

## **13. TECHNICAL SPECIFICATION FOR FIRE FIGHTING (PROTECTION) SYSTEM**

### **1.0 SCOPE OF WORK**

The scope includes fire protection system only, the detection is covered under separate tender

- 1.1 Fire Hydrant system
- 1.2 Fire Sprinkler System for basement
- 1.3 Fire Extinguishers

The detailed scope is described in the chapter "Extent of Work. "

### **2.0 FIRE EXTINGUISHERS**

#### **2.1 GENERAL:**

The scope of work under this part of the specification covers supply and installation of internal appliances as per requirements specified in schedule & marked on drawings and instructions of engineer-in-charge.

Makes of all the appliances supplied and installed shall be as per the 'List of Approved Make ' or as approved by LFA and shall be of identical design for the entire premises.

Mounting accessories, indicator boards etc are part of the scope of supply of internal appliances.

#### **2.2 SPECIFICATIONS:**

Internal appliances with various fire extinguishing medium shall conform to the following specifications and shall be installed and maintained as per IS: 2190 / NFPA 10

Portable Extinguishers of the following types shall be installed.

- 1. Dry chemical Powder type
- 2. Co2 type
- 3. Water / Foam type
- 4. ABC type

##### **2.2.1 DRY CHEMICAL POWDER TYPE:**

The Dry chemical powder type shall be of 5 Kg. Capacity and shall have the IS mark 2171 or latest Indian standard complete with powder and charged including with fixing bracket, fitted with gunmetal cap, and discharge hose and open grip nozzle.

##### **2.2.2 CO2 TYPE:**

The Co2 Extinguisher shall be ISI mark, with initial charge with high pressure cylinder, complete with wheel type valve, internal discharge tube, with high pressure discharge hose with horn and suspension brackets. The extinguisher shall have ISI mark of 2878 or latest Indian standard and capacity shall be 2 Kgs.

##### **2.2.3 WATER / FOAM TYPE :**

The water type extinguisher shall conform to IS 15683 or latest Indian Standard having 9 ltr. capacity & will be with fixing arrangement with all accessories.

- 2.2.4 ABC (Powder) TYPE : 6 Kg ABC (Powder) type fire extinguisher shall conform to IS 15683 or latest Indian Standard & will be with all accessories & mounting arrangement.

However, type & capacity of fire extinguishers are to be provided according to local CFO requirement

### **3.0 PIPE WORK**

#### **3.1 GENERAL REQUIREMENTS:**

- 3.1.1 All the materials shall be of TAC/LFA approved, best quality conforming to the specifications and subject to the approval of the Client or his representative. If so directed, materials shall be tested in an approved testing laboratory & the contractor shall produce the test certificate in original to the Engineer-in-charge & the entire charges for original as well as repeated tests shall be borne by the Contractor.
- 3.1.2 Before welding, the pipe faces shall be cleared & then shall be welded conforming to IS : 9595 – 1980. The electrodes used for welding shall comply with IS:814. the laying of welded pipe shall also comply to IS 5822 – 1986. The welding joints shall be tested in accordance to IS:3600, Part 1973.
- 3.1.3 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workman like manner.
- 3.1.4 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.
- 3.1.5 Pipes shall be securely fixed to walls, and ceilings by suitable clamps or supported at every 3 mtr. & at change of direction as required. Only approved type of anchor fastners shall be used for RCC ceiling and walls.
- 3.1.6 Valve and other appurtenances shall be so located that they are easily accessible for operations, repairs and maintenance.

#### **3.2 PIPING**

Pipes of the following types are to be used:

- 3.2.1 M.S. pipes as per IS: 1239, heavy duty (for pipes of sizes 150 mm N.B. and below) suitably lagged on the outside to prevent soil corrosion. M.S. pipes buried below ground shall be lagged as per IS: 10211.
- 3.2.2 MS pipe lines upto 150 mm dia. shall have all fittings as per IS: 1239, Part-II (heavy grade) while pipelines above 150 mm dia shall be fabricated from IS: 3589 Gr.320 pipes as applicable or from steel plates.
- 3.2.3 For MS pipelines upto 50 mm dia screwed jointing shall be adopted, while for pipelines above 50 mm dia welded or flanged construction is to be carried out or as specified in Schedule of quantities.
- 3.2.4 Hangers and supports 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 Consultant / Client / Architect.
- 3.2.5 The piping system shall be capable of withstanding 150% of the working pressure including water hammer effects.

- 3.2.6 Flanged joints shall be used for connections to vessels, equipment, flanged valves and also on suitable straight lengths of pipeline of strategic points (@ at every 15-20 mtr.) to facilitate erection and subsequent maintenance work.
- 3.2.7 Excavation for pipe line shall be in open trenches. Pipes shall be buried atleast one meter below ground level and shall have 230 mm x 230 mm masonry supports atleast 300mm high at 3m intervals. Masonry work to have plain cement concrete foundation (1 cement: 4 coarse sand: 8 stone aggregate) of size 380 x 380 x 75 thick resting on firm soil.
- 3.2.8 Wherever required Contractor shall support all trenches or adjoining structures with adequate supports to prevent land slides.
- 3.2.9 On completion of testing and painting trenches shall be refilled with excavated earth in 15 cm layers and compacted.
- 3.2.10 Contractor shall dispose off all surplus earth within the site.
- 3.2.11 Contractor shall provide suitable cement concrete anchor blocks for overcoming pressure trusts in underground / external pipes. Anchor blocks shall be of cement concrete 1:2:4 mix.

#### **4.0 VALVES**

- 4.1 Valves shall be used to start, stop or control flow. Non-return valves shall be provided unidirectional flow.
- 4.2 Butterfly valve conforming to BS 5155 or as indicated in BOQ will be used for isolation of flow in pipelines. Optionally, gate valves having outside screw rising spindle shall be used and shall be as per IS: 780 / 14846 PN 1.0/1.6, as applicable. For sizes 50mm to 200mm, Butterfly valve shall be as per IS: PN = 1.6 or as specified in Schedule of quantities. Non-return valves shall be swing check/spring operated type. An arrow mark in the direction of flow shall be marked on the body of the valve. These valves shall conform to IS:5312 for swing type or API 596/598 for spring type check valves
- 4.3 Valves below 50 mm size shall have screwed ends while those of 50 mm and higher sizes shall have flanged connections. Drain lines will have locks for draining.

#### **5.0 INTERNAL HYDRANT:**

Internal hydrant shall be provided at each landing or at suitable location consisting of single / twin headed gunmetal landing valve as indicated in BOQ with 63 mm dia oblique female instantaneous pattern with caps & chains. Outlet and 80 mm inlet (IS: 5290-1969) with separate shut off valve. Landing valves shall be 63 mm dia. oblique female instantaneous pattern with caps and chains. Landing valves shall be of gunmetal and fitted with instantaneous coupling conforming to IS: 901. The valve body, stop valve, check valve, nut, instantaneous female outlet and blank cap shall be of leaded-tin bronze conforming to Grade-II of IS: 318-1962. The valve spindle shall be of brass rod conforming IS: 320 - 1962. The hand wheel shall be mild steel or cast iron washers gaskets shall be of rubber conforming to IS:638 - 1965 or leather conforming to IS:581 : 1969. The coupling shall be fitted with an internal plug secured by chain landing valves shall be installed on hydrant riser at a height of 1.0 to 1.2 meter from the floor level.

Each internal hydrant shall be provided with two nos. 63 mm. Diameter 15 mtr. Long hose pipe with gunmetal male and female instantaneous type coupling, machined wound with G.I. wire hose of IS 636 type A and couplings to IS:903 with IS certification, gunmetal branch pipe with nozzle conforming to IS:903.

#### **6.0 HOSES**

Hoses pipes shall be of fabric reinforced rubber lines as per IS:636 Type II or canvas hose as per IS:4927, with nominal size of 63 mm and lengths of 15 meter or 7.5 meter, as per quantities specified for in schedule or bill of quantity.

All hose pipes shall carry ISI marking on the body of the hose.

The hose shall have instantaneous spring lock-type coupling on ends. The instantaneous coupling shall be as per IS: 901. It shall be fixed to each other by copper rivets and galvanized M.S. wires and leather bands. All coupling shall be interchangeable with each other, and shall bear ISI markings.

## **7.0 HOSE CABINETS ( HOSE BOX )**

Each hydrant shall be housed in a Hose cabinet of suitable size. The hydrant cabinet shall hold double / single headed hydrant as specified, 2 hoses and one branch pipe as required. Internal hydrants shall normally fit the size of the niche made for it. The cabinet shall be of minimum 16 SWG M.S. sheet with centre opening, double glass front doors (cleat glass of 4mm thickness). The glass shall be firmly fixed by means of steel clips and screw with rubber beading. Hinges shall also be screwed and not welded. The corner members (frame) shall be of 25 x 25 x 3 mm thick angle. The hose box shall be firmly fixed to the wall/support by means of brackets and dash fasteners. The steel work shall have one coat of primer and two coats of red paint. The words "Yard Hydrant", "Hydrant" etc. should be painted in white or red on the glass in 75 mm high letters. The hose box shall be lockable for internal hydrant installation.

## **8.0 HOSE REEL**

The hose reel shall be directly tapped from the riser through a 25 / 32 mm dia pipe, the drum and the reel being firmly held against the wall by use of dash fasteners. The hose reel shall be swinging type (180degrees) and the entire drum, reel etc. shall be as per IS: 3876 and IS: 884. The rubber tubing shall be of best quality and the nozzle shall be shut off type.

## **9.0 BRANCH PIPES**

Branch pipe shall be of either gun metal or aluminium and should conform to IS: 903. One end of the branch pipe will receive the coupling while the other end shall have a nozzle screwed to it. It shall bear ISI marking.

## **10.0 YARD / EXTERNAL HYDRANT**

Yard or External Hydrants shall be as per IS: 908 and the valve as per IS:5290. The hydrant shall consist of stand post assembly and a masonry base 200 mm X 200 mm X 200 cm high and shall be made at the point where it comes out of the soil. The valve shall complete with hand wheel, quick coupling connection spring and blank cap. The hydrant shall be laid on 150 dia. or as mentioned in BOQ.

Yard or External hydrant shall be controlled by a cast iron sluice valve. Hydrant shall have oblique female instantaneous pattern 63 mm diameter outlets with caps and chains. The hydrant shall be of gunmetal and flange inlet and single outlet conforming to IS: 5290, a duck foot bends and flanged riser of required height to bring the hydrant to level above ground. The valve body, stop valve, check valve, nut, instantaneous female outlet and blank cap shall be of leaded-tin bronze conforming to Grade-II of IS:318-1962. The valve spindle shall be of brass rod conforming IS:320 - 1962. The hand wheel shall be mild steel or cast iron washers gaskets shall be of rubber conforming to IS:638 - 1965 or leather conforming to IS:581 : 1969.

Each external hydrant shall be provided with two nos. 63 mm. Diameter 15 mtr. Long hose pipe with gunmetal male and female instantaneous type coupling, machined wound with G.I. wire hose of IS 636 type A and couplings to IS:903 with IS certification, gunmetal branch pipe with 20 mm nozzle conforming to IS:903.

## **11.0 VALVE CHAMBERS**

A valve chamber shall be brick masonry chamber in cement mortar 1:5 (1 cement: 5 coarse sand) on cement concrete foundation 150 mm thick foundation 1:5:10 mix (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), 15 mm thick cement plaster inside and outside finished with a floating coat of neat cement inside with cast iron surface box approved by fire brigade including excavation, back filling, complete. The wall shall be 230 mm thick with heavy duty ISI marked C.I. manhole covers.

## **12.0 FIRE BRIGADE INLET CONNECTION**

A fire brigade inlet connection with a non-return valve shall be provided to facilitate the fire brigade to pump water into the installation by the use of their own equipment. Four way or 150 mm dia connection to the system shall comprise of four instantaneous pattern 63 mm dia. male inlets shall be with caps and chains complete with 150 mm dia. sluice valves, non-return valve housed in a M.S. cabinet with glass fronted door. The cabinet shall be suitable for recess mounting.

Two way or 100 mm fire brigade inlet connection to the system shall comprise of two instantaneous pattern 63 mm dia. male inlets shall be with caps and chains complete with 100 mm dia sluice valve, non-return valve housed in a M.S. cabinet with glass fronted door. The cabinet shall be suitable for recess mounting.

## **13.0 SYSTEM DRAINAGE**

The systems shall be provided with suitable drainage arrangements with MS piping of 50 mm dia. complete with all accessories, and provided with drain valve.

## **14.0 HYDRANT SYSTEM**

14.1 The hydrant system shall comprise of AC motor driven pump sets. Diesel pump, Jockey pump etc. with all required accessories including valves, appurtenances, instrumentation and controls etc. complete in all respects. The system shall cover the entire area from independent pipe work from the fire water pump set. The hydrant work shall remain pressurized through the proposed Jockey pump taking care of any leakages in the system pipelines and valve glands. All pumps / motors / engines to be of makes approved by local Fire Authority.

14.2 The hydrant system shall be kept charged by pressurized water at approximately 7.5 Kg/cm<sup>2</sup> at all times. In the event of fire when any of the hydrant valves in the net work is opened, the resultant fall in header pressure should enable starting the Electric Motor driven fire water pumping set through pressure switches automatically. One Diesel Engine / DG set driven pump shall be a stand-by pump serving hydrant system & sprinkler both. In case of failure of electricity or failure of Elec. Pump to start on demand, the stand-by DG set operated pump shall automatically take over. Apart from the automatic starting of the pump sets, provision shall be kept for manual starting also. However shifting down of the pump sets shall be manual.

14.3 The hydrant system in the yard shall be furnished with external hydrants consisting of landing valves (positioned approx. one meter above ground level) fitted M.S. (Heavy) flanged single headed stand pipes installed on underground hydrant headers distributed 45 M apart approximately or as marked on the plan.

The entire system including all pumps, motors, diesel pump set and panels shall be of approved make by TAC / Local Fire Authority.

## **15.0 SPECIFICATION FOR PUMPS AND ANCILLARY EQUIPMENT**

### **15.1 SCOPE OF WORK**

- 15.1.1 Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install electrically operated pumps for fire hydrant installations as required by the drawings and specified hereinafter or given in the schedule of quantities.
- 15.1.2 Without restricting to generality of the foregoing the pumps and the ancillary equipment and shall include the following:
- a) Electrically operated pumps having twin outlets with motors base plate and accessories.
  - b) Pump suction and delivery headers, valves, air vessel and connections.
  - c) Pressure gauges / pressure switch.
  - d) Only single point 3 phase supply will be made available to the Contractor. From there, all provision viz. Electrical switchboard, wiring, cabling, cable tray, control panel, earthing, etc. shall be made.

### 15.1.3 GENERAL REQUIREMENT

- a) Pumps shall be installed true to level on suitable concrete foundations. Base plate shall be firmly fixed by foundation bolts properly grouted in concrete foundations.
- b) Pumps and motors shall be truly aligned with suitable instruments.
- c) The pump shall have single suction & twin discharge connection
- d) All pump connections shall be standard flanged type with appropriate number of bolts.
- e) Manufacturer instructions regarding installation connections and commissioning shall be followed with respect to all pumps, switchgear and accessories.

### 15.1.4 FIRE AND JOCKEY PUMPS

- a) The main Fire hydrant & Sprinkler pumps shall be End Suction Back Pull Out type while Jockey pumps shall be of Centrifugal Monoblock Pump type having following specifications.
- b) Shut off head should not exceed 140% of rated head. Pump shall not develop less than 65% of rated head at 150% of rated capacity.

### MATERIALS OF CONSTRUCTION

Part	Material
Casing	Cast Iron
Impeller	Bronze IS:318, Gr. LTB 2
Casing Wearing	SS
Shaft	ISI – 410 / Stainless Steel
Shaft Sleeve	S.S. 316
Stuffing Box	Gland Packed

- c) Pumps shall be provided with pressure gauge with isolation cock on the delivery side.
- d) In case of motor driven pump the motor rating should be adequate to drive the pump at 150% of rated discharge.
- e) The pump and its prime mover (Electric motor or Diesel Engine) shall comply with all the equipment of the Rules of the Traffic Advisory Committee.
- f) All pumps shall have positive suction & shall be provided with suction strainer of SS & CI bell mouth. In case of negative suction suitable priming arrangement shall be provided.
- g) All the pumps shall have single suction & twin discharge connections i.e. low pressure & high pressure to serve designated lower & higher floors respectively as per drawing.

#### **A) JOCKEY PUMP**

Starting and stopping of Jockey Pump set shall be automatic at predetermined levels through pressure switch. However, arrangements for manual start and stop of the pump shall also be made. Jockey Pump shall take care of small leakages in the piping system and pumps cushion tanks. Jockey pump shall have also single suction & twin discharge connections.

#### **B) ELECTRIC DRIVEN**

Electrically driven pumps shall be provided with totally enclosed fan cooled, foot mounted, squirrel cage induction motors suitable for fire pumps with IP-55 enclosure.

The motors should be rated not to draw more than 4.5 times the starting current.

Motors shall be at least equivalent to the horse power required to drive the pump at 150% of its rated discharge.

The motors shall be wound for class-F insulation and windings shall be vacuum impregnated with heat and moisture resisting varnish, glass fiber insulated.

#### **C) DIESEL ENGINE**

- a) Diesel engine shall have suitable no. of cylinders with individual heat assemblies. The engine shall be water cooled and shall include heat exchanger and connecting piping strainer, isolating pressure reducing valves, bye-pass line, exhaust pipe, silencer, day tank for fuel all interconnected piping etc., complete in all respects.
- b) Engine shall be direct injection type with low noise and exhaust emission levels,
- c) The speed of engine shall match the pump speed for direct drive.
- d) The engine shall be capable of being started without the use of the wicks, cartridge heater plugs or either at engine room temperature of 4°C and shall take full load within 15 seconds from the receipt of the signal to start.
- e) The engine shall effectively operate at 46°C ambient temperature at 150 meter above mean sea level.
- f) Engine shall be suitable for running on high speed diesel oil.
- g) The system shall be provided with a control panel with push button starting arrangement also wired to operate the engine on differential pressure gauge.

- h) The entire system shall be mounted on a common structural base plate with anti-vibration mounting, Dunlop make, and flexible connections on the suction and delivery piping.
- i) Contractor provide one fully mounted and supported Day Oil Tank fabricated from 6mm thick MS sheet electrically welded for 8 hours working load and having suitable capacity of oil. Provide level indicators – low level and full level in the Day Oil Tank on the control panel through float switches and an breather. Day Oil Tank shall also be provided with filling connection (Threaded) with cap, gauge glass indication and cocks, drain cock, inspection / cleaning cover with gasket and nuts / bolts. MS dyke to hold 150% of the Day Tank capacity to be built around the Day Tank.
- j) Contractor to provide one exhaust pipe with suitable muffler (residential type) to discharge the engine gasses to outside in open air as per site conditions (Contractor to check the site).
- k) Contractor to provide all accessories, fittings and fixtures necessary and required for a complete operating engine set. The exhaust pipe shall be taken outside the building with minimum number of bends (approx. length 30 Meters) and shall be duly heat insulated with 50mm thick glass wool covered with 24 gauge aluminum cladding.
- l) Contractor shall indicate special requirements, if any, for the ventilation of the Pump Room.

Noise & Vibration level of the pump driven by motor/engine shall be within the acceptable limits of ISO 2372, IS 11727.

#### **15.1.5 BOOSTER PUMP (Not Applicable)**

A booster pump shall be provided at terrace to pressurize the wet riser system. The pump shall be centrifugal end suction / monoblock type.

#### **15.1.6 BASE PLATE**

Pumps and motors shall be mounted on a common structural base plate and installed as per manufacturer's instructions.

### **16.0 CUBICLE TYPE SWITCH BOARD/L.T. PANEL**

Cubicle type switchboards and components shall conform to the requirements of the latest revision including amendments of the following codes and standards.

IS: 8623	Specification for factory built assemblies of switchgear and control gear for voltage upto and including 1000V AC / 1200V DC.
IS: 4237	General requirements for switch-gear and control-gear for voltage not exceeding 1000-V.
IS: 2147	Degree of protection provided by enclosure for low voltage switch-gear and control-gear.
IS: 1018	Switch-gear and control-gear selection/installation and maintenance.
IS: 6005	Code of Practice for phosphating of iron and steel.
IS: 13947-1993/ IEC 947 - 1989	Air circuit breaker / moulded case circuit breaker.
IS: 1248	Direct acting indicating analogue electrical measuring instruments and testing accessories.



IS: 2705  
Part - I,  
II & III 1964

Current transformers for metering and protection with classification burden and insulation.

## **17.0 AIR CUSHION TANK**

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

## **18.0 PRESSURE GAUGE**

All pressure gauges shall be dial type with Borden tube element of SS 316. The dial size shall be of 150 mm diameter and scale division shall be in metric units marked clearly in black on a white dial. The range of pressure gauge shall be 0-10 kg.sq.cm or as specified in BOQ. The pressure gauges shall be complete with isolation cock, siphon tubing, etc.

## **19.0 PRESSURE SWITCHES**

19.1 The pressure switch shall be industrial type single pole double throw electric pressure switch designed for starting or stopping of equipment when the pressure in the system drops or exceeds pre set limits. It shall comprise of a single pole change over switch, below element assembly and differential spindle.

19.2 All pressure switches shall have ¼" BSP (F) inlet connection and screwed cable entry for fixing cable gland. All control cabling shall be provided.

## **20.0 SPRINKLER HEADS**

Sprinkler heads shall be provided at approximate spacing so as to cover 12 sq.mtr. per sprinkler head in case of ordinary hazard for basement having car parking area. The spacing shall however be in uniformity with the drawings and properly coordinated with electrical fixtures, ventilation ducts and grilles and other services along the ceiling. Sprinkler heads shall be gunmetal quartz bulb type with a temperature rating of 68°C. Sprinkler heads shall be of upright conventional type with fusible link for operation. Sprinkler head shall be approved by the under writers Laboratories (U.L.) or Fire Officers Committee (FOC). The finish shall be as specified in bill of quantities.

Contractor shall install cabinet (fabricated from 16 Gauge M. S. sheets with lockable glass shutters. Shelves for keeping spare sprinklers and spanner at locations approved by the Engineer-in-Charge and given in the schedule of quantities. The contractor shall also give required tools for removing and fixing of different types of sprinkler free of cost as directed by Engineer-in- Charge.

## **21.0 SPRINKLER SYSTEM**

### **21.1 GENERAL:**

To supply, install, testing and commissioning of sprinkler system as per drawing and Sprinkler heads spacing shall be in conformity with the drawings and properly coordinated in reflected ceiling with electrical fixtures, ventilation ducts and grills and other services along the ceiling.

Sprinkler heads shall be brass / gunmetal with quartz bulb with temperature rating of 68 degree celsius. Sprinkler heads shall be of type and quality approved by the local fire brigade authority. The inlet shall be screwed. Sprinkler heads shall be pendent, recessed or special side type. All sprinklers shall conform to the specifications given by TAC, IS, NFPA, FOC, UL & FM.

### **21.2 UPRIGHT TYPE SPRINKLER HEAD**

Sprinkler heads shall be quartzite bulb type with bulb, valve assembly, yoke and the deflector. The sprinkler shall be of approved make and type with 15 mm nominal diameter outlets.

The bulb shall be made of corrosion free material strong enough to withstand any water pressure likely to occur in the system. The bulb shall be shatter when the temperature of the surrounding air reaches at 68 c. Upright sprinklers shall be considered for basement.

The nominal bore shall 15 mm diameter and colour of liquid shall be as per temperature rating.

### **21.3 FLOW SWITCH**

Flow switch shall have a paddle made up of flexible 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 Fire alarm panel. The seat shall be of stainless steel. The flow switch shall have IP: 55 protections.

The flow switch shall work at a minimum flow rate of 100 LPM. Further, it shall have a retard to compensate for line leakage or intermittent flows.

### **21.4 BUTTERFLY VALVE**

The Butterfly valve shall be suitable for waterworks and tested to minimum of 16 kg/sq cm Pressure. The valves shall fulfill the requirements of BIS(Indian Standard)BS: 5155 or AWWA C 504, API 609 and MSS-SP-67.

The body shall be of cast iron to IS: 210 in circular shape and of high strength to take the minimum water pressure of 10 kg/sq cm. The disc shall be heavy-duty cast iron with anti-Corrosive epoxy or nickel coating.

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

The valve shall be supplied with manual gear operated opening/ closing system by lever.

### **21.5 DRAIN VALVE**

50 MM / or as specified in SOQ diameter MSpice conforming to I.S.:1239 (heavy grade) with 50 mm diameter / or as specified in SOQ gunmetal full way valve shall be provided for drainage of any water in the system in low pockets.

### **22.0 TESTING OF THE HYDRANT SYSTEM:**

22.1 All air shall be trapped from the pipeline through hydrants & air valves. Each section of the pipe shall be slowly filled with the water & allow to stand the water for 2 hours minimum with the ends closed. No joints / connection shall be leaked within this duration. The hydraulic test pressure shall be 1.5 times the design pressure.

22.2 Flushing of underground connections: Underground mains and lead-in connections to system risers shall be flushed before connections made to piping in order remove foreign

materials which may have entered the underground during the course of installation. For hydrant system the flushing operation shall be continued until water is clear.

- 22.3 Underground mains and lead-in connection shall be flushed at a flow rate of not less than 480 ltrs. per minute.
- 22.4 Provision shall be made for the disposal of water issuing from test outlets to avoid property damage.

#### 22.5 Acceptance Test

At the time of taking over, the hydrant system shall fulfill the following acceptance tests:-

- 22.5.1 Starting up of the pressure suction (Jockey Pump) : The pressure switch shall be set at 3.5 kg/cm<sup>2</sup> at the lower limit and 7.5 kg/cm<sup>2</sup> at the upper limit. The system drain shall be opened to cause a drop in the pressure. The Jockey Pump shall start as soon as the pressure gauge needle falls down to 3.5 kg. The Jockey pump shall also stop automatically when the system has been pressurised again upto 7.5kg/cm<sup>2</sup>.
- 22.5.2 The main electrical pump shall be set to start at 3.5 kg/cm<sup>2</sup>. An external hydrant valve using a single length of hose and branch pipe shall be fully opened to cause a drop of pressure in the system. At first, the jockey pump shall start when the pressure drops from 7 kg. Further, drop in the pressure from 3.5 kg should be allowed to test automatic start-up of the electrical pump. The electrical pump shall continue to run atleast for 5 minutes and register rise in the pressure upto 3.5 kg the Jockey Pump shall be automatically start at this. The electrical pump shall be stopped manually by pressing the stop button.
- 22.5.3 After having the system got fully charged at 7.5 kg/cm<sup>2</sup> the external hydrant valve using hose and branch pipe at (ii) above shall be opened. When the pressure has dropped from 3.5 kg/cm<sup>2</sup>, the electric main pump shall come into operation automatically. After the main pump has run for 5 minutes, the power supply in the pump house shall be switched off. The diesel pump shall automatically come into operation immediately.
- 22.5.4 All these tests mentioned above shall be repeated after one hour interval. The result of all the tests shall be identical again. After the system has satisfactorily withstood the above tests, it can be taken over from the contractor.

### 23.0 START-UP/SYSTEM TESTING

It will be the responsibility of the tenderer to cause interim/stage inspection by the Local Fire Authority LFA/ Chief Fire Officer C.F.O during execution of the work as and when so called for by the Employer / Consultant and shall carry out any rectification / modification as may be suggested by the Local Fire Authority (LFA), Chief Fire Officer (CFO).

Soon after the work is completed, the contractor shall inform the LFA/CFO in writing with a copy to the Consultant/Employer for getting the complete system including all sub system and instrumentation, control etc. thoroughly inspected and tested for satisfactory performance. After satisfactory completion of tests of the systems by the LFA / CFO, the contractor shall be required to submit as built drawings to the Consultant / OWNER which have been so approved.

### 24.0 COMMISSIONING OF SYSTEM

- 24.1 Pressurised the fire hydrant system by running the main fire pump and after attai required pressure shut off the pump.
- 24.2 Open bye-pass valve and allow the pressure to drop in the system. Check that the jockey pumps cuts-in and cuts-out at the pre-set pressure. If necessary adjust the pressure switch for the jockey pump. Close bye-pass vavle.

- 24.3 Open bye-pass valve and allow the water to flow into the fire water tank in order to avoid wastage of water. The main fire pump should cut-in at the preset pressure and should not cut-out automatically on reaching the normal line pressure. The main fire pump should stop only by manual push button. However, the jockey pump should cut out as soon as the main pump starts.
- 24.4 Switch off the main fire pump and test check the diesel engine driven pump in the same manner as the electrically driven pump.
- 24.5 When the fire pumps have been checked for satisfactory working on automatic controls, open fire hydrant simultaneously and allow the hose pipe to discharge water into the fire tank to avoid wastage. The electrically driven pump should run continuously for eight hours so that its performance can be checked.
- 24.6 Diesel engine / DG set driven pump should also be checked in the same manner as given in clause above by running for 8 hours.
- 24.7 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 does not fit into the other properly, shall be replaced by the Contractor. Landing valves shall also be checked by opening and closing under pressure.

## **25.0 HANDING OVER**

- 25.1 All commissioning and testing shall be done by the Contractor to the complete satisfaction of the Engineer-in-Charge / Consultants, and the job handed over to the Client.
- 25.2 Contractor shall also hand over to the Client all maintenance and operation manuals and all items as per the terms of the contract.