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TENDER DOCUMENT TECHNICAL SPECIFICATIONS

FOR THE PROPOSED

FIRE HYDRANT, SPRINKLER, GAS TYPE FIRE SUPPRESSION
SYSTEMS, FIRE PUMP ROOM AND ASSOCIATED CIVIL WORKS AT
CIRCLE OFFICE, CHENNAI



PART B - TECHNICAL

Fire Hydrant, Sprinkler & Gas Type Fire Suppression System

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SECTION I - INTRODUCTION

The ensuing Technical Specifications are for Fire Fighting System and Sprinkler System for the proposed Building - Canara Bank circle office building.

Fire Fighting & Sprinkler System:

The Fire Fighting and Sprinkler System designed features a Fire pump completes with Landing Valves and Hose Reels at every floor level. The Hose Reels - accommodated in glass-fronted boxes - are located in basement floor and in all other floors (Ground plus eight floors) 1 No. near the right side stair case i.e. totaling to 11 Nos., so as to have easy approachability. The system design has been carried out in accordance with relevant IS Codes and NBC Regulations.

General:

Upon Completion of installation the Contractor shall test the system and hand over the same in operating condition to the Owner or other Agencies as assigned by the Owner. Necessary operating and maintenance manuals together with as-built drawings, all in quadruplicate shall be submitted. The system shall be deemed to be taken over only upon submission of these documents and against the issuance of Completion Certificate from the Consultants.

Approvals:

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.



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SECTION II - GENERAL SPECIFICATIONS

1.0 GENERAL:

Materials shall be of the best approved quality as per Makes / Brand of Materials, obtainable and unless otherwise specified they shall conform to the respective Indian Standard Specification.

- 1.1 Samples of all materials shall be got approved before placing order and the approved samples shall be deposited with the Employer. Installation should be done after getting approval from the Employer for ALL the materials reaching site, by way of physical check by the Employer's appointed engineer and recording the same in MIRs (Material Inspection Reports).
- 1.2 In case of non-availability of materials in metric sizes, the nearest size in FPS units shall be provided with prior approval of the Employer / Architects for which neither extra will be paid nor any rebate shall be recovered.
- 1.3 If directed, materials shall be tested in any approved testing laboratory and the contractor shall produce the test certificate. The entire charges for original as well as repeated tests shall be borne by the Contractor. If required by the Employer / Architects, the Contractor shall arrange to test portion of work at his own cost in order to prove their soundness and efficiency. If, after any such test, the work or portion of work is found, in the opinion of the Employer / Architects, to be defective or unsound, the Contractor shall pull down and re-do the same at his own cost. Defective material also shall be removed from the site.
- 1.4 It shall be obligatory for the contractor to furnish certificate if demanded by the Employer / Architects, from manufacturer or the material supplier, that the work has been carried out by using their material and installed / fixed as per their recommendations.



2.0 Scope of Work:

- 2.1 The General scope of work shall be to carry out the Fire Protection System installation, both External & Internal as set out in the ensuing specifications, Bill of Quantities and the drawings enclosed.
- 2.2 The Contractor shall furnish all labor, materials, tools and appliances necessary for carrying out the entire works as per the standards set out in Bureau of Indian Standards (BIS), British Standards and as per the ensuing specifications.
- 2.3 The Contractor shall fully co-ordinate with other trades of activities in the site and no hindrance shall be there to other contractors.
- 2.4 The Contractor shall repair all damages to the site premises as a result of the firefighting system installation works and remove all debris from site.
- 2.5 The Contractor shall be responsible for the safety of all the fixtures and fitting fitted in site installations till the installation is taken over by the Client.

2.6 Removal of Debris:

The Contractor shall remove all DEBRIS generated by him. The debris shall be taken out of site at the contractors own cost.

- 2.7 The Contractor shall be an experienced firefighting system installer and having good amount of experience in the field and good rapport with the local fire force department.

2.8 Tender Drawings:

The tender drawings enclosed are only indicative of the system spread. Any changes required at site to co-ordinate with other trades shall be carried out at site by the Contractor without any additional cost. The drawings and specifications are only for assistance and the site conditions shall be the governing factor for installation of the works.

2.9 Shop Drawings:

The Contractor shall, on award of works, prepare and submit for client approval with complete set of shop drawing for the entire installation showing the following: the drawings shall be prepared with reference to the tender drawings:

- Floor plans showing the floor firefighting system components' installations,
- Enlarged details as required.,



- Site external hydrant and sprinkler piping layouts,
- UG sumps, Overhead tank and pump room layouts,
- Schematic layouts as applicable,
- Manufacturer's catalogue for pumpsets, Piping & fittings, Hydrants, hose reels, valves, sprinklers, PRVs, Orifice assemblies and other items like support brackets, clamps etc., for approval.

2.10 As Built Drawings:

The Contractor shall, on completion of all installation, prepare and submit the "As-Built" drawings for the complete installation. The drawings shall be clear and legible and shall be in A0 or A1 (as required for the clarity) and shall carry the approved title blocks. The drawings shall clearly indicate:

- The size, run and invert levels of external hydrant and sprinkler piping system.
- The location, size and invert levels of all valve chambers.
- The size and run of all pipes in vertical riser stacks.
- The layout of all equipment like pumps, tanks, vents, valve pits & valves etc.,

2.11 The Contractor shall submit four copies of the above drawings and also the manufacturer's catalogue for the equipment supplied.

2.12 The Contract shall be deemed to be completed only after the above 'as-built' drawings and catalogues are submitted.



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**SECTION III - PIPING, VALVES & ACCESSORIES, WELDING, PAINTING,
TESTING, COMMISSIONING & HANDING OVER.**

SCOPE:

The scope of this section comprises the supply and laying of pipes, pipe fittings and valves and testing of all water piping required for the complete installation as shown on the drawings. All piping inclusive of fittings and valves shall follow the applicable Indian Standards.

1. Hydrant and Sprinkler Piping:

Material of construction of various pipes shall be as follows:

1.1 Buried Pipes:

Mild steel black pipes as per IS:1239, Part-I heavy grade, class-c OR as specified in BOQ (for pipes of sizes 150 NB and below) or IS:3589, Fe 410 grade (for pipes of sizes 200 NB and above) suitably lagged on the outside to prevent soil corrosion, as specified elsewhere.

1.2 Overground Pipes:

Mild steel black pipes as per IS:1239, Part-I heavy grade OR as specified in BOQ (for pipes for sizes 150 NB and below) or IS:3589, Fe 410 grade (for pipes of sizes 200 NB and above).

1.3 Fitting:

All fittings to be used in connection with steel pipe lines shall be UL / FM approved.

1.4 C.I. Non Return Valve:

All C.I non return valve shall be "Swing / Ball type" Check Valves as per API 594. These check valves, without bypass shall be provided for the delivery lines of the pump sets and also for the interconnection of the fire hydrant and the sprinkler system.

1.5 C.I. Foot Valve (Ball Type):

Cast Iron Body Ball Type Foot valve conforming to IS 4038 with a rating of PN 16 shall be used for the system. These valves are provided at suitable locations.



1.6 Butterfly Valve:

All isolation / shut-off valve shall be of Dear Operated Butterfly type wherever indicated in the Drawings. The Valves shall have cast iron body conforming to IS 210 GR FG 200 and suitable for ANSI 150 Grade flanges with PN16 pressure. The Valve stem shall be of Stainless Steel conforming to SS 410 / 316. The disk material shall be of Ductile Iron with Electroless Nickel Plating. The seat material shall be EPDM. All shut-off valves of 50 mm NB and above shall be Butterfly valves only.

1.7 Ball Valve:

All shut-off valves of size 40 mm NB and below shall be full bore type ball valves only conforming to BS 5351 and should be of 3 piece construction only. The body shall be of carbon steel as per ASIM A 216 - WCB. The end connectors shall also be of carbon steel as above. The ball and stem shall be stainless steel SS 304 / 316. The Valve seat, body gasket and stem packing shall be PTFE. The make shall be as indicated elsewhere in this tender.

1.8 Valve Chamber:

Brick masonry chamber of size 1200 mm x 1200 mm x 1500 mm depth with 600 mm x 600 mm Cast Iron manhole cover shall be provided for the valves that are proposed for the underground fire hydrant lines.

1.9 Flanges:

Flanges shall be of approved make. The supply of flanges shall also include supply of bolts and nuts and suitable asbestos / fiber rubber insertion gaskets (minimum 3 mm thick).

1.10 Strainers:

Strainers shall be of approved make, equal "Y" type or pot strainers, with Cast / MS fabricated bodies. Strainers shall have bronze screen with 3 mm perforations. Screen shall be removable and replaceable without disconnection of the main pipes. All strainers shall be provided with equal size isolation valves, so that the strainer may be cleaned without draining the system. All "Y" type strainers wherever specified shall be MS fabricated type only. 20-mm dia drain valves shall be fitted on to the blank-off flanges at strainer basket removal access port.

1.11 All pipe supports shall be mild steel, thoroughly cleaned and given one primary coat of red oxide paint before being installed.



2. Water Flow Switch:

Vane-Type Water Flow Detectors shall be installed on the sprinkler system piping as designated on the drawings and / or as specified herein. Detectors shall be designed for mounting on either vertical or horizontal piping, but shall not be mounted in a fitting or within 300 mm (12 inches) of any fitting that changes the direction of water flow, and shall have a sensitivity setting to signal any flow of water that equals or exceeds the discharge from one sprinkler head. Detector switch mechanisms shall incorporate an instantly recycling pneumatic retard element with an adjustable range of 0 to 70 seconds. Switches shall have a minimum rated capacity of 7 amp. 220 volt A.C. 0.25 amp. 24 Volt D.C. and shall be actuated by a polyethylene vane extending into the water way of the piping. Detectors shall be of weather proof dust tight construction and shall provide a 15 mm (1/2 inch) conduit entrance and shall be finished in red baked enamel.

3. Tamper Switch:

If specified and listed in BOQ, valve supervisory switches shall be on all control valves throughout. Switches shall be mounted so not to interfere with the normal operation of the valve and shall be adjusted to operate within two revolutions of the valve control or when the stem has moved no more than one fifth of the distance from its normal position. The switch mechanism shall be contained in a weather proof die cast aluminum which shall provide a 1” tapped conduit entrance and incorporate the necessary facilities for attachment baked enamel. The switch mechanism shall have a minimum rated capacity of 7 amp., 220 volt, 0.25 amp., 24 volt D.C. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed or if the unit is removed from its mounting.

4. External Stand Post Type Hydrant Assembly:

4.1 Stand Post:

MS Stand Post with MS heavy grade pipe for seating the yard hydrant valve. The pipe shall be 80 mm dia. and suitable for mounting the hydrant valve at 1.0 m finished ground level (FGL) at installation location.

4.2 Single & Double Headed Hydrant Valve:

Gun Metal oblique type hydrant valve of single outlet with necessary hose coupling adaptor of 63 mm size, instantaneous spring lock arrangement and blank cap conforming to IS 5290.



4.3 Hose with Coupling:

Controlled percolation / RRL Hose conforming to IS 8423 of 63 mm dia. x 15 RMT long shall be provided with suitable fire hose delivery coupling of instantaneous spring lock arrangement comprising of male and female half and rubber cup washer as per IS 903.

4.4 Gun Metal Branch Pipe with Nozzle:

Gun metal short branch pipe shall be of 63 mm dia. female instantaneous inlet, male threaded outlet complete with hexagonal nozzle of 19 mm dia. heavy quality as per IS 903 shall be provided.

4.5 Fire Brigade Connections FBI:

2-sets of FBI connections shall be provided. One FBI shall be pipes to fill the fire water UG storage tank. The other FBI shall be piped in to the yard hydrant mains in order to pump water from fire trucks and feed the entire Yard and Internal Hydrants, in case of emergency. Here since tower block in H-8 is directly fed at higher pressure an addition FBI is provided and fitted exclusively in its hydrant piping system. The FBIs shall comprise of four instantaneous pattern 63 mm dia. inlets with four nos. built-in non-return valve including cap with chain and 150 mm dia. butterfly valve. The manifold shall be mounted in a MS cabinet with glass fronted door, or left exposed as directed by the Engineer-In-Charge / Architects / Consultant / Client.

4.6 Hose Cabinet

Hose cabinet shall be provided for all internal and external fire hydrants. Hose cabinets shall be fabricated from 14 gauge SS 304 of fully welded construction with hinged double front door partially glazed (4 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.

The hose cabinet shall be of size to accommodate the following

- Single/Double headed yard hydrant valve
- Hose pipe (2 length of 15.0 m)
- Branch pipes, nozzles (2 sets)



5. Internal Hydrant Assembly:

5.1 Single / Double Headed Hydrant Valve:

Gun Metal oblique type hydrant valve of single / double outlet(s) as specified in BOQ, with necessary hose coupling adapter of 63 mm size, instantaneous spring lock arrangement and blank cap conforming to IS 5290.

5.2 Hose with Coupling:

Controlled percolation / RRL Hose conforming to IS 8423 of 63 mm dia x 15 RMT long shall be provided with suitable fire hose delivery coupling of instantaneous spring lock arrangement comprising of male and female half and rubber cup washer as per IS 903.

5.3 Gun Metal Branch Pipe with Nozzle:

Gun metal short branch pipe shall be of 63 mm dia. female instantaneous inlet, male threaded outlet complete with hexagonal nozzle of 19 mm dia. heavy quality as per IS 903 shall be provided.

5.4 Hose Reel:

Hose reel shall conform to IS : 884, heavy duty, 20 mm dia length shall be 30 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.

5.5 Hose Reel Cabinet:

MS Hose cabinet of size to suit the location shown in drawings for the fire escape hydrant and the hose reel assembly and shall be flush with the wall. These cabinets shall be of glass fronted with hinged door and lock. The cabinet is spray painted to scarlet red color.

5.6 Hose Cabinet & Fire Shaft Shutter:

Hose cabinet shall be of glass fronted with hinged door & lock. The cabinet shall be made of 14 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 (Single headed)
- 2 nos. of Hose pipe (7.5 m)
- Hose reel (30 m)
- Branch pipes, nozzles (2 sets)



- Fire man's axe and hand appliances

Hose cabinet shall be fabricated out of 16 SWG M.S. sheet metal and the finished dimensions shall be 750mm x 600mm x 250mm. Hose cabinet shall have glass fronted door fitted with 4mm thick clear glass with rubber beeding & powder coated finish to fire red on the outside & white on the inside. Cabinet shall be suitable for stand mounting and shall have built in breakable glass type feature to keep the key. The cabinet shall be provided with suitable mounting stands.

Fire shaft shall have shutters fabricated out of 16 SWG M.S. sheet metal with glass-fronted door with 4mm thick plain glass and size of the shutter shall be 900mm W x 1500mm H minimum or as furnished in the drawings as directed by the Engineer-In-Charge. The door shall be in two leaves with necessary stiffeners. Shutter shall be powder coated finish to fire red on the outside & white on the inside and a label stating "FIRE" shall be stuck on the glass. The letter size shall be min. 75 mm height. Also there shall be built in breakable glass type feature to keep the key.

5.7 Sprinklers:

- a) Sprinklers shall be provided at stilt floor areas' ceiling level as shown in the drawings. The class of hazard considered is ordinary hazard as per Local Statutory authority. The rated temperature of quartzoid bulb shall be 68 °C to 79 °C as specified in BOQ. Sprinkler heads shall be provided at approximate spacing to cover 6.96 to 12 Sqm per sprinkler. The spacing shall however conform to the detailed drawing, in co-ordination with electrical and other allied services at the ceiling level.
- b) A water motor gong and an inspection test connection shall be provided on the down streamside of the system.
- c) The sprinkler heads shall be UL listed & FM approved, fixed temperature type with a quartzoid bulb containing liquid having high vapor pressure held in position by a forged GM yoke and deflector. The rated temperature of quartzoid bulb shall be 68 deg. C for office areas and car parking.
- d) Sprinklers for below false ceiling shall be fixed with recessed (two piece) type Rosette plate fabricated by M.S. sheet of 2mm thick with Powder coated finish of approved color.
- e) Sprinklers for car parking areas and ceiling void shall be upright type.
- f) The size of sprinklers selected for Ordinary hazard shall be 15mm nominal bore



g) COLOUR CODE

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

Sl. No.	Sprinkler Temperature Rating (°C)	Color of Bulb
1	57	Orange
2	68	Red
3	79	Yellow
4	93	Green

5.8 Alarm Check Valve:

Black enamel coated ductile iron body conforming to ASTM A-536, grade 65-45-12, aluminum bronze clapper, stainless steel spring and shaft, EPDM seal, and Nitrile seat O-rings. Valve internal parts shall be replaceable without removing the valve from the installed position. Water working pressure is 300 psi. Suitable for constant and variable pressure systems with optional Series 752 retard chamber. Victaulic FireLock® Series 751.

5.9 Pressure Guage:

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.



6. Piping Installation:

6.1 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-section, longitudinal sections, details of fittings, locations of isolating and control valves, drain and air valves, and all pipe supports. He must view the specific openings in buildings and other structures through which pipes are designed to pass.

6.2 Above Ground Piping:

All pipes inside and outside the building, laid above the ground shall be properly supported on, or suspended from, stands, clamps, hangers as specified and as required. The Contractor shall adequately design all the brackets, saddles, anchors, clamps and hangers, and be responsible for their selection and usage. Approved type of Anchor fasteners shall be used along with Standard pipe supports, like HITEC supports.

6.3 Vertical risers shall be parallel to walls and column lines and shall be straight and plumb. Risers passing from floor to floor shall be supported at each floor by clamps or collars attached to pipe and with a 15 mm thick rubber pad or any resilient material. Where pipes pass through the terrace floor, suitable flashing shall be provided to prevent water leakage.

6.4 All pipe work shall be carried out in a workmen 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 laying of pipe supports, pipe and pressure testing for each area shall be carried out in one stretch.

6.5 Cut-outs in the floor slab for installing the various pipes are indicated in the drawings. Modification of these cutouts / additional cutouts if required shall be included in the offer.

6.6 The Contractor shall make sure that the clamps, brackets, clamps saddles and hangers provided for pipe supports are adequate. Piping layout shall take due care for expansion and contraction in pipes, and include expansion joints where required.

6.7 All pipes shall be accurately cut to the required sizes in accordance with relevant ISI 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 reducers may be used.





6.8 Fabrication & Erection:

The contractor shall fabricate all the pipe work strictly in accordance with the related approved drawings.

6.8.1 End Preparation

- (a) For steel pipes, end preparation for butt welding shall be done by machining.
- (b) Socket weld end preparation shall be sawing / machining.
- (c) For tees, laterals, miter bends, and other irregular details cutting templates shall be used for accurate cut.

6.8.2 Pipe Joints

- (a) In general, pipes having sizes over 25 mm shall be joined by butt welding. Pipes having 25 mm size or less shall be joined by socket welding/screwed connections. Galvanized pipes of all sizes shall have screwed joints. No welding shall be permitted on GI pipes. Screwed joints shall have tapered threads and shall be assured of leak tightness without using any sealing compound.
- (b) Flanged joints shall be used for connections to vessels, equipment, flanged valves and also on suitable straight lengths of pipe line of strategic points to facilitate erection and subsequent maintenance work.

6.8.3 Over ground Piping

- (a) Piping to be laid over ground shall be supported on pipe rack/supports. Rack/supports details shall have to be approved by Employer/Engineer.
- (b) Surface of over ground pipes shall be thoroughly cleaned of mill scale, rust etc. by wire brushing. Thereafter two (2) coats of red oxide primer shall be applied. Finally, two (2) coats of synthetic enamel paint of approved color shall be applied.

6.8.4 Buried Pipe Lines

- (a) Pipes to be buried underground shall be provided with protection against soil corrosion by coating and wrapping specified below.
- (b) Buried pipelines shall be laid with the top of pipe at minimum one meter below ground level or as specified in the layout.
- (c) At site, during erection, all coated and wrapped pipes shall be tested with an approved Holiday detector equipment with a positive signaling device to



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indicate any faulty hole breaks or conductive particle in the protective coating.

6.8.5 General Instruction for Piping Design and Construction:

- (a) While erecting field run pipes, the contractor shall check, the accessibility of valves, instrument tapping points, and maintain minimum headroom requirement and other necessary clearance from the adjoining work areas.
- (b) Modification of prefabricated pipes, if any, shall have to be carried out by the contractor at no extra charge to the Employer.

6.8.6 General Material Specification for Valves:

ITEM	NOM. SIZE.		STANDARDS, MOC, TYPE, ETC.	REMARKS
BALL VALVES	15-40	BODY BALL SCREWED ENDS CAP & STEM BALL GASKETS STEM GASKETTE STEM SEAL HANDLE NUT THREADING WORKING PRESSURE	HOT PRESSED BRASS Cu Zn 40 Pb2, NICKEL PLATED. BRASS Cu Zn 40 Pb2 & CHROMIUM PLATED. HOT PRESSED BRASS Cu Zn 40 Pb2, TURNED FROM BRASS BAR PTFE H-NBR 70 SH "O" RING. CAST ALUMINIUM STEEL FEMALE PARALLEL THREAD TO ISO 228/1' G. UP TO 25-mm - 30 BAR. UP TO 50-mm - 25 BAR.	USED FOR FIRE WATER LINES.
BUTTERFLY VALVES	50 & ABOVE	BODY DISC SEAT SHAFT BEARING HANDLE WORKING PRESSURE	CAST IRON AS PER IS 210 FG 220 SG IRON AS PER IS 1865 SG400, EPOXY COATED EPDM CARBON STEEL - EN8 NYLON / TEFLON. HAND LEVER FOR SIZES UP TO 200-mm GEAR OPERATED FOR SIZES 250-mm & ABOVE. 16 BAR FOR WATER.	USED FOR FIRE WATER LINES.
DUAL PLATE	ALL	BODY	CAST IRON	USED FOR FIRE WATER LINES.



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ITEM	NOM. SIZE.		STANDARDS, MOC, TYPE, ETC.	REMARKS
CHECK VALVES	SIZES	DISC STOP PIN HINGE PIN SPRING SEAT WORKING PRESSURE	CAST IRON SS 304 SS 304 SS 304 EPDM. 16 BAR	USED FOR FIRE WATER LINES.
HEAVY DUTY BALL TYPE	ALL SIZES	BODY	CAST IRON	
FOOT VALVES	SIZES	BALL SEAL RING BALL SEAT RING FASTENERS	NITRILE RUBBER NITRILE RUBBER BRONZE CARBON STEEL.	
FABRICATED "Y" TYPE STRAINERS.	ALL SIZES	BODY STRAINER BASKET STRAINING AREA END CONNECTION WORKING PRESSURE	MS PIPES TO SUIT PARENT PIPE 3-MM THK. BRASS PLATE WITH 1-MM HOLES. TOTAL EFFECTIVE PERFORATION SHOULD BE ATLEAST 5 TIMES THE PIPE BORE AREA. FLANGED AS SPECIFIED ABOVE. 16 BAR	USED FOR FIRE WATER LINES.
FLANGES	ALL SIZES	BODY TYPE PR. RATING DIMENSIONS, PCD, NO. OF HOLES, ETC.,	MS PLAIN FACE PLATE FLANGES 1.6 N/MM ² (16 BAR) AS PER TABLE 20 OF IS 6392 - 1971	USED FOR FIRE WATER LINES.

6.8.7 PIPE SUPPORTS:

- a) The materials used in construction of Clamps, supports and accessories shall be the most suitable for the service intended. Test certificate preferably from third party shall be furnished. One coat of red oxide zinc chromate primer and two coats of enamel paint of desired color shall be applied by CONTRACTOR.
- b) Lugs or other means of welded attachment of pipes shall be welded in the shop and shall be of the same material as the parent pipes.



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- c) The hangers shall be fabricated and assembled in such a manner that they do not become disengaged by any movement of the supported pipe.
- d) The diameter of the hanger rod for piping 65 mm NPS and larger, shall not be less than 13mm.
- e) Bolted pipe clamps, used with rod hangers, shall have a minimum thickness of 5 mm for weather protected locations and 6 mm for places exposed to weather.
- f) All rigid hangers shall provide a means of vertical adjustment after erection.
- g) **Spacing of Supports:**

PIPE SIZE	SUPPORT SPACING HORIZONTAL RUN	SUPPORT SPACING VERTICAL RUN
Upto 15 mm	1.25 Mts.	1.80 Mts.
20mm to 25 mm	2.00 Mts	2.50 Mts
32 mm to 125 mm	2.50 Mts	3.00 Mts
150 mm and above	3.00 Mts	3.00 Mts

Additional supports shall be provided at Bends, Valves etc., Supports structures could be fixed on to the walls and concrete ceilings using Anchor Fasteners.

h) Wall & Floor Crossings of Pipes:

Space	Sleeves dia (mm)	Sleeve Projection (mm)	Sleeve Material	Sleeve Packing & Closure for the annular space
Floor	D + 50	50 AFF	1.25mm GSS OR Light duty galvanized steel tube	Follow ensuing specifications for Fire Stop Sealants.
Wall i) Internal	D + 50	Flush with finish	1.25mm GSS OR Light duty galvanized steel tube	Follow ensuing specifications for Fire Stop Sealants.
ii) External	D + 50	Flush with finish	1.25mm GSS OR Light duty galvanized steel	Follow ensuing specifications for Fire Stop



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			tube	Sealants.
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D = Outside Diameter of pipe with insulation
GSS = Galvanized sheet steel
AFF = Above finished floor



6.8.8 Welding:

- i. Welding shall be done by qualified welders only. Necessary weld qualification certificates shall be furnished for each welder employed at site. Welders without qualification shall not be allowed to site. A welding procedure shall be prepared and qualified before any welding is done.

Welding Procedures IS: 823
Welding Electrodes IS: 814, but of approved makes only
Testing of Welders IS: 817
- ii. Before welding, the ends shall be cleaned by wire brushing, filing or machine grinding. Each weld-run shall be cleaned of slag before the next run is deposited. Care shall be taken to see that the longitudinal joints (ERWs) of the consecutive pipes are staggered (rotated) by at least 30° and should be kept in top (upper) third surface (120°) of the pipeline, to facilitate repair of the weld, if found leaking during pressure testing.
- iii. Welding at any joint shall be completed uninterrupted. If this cannot be followed for some reason, the weld shall be insulated for slow and uniform cooling.
- iv. Welding shall be done by manual oxyacetylene or manual shielded metal arc process. Automatic or semi-automatic welding processes may be done only with the specific approval of Employer/Consultant.
- v. As far as possible welding shall be carried out in flat position. If not possible, welding shall be done in a position as close to flat position as possible.
- vi. No backing ring shall be used for circumferential butt welds.
- vii. Welding carried out in ambient temperature of 5°C or below shall be heat-treated.
- viii. Tack welding for the alignment of pipe joints shall be done only by qualified welders. Since tack welds form part of final welding, they shall be executed carefully and shall be free from defects. Defective welds shall be removed prior to the welding of joints.
- ix. Tacks should be equally spaced as follows:

for 65 NB and smaller pipes: 2 tacks
for 80 NB to 300 NB pipes: 4 tacks
for 350 NB and larger pipes: 6 tacks
- x. Root run shall be made with respective electrodes/filler wires. The size of the electrodes/filler wires. The size of the electrodes shall not be greater than 3.25 mm (10 SWG) and should preferably be 2.3 mm (12 SWG). Welding shall be done with direct current values recommended by the electrode manufacturers.



- xi. Upward technique shall be adopted for welding pipes in horizontally fixed position. For pipes with wall thickness less than 3 mm, oxyacetylene welding is recommended.
- xii. The root run of butt joints shall be such as to achieve full penetration with the complete fusion of root edges. The weld projection shall not exceed 3 mm inside the pipe.
- xiii. On completion of each run craters, weld irregularities, slag etc. shall be removed by grinding or chipping.
- xiv. Fillet welds shall be made by shielded metal arc process regardless of thickness and class of piping. Electrode size shall not exceed 10 SWG. (3.25 mm). At least two runs shall be made on socket weld joints.

6.8.9 Tests at Site:

Testing at supply works:

- i. Mechanical and chemical tests shall be performed as required in the codes/standards and relevant test certificates shall be submitted along with each batch of pipe supply.
- ii. All pipes shall be subjected to hydrostatic tests as specified elsewhere in this specification.

Testing of Welds:

- iii. 2% spot Radiography test on welds of buried pipes shall be carried out as per ASME VIII.

6.9 Painting of Above Ground Piping:

6.9.1 Pipe Preparation:

Mill scale, rust, rust scale and foreign matter shall be removed fully to ensure that a clean and dry surface is obtained. Rust, mill scale spatters, old coatings and other foreign matter, shall be removed by hammering, scrapping tools, emery paper cleaning, wire brushing or combination of the above methods. On completion of cleaning, loose material shall be removed from the surface by clean rags and surface shall be brushed, swept, de-dusted and blown off with compressed air to remove all loose matter. Remove all other contaminants, oil, grease etc.

6.9.2 Primer & Finish Coat:

Primer to be used:	Red oxide zinc chromate primer:
Type	Single pack
Composition	Modified phenolic alkyd medium pigmented with red oxide and zinc chromate.
Volume solids	30-35%
DFT	25 microns/coat (min)



Covering capacity 12-13 M²/lit/coat

The first coat of primer must be applied by brush on dry surface. This should be done immediately and in any case within 4 hours of cleaning of surface.

Finish coat:	Synthetic Enamel
Type	Single pack
Composition	Alkyd medium pigmented with superior quality water & weather resistant pigments.
Volume solids	30-40%
DFT	20-25 microns/coat (min)
Covering capacity	16-18 M ² /lit/coat

6.9.3 DFT Measurement:

The contractor shall provide standard thickness measurement instrument with appropriate range(s) for measuring Dry Film Thickness of each coat. The subsequent coats shall NOT be applied before measuring the DFT of the earlier coat. Subsequent coats shall be applied after the complete drying of the earlier coat.

6.10 Under Ground Piping:

All buried piping shall be duly painted with one coat of bituminous primer and above this one layer of wrapping and coating as specified below. The UG piping is to be laid in such a way that T.O. P level is minimum 1 Mtr. from ground level. PCC 1:4:8 anchor supports shall be provided for bends and tees wherever change in flow direction occurs.

6.11 Coating-Wrapping for underground pipes:

All underground piping shall be protected by coating and wrapping as per the following procedure:

- The materials and workmanship shall in general confirm to IS:10221 or as directed by the Owner

Cleaning:

- The pipes shall be thoroughly cleaned by dust, rust, mill scales, oil, grease etc., by stiff wire brush and scrappers. The surface shall be coated with the primer immediately after cleaning.

Application of Primer:

- Apply TWO coats of fiber, coal tar and solvent-based primer of density 0.92gms/Cm³ and viscosity of 1000 - 2000 cps at 190-gms/sqm (Pypkote primer manufactured by IWL). The 2nd coat shall be applied after the 1st coat has fully dried. The 2nd coat of primer will be allowed to dry until the



surface becomes tacky. The primer will be applied by brushing so as to produce effective bond between metal and subsequent coating of Pypkote 2-mm tape.

Paste Application:

- PYPKOTE - AW Paste / CORPORATE paste shall be applied to fill up uneven surfaces in order to ensure smoothness for subsequent wrapping with multi-layer tape.

Application of coating and wrapping tape:

- Tape will incorporate a Centre core of 90 micron HMHDPE film and Centre core of textile fabric @ 140 gms/sqm and 3 layers of modified coal tar mix interleaved between above Centre cores and terminated on either side by thermo fusible HMHDPE film (Pypkote 42-m manufactured by IWL).
- Tape must be wound spirally using thermo fusion process to completely adhere with the primer-coated surface and specified overlaps.

Overlapping:

- Winding is to be done with 50% overlap so that the total thickness of 2.0 mm tape would become 4.0 mm. It should be ensured while wrapping that air bubbles are wrapped. The ends of tape shall be secured with nylon binding to ensure that the tape doesn't get loosened while handling.
- The total thickness including 2 coats of primer, 50% overlap of tape etc., should not be less than 4.5 mm or as per manufacturer recommendations.
- Each end of the pipe left uncoated for welding purpose will be hand coated and wrapped after field welding is completed and surface cleaned.
- The 'Holiday Test 'is to be conducted for detecting any entrapped air or any other defect. The contractor is to arrange for the Holiday Test and to rectify the defects if found any.

6.12 Excavation and back filling:

Excavation for UG Pipe line shall be done in all type of soil conditions to a minimum of 1 Mtr. below the ground level i.e., to the top of pipe elevation.

6.13 Construction of Valve Chambers:

i. Excavation:

This shall be done to dimensions and levels on the drawing.

ii. Bed Concrete:



Base of the manhole shall be constructed in R.C.C. 1:2:4, using 20 mm graded stones. Thickness shall be 200 mm upto 4250 mm depth and 300 mm for depths more than 4250 mm depth or as specified by the Engineer-in-charge / Owners Representative at Site.

iii. Brickwork:

Brickwork shall be in C.M. 1:4 constructed with Class B wire cut bricks. Brick masonry in arches and arching over the pipe shall be in C.M. 1:3. Walls shall be generally built in 230 mm thickness for inspection chambers and manholes upto a depth of 2100 mm and 350 mm for depth over 2100 mm.

iv. Plastering:

Walls of valve chambers shall be plastered inside with 15 mm thick cement plaster 1:3 using W.P. Compound and finished smooth. Where ground water table is high, external surfaces of manholes shall also be plastered in C.M. 1:3.

v. Filleting or Flashing:

75 mm fillet shall be made with C.M 1:3 all-round the external joint between the bed concrete and brick masonry wall of manhole.

vi. R.C.C. Cap Slab:

RCC M-150 cap of 1:2:4 150 mm thickness shall be provided on top of manholes for fixing the manhole frame.

vii. Chamber Manhole frames and covers:

The chamber manhole cover and frame shall be Cast Iron. Approximate weights for various dimensions of frames and covers of various duties shall be as follows: All (M.H. Covers of heavy duty and medium duty shall be of Double seal type and light duty single seal type).

Size	Heavy duty kg.	Medium Duty kg.	Light Duty Kg.
Square 600 x 600	200	100	50
Rect. 910 x 455	230	200	60
Rec. 910 x 1200	275	251	70
Circular 530 dia.	238	125	-



The covers and frames shall be cleanly cast and be free from air and sand holes and from cold shuts. They shall be neatly dressed and carefully trimmed. All castings shall be free from voids either due to shrinkages gas inclusion or other causes.

Covers shall have raised checkered design on the top surface to provide adequate non-slip grip. The cover shall be capable of easy opening and closing and it shall be fitted in the frame in a workman-like manner. Covers shall be gas and water tight. Size of the cover shall be the clear internal dimensions of frame. 2 1/2% variation in weights shall be permissible.

Covers and frames shall be coated with a black anti-corrosive paint of bituminous composition. The coating shall be smooth and tenacious. It shall not flow of 63 deg. C and shall not drip off at 0 deg. C. The covers shall be so fixed as to be flush with ground surface. After completion the manhole covers shall be sealed by means of grease.

6.14 Thrust Blocks:

Contractor has to provide suitable, thrust (anchor) blocks of ample dimensions in cement concrete at all bends, tee connection and other places as required and necessary for overcoming pressure thrusts in pipes. Anchor blocks will be of cement concrete 1: 2: 4 mix (1 Cement: 2 coarse sand: 4 stone aggregate 20mm nominal size).

6.15 Flushing of hydrant system:

After installation of complete system flushing of hydrants system shall be done as under:

- a. Underground mains and lead-in connections to system risers shall be flushed before connections made to piping in order to remove foreign materials which may have entered underground during the course of installation. For hydrant system the flushing operation shall be continued until water is clear. Water samples shall be collected and presented to Employer, immediately after start of flushing and on completion of flushing to record the clarity attained.
- b. Underground mains and connections shall be flushed at a flow rate of not less than 1620 ltrs. per minute. The pump and other equipment necessary for the flushing shall be arranged by the contractor at his own cost.
- c. The water coming out from the outlet will be connected to storm water drain by means of suitable hose.

6.16 Fire Sealing of Vertical penetrations / services shafts:



- a. A **firestop** (fire protection system) made of various components shall be used to seal openings and joints in fire-resistance rated wall and/or floor assemblies. For vertical shafts, the balance area left out after the services' penetrations shall be properly sealed.
- b. Firestops shall be designed to restore the fire-resistance ratings of wall and/or floor assemblies by impeding the spread of fire by filling the openings with fire-resistant materials.
- c. The following "openings" shall be treated for such fire sealing:
 - Electrical through-penetrations
 - Mechanical through-penetrations
 - Structural through-penetrations
 - Unpenetrated openings (openings for future use for example)
 - Re-entries of existing firestops
- d. Firestop material to be used can be "**cementitious mortars**" and "**mineral fibers**". Mortars shall be used to permanently seal-off the openings. Mineral fibers can be used for sealing-off of re-entry openings, which can be broken to allow future addition of pipes / cables in the same shaft.
- e. The fire stop mortars shall have a minimum of 2-hours fire rating tested in accordance with BS 476 part 20 / UL 1479 (ASTM E 814) for horizontal openings in fire rated floors or slabs. The mortar shall have a minimum hardened density of 0.8 g/cm³.
- f. The product shall be tested for withstanding Zone4 earthquake. The product shall be age tested for 30 years as per Dafstb and DIBT standards. The product shall be tested and approved by third party agencies such as UL & Warrington laboratory. The product shall bear the UL logo on the packing.
- g. **Application Method:**
 - The shaft area concrete must be a minimum of 3 days old. The concrete must be clean and rough. All oil, dirt, debris, paint and unsound concrete must be removed. The surface must be prepared mechanically using the proper equipment which will give a surface profile (ups and downs) of a minimum of 1/8 in. (3mm) and expose the coarse aggregate of the concrete. The final step in cleaning should be the complete removal of all residues. Use a hand held air blower for this.
 - Dampen with water the exposed concrete surface to improve the adhesion of the fire resistant mortar.
 - Prepare separately slurry of the sealant with water and also one batch of mortar as required to seal-off the shaft.
 - Apply a brush coat of the slurry on the dampened concrete surface.



- Quickly apply the mortar before the slurry dries. Finish the mortar, using a standard trowel to desired texture.
- Excess sealant and smears can be cleaned up or removed with soapy water before sealant skins. Any utensils used for tooling can also be cleaned with soapy water.
- Wet cure the mortar for a minimum of 3-days.
- Shafts meant to facilitate re-entries in future can be first densely packed with mineral wool and then the mortar be applied. The mortar thickness shall be for a minimum thickness of 50-mm.

7. Pressure Testing of pipes:

- 7.1 After laying and jointing, the entire piping shall be tested to hydrostatic test pressure. The pipes shall be slowly charged with water so that the air is expelled from the pipes. The pipes shall be allowed to stand full of water for a period of not less than 24 hours and then tested under pressure. The test pressure shall be at least 1.5 times the operating pressure. The test pressure shall be applied by means of an electrical test pump to be provided by the contractor. Precautions shall be taken to ensure that the required test pressure is not exceeded.
- 7.2 The open end of the piping shall be temporarily closed for testing.
- 7.3 All leaks and defects in joints revealed during the testing shall be rectified and got approved at site.
- 7.4 Piping repaired subsequent to the above pressure test shall be re-tested in the same manner, till no leaks and pressure drops are found.
- 7.5 System may be tested in sections and such sections shall be securely capped, then retested for entire system.
- 7.6 The Contractor shall give sufficient notice to all other agencies at Site, of his intention to test a section or sections of piping and all testing shall be witnessed and recorded by Owner's Site Representative.
- 7.7 The Contractor shall provide all materials, tools, equipment, instruments, services and labor required to perform the test and to remove water resulting from cleaning and after testing.

8. Measurements for Piping:

Unless otherwise specified measurements for piping for the project shall be on the basis of Centre line measurements described herewith.

Piping:



Shall be measured in units of length along the Centre line of installed pipes including all pipe fittings, flanges (with gaskets and nuts and bolts for jointing) unions, bends, elbows, tees, concentric and / or eccentric reducers, inspection pieces, expansion loops etc., The above accessories shall be measured as part of piping length along the Centre line of installed pipes and no special rates for these accessories shall be permitted.

The quoted unit rates for Centre line linear measurements of piping shall include all wastage allowance, pipe supports including hangers, MS Channel, wooden haunches, nuts and check nuts, vibration isolator suspension where specified or required, and any other item required to complete the piping installation as per the specification. None of these items will be separately measure NOR paid for.

However, all valves (gate / globe / check / balancing / butterfly / ball etc.,) strainers, orifice plates, thermometers, pressure gages shall be separately measured and paid as per their individual unit rates.

9. TESTING, COMMISSIONING & HANDING OVER:

9.1 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 Client / Engineering Consultants 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.
- Three copies of all test results shall be submitted to the Engineer in A4 size sheet paper within one / two days after completion of the tests.

9.2 PRE-COMMISSIONING:

Fire Protection System

- a. Check all hydrant valves by opening and closing any valve found to be open shall be closed.
- b. Check all the piping under hydro test.



- c. Check that all suction and delivery connections are properly made for all pump sets.
- d. Check rotation of each motor after decoupling and correct the same if required.
- e. Test runs each pump set.
- f. All pump sets shall be run continuously for 8 hours (if required with temporary piping back to the tank).

9.3 COMMISSIONING:

9.3.1 Hydrant System:

- a. Pressurize the fire hydrant system by running the jockey pump and after it attains the shutoff pressure of the pump.
- b. 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.
- c. Open hydrant valve and allow the water into 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,
- d. Switch off the main fire pump and test check the diesel engine driven pump in the same manner as the electrically driven pump,
- e. 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.
- f. 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.
- g. Check all annunciations by simulating the alarm conditions at site.

9.3.2 Sprinkler System:

- a. Start the sprinkler pump and develop the required pressure in the sprinkler pipes.
- b. 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



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and the alarm for each section (via flow switch) shall be checked for operation.

- c. After satisfactory operation of the pump the Contractor shall set up mock fire and test the system.
- d. Check all annunciations by simulating the alarm conditions at site.



9.4 FINAL ACCEPTANCE TESTING:

Following the 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 program to be agreed with the Client/ Engineering Consultants. The test procedure shall be generally as under:

i. Starting up of the pressurization (Jockey) Pump:

The pressure switch shall be set for the designed set pressures for the site for the **upper limit** and at 0.5 kg /cm² less for the **lower limit** (i.e) if the upper limit is set at 10.0 kg/cm², then the lower limit shall be set at 9.50 kg/cm². All subsequent pump-starts shall be set at steps of 0.75 kg/cm². 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 **lower limit**. The Jockey Pump shall also automatically stop when the system has been pressurized again upto the **upper limit**.

- ii. The electric pump shall be set to start at a pressure lower than the **lower limit** of the jockey pumps. 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 to the **lower limit**. Further, drop in the pressure upto main pump sets' start pressure should be allowed to test automatic start-up of the main electrical fire pump. The Jockey Pump shall automatically stop at this stage. The external hydrant valve will be closed and the electrical pump shall continue to run and register rise in the pressure upto the **upper limit** set pressure of the site. The electrical pump shall be stopped manually by pressing the stop button.
- iii. After having the system got fully charged at upper limit of the site setting and the main electrical fire pump having stopped, the external hydrant valve using hose and branch pipe shall be opened again. After the sequence of automatic starting of the jockey pump and starting of the main electrical fire pump at their respective set pressures, (the jockey pump will stop automatically at the starting of the main electrical fire pump), the power supply in the pump house shall be switched off. The standby pump shall automatically come into operation at a drop in pressure, (i.e) the set pressure of the diesel pump to start. The standby pump will be allowed to run for 10 minutes. The external hydrant valve will be closed and standby pump will continue to run and register a rise in pressure upto the site set pressure. The standby pump will be stopped manually by pressing the stop button.
- iv. 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.



9.5 HANDING OVER OF DOCUMENTS:

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.

9.6 CHECK LIST FOR COMMISSIONING:

Fire Protection System:

- 1) Check all hydrant & other valves by opening and closing. Any valve found to be open shall be closed.
- 2) Check all clamps, supports and hangers provided for the pipes.
- 3) 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).
- 4) Pressurize the fire hydrant system by running the jockey pump and after it attains the shutoff pressure of the pump,
- 5) Open bypass valve and allow the pressure to drop in the system.
- 6) Check that the jockey pump cuts-in and cuts-out at the preset pressure. If necessary, adjust the pressure switch for the jockey pump.
- 7) Close by-pass valve.
- 8) Open hydrant valve and allow the water to flow into the fire water tank in order to avoid wastage of water.
- 9) The main fire pump shall cut-in at the preset pressure and shall not cutout automatically on reaching the normal line pressure.
- 10) The main fire pump shall stop only by manual push button.
- 11) However, the jockey pump shall cut-out as soon as the main pump starts.
- 12) Operate pump continuously for 30 minutes with piping back to underground tanks from the hydrant nearest to plant room.
- 13) 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.
- 14) Each landing valve shall also be checked by opening and closing under pressure.
- 15) Check air cushion tanks / air vessel for proper functioning.



PART - B TECHNICAL

SECTION IV - PUMP SETS

1. **Main Electric Hydrant & Sprinkler Fire Pumps & Controllers (Re-Installation):**

Removing, Servicing, Re-Installation, Testing and Commissioning of Electrically driven Main fire pump set. Couples end Suction fire Pump set with 60 HP Motor TEFC type, 2900 rpm, 420V, 50 cycle frequency 3 phase class 'F' insulation, I.P. 55 protection, starting on Star Delta. The Pump shall be horizontal, end suction, top discharge. The pump shall have cast iron casing, bronze impeller, steel shaft with common base frame capable of discharging 137.0 Cu.m./hr (2280 LPM) at 70m Head. complete with base frame & foundation bolts / Anti Vibration Pads.

2. **Jockey Pump:**

- a. Pumps shall be horizontal centrifugal end suction top discharge type, having bronze impellers which are pinned for positive driving to stainless steel impeller shafts.
- b. For pump rating, total dynamic head and electrical characteristics, refer to "Particular specifications".
- c. Pump shall contain close grained cast iron diffusers and equipped with bronze casing rings. Sleeve-type base bearings shall be bronze.
- d. Pump base and motor adapter shall be cast iron, with complete mechanical shaft seals and standard TEFC / SPDP proof motors with drip canopies.

3. **Diesel Engine Driven Pump Set:**

As a stand-by for the Main Electric Motor Driven Pumpset, a Diesel Engine Pump Set shall be provided. The Pump construction and duty conditions shall be similar to the Electric Motor Driven Pump Sets.

The engine shall be multi cylinder radiator water cooled diesel engine directly coupled to the pump. The capacity of the engine shall be at least 20% greater than HP required to drive the pump at its duty point. The engine shall be complete with following accessories.

- (i) Fly Wheel.
- (ii) Direct coupling for pump and coupling guard, radiator with fan, water pump drive arrangement and guard.
- (iii) Air Cleaner.
- (iv) Corrosion resister.



- (v) Fuel Service tank (8 hour) level gauge, supports, fuel oil filter with GI Pipe work & valves from tank to engine.
- (vi) Lube oil pump & filter.
- (vii) Electrical Starting battery 2 x 12 V, with mounting brackets, stands and frames.
- (viii) Residential Exhaust silencer with insulated exhaust piping. The exhaust pipe shall be insulated with 2 layers of 50-mm thick 24 kg/cum density fiberglass. Each layer shall be tied down with 1 mm dia Galvanized Steel wires @ 500 mm centers and finally finished with 24SWG Aluminum sheet metal cladding.
- (ix) Instrumentation panel complete with Lube oil pressure, temperature gauges, water temperature, pressure gauges, tachometer, hour meter and starter switch with key for manual operation.
- (x) Safety controls consisting of low lube oil pressure, high cooling water and lube oil temperature and over speed.
- (xi) Anti-vibration mounting.
- (xii) Battery charger with float and booster charger.

4. Control Panels:

A combined control panel for automatic / manual operation of fire pump sets shall be provided. The functional requirement of control panel shall be as follows.

- a. When the water pressure in the system falls 0.35 kg / sqcm below normal system pressure, the jockey pump shall start automatically when set to auto status and shut down when the system pressure reaches set value. The pressure setting shall be adjustable.
- b. When the water pressure in the system falls below 1 kg/ sqcm below the normal system pressure (due to opening of hydrant / test valves etc.,) the main electric pump shall start automatically when set to auto status and shut down when system pressure reaches set value. The pressure setting shall be adjustable.
- c. If within preset period of 15 to 30 seconds, the electric pump has not started pumping water or electric fire pump fails during operation, the electric pump shall be locked out and startup of diesel pump shall be initiated. An audio visual alarm shall be given indicating failure of main pump operation.
- e. If within a preset period the standby pump also fails to start pumping water, the standby pump shall be shut down and an audio visual indication of standby pump failure shall be given a control panel.



- f. The control panel shall have manual / auto operation selector switches. During manual operation individual pumps shall be manually operated through relevant push buttons.
- g. Returning the locked out pumps to normal operation shall be feasible by manual reset of locked out units by operation of appropriate push buttons.
- h. When main fire pump is in operation an audible tone shall be provided to indicate healthiness of the system. This tone will be shut down along with Main Fire Pump shut down.
- i. Alarm for failure / lock out of the pump shall be distinct from the healthy alarm. Failure alarm shall be loud and can be silenced on acceptance.
- j. The Control Panel shall have visual annunciator for running of jockey & fire pumps, power failure and mains on.
- k. The control system shall be designed for 24 V DC Supply and shall be complete with battery charger unit with boost / float charge facility with voltmeter capable of charging 2 sets of batteries at a time.

5. 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 and IS: 4736. 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 25mm 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 or 10.5 KG /cm² pressure.

6. 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.

7. Submittals:

- a. Pump factory test data.
- b. Shop drawings for the installation of the Main and Jockey pump sets, including foundation details.
- c. Working drawings for the sprinkler system, showing the location of the sprinklers, pipe layout, location of landing valves and hose reel assemblies, etc., shall be submitted and approval sought for from the consultants before



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- start of work. Care should be taken to co-ordinate with other services like HVAC, Lighting etc., so that there shall be no mutual hindrances.
- d. Upon completion of the installation, as-built drawings for the entire system shall be prepared and submitted along with 4 sets of operating manuals for the systems.



PART B - TECHNICAL

SECTION V - PARTICULAR SPECIFICATIONS

1. Electrical Jockey Fire Pumps

ITEM	PUMP
Water flow rate LPM	180
Total Head M	88
Pump speed RPM	2900
Pump Efficiency	Up to 65%
Pump Drive	Electric Motor
Type of coupling	Direct
Pump casing Material	Cast Iron
Impeller	Bronze
Shaft	Stainless Steel
Shaft Seal	Mechanical
Type of Starting	DOL

2. Diesel Engine Fire Pumps

ITEM	PUMP
Water flow rate LPM	2280
Total Head M	88
Pump speed RPM	1500 to 2300
Pump Efficiency	Up to 65%
Pump Drive	Diesel Engine Drive
Type of coupling	Direct
Pump casing Material	Cast Iron
Impeller	Bronze
Shaft	Stainless Steel
Shaft Seal	Mechanical
Type of Starting	12 V Battery



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SECTION VI - PORTABLE FIRE EXTINGUISHERS

1. Fire Extinguisher

Hand held and wheeled Dry chemical, CO₂ & Foam extinguishers shall be installed strategically throughout the Building areas for first attack firefighting. The following criteria shall be followed:

- Portable dry powder ABC or CO₂ extinguishers (not less than 5 kg.) shall be provided throughout the Building.
- The powder or CO₂ extinguishers shall be located at strategic points at grade and on the platforms of structures with a guide maximum travel distance of 15 m in order to protect motors, electrical equipment's, electrical panels, etc.
- Fire extinguishers shall be conspicuously located where they will be readily accessible and immediately available in the event of fire. Preferably they shall be located along normal paths of travel, including exits from areas.
- Portable fire extinguishers other than wheeled types of extinguisher shall be mounted on a proprietary hanger attached to a structural steel vertical I beam or to the face of suitable wall (top of extinguisher 1.2 m from standing level) and protected by a soft vinyl red cover. If a suitable mounting point is not available, a proprietary steel cabinet (red color) sized for a single fire extinguisher shall be provided, top of cabinet 1.2 m from grade.
- The wheeled extinguishers shall be located at strategic points near hazardous equipment such as oil filled transformers, Mill drive, Packer's, Stores area, etc.
- The wheeled extinguishers shall be protected by a suitable identified, heavy-duty soft vinyl or vinyl-coated canvas cover.

Fill and service extinguishers to comply with requirements of governing authorities and manufacturer's requirements.

All extinguishers shall be supplied with a weather-proof, non-rotting protective cover.



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The type of extinguisher shall be identified by a color coding as national & international standards.



PART B - TECHNICAL

SECTION VII - FIRE RATED EXIT DOORS & SIGNS

1. FIRE RATED EXIT DOORS SPECIFICATIONS

Providing and fixing 2 hr fire rated double skin steel door constructed from 1.5mm thick MS sheet on both sides fitted on 70 X 50 mm MS tube surrounded at edges and around glass, duly filled in with PU foam insulation, door frame of pressed ms sheet 2 mm thickness, 10 mm square bar bracing at bottom, including all approved type heavy duty fastenings and fixtures comprising of: S.S. hinges, cylindrical lock, handles 2 Nos., air seal gaskets between shutter and frame, rubber sweep strip at bottom, "Dorma" make door closers, threshold, vision glass, Aluminum louvers as per drawing, powder Coating 50 micron of approved shade .

Fire door should be tested at CBRI or ARAI for maximum rating of 2hrs with vision panel. Vision Glass panel should be 6mm thick clear glass provided in square in standard dimensions of 300mm x 300mm. Door Frame should be formed to double rebate profile of size 143mm X 57mm (+/- 0.3mm) or as per the drawing with a maximum bending radius of 1.4mm and fixed as per manufacturers specification. Including all approved type (Dorma Make) heavy duty fastenings and fixtures comprising of :S.S. Ball Bearing Butt hinges 3 mm thickness, Mortise Sash Lock, D handles, Mortise Dead Bolt, Mortise Latch, Door Closer, air seal gaskets between shutter and frame, threshold, etc complete.

The door frames and door shutters are primed with Zinc-Phosphate Stoving Primer and finished with Polyurethane Aliphatic grade or epoxy paint as per approved manufacturer specifications. (Supplier -Shakti Met-dor or approved equivalent). (Note - Test certificates should be available for vision panels as part of the fire door assembly. Independent glass test certificates will not be accepted. Manufacturer test certificate shall cover doors both single and double leaf and all doors supplied should be within the tested specimen, deviation in specification and sheet thickness other than what is mentioned in the test certificates are not allowed. Proper label confirming the type of door and the hourly rating is mandatory.) The contractor should submit shop drawing for approval from consultant / client before execution.



2. EXIT SIGNS SPECIFICATIONS

Exit sign shall be of self contained, maintained type either wall mounted or hanging type with directional arrow mark with pictogram as applicable on every exits and as shown on the drawings.

Each exit sign unit shall contain a miniature fluorescent lamp, a sealed rechargeable nickle-cadmium battery and solid state charger unit. A mains healthy indicator light shall be incorporated together with a test switch. The units shall be capable of providing light under mains failure conditions for up to three hours.

The charger unit shall be capable of fully recharging the batteries with in 8 hours after usage in a mains failure.

All exit sign fittings shall be connected in such a manner that when under healthy conditions a pilot indicator lamp is present indicating that the unit is fully charged.

The units shall only become energised under mains failure conditions, and under no circumstances will any unit connected to a switch circuit be admissible.



PART B - TECHNICAL

SECTION VIII - GAS TYPE FIRE SUPPRESSION SYSTEM

1. SPECIFICATIONS FOR NOVEC-1230 GAS BASED FIRE SUPPRESSION SYSTEM

1.1 GENERAL INFORMATION

Novec-1230 is a Clean Agent efficient on Class A, B and C fires. It is a clean, electrically non-conductive media used for the protection of variety of potential fire hazards including electrical and electronic equipment.

For most common applications involving Class A & C fires, the recommended volumetric design concentration is 4.7% for protection of normally occupied areas. As per NFPA, the minimum extinguishing concentration for Class 'B' fuels is determined by the cup burner value. The minimum extinguishing concentration for the specific fuel, plus a safety factor of 20% gives the Design Concentration.

Novec-1230 is stored in high pressure containers and super pressurized by dry nitrogen to provide additional pressure to ensure rapid discharge. Once the system is activated, the container valves are opened and the nitrogen propels the liquid under pressure through the pipe work to the nozzles where it vaporizes. High rate of discharge through the nozzles ensures that homogenous mixture with the air.

The composition of Novec-1230 is

Dodecafluoro-2-methylpentan-3-one - CF₃CF₂C(O)CF(CF₃)₂, FK-5-1-12

The NOAEL and LOAEL of Novec-1230 are NOAEL LOAEL 10 >10

1.2 SUMMARY OF GAS SUPPRESSION SYSTEM

Sl. no	Description	IPP	IPG	DOT
1	Cylinders- 140kg			7
2	Cylinders- 120kg	2	2	11
3	NOVEC 1230 agent- Kg	224	186	1830
4	Discharge Nozzles	4	2	88
5	Discharge pressure switch	1	1	30
6	Directional Valve		20	
7	Manifold for cylinders	2	2	13



8	Gas release panel	1	1	30
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1.3 SCOPE

The contractor shall supply, install, test and put in operation a Novec-1230 based fire suppression system. The fire suppression system shall include and not be limited to gas release control panel, PESO approved seamless cylinders only, discharge valve (with solenoid or pneumatic actuator) as the case may be, discharge pipe, non-return valve and all other accessories required to provide a complete operation system meeting applicable requirements of NFPA 2001 or ISO standards and installed in compliance with all applicable requirements of the local codes and standards.

The system design should be based on the specifications contained herein, NFPA 2001 (Latest Edition) & in accordance with the requirements specified in the design manual of the agent. The bidder shall confirm compliance to the above along with their bid.

1.4 DESIGN AND ENGINEERING

Novec-1230 systems shall be designed minimum design concentration of 4.7% (0.684 kg/m³) as applicable to class 'A & C' risks according to NFPA-2001:2012. The system design must consider the limitations caused by the void height. It should also consider temperature in the void to determine the appropriate quantity of agent required. The vendor should clearly indicate the qty. of the gas in Kgs. to be used for the system. All voids within each hazard shall be discharged simultaneously. Each hazard shall have an independent system with 100% Online Standby System.

Novec-1230 systems shall have a working pressure of 25/42 bar.

A fill density between 0.5 to 0.87 should be considered for the agent to be discharged within the specified time of 10 seconds.

The system engineering company should carry out the piping Isometric design and validate the same with a hydraulic flow calculation generated by using the agent's design software. The appropriate fill density to be arrived at based on the same and shall conform to clause.

The design & calculation shall be carried out using OEM Software Program only provided by the manufacturer. You may note that the calculation is the only guarantee that the system will work, provided the system is installed exactly as per the design. The contractor has to take into consideration the routing available while designing the pipe network.

1.5 NOVEC-1230 AUTHENTICATION



A certification (from the manufacturer of the agent or their direct distributor) on the genuinity and quality of the agent filled in the system procured should be submitted by the System Engineering Company.

1.6 REFILLING AND MAINTENANCE

In case of any leakage or accidental discharge of the agent, it should be possible to refill the cylinders in India itself. The contractor should indicate the source of refilling and time that will be taken for refilling and replacement.

1.7 DISCHARGE TIME

As gas has to be fully discharged within 10 seconds for effective quenching of fire as per the relevant standards, the contractor has to ensure that the design meets this requirement. A pre discharge alarm along with illumination of warning signs to be installed inside the protected area to notify the personal present inside to evacuate the protected area. Once the discharge takes place there should be warning signs restricting personal from entering the protected area until the gas has been cleared from the area.

1.8 MATERIALS AND EQUIPMENT'S

All materials and equipment's shall be from approved manufacturers and shall be suitable for the performance of their respective functions.

The cylinders should be complete with all accessories. The contractor shall indicate the dimensions of the cylinders required for each area while quoting.

The number of nozzles and their positions must be chosen so that the design concentration is established everywhere in the enclosure.

The gas release panel should have manual override and manual discharge keys/lever.

1.8.1 CYLINDER

The cylinder shall be high pressure, seamless steel gas cylinder, flat type, concave bottom as per IS 7285 complete with neck ring. Welded and Non-PESO approved cylinders will not be accepted.

As per the regulations of the Petroleum & Explosive Safety Organization (PESO) Nagpur, any system which has a working pressure above 19 bar (280 psi) will require the use of seamless cylinders that have been duly approved by the PESO, Nagpur.



The maximum and minimum fill density of Novec-1230 in a cylinder shall not be less than 0.5 kg/lit. and not exceed 0.87 Kg/Lit. of internal volume. Appropriate fill density shall be chosen based on the cylinder location and piping. The hydraulic calculations should prove that the fill density is appropriate and total discharge will take place within 10 seconds.

The cylinders shall be super-pressurized with dry nitrogen to 25/42 bars at 20°C. The cylinder shall be capable of withstanding any temperature between 30° C and 70° C.

Cylinder shall be mounted according to manufacturer recommendations.

The cylinder shall withstand Hydrostatic test pressure of minimum 150 bar and working pressure at 15°C shall be 100 bar minimum.

1.8.2 VALVES

The discharge valve shall be approved for use with Novec-1230. All the gaskets, O-ring, sealant and other valve component shall be constructed of materials compatible with the clean agent.

The system should be engineered using hardware approved for use with Novec-1230 systems. This would include main discharge valve, solenoid, check valve / non-return valve and pneumatic actuators. Certificates from OEM to be provided for the same.

1.8.3 PIPES & FITTINGS

All Pipes shall be of ASTM-A-106, Gr: B, schedule-40 seamless CS Pipes and fittings shall be as per ASTM A-105, A 234 standard of appropriate class.

All Fitting Joints below 2” size shall be threaded or Socket Welded

All Fitting Joints above 2” size shall only be Butt / Socket Welded.

The Contractor shall provide the Test Certificates for all Pipes and Fittings.

1.8.4 DISCHARGE NOZZLE

Nozzle shall control the flow of Novec-1230 to ensure high velocity, proper mixing in the surrounding air and uniform distribution of the agent throughout the enclosure. The number of nozzles and their positions must be chosen so that the design concentration is maintained everywhere in the enclosure. Nozzle shall be located where they can be adequately supported on walls, ceiling or



FIRE PROTECTION SYSTEM TECHNICAL SPECIFICATION

structural members. Software generated calculation supporting the nozzle design shall be submitted by the successful bidder before signing of contract.



1.8.5 FIRE DETECTION AND GAS RELEASE PANEL

Fire detection shall achieve using Conventional smoke/heat/multi criterion detectors. The protected area shall have 2-zone fire control panel and one set of detectors. Each zone shall have a set of detectors which are sensitive to fast flaming fire and slow smoldering fires. In case of either type of fire, the detectors shall detect the condition at an early stage (the moment products of combustion enter the detector) and shall cause the alarm panel to activate.

The moment the first zone gets activated the specific zone number shall be displayed and the panel buzzer shall start operating. At the end of timer one, stage 1 bells and relays shall be switched on. There shall be two sounders, both of which get switched on simultaneously to ensure that at least one shall work even if the other fails. The stage 1 bells shall be identified by the fact that they pulsate at the rate defined by timer 1.

When the second zone also activates, the second zone number shall also be displayed on the panel and stage 2 bells shall be activated which is identified by a continuous tone. The stage 2 bells indicate that area is to be evacuated. The output from the panel to the gas release module (actuator output) shall activate at the end of timer two, which is initiated from the moment the panel enters stage 2. It is important to note that the actuator output on the panel shall be enabled only if the automatic gas release mode is selected.

In the manual mode, even if the panel enters the stage 2, the actuator output shall not be enabled. In this case, actuator output shall be enabled if and only if the manual release switch is pressed, which shall cause the panel to enter stage 2 directly and at the end timer 2 enables the actuator output.

In case of alarm during presence of staff, the mute key shall be pressed to silence the alarm. Reset switch shall be pressed to reset the system. In case any zone is faulty, the zone isolate switch shall be pressed. This shall cause the zone isolation lamp to light on the panel.

In case of any fault condition (open circuit or short circuit on zone loop or power fault or bell fault or actuator fault) the indicator and the buzzer shall come on. The fault relay shall also be activated and provide a changeover contact. Pressing the mute key shall cause the buzzer to shift to intermittent state and the LEDs shall also glow steadily instead of flashing.



1.8.6 TESTING

The pipe network shall be pressure tested as per the Annexure-A

The control panel & actuators shall be tested in manual / Auto modes.

All opening inside the rooms protected through which the gas might escape shall be sealed close.

The test certificates for cylinders and other accessories shall be submitted.

1.8.7 DOCUMENTATION

The bidder should be the manufacturer or an authorized, trained and certified reseller of a manufacturer/distributor of Novec-1230system. Documentation to validate the same shall be submitted along with the bid documents.

The system engineering company should prepare & submit along with the bid documents, the piping Isometric drawing and support the same with a hydraulic flow calculation generated by using the agent's design software. The calculations shall validate the fill density assumed by the bidder.

The bidder shall submit copies of the datasheets of the hardware used in the system. The bidder shall also submit copy of PESO approval letter for the cylinder proposed to be used. These documents shall be attached to the bid.

The bidder shall also submit calculations to evidence the quantity of agent considered for the system.

The successful vendor must submit, along with the supply invoice, a certificate of authenticity, for the agent from the manufacturer/distributor.

The System Company should provide, as part of handing over, the as-built drawing, operation manual and maintenance manual. The as-built drawing shall exactly match the Isometric drawing submitted with the flow calculation prior to commencement of work.



PART B - TECHNICAL

SECTION IX - GENERAL CIVIL WORKS

Fire Pump Room Construction with 9” Brick wall & RCC (1:1.5:3)Roofing, MS Steel Gates (conforming for IS 800-2007) as required, tiles outside, Fire Pump Foundations, Suction Hole and Finishing and all related activities inside pump room

Removal of Existing Riser, Riser entry opening for all Floors, Packing/Closing, External Supports Grouting, Roof Overhead Tank connection supports and Misc. civil works

Road Crossing at 1 Mtr depth excavation and Refilling with Quarry dust/Fine sand for pipe covering removal of soil and all associated works

Any Miscellaneous Civil works required during Fire Hydrant system execution

All civil works for protection of valve from the building steel frame for support shall be in the contractor scope.

All Civil jobs related to pipe laying with clamps | supports | pedestals | buried excavation. Back filling Etc is in contractor scope.



PART B - TECHNICAL

SECTION X - LIST OF STANDARDS

TAC	Tariff Advisory Committee fire protection manual Part-I.
TAC	Rules of Tariff Advisory Committee for automatic sprinkler system.
NFPA: 12, 1993	Standards on Carbon Dioxide Extinguishing System
IS: 636	Non-percolating flexible firefighting delivery hose.
IS: 884	Specification for first aid hose reel for firefighting.
IS: 901	Specification for couplings, double male and double female, instantaneous pattern for firefighting.
IS: 902	Suction hose couplings for firefighting purposes.
IS: 903	Specification for fire hose delivery couplings, branch pipe, nozzles and nozzle spanner.
IS: 904	Specification for 2-way and 3-way suction collecting heads for firefighting purposes.
IS: 907	Specification for suction strainers, cylindrical type for firefighting purposes.
IS: 908	Specification for fire hydrant, stand post type.
IS: 909	Specification for underground fire hydrant, sluice valve type.
IS: 910	Specification for portable chemical foam fire extinguisher.
IS: 933	Specification for portable chemical foam fire extinguisher.



FIRE PROTECTION SYSTEM TECHNICAL SPECIFICATION

IS: 1648	Code of practice for fire safety of building (general): Firefighting equipment and its maintenance.
IS: 2171	Specification for portable fire extinguishers dry powder (cartridge type)
IS: 2190	Selection, installation and maintenance of first aid fire extinguishers - Code of practice.
IS: 2871	Specification for branch pipe, universal, for firefighting purposes.
IS: 2878	Specification for fire extinguishers, carbon dioxide type (portable and trolley mounted).
IS: 3844	Code of practice for installation and maintenance of internal fire hydrants and hose reel on premises.
IS: 5290	Specification for landing valves.
IS 5714	Specification for coupling, branch pipe, nozzle, used in hose reel tubing for firefighting.
IS: 8423	Specification for controlled percolation type hose for firefighting.
IS: 10658	Specification for higher capacity dry powder fire extinguisher (trolley mounted).
IS: 11460	Code of practice for fire safety of libraries and archives buildings.
IS: 1309	External hydrant systems - Provision and maintenance - Code of practice.
NFPA 70	National Electric Code.
NFPA 72 A Edition	Standard for the Installation, maintenance and use of protective Signalling systems
BS 5839	Code of practice for Installation of Fire Alarm system.
IS 2189 -1999	Code of practice for Installation of Automatic Fire Alarm System.



PART - B TECHNICAL

SECTION XI - TECHNICAL DATA

1. **Hydrant and Sprinklers Pipes:**

Make :
Material :
IS Specification :
Type of joining :
IS Specification for fittings :
Type of coating for UG Pipes :

2. **Butterfly, Check & Ball Valves:**

Make :
Material of body :
Material of stem :
Material of Disc / Ball :
Material of seat :
Conforming Specification / Codes :
Pressure Rating :

3. **Sprinkler Heads:**

Make :
Type (Upright / Pendant /both) :



FIRE PROTECTION SYSTEM TECHNICAL SPECIFICATION

Material of body & Deflector :
Thread Size :
Min & Max Operating Pressure :
Factory Test Pressure :
K-Factor Nominal :
Bulb burst temperature :



PART - B TECHNICAL

SECTION XII - APPROVED MAKE OF ITEMS

MS Pipes	:	Jindal / Tata
Pipe Fittings	:	Bharat Forge / Tube Products / Sanjay Forge / B & M
Pipe Supports and Clamps	:	HiTech /
Butterfly Valves	:	Audco / KSB / Kitz / Normex
Swing / Ball type Check Valve	:	Kalpana / Normex / Kirloskar
Ball Type Foot Valve	:	Kalpana / Normex / Kirloskar
Single Head S.S. Landing Valves	:	Newage / Winco / Shahbhogilal
Fire Hose	:	New Age / CRC / Torrent
SS Branch Pipe with Nozzle	:	Newage / Winco / Shahbhogilal
First Aid Fire hose reel (Drum)	:	Newage/ Eversafe / Monsher
Fire Hydrant box / hose cabinet	:	M.S. powder Coated with 16swg sheet as spec.
Fire Brigade Inlets	:	Newage / Winco / Shahbhogilal
Alarm Check Valve	:	Tyco / Viking / HD
Sprinkler Heads	:	Tyco / Viking / HD
Sprinkler Flexible Drop	:	Easyflex / Flexdrop / HD
Automatic Air Release	:	Giacomini / Equal
Fire Extinguishers	:	Intime / Safetyfirst / Safex
System Flow Switch	:	System Sensor / Tyco
Test & Drain Sight Glass	:	Sporlan / Teleflow / Flowtech / Alco
Ball Valves	:	RB / Zoloto / Leader
'Y' Strainer	:	Kalpana / Gloabal / Teleflo
Paints	:	Asian / Nippon / Berger
Primer	:	Asian / Nippon / Berger



FIRE PROTECTION SYSTEM TECHNICAL SPECIFICATION

Fire/Sprinkler Main Pumps & Jockey Pumps	:	Kirloskar / Mather & Platt / KSB / Grundfos
Diesel Engine	:	Cummins / KOEL / Greaves
Motor Electrical	:	ABB / Siemens / Kirloskar
Couplings	:	Lovejoy
Anti-Vibration Mountings	:	Kanwal / Dunlop / Resistoflex
Pressure Switch	:	Danfoss / Indfoss / Potter
Pressure Gauges	:	H. Guru / Fiebig / Baumer
Needle Valves	:	Leader / Swagelock
Pipe Protection Wrapping	:	IWL / Rustech
Welding Rods	:	Advani / ESAB
Anchor Fasteners	:	Hilti / Fisher
Firestop Sealants	:	Hilti / 3M / Murugappa
Fire Door	:	Shakti Met-dor or Equal

NOTE:

All Equipment / Components used in execution of work shall be preferred make listed above subject to the approval of OWNER / CONSULTANT.

The Owner / Consultant reserve the right to choose any one of the make listed above. If any other makes are offered, the same shall be clearly indicated in offer and pre approval obtained.

