- i. Check valve shall conforming to IS-5312-1 (2004), dimensionally to ANSI B16.10 and shall be of CI body and disc and bronze internals. Ends shall be drilled to ANSI B16.5.
- ii. Check valve, in smaller sizes ( $\leq 50$  NB) shall be all bronzed confirming to IS: 778 with screwed ends.
- iii. Working pressure shall be 150% greater than the system pressure and of minimum PN10 whichever is greater.

## **5.4 GLOBE VALVE**

- i. Globe valve shall be all bronze and confirming to IS: 778 with screwed ends.
- ii. Working pressure shall be 150% greater than the system pressure and of minimum PN10 whichever is greater.

## **5.5 PRESSURE RELIEF VALVE (PRV)**

- i. Relief valve shall be provided on the delivery header. The relief valve shall have adjustable setting in range suitable for operating range of the pump. The relief valve outlet shall be led back to the tank.
- ii. The valve shall be 150# rated. Relief valve body shall be cast steel confirming to ASTM A216 Gr. WCB.
- iii. Relief valve sizing shall be done considering pump characteristics.
- iv. Relief valve body shall be hydraulically tested at 24.0 kg/sq.cm (g).

## **5.6        STRAINER**

- i. The "Y" type strainer shall be installed in suction piping as shown in the schematic drawing at the inlet of fire Protection pumps.
- ii. Working pressure shall be 150% greater than the system pressure and of minimum PN10 whichever is greater.
- iii. Strainer shall dimensionally conform to ANSI B16.10 and shall be of Bronze body marked with flow direction.

## **5.7        EXPANSION JOINT (BELLOWS)**

- i. Expansion Joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron. Material properties conform to ANSI/AWWA C153/A21.53.
- ii. Working pressure shall be 150% greater than the system pressure and of minimum PN10 whichever is greater.

## **5.8        HYDRANT VALVE, HOSES, HOSE CABINET**

(Note: Items shall be ISI marked)

### **A. Hydrant valve (external)**

- i. Hydrant shall be, as per IS 5290 (Type "A"), provided externally as shown in the drawing mounted at 1.0 m above the floor level.
- ii. Hydrant valve shall have single 63mm outlet having 80 NB flanged inlet. Outlet shall be oblique female instantaneous type coupling having spring loaded lugs.



- iii. External hydrants shall be located at least 2m away from and within 15m from the building wall
- iv. Internal parts shall be of copper or gunmetal.
- v. A cap with chain shall be provided on the outlet of the valve.

**B. Hose**

- i. Hoses for external hydrants shall conform to IS 8423.
- ii. Each cabinet shall have two nos. hoses of 15 m length.
- iii. Hose coupling shall confirm to IS 903.
- iv. Each hose shall have one male half coupling at one end and female coupling at other end.
- v. Material of construction of coupling shall confirm to IS 318 Gr LTB 2.
- vi. Hoses shall be tested and certified by the manufacturers to withstand an internal water pressure of not less than 35 kg/sqcm without bursting.
- vii. The hose shall also withstand a working pressure of 7 kg/sqcm without leakage or undue sweating.

**C. Branch pipe with nozzle**

- i. Branch pipe shall confirm to IS 903. Material of construction shall confirm to IS 318 Gr LTB 2.
- ii. Branch pipe shall have 63mm dia instantaneous type inlet at one end and second end shall have threading.
- iii. The nozzle shall be of gunmetal, 20mm internal dia. The screwed inlet fitted to the branch pipe.

**D. Hose cabinets (External)**

- i. Fire hose cabinets shall be fabricated from 2.00 mm thick CRCA sheet with locking arrangement of size of hose cabinet shall be 750 mm x 600 mm x 250 mm the painting of the hose cabinet shall be Post Office RED.
- ii. Each hose cabinet shall accommodate two nos. of 15 Mt. Long hose- pipes and one no. of branch pipe with nozzle.

- iii. The fire hose cabinet will have the legend "FIRE HOSE" painted prominently in the graphic style.
- iv. The hose cabinet shall be weatherproof as per IP 65

## **5 GAUGES**

- i. Provide pressure gauges, conforming to the requirements of IS-3624:1987, where indicated on the drawings and in accordance with the schedule given below.
- ii. All gauges shall be provided with snubbers. Gauges shall have 100mm diameter dial, white coated with black figures and graduations.
- iii. Shutoff cock shall be provided between gauge and piping to permit gauge removal while system is under pressure.
- iv. Gauges shall have graduation such that at normal working pressure the needle is in the center of the field
- v. Gauge Location Inlet and Outlet of Pumps
- vi. Mount gauges no higher than 1.5m above finished floor.
- vii. All gauges shall be calibrated in kg./sq.cm. to a maximum of not less than 1-1/3 times and not more than 2 times the operating pressure.
- viii. Wherever necessary, pressure reducing orifices shall be provided so as to limit the pressure to 3.5 kg/sqcm or any other rating as required by the local fire brigade.

## **6 SPRINKLERS AND INSTALLATION CONTROL VALVE:**

- i. Sprinklers shall be K81, 79 degree rated for office area and 79 degree for basement area.
- ii. Necessary rosette plates shall be provided for sprinklers.
- iii. In case a fire sprinkler is activated (opened) due to fire, the alarm valve will open and permit water flow into the system and a pressure switch gives a signal to activate the fire-pump

## **7 PRESSURE SWITCH ASSEMBLY**

A pressure switch assembly shall be provided for the operation of hydrant pumps. The assemblies shall consist of pipe work, pressure switches, pressure gauge, valves, orifice plates, and the like and such arrangement shall conform to NFPA Standards and shall be accepted by local fire authority

## **8 PUMP SETS AND CONTROL INSTRUMENTS & PANELS**

**8.1** The system shall be provided with Pump sets as per Table 07 of NBC part IV 2016 viz.

- (a) One Motor driven fire water pump in underground tank for internal hydrant system.
- (b) One Engine driven fire water booster pump as common stand-by to (a) above
- (c) One Jockey pump for internal hydrant system.

**8.2** The jockey pump shall be used for make-up of leakages. In case of opening of hydrant valve(s) the motor driven fire pump shall start automatically. The start-stop of jockey pump and start of motor and engine driven pump shall be automatic by sensing of falling header pressure by individual pressure switches. Stopping of fire water pumps shall be manual. Additionally a pressure switch shall be provided on header for sensing header pressure low. A pressure gauge shall be provided at discharge of each pump and at delivery header. There shall be time delay of 15 seconds between fail to start of motor driven fire pump and start of diesel engine driven pump.

## **8.3 FIRE PUMPS**

### **8.3.1 General requirements**

The pumps shall be designed for continuous operation and shall have a continuously dropping head characteristic without any zone of instability. The power capacity characteristic shall be non over loading type.

The head vs. capacity, input power vs. capacity characteristics, etc., shall match to ensure load sharing and trouble free operation throughout the range.

In case of accidental reverse flow through the pump, the driver shall be capable of bringing the pump to its rated speed in the normal direction from the point of maximum possible reverse speed.

The contractor under this specification shall assume full responsibility in the operation of the pump and the drive as one unit.

The pumps shall be of the type approved by fire authority and capable of delivering not less than 150% of rated capacity at a head of not less than 65% of the rated head. The shut off head of pump shall not exceed 120% of the rated head. The drive motor shall be continuous rating type and its rating shall be at least equivalent to the horse power required to drive the pump at 150% of its rated discharge.

Pump coupled with motor or engine on a common platform shall perform smoothly without any excessive noise or vibration.

### **8.3.2 End Suction Pumps**

#### **1.1**

##### **A. Casing**

Casing shall be made out of heavy class grained cast iron accurately machined and capable of withstanding to the maximum pressure developed by the pump at the pumping temperature.

##### **B. Shaft**

Shaft shall be machined from EN-8 Stainless steel with bronze sleeves to protect the shaft from corrosion.

##### **C. Ball Bearings**

Double row deep groove ball bearing at the pulley end to take radial as well as axial load shall be provided. Single row deep groove ball bearing at the impeller end to take the radial load shall be provided.

**D. Impeller**

The impeller shall be close type bronze type made out of bronze hydraulically & dynamically balanced. Gun metal/ bronze wearing ring shall form a part of the impeller. The impeller shall be secured to the shaft and shall be retained against circumferential movement by keying, pinning or lock rings.

All screwed fasteners shall tighten in the direction of normal rotation.

**E. Sealing Arrangement**

- i. Pumps shall be provided with mechanical seals.
- ii. Pump shall be provided with close-grained C.I. suction head accurately machined & fitted with gun metal/bronze wearing ring. Pumps shall be fitted with an air release valve, grease lubrication nipples, drain plug and seal connections.

**F. Coupling**

The pump & driver shall be supplied with either love joy or spacer type coupling. A coupling guard made of sheet steel, duly painted mounted on a common base shall be provided.

The pump shall conform as per IS-1520-1660, IS-9079, IS-325 and shall be of the following construction:

<b>Sr.No.</b>	<b>Description</b>	<b>Material of construction</b>
1.	Casing	Cast Iron/Cast Steel
2.	Impeller	Bronze
3.	Shaft	High Tenstile Steel
4.	Bearings	Heavy duty Ball/Roller Bearings
5.	Base Plate	Cast Iron/Fabricated M.S.

6.	Flanges	Conforming to ASME B 16.5
7.	Packing	Mechanical Seal
8.	Max.Speed	1500 RPM/2900 RPM

### 8.3.3 **Accessories and Fittings**

The following accessories shall be provided with each pump among other standard accessories required:

- (a) Coupling guard for horizontal end suction pumps.
- (b) Lubrication fittings and seal piping.
- (c) Test and/or air vent cocks.
- (d) Base frame, fabricated mild steel or cast iron.
- (e) Suction and discharge eccentric reducer and flexible coupling.

### 8.3.4 **VERTICAL TURBINE TYPE**

#### A. Construction Features - General

- 8.3.1 Pumps shall be of vertical, wet pit type complete with bowl, column and head assemblies.
- 8.3.2 The bowl assembly shall consist of rotating impellers, which are housed in stationary bowls having guide vanes. The bowl shall also include the housing of the bottom pump shaft bearing.
- 8.3.3 The column assembly shall consist of the column pipe to convey the liquid handled from bowl assembly to head assembly, shaft enclosing tube, if required, and shaft assemblies. If shaft-enclosing tube is called for the line shaft, bearing shall be supported from shaft enclosing tube. If shaft-enclosing tube is not specified, the line shaft bearings shall be supported from the column pipes.
- 8.3.4 Head assembly shall consist of the base from which the column shaft assembly is suspended. The discharge can be surface discharge or an underground discharge

#### B. Bowls

- i. The bowls shall be cast, free from blowholes, sand holes and other detrimental defects.
- ii. The bowls shall be equipped with replaceable wearing rings on suction side of enclosed impellers. Liquid passage shall be smooth finished and enamelled. The bowls shall contain bushes to serve as bearings for the impeller shaft.
- iii. In case of oil lubricated units, the discharge casing shall be provided with means to prevent the leakage of liquid into the shaft enclosing tube.
- iv. Suction bell shall be designed for smooth inflow of water with minimum losses.

C. Impeller

- i. The impeller shall be of the enclosed type and shall be properly balanced dynamically. The impeller shall be properly machined, with liquid passage hand finished. Impeller shall be adjustable vertically by means of an adjusting nut in the head assembly. Open impeller shall be offered, if specially called for. In such a case, the pump shall be designed to take care of the additional thrust produced.
- ii. Impellers shall be securely fastened to the impeller shaft with keys, taper bushings or locknuts.

D. Impeller shaft

The shaft shall be straight within 0.125 mm for 3 metres length total dial indicator reading. The maximum permissible error in the axial alignment of the thread axis with the axis of the shaft shall be 0.05 mm in 150 mm.

E. Line shaft

The shaft shall be furnished with interchangeable sections having a length of 1.5m, 2.5m & 3m. The butting faces of shaft shall be machined square to the shaft axis and the shaft ends shall be chamfered on the edges.

F. Line shaft coupling

Couplings shall be designed with a safety factor of 1.5 times the shaft safety factor and shall have threads to tighten during pump operation.

#### G. Line shaft bearings

- i. Line shaft bearings shall be external water or oil lubricated or self-lubricated type.
- ii. For self-water lubricated type a pre lubrication connection with all accessories shall be provided to wet the bearings. The selection of material for such bearings shall suit the quality of water to be pumped and suspension length.
- iii. If shaft-enclosing tube is not specified, the shaft bearings shall be lubricated by the liquid being pumped.

#### H. Shaft enclosing tube and column pipe

- i. The standard length of these shall be same as that for the shaft. No part of the column pipe shall exceed the outside diameter of bowl.
- ii. The size of the column pipe shall be such that the friction loss will be limited to 0.5 M per 10 M of length at rated capacity.

#### I. Discharge head

- i. The discharge head shall have an arrow indicating the direction of rotation of shaft.
- ii. For oil lubricated type, an automatic lubricator shall be installed for electric motor driven pumps and manual or other types of lubricator for engine driven pumps.
- iii. A tube tension plate shall be installed on the discharge to tighten up the shaft tubes for the purpose of aligning the shafts. A gland shall be provided at the tube tension plate to seal off any leakage from the discharge head.
- iv. For water lubricated pumps, the discharge head shall have a stuffing box with a renewable bushing.
- v. The discharge elbow shall be designed to directly connect to the discharge pipe without reducer / expander.

#### J. Driver

- i. Motor shall be coupled directly to the head shaft.



- ii. Electric motor which is directly coupled to the head shaft shall be a hollow shaft motor with thrust bearings capable of taking thrust load developed by the pump and the dead weight of the shaft and impeller.
- iii. Pump shall be complete with base plate and foundation bolts.

#### Materials of Construction

(a)	Casing	:	CI IS 210 Gr. 220 or BS 1452 Gr 220
(b)	Impeller*	:	SS ASTM A351 CF8M
(c)	Casing rings	:	SS ASTM A351 CF8M
(d)	Shaft*	:	SS ASTM A276 TYPE 410
(e)	Shaft sleeve	:	SS ASTM A276 TYPE 410
(f)	Base Plate	:	MS/CI
(g)	Gland Packing	:	Non-Asbestos
(h)	Hardware	:	ASTM A193 Gr. B7/A 194 Gr. 2H

### **8.4 ELECTRIC MOTOR**

#### 1.2

The motor shall be designed not to draw starting current more than 3times normal running current. Motor shall be capable of driving the pumps at 150% of its rated discharge and shall be designed for continuous full load duty. The cooling fans shall be directly driven from the motor shaft. The motor shall be suitable for 415 V, 3phase, 50 Hz,  $\pm 10\%$  supply system.

The motors shall be wound for Class-F insulation and the winding shall be vacuum impregnated with heat and moisture resisting varnish.

- A. The motor shall be totally enclosed or drip proof type.

- B. The 415 volts power terminals shall be suitable for receiving 1.1KV grade armored power cable. The cable boxes shall be designed to enable easy disconnection and replacement of cables.

1.3 8.4.1 Installation and Testing

- C. Pump shall be installed as per manufacturer's recommendations. Pump-sets shall be mounted on machinery isolation cork or any other equivalent vibration isolation fitting. Concrete foundation shall be provided by the Owner as per approved shop drawings and specifications. The isolation pads, foundation bolts etc shall be supplied by the contractor. Contractor shall however ensure that the foundation bolts are correctly embedded.
  - D. Pump-sets shall preferably be factory aligned, wherever necessary, site alignment shall be done by competent persons. Before the foundation bolts are grouted and the couplings are bolted, the bedplate levels and alignment results shall be submitted to the Architect/Consultant.
  - E. Tenderers shall submit the performance curves of the pumps supplied by them. They shall also check the capacity and total head requirements of each pump to match their own piping and equipment layout.
  - F. On completion of the entire installation, pumps shall be tested, wherever possible, for their discharge, head, flow rate, B.H.P. Where it is not possible at least the discharge, head and B.H.P. (as measured on the input side) shall be field tested. Test results shall correspond to the performance curves.
  - G. After complete installation and testing, pumps, accessories and fittings shall be given two coats, three mils each of approved finishing paint.
- 8.4.2 Fire water pumps shall be end-suction top-discharge type with enclosed impeller. Jockey pump shall be end-suction top-discharge back pull-out type. Pumps shall draw suction from the adjacent fire water tank. Pump suction shall be positive.
- 8.4.3 Fire water pump parameters indicated in Bid Drawings is for guidance of the Bidder. Bidder is responsible to install pumps of adequate capacity. The capacity of pumps selected by Bidder shall not be less than that indicated in Bid drawings.

- 8.4.4 The fire water pump characteristics should be as per IS guidelines. The drive rating shall be sufficient to run the pump at 150% discharge for motor driven pump and higher of power required to run the pump at 150% discharge or 1.2 times duty point power for engine driven pump.
- 8.4.5 Jockey pump shall be motor driven and drive rating shall be atleast 1.25 times the power required at duty point.
- 8.4.6 Motor shall be squirrel cage operating on 415 V, 3 $\phi$  supply and TEFC. Supply conditions for which motors are desired to operate are  $\pm 10\%$ ,  $\pm 5\%$ ,  $\pm 10\%$  respectively for voltage, frequency and combined voltage and frequency. Motors shall be of S1 duty and DOL starting. The class of insulation shall be 'F'. Motor shall be IP 55 protected.

## **8.5 DIESEL ENGINE**

- 8.5.1 Diesel engine shall be radiator cooled, battery started and "continuous" duty type. Diesel engine shall be capable of running on HSD fuel. It shall be capable of accepting full load in 15 seconds. Diesel engine's day oil tank shall be of capacity sufficient to hold fuel up to 6 hrs of engine operation. The battery shall be rated adequate for taking 10 consecutive starts. The engine exhaust shall be routed out of the fire water pump house. The engine shall be supplied with separate batteries and shall be charged by a 2 rate trickle charger with manual selection of boost charge. The charger shall be capable of trickle charging both the batteries simultaneously. The engine shall not trip from any external signal. Multiple belts shall be used for drive transmission for running pumps/fan such that, should half the belts breaks the functioning would not be affected. A stand mounted panel having start-stop facilities and following indications/annunciation shall be provided:

- (a) Speed indicator
- (b) Indication for state of battery charge
- (c) Low level alarm of fuel in day oil tank
- (d) Engine over speed alarm
- (e) High jacket water temperature alarm
- (f) High lube oil temperature alarm

- (g) Jacket water outlet temperature
- (h) Lube oil pressure

Following auxiliaries shall be provided for fuel oil system:

- (a) Sludge and sediment trap
- (b) Fuel level gauge
- (c) Inspection and cleaning hole
- (d) Filter between fuel tank and fuel pump in an accessible position
- (e) Means for draining entire system

## **8.6 ELECTRICAL MCC PANEL**

8.6.1 A motor-control centre-cum-control panel shall house, the logic of pump operation. The panel shall be vertical free standby type with top entry of cables and enclosure complying to IP-54. The sheet material used for construction of panel shall be with 2 mm thick sheet metal. 3 mm thick sheet metal shall be used for gland and mounting plate. The power and control section of the panel shall be isolated. Panel shall be tagged for control switches and annunciation windows. Panel shall be supplied complete with wiring of all instruments and accessories and wiring to terminal blocks. Panel shall have adequate maintenance space. Eye bolts for lifting shall be provided on the panel. Each section of the panel shall be provided with 3 pin receptacle for 240 V, 1 $\phi$ , 50 Hz supply. An earthing strip shall be provided. Each alarm annunciators window of 50 x 35 (mm x mm) size shall be provided. The annunciator shall be solid state, split type with alarm windows mounted on front door and electronic modules inside the panel. The annunciator shall be mounted flush with the panel. The annunciator shall have potential free contacts. The annunciator shall have IP-54 protection. Annunciator and control circuit shall operate on DC supply available. Following alarms shall be annunciated:

### **A. For hydrant system – jockey pump**

- (a) Jockey pump failed to start
- (b) Jockey pump running

- (c) Jockey pump tripped on overload
- (d) Jockey pump in manual mode

**B. For hydrant system – Electrical pump**

- (a) Motor driven fire pump running
- (b) Motor driven fire pump failed to start
- (c) Motor driven fire pump in manual mode

**C. For Engine driven fire pump**

- (a) Engine driven standby fire pump running
- (b) Engine driven standby fire pump failed to start
- (c) Engine driven standby fire pump in manual mode
- (d) Engine driven system in trouble
- (e) Engine driven fire pump battery charger failure

**D. Other annunciations:**

- (a) Low pressure in the discharge header of the system
- (b) Fire water storage tank level high
- (c) Spare windows: 4 Nos.

8.6.2 A level indicating Transmitter (Ultrasonic type) shall be provided for local digital indication of fire water tank level as well as high- low water level alarm. The level Sensor enclosure shall be protected to IP-65 and Remote Transmitter shall have IP-54 ingress protection.

8.6.3 The panel shall be verified for degree of protection, type and routine test.

8.6.4 Power and Control Cables shall be FRLS with copper conductor.

**8.7 DATA TO BE FURNISHED BY CONTRACTOR ALONG WITH THE TECHNICAL OFFER**

- (a) Outline dimensional details of the pump and electric motor. This drawing shall also indicate mounting plate details.

- (b) Performance curves for capacity v/s total head, efficiency and power input to pump.

## **8.8 DATA TO BE FURNISHED BY CONTRACTOR AFTER THE AWARD OF CONTRACT**

- (a) Final overall dimensional drawings for the pump. These shall show all the major parameters of the sets.
- (b) Drawings, indicating details of fixing, grouting, sealing, net weight (static and dynamic), clearances and any other relevant data required for verifying the design of civil structure.
- (c) Cross sectional drawings for pumps with complete bill of materials with material of construction and relevant standards of all components.
- (d) Motor drawings with details of cable entry, grounding etc.
- (e) Detailed pump house general arrangement drawing.
- (f) Operation and maintenance manual
- (g) Allowable nozzle loads

## **9 LIST OF ACCEPTABLE MAKES:**

### **A. Pumps**

- (a) Kirloskar Brothers Ltd.
- (b) Mather & Platt (I) Ltd.
- (c) Jyoti Ltd.
- (d) Flowmore

### **B. Motors**

- (a) Kirloskar Electric Co. Ltd.
- (b) Siemens India Ltd.
- (c) Bharat Bijlee Ltd.
- (d) ABB
- (e) Crompton Greaves Ltd.

### **C. Diesel Engine**

- (a) Greaves Ltd.
- (b) Kirloskar Oil Engines Ltd.
- (c) Cummins Ltd.

D. Switchgear Components

- (a) ABB
- (b) SIEMENS
- (c) Schneider Electric
- (d) G E Power
- (e) L & T
- (f) Klockner Moeller

E. Pipes

- (a) Jindal Pipe Pvt Ltd (hisar Plants only).
- (b) Advance Steel Tube Ltd.
- (c) Indus Tube Ltd.
- (d) Maharashtra seamless Ltd.
- (e) TATA Pipes

F. Valves

- (a) Avishkar Engineers Pvt Ltd.
- (b) Valtech Industries
- (c) Bankim & Company
- (d) Hawa Valves( India) Pvt. Ltd.
- (e) Upadhaya
- (f) L&T Audco

G. Pipe Fittings

- (a) M. S. Fitting Manufacturing Pvt. Ltd.
- (b) Tube- Bend Pvt. Ltd.
- (c) Commercial Supplying Agency

- (d) Sanghvi Forging & Engg Ltd.
- (e) Tube Products Incorporate

H. Pressure Safety Relief Valves

- (a) Sebim Valves (I) Pvt. Ltd.
- (b) Durga Engineering Co.
- (c) Spirax Marshall P. Ltd.
- (d) Teleflo

I. Fire Brigade Inlets. Branch and Hydrant Valves

- (a) Newage Industries
- (b) Steelage Industries
- (c) Mather & Platt (I) Ltd
- (d) Reliable Fire Protection Industries

J. Pressure Indicators

- (a) Bells Controls Ltd.
- (b) General Instruments Co.
- (c) Manometer (I) Ltd.
- (d) Gluck

K. Pressure Switches

- (a) Indfoss India Ltd.
- (b) Switzer Instrument Co.
- (c) Varna Trafag Instrument Pvt. Ltd.
- (d) AN Instruments

L. Level Indicator

- (a) Forbes Gokak
- (b) Endress & Hauser
- (c) Rittmeyer (JSK Engineering)



- (d) Druck (MTL Instruments)

M. Alarm Annunciator

- (a) Instalarm Control Products
- (b) Industrial Control & Appliances Pvt. Ltd.
- (c) Procon Instrumentation Ltd.
- (d) Minilec

N. Battery

- (a) Amco Batteries Ltd.
- (b) Chloride India Limited
- (c) Standard Batteries Ltd.
- (d) Exide Batteries

O. Battery Charger

- (a) Afco Limited
- (b) Mass-Tech Controls (P) Ltd.
- (c) Chabbi Electricals Pvt. Ltd.
- (d) Servolink

P. Power. Control & Instrumentation Cables

- (a) Delton
- (b) RPG Cables.
- (c) Associated Cables Ltd.
- (d) Thermo Control Systems
- (e) Polycab
- (f) Fort Gloster.
- (g) Gemes Cab

Q. Hose

- (h) Indian Rayon

- (i) Newage Industries

R. Portable Extinguishers

- (a) Newage Industries
- (b) Kooverji Devshi
- (c) Minimax
- (d) Safex Fire Extinguishers
- (e) CO2 Fire Fighter Company

S. Indicating Lamps (Cluster LED type)

- (a) Teknik
- (b) L&T
- (c) Siemens

T. Push Button

- (a) Teknik
- (b) L&T
- (c) Siemens

U. Meters

- (a) Automatic Electric
- (b) Rishabh
- (c) IMP
- (d) Mecor
- (e) Conzerv (Enercon)

**10 DATA SHEET TO BE FILLED BY BIDDER**

**10.1 FIRE PUMPS & MOTOR**

**10.1.1 Electrical Driven Pumps**

Make / Manufacturer	:	*
Quantity	:	1
Liquid Handed	:	Water
Liquid Temp deg.C	:	Ambient
Special Gravity of Liquid	:	1
Type of Suction	:	Positive
Rated Discharge	:	97 m <sup>3</sup> /hr
Rated head	:	70m
Model	:	*
Pump type	:	*
Speed / No. of Stages	:	*
Impeller Dia (Maximum)	:	*

Suction / Delivery Size : \*

Efficiency at Rated Capacity & Head : \*

KW required at rated capacity & head : \*

Shut Off Head : \*

**Material of Construction**

Discharge and suction case bowls : IS:210 Gr. FG 260

Impeller : IS:3444, CF 8M Grade 9

Pump Shaft, Line shaft & shaft sleeve : IS:570 SS - AISI 410/416

Line shaft bearings : Neoprene rubber

Wearing Rings : IS:1570 SS 410

Strainer : CI / MS Galvanized

Column pipes & Shaft Enclosing tubes : IS:226 Gr. Fe 410 S MS

Discharge head / Bell mouth / motor stool : CI / MS Fabricated

Nut bolt and washer : SS AISI 304 / 316

Whether pumps is capable of discharging : \*  
150% of rated capacity at a head not less  
than 65% of rated head.

Description of Motors

Make : \*

Model No. : \*

Type : \*

Frame size : \*

Speed (RPM) : \*

Rated Capacity (Power) : \*

Full load current : \*

Enclosure : \*

Coupling / Pulley : \*

Class of Insulation : F

Size of Foundation : \*

For complete coupled set mounted over MS base frame : \*

#### **10.1.2 Diesel Engine Driven Pump**

Make / Manufacturer : \*

Quantity : 1

Liquid Handed : Water

Liquid Temp deg.C : Ambient

Special Gravity of Liquid : 1

Type of Suction : Positive

Rated Discharge : 97m<sup>3</sup>/hr

Rated head	:	70 mwc
Model	:	*
Pump type	:	End suction
Speed / No. of Stages	:	*
Impeller Dia (Maximum)	:	*
Suction / Delivery Size	:	*
Efficiency at Rated Capacity & Head	:	*
KW required at rated capacity & head	:	*
Shut Off Head	:	*

Material of Construction

Pump Casing	:	CI
Impeller	:	Bronze

Pump Shaft : High strength steel

Base Plate CI / Fabricated MS

Type of sealing : Mechanical seal

Whether pumps is capable of discharging : \*  
150% of rated capacity at a head not less  
than 65% of rated head.

Description of Engine

Make : \*

Model No. : \*

Type : Multi cylinder

Frame size : \*

Speed (RPM) : \*

Rated Capacity (Power) : \*

Full load current : \*



Enclosure	:	*
No of Cylinder	:	Multi cylinder
Engine Cooling	:	Radiator cooled
Diesel Oil tank capacity	:	990 lit
Fuel Oil storage shall ensure working of pump for number of hours	:	Yes / No

#### **10.1.3 Jockey Pump**

Make	:	*
Liquid Handed	:	Water
Liquid Temp deg.C	:	30° C
Special Gravity of Liquid	:	1
Type of Suction	:	Positive
Rated Discharge	:	10.8m <sup>3</sup> /hr

Rated head	:	70mwc
Model	:	*
Pump type	:	End suction
Speed / No. of Stages	:	*
Impeller Dia (Maximum)	:	*
Suction / Delivery Size	:	*
Efficiency at Rated Capacity & Head	:	*
KW required at rated capacity & head	:	*
Shut Off Head	:	*
<b>Material of Construction</b>		
Pump Casing	:	CI
Impeller	:	Bronze

Pump Shaft : High strength steel

Base Plate : CI / Fabricated MS

Type of sealing : Mechanical seal

### **Description of Motor**

Make : \*

Model No. : \*

Type : Induction

Frame size : \*

Speed (RPM) : \*

Rated Capacity (Power) : \*

Full load current : \*

Enclosure : TEFC

## **10.2 PIPING**

MAKE : \*

MOC : As per IS 1239, IS 3589

Flanges : ASME B 16.5

Gaskets : Black rubber (self centering)

### 10.3 HYDRANT VALVES

**Make** : \*

Working Pressure : PN 16

Code for Design & Manufacturing : \*

#### **Construction Features**

Type of Stem : \*

Type of Inlet : \*

Type of Outlet : \*

Flange Drilling : ASME B 16.5

**Material of Construction**

Body and Bonnet : Leaded tin bronze as per Gr LTB2 of IS 318

Hand wheel : CS as per IS 1030

Valve spindle : Brass rod as per IS 319

**10.4 PRESSURE GAUGE**

**Make** : \*

Working Pressure : \*

Code for Design & Manufacturing : \*

**Construction Features**

Case : SS

Pointer	:	Indicator
Dial Size	:	100mm
Dial Lettering	:	Black
Process Connection	:	Threaded
Weather protection class	:	Outdoor duty

**Material of Construction**

Housing	:	Die cast aluminium
Movement	:	SS 304
Pressure element	:	SS 316
Chemical diaphragm seal	:	SS 316
Glass	:	Shatter proof
Socket	:	SS 304

**10.5 PRESSURE SWITCHES**

<b>Make</b>	:	*
Working Pressure	:	7 bar
Scale range	:	0 - 25 bar
Make & Model no.	:	*
Protection	:	Outdoor duty
Cable Entry	:	Threaded
Process Connection	:	Bottom
Switch Type	:	Micro / Mercury
No. of contacts	:	2NO + 2NC
Enclosure	:	IP 65
Pressure element	:	SS 316

**Material of Construction**

Housing : Die cast aluminium

Movement : SS 304

Pressure element : SS 316

Chemical diaphragm seal : SS 316

Glass : Shatter proof

Socket : SS 304

## **10.6 Valve**

### **10.6.1 Globe Valve**

Make : \*

Body and trim : Bronze ASTM B62

Pressure rating : PN 16

Size : 15NB

### **10.6.2 Gate Valve**



Make : \*

Body and trim : Bronze ASTM B62

Pressure Rating : 16 bar

Size : As per Drgs

#### **10.6.3 Swing type check Valve**

Make : \*

Body : CI IS 210 Gr. FG 200

Trim : Bronze ASTM B62

Pressure Rating : PN 16

Size : As per Drgs

#### **10.6.4 Pressure Reducing Valve**

Make : \*

Material : \*

Pressure Rating : PN 16

Size : As per Drgs

#### **10.7 Hydrant Accessories**

Branch pipe : \*

Make : \*

Standard : IS 903

Material : GR LTB2 OF IS 318

Inlet : 63 mm

Dia of nozzle : \*

#### **10.8 Fire hose pipe**

Make : \*

Standard : IS 8423.

Length : 15m

Pressure rating : 35bar

#### **10.9 Fire Hose Box (External)**

Make : \*

Size : 675mm H x 750mm W x  
250mm D

Materials : GI CRCA as per IS 277 & base  
metal conforming to IS 513

Mounting : Structural support legs  
complete with foundation bolts,  
nuts etc

PAINTING : One coat of red oxide primer,  
two coats of synthetic enamel  
finish paint po red shade 538  
as per IS-5.

#### **10.10 Fire Brigade Connection**

Make	:	*
Standard	:	*
Materials	:	Gun Metal
No. of Connection	:	Four