



Engineering Division:

- * Fire Protection & Detection System
- * Plumbing, Sanitary & Drainage System
- * Annual Maintenance Contracts

CIN No. : U74140DL2015PTC279235

Fire Protection system

A. Review of Local Fire Service No Objection Certificate.

The Provisional No Objection Certificate issued for the construction of the project shall be scrutinized in detail. The mentioned fire fighting requirements shall be implemented to satisfy the requirements of fire safety and local by laws. As and when there are any changes made in the design of fire fighting system, the same shall be notified to **Local** Fire Services. There shall be inspections done by **Local** FS at the construction site as and when required by the Department. **Local** FS shall be notified for preliminary and final inspections of fire fighting system. There shall be live demonstration of the Fire fighting system to **Local** FS, for their verification and approval.

B. Preparation of Shop Drawings:

Qualified Design Engineers and Draftsmen shall prepare the shop drawings based on the consultant's drawings and WBFS Provisional NOC. All details regarding location of sprinklers heads, smoke / heat detectors, manual call points, hooters, internal & external hydrants, hose reels, fire pumps, motor controls, fire alarm panels, etc., shall be marked in the shop drawing. Also the details of pipes, fixtures, fittings, specials, supports etc., shall be shown in the shop drawings. Require Nos. of sets of blueprint copies of all shop drawings shall be submitted for approval by the concerned authorities. If there are major comments or changes in design and drawing, the same shall be re-submitted as required. If there are minor deviations or comments, the same shall be incorporated in as-built drawings. We shall keep two sets of approved shop drawings at site office and one at main office for reference.

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C. List of Materials:

All materials required for the project shall be formulated in tabular column and shall be exhibited at our site office. All drawings shall carry the approved makes of materials. Samples of all materials shall be submitted on a sample board with suitable tags. The approved samples shall be displayed at the sample room in our site office and shall remain there till the end of the project.

D. Storage of Materials:*** Pipes**

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Mild Steel / Galvanized steel / DI Pipes as per IS: 1239 / 3589 & 8329(2000) shall be stacked in stockyard, diameter-wise. The pipes shall be supported at 3 meters intervals by wooden sleeper and shall be at least six inches above the ground level. All the pipes received at site shall be painted with one coat of primer and marked with color strip at one end for identification. The stack should not exceed a maximum height of 1.80 Mts. The threaded ends of the pipes should be protected with a collar on one side and a plastic bush on the other side. All cut pipes shall be segregated and stacked diameter-wise.

*** Pipe fittings and specials:**

Up to 50mm diameter, all pipe specials shall be neatly arranged and labeled in wooden compartments, diameter-wise. Beyond 50mm diameter, all pipe specials shall be kept in bags and segregated according to sizes. Pipe specials above 100mm size shall be kept in open, arranged neatly and labeled.

***Cables:**

Cables shall be kept open inside the storage area coiled properly with proper labeling mentioning size and make of cables. The necessary length of cables shall be cut and used. The cut pieces shall be kept properly in one corner of the storage area segregated according to sizes. No cable pieces shall be left on the construction area. The available cable lengths shall be returned to site store properly to achieve proper stock at Site office.

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Gunmetal and special fixtures shall be stored neatly with its original packing material and labeled properly.

Hose reel drums shall be kept on ground not stacking more than three hose reel drums on one row, wrapped properly with hessian cloth.

***Sprinkler Heads (Quartzoid Bulb Type)**

Sprinkler Bulbs are packed and arranged in thermalcol boxes and stacked in a cupboard. They shall not be exposed to high temperature.

***Special Fixture/Fitting:**

Pressure Gauges, Pressure Switches, Air Release valves, etc., shall be kept in cartons filled with light packing material and stacked accordingly with a proper label on them.

E. Schedule of Drawings:

The drawing nos. and description of shop drawings shall be formulated and tabulated in columns. The submission dates of the drawings shall be shown properly in the rows. The remark column shall be used for comments by concerned authorities.

F. Schedule of Work Progress/Completion

The description of various activities of work at different areas shall be formulated and tabulated in columns. The start and finish dates of individual activity shall be shown on the rows. Date of completion of work shall be mentioned at the end of the row, with remarks.

G. HYDRANT AND HOSE REEL SYSTEM INSTALLATION***Scope**

The scope of work includes providing and installing External and Internal hydrant arrangements. Internal hose arrangement includes double-headed hydrant valves, hose reel drums duly reeled with rubber hose & connected to shut off nozzle, RRL Fire hoses, and branch pipe. The external hydrant system consists of single headed hydrant valves, CP Fire hoses, branch pipes, hose cabinets and fire brigade inlets. All the

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hydrants are connected with pipes and valves to the pumps installed at pump room located in ground floor.

***Clearance**

The Clearances required to start the above works are:

1. Fire ducts should be completed to install vertical pipes (wet riser).
2. All floors and ceiling area of respective floors should be cleared to install horizontal pipes, which will be interconnected to form a network of pipelines.

***Method of Working**

After the clearances are obtained as mentioned above, the following step-by-step procedure shall be followed for installation of Fire Hydrant arrangements:

- a) Location of Wet riser/Down comer (pipe) shall be marked as per approved drawings in their respective fire shaft using plumb marking system.
- b) The MS angle/ channel supports shall be marked approximately at intervals of 3 to 4 mts vertically and fixed using Anchor Bolts.
- c) Pipes shall be carried through the shaft / stairs properly using required manpower.
- d) Vertical rise of the pipes shall be erected using chain pulleys.
- e) These pipes shall be fixed rigidly to the Angle support by using bright rod 'U' clamps and additional pipes shall be butt-welded to raise the riser as per standards.
- f) Tapping piece to fix double-headed hydrant valve shall be of 80 mm dia pipe. One number 80 mm dia slip-on flange shall be welded to one end of the above pipe and the other end shall be tapped (butt-welded) to the vertical pipe (wet riser).
- g) Hose reel drum shall be fixed using the holes provided on them by using anchor fasters or grouting angle frames with bolts.
- h) The horizontal pipes shall be hanged on the ceiling by means of universal clamps and spaced accordingly.
- i) Hydrostatic testing of Welded joints and Pipes shall be done in stages as and when pipes and fittings are installed.



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- j) Hydrostatic testing shall be done at 1.5 times the working pressure for two hours and shall be notified to the concerned authorities before start and finish of the testing.
- k) The pipes shall be flushed to remove any foreign material / welding flux trapped in the pipe during fabrication.
- l) The pipes shall be cleaned properly and painted with one coat of primer and two coats of red enamel paint.

*** Welding and Cutting Operations**

Welding is extensively used in the fabrication work in which metal plates / rolled steel

sections (pipes), etc., are joined together.

*** Principle of Welding**

Welding is a metallurgical process in which the junction of the two parts to be joined are heated and fused together with or without the application of pressure to produce a continuity of the homogenous material of the same composition and the characteristics of the parts, which are being joined. Fusion or non-pressure welding i.e., Arc welding shall be followed. The procedure for welding shall be as follows:

- a) Pipe end shall be chamfered to 60° using an angle grinding machine and proper gap of minimum 2 mm shall be maintained. Electrode between two pipes in Butt weld joint.
- b) The fitter shall use a normal welding transformer to join pipes by tack welding them.
- c) The skilled welder then shall start a root weld, and wire brush the root joint so that the flux on the joint is completely removed.
- d) After letting the joint to solidify for a few minutes, the final weld shall be performed and the flux is removed once again.

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*** Arc Welding Machine**

For A.C arc welding, a step down transformer is used. The transformer receives the A.C supply between 200 and 440 volts and transforms it to the required low voltage in the range of 80 to 100 volts. A high current of 100A to 400A will be suitable for general arc welding work.

*** Arc Welding Electrodes**

Consumable-coated electrodes shall be used to fill the joints.

- i) The protection of molten metal from oxygen and nitrogen of the air by providing a gas shield around the arc and the molten pool of metal.
- ii) To establish and maintain the arc throughout welding.
- iii) The formation of slag over the joint thus protects from rapid cooling.
- iv) The addition of alloying element.
- v) The electrodes are made of either soft steel wire or alloy steel. .
- vi) E-6013 class welding electrodes shall be used

Welder should be qualified and skilled to perform the welding joints and follow all safety procedures during the performance of welding.

*** Gas Cutting Equipment**

Gas cutting is fusion method of cutting, in which a strong gas flame is used to raise the temperature of work pieces so as to melt them. The following gases can be used for heating and cutting

- i) Oxygen and Acetylene mixture.
- ii) Oxygen and Liquefied Petroleum gas mixture.

The oxy-acetylene gas equipment consists of two large steel cylinders; one containing oxygen at high pressure, and the other dissolved acetylene also at high pressure, rubber tubes, pressure regulators and blowtorch. The oxygen and the acetylene are supplied to

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the blowtorch separately, where both of them get mixed and come out through the nozzle of the blowtorch.

*** Quality Control for welding**

Cracking:- It occurs due to incorrect electrodes or wrong working procedures. Cracked welds must be cut and re-welded.

Incorrect edge preparation:- Too narrow and angle of the edges of the work pieces result in poor fusion, slag inclusion and weak weld. Too wide an angle between the inclined edges results in heavy welding, resulting in overheating and locked up stresses.

Craters:- These are concave depressions in the external surface of the welded joints which reduces the volume of the weld and thus the strength of the joint

Under-cutting:- It is excess melting of the parent metal which reduces its strength.

Unequal legs:- In fillet welding, the unequal length of the legs of the weld reduces the strength of the joint.

Porous weld:- Insufficient gap between the electrode and the work piece results in poor penetration, which may cause slag inclusion and porous welds.

Over welding:- When welding is carried out and the already welded layer may overheat the earlier layer of weld and there may not be proper fusion between the two layers.

H. SPRINKLER SYSTEM INSTALLATION:*** Scope :**

The scope of work includes the minimum requirements for the designing, supply and installation of automatic sprinkler system including piping, valves, sprinkler heads, flow switches, Sprinkler alarm valves and other accessories. The sprinkler system consists of nos. of risers (in fire shaft) connected to nos. of sprinkler alarm valves incoming of which is from pump room delivery line and headers are tapped off in each floor. The headers at

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each floor will be provided with branches for proper distribution of water. Sprinkler bulbs are located at ceiling level only, spaced accordingly to meet the requirements of local bylaws, consultant's specification and to cover the maximum areas to be protected.

*** Purpose**

The purpose of this system is to provide a reasonable degree of protection for life and property from fire through standardization of design, installation and testing requirements including private fire service mains, based on sound engineering principles, test data and experience, while meeting the needs of changing technology.

*** Clearance**

The clearance required to install sprinkler system are:

1. Fire Shaft clearance to erect risers
2. Finalization of location of sprinkler alarm valves
3. Freezing of coordination layout with other services at ceiling level
4. Completion of plastering / painting in the ceiling to enable drilling and erection of pipes.

*** Method of working**

After obtaining the above clearances, the work shall be carried out as follows:

1. Location of sprinklers risers, headers and branches are marked in the fire shafts / ceiling
using thread / plumb marking system
2. The location of pipe supports are also marked at intervals as prescribed in the standards for different dia. of pipes.
3. Holes are drilled in the ceiling using drilling machines and suitable anchor fasteners are driven inside the holes to fix the stud supports.
5. The pipes are marked and cut to different lengths as per drawing and chamfered the ends for welding.
6. The pipes upto 50 mm dia. Shall be joined together by threading process and pipe 65 mm dia. & above shall be joined using butt welding.

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7. Once the pipes are fixed in position, the plumb level of sprinkler fittings / collars are checked for proper alignment of sprinkler bulbs.
8. Hydrostatic testing at 1.5 times the working pressure for two hours shall be done in stages, once the fabrication work is completed. The same shall be notified to the concerned authorities for their verification. The pipes shall be flushed thoroughly to remove any foreign particles trapped in the pipes during testing.

*** Quality control**

The pipes shall be checked for its thickness and seam welding before being taken for fabrication. The fittings used shall undergo 100% sampling inspection prior to fabrication works. Fittings, which does not meet the standards, or any defective fittings will be rejected. While fabricating the pipes, the engineer-in-charge will check the joints for proper alignment and welding. Any improper joint shall be cut and rewelded to meet the basic quality requirements. Once the pipes are erected in position, the alignment of pipes with respect to ceiling / beams shall be checked. The sprinkler bulbs shall be fixed and the alignment of the same shall be checked to achieve symmetry / uniformity of the fixtures.

I. FIRE DETECTION & ALARM SYSTEM:**I. Installation of Fire Alarm & Detection System**

- The scope of work includes providing, installing and commissioning of smoke / heat / duct detectors, manual call points, hooters, main fire alarm panel. All these equipments shall be interconnected by 2Runs x 1.5 sq. mm Multi strand copper conductor, PVC insulated copper conductor Wire

- **Clearance**

The clearances required to start the above works are:

- 1) The electrical ducts and lobbies to be completed for installation of conduits /cables and detectors.
- 2) All floor ceilings to be cleared for laying of control cables.
- 3) Completion of wall surface wherever manual call points & hooters to be installed.
- 4) Freezing of coordination layout with other services at ceiling level



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- **Method of working**

After obtaining the above clearances, the work shall be carried out as follows:

- 1) Location of detectors, manual call points, hooters and control panels shall be fixed as per approved drawings
- 2) Marking shall be done for the conduit /cable routing in consultation with consultant and client.
- 3) Conduit / cables shall be laid according to the marking done using spacer and saddles. Junction boxes shall be provided wherever necessary.
- 4) Continuity test shall be carried out during cable laying work for various equipment, in stages as work proceeds.
- 5) Detector bases will be fixed at false ceiling level as per approved drawings
Manual call points shall be installed at a height of 1200 mm from FFL in all floors as per approved layout drawings.
Hooters shall be installed at a height of 2400 mm from FFL in all floors as per approved layout drawings.
Main Fire Alarm Panel shall be installed at the ground floor FCC Room. However, the exact location of main fire alarm panel shall be decided in coordination with other services.
Prior to installation of any equipment approval from consultant/client shall be taken.
- 6) Continuity test (NO/NC) shall be carried out for all detectors, manual call points, and hooters after installation is completed.
- 7) Testing & commissioning of the system shall be carried out as per tender specifications and standard procedures.

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PHILOSOPHY OF HYDRANT SYSTEM

- a) The system is pressurized up to the hydrant valves through pressurizing unit comprising of a jockey pump of capacity 180 lpm, a dedicated main motor driven pump of capacity of 2850 lpm booster pump of capacity 900 lpm and a common standby pump of capacity 2850 lpm. The pressure available at basement pump room is 7.0 Kg / Sq. cm.
- b) In the event of any small drop in pressure, the jockey pump will try to maintain the pressure. The jockey pump is set to start at 6.0 Kg/Sq. cm and is set to stop automatically at 7.0 Kg / Sq. cm.
Jockey pump shall not run when any of the other pumps are running
- c) In the case of any fire hazard, hydrant valves installed inside and / or outside the building will be operated thereby resulting a fall in pressure in the system.
- d) Due to rapid fall in pressure, the booster pump, which is set to start at 5.0 Kg / Sq. cm, will come into operation automatically. The set pressure for automatic off for the pump will be 6.0 Kg / Sq. cm as measured in main pump room at lower ground floor.
- e) When the pressure further falls due to opening of one or more hydrant valves, the hydrant system – electric motor driven main driven pump will start automatically at the preset pressure of 4.5 Kg / Cm².
- f) In case of failure of the main motor driven pump, the pressure in the pipe line will drop further and at the preset pressure of 3.0 kg / cm², the diesel engine driven common standby pump will come into operation automatically.
- g) The fire fighting common control panel provided in the main pump room (at ground floor) will regulate the complete operation of the pumps. Besides auto starting / stopping provision, it also has manual start / stop provision. The main motor driven



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pump and standby pumps should be switched off manually only, as per statutory requirement.

PHILOSOPHY OF SPRINKLER SYSTEM

- a) The system is pressurized up to the sprinkler bulbs through pressurizing unit comprising of a jockey pump of capacity 180 LPM, a dedicated electric motor driven main pump of capacity of 2850 LPM and electric motor driven common standby pump of capacity 2850 LPM. The pressure available at basement pump room is 7.0 Kg / Sq. cm.
- b) Sprinkler system is fully automatic in operation. In case of any fire hazard, when the temperature near the sprinkler bulb reaches 68°C, the bulb breaks due to expansion of liquid inside the bulb. This will result in sudden outburst of water to the affected area. A minimum pressure of 3.0 kg / sq. cm will be available for the remotest sprinkler point.
- c) Initially the jockey pump will try to maintain the pressure. The jockey pump is set to start at 6.0 Kg / Sq. cm and to stop automatically at 7.0 Kg / Sq. cm.
Jockey pump shall not run when any of the other pumps are running
- d) In the case of any fire hazard, sprinkler bulbs installed in the floors will be actuated thereby resulting a fall in pressure in the system.
- e) Due to rapid fall in pressure, the booster pump, which is set to start at 5.0 Kg / Sq. cm, will come into operation automatically. The set pressure for automatic off for the pump will be 5.5 Kg / Sq. cm as measured in main pump room at lower ground floor.



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- f) As more sprinkler bulbs break, the electric motor driven main pump will start automatically through the impulse received from the pressure switch. This pump is set to start at 4.0 Kg / sq. cm.
- g) In case the main motor driven pump fails to start, the pressure will further fall and at the preset pressure of 3.0 Kg / Sq. cm, diesel engine driven standby pump will come into operation automatically.
- h) The fire fighting common control panel will regulate the complete operation of the pumps. Besides auto operation of the pumps, the panel will have provision for manual start and stop of pumps. The main motor driven pump and standby pump should be stopped manually only. Necessary electrical interlocking arrangement will be provided in the panel for switching off of jockey pump, incase the other pumps are running.
- i) The exact location of fire can be identified from the sprinkler annunciation panel located in the ground floor. The flow switches provided at each sprinkler main tap off from riser will send the signal to the panel.



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PHILOSOPHY OF CONVENTIONAL FIRE DETECTION & ALARM SYSTEM

- a) The main fire alarm panel forms the nerve center of the system where all signals are received and transmitted. As there are around 600 nos. of detectors, a 50-zone panel will be provided. Maximum 20 nos. of detectors shall be accommodated in one zone.

- b) Conventional photoelectric smoke detectors are provided at the ceiling level in all floors, electrical rooms and as per approved drawings Heat detectors shall be provided in such areas where fire may occur due to heat like pantry, DG Room etc. Duct detectors shall be provide in AC ducts. These detectors will sense the smoke / heat content and send signal to the main fire alarm panel. The detailed location of fire zone will be displayed in the main fire alarm panel.

- c) On receipt of the signals from detectors, the main panel will actuate the wall-mounted hooters.

- d) Each detector will be symbolically represented with an LED light. In case of normal working condition of detector LEDs will be blinking at intervals. In case of any fire conditions, the LED will get continuously latched indicating the location of fire.

- e) The manual call points provided at each floor landing shall be used for actuating the wall-mounted hooters. In case of fire emergency, the glass provided in the manual call point should be broken. Once the glass is broken, the hooters will be actuated giving an audio alarm in all the floors. As soon as the alarm is received, the area of trouble can be identified from the main fire alarm panel

- f) Once receipt of fire alarm signal the panel has to be first acknowledged and signal silenced for the hooters to stop hooting. Once the fire situation is brought under control, the panel should be reset.



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TWO WAY COMMUNICATION SYSTEM

INTRODUCTION:

The Two-way communication System is used to make announcements through the speakers, which are spread over the entire building mainly at the staircase landing. Set of speakers installed in particular floors shall be grouped as single zone i.e ground floor as zone 1. The speakers are designed to serve two purposes. Occupants can listen the message from central console. Also, communication can be done from speaker to main control panel, which is kept at security room / reception generally.

One Control console is provided through which announcement can be selected. Also the zone numbers to which announcements to be made can be selected through the console.

The Two-way Communication system comprises of Amplifier, Central Console with gooseneck microphone, Wall mounted speakers and communication cables