

TENDER

FOR

**SITC OF FIRE PROTECTION SYSTEM FOR THE EXISTING
BUILDING FOR FACTORIES AND BOILERS, KAKKANAD, KOCHI**

**Volume- III
TECHNICAL SPECIFICATION**

TENDER NO. HITES/IDS/19/05 dated 04.07.2019

July 2019



HLL INFRA TECH SERVICES LIMITED

(A Fully owned Subsidiary of HLL Lifecare Limited)

HLL Bhavan- Golden Jubilee block

Mahilamandiram Road

Poojappura, Thiruvananthapuram-695012

Ph: 0471 2775500

FIRE PROTECTION SYSTEM

1. SCOPE

The basic system requirement shall be as per National Building Code of India 2016 - Part 4 Type of Building Occupancy-Business Buildings (E)-3, Above 15 m and up to 24m in height. The scope involves installing downcomer system with sprinklers in the Existing old office building and interconnecting the system with wet riser system of the newly constructed block next to the old building. Automatic detection system shall be provided and the Fire Alarm Control Panel in the newly constructed block shall be used for installing the detectors and other allied components.

2. CODES AND STANDARDS

NBC: National Building Code 2016, Part 4, Fire and Life Safety

TAC: TAC Protection Manual / 1998 (Guidance only)

& as per the direction given by the local fire force department

Engineering Practices

IS-1239 / IS-3589: Specifications for GI Pipes

IS-778/14846: Specifications for Gun Metal gate, globe, and check Valves for water supply.

IS-814: Specifications for covered electrodes for metal arc welding of structural steel.

BS-5155: Specifications for C.I. butterfly valve.

IS-1641: Specifications for C.I. screwed fittings.

IS-903: Specifications for Branch pipes (long Pattern)

IS-3844: Code of practice for installation of internal Fire Hydrant in Multi storied building IS-IS 5290: Specifications for hydrant landing valves.

IS-903: Specifications for coupling double male double female instantaneous pattern for firefighting.

IS-1879: Malleable iron fittings (Parts I to X)

IS-4853: Recommended practice for radiographic inspection of fusion welded butt joints in steel pipes.

IS-636: Synthetic, jacketed hose pipes.

IS-1520: Electrically operated multistage / multi outlet pump.

IS-5: Specification for painting

3. PUMPING SYSTEM

SI No	Pump Details
1	Down Comer system with Fire Pump at terrace of 900 lpm ensuring minimum pressure of 3.5 kg/sq.cm
2	The riser shall be interconnected to the wet riser system of the new building

4. DESIGN PARAMETERS

- The yard hydrants will be fixed on the stand post at 30 m intervals around the buildings (on both sides)
- Each single headed hydrant valve will be provided with 2 Nos. of 15 m hose and 1 No. of branch pipe.
- Isolating valves will be provided from maintenance point of view
- The Down Comer system piping will be as per relevant IS standards.
- The hydrant mains will be sized for the entire aggregate pumping capacity considering velocity of 5 m/s.
- Minimum pressure of 3.5 kg/cm^2 will be ensured at the remotest hydrant point.
- All the hydrants will be used oblique type with the outlet angle towards ground.
- All the outdoor hydrants will be provided with two (2) Nos. RRL hoses (63 mm size x15m long with couplings) and one (1) no. branch pipe with nozzle (20mm bore).
- At every internal hydrant location, one (1) no. of hose reel arrangement will be provided except for terrace level.

- In addition there shall be a set of fire department connections mounted on the external wall of the property near the main entrance. These shall comprise of 4 Nos. 63 mm dia male outlets
- The system will be automatic in operation.
- The power supply to MCC & control panel of the firewater pumps will be directly from the sub-station without any tapping.

5. AUTOMATIC SPRINKLER SYSTEM

Automatic sprinkler system shall be provided.

The terrace pump and main pump are used for the sprinkler system. The sprinkler riser mains will be charged with water to the system design pressure. The operation system will be automatic through the pressure switches installed in the system. When the sprinkler bulb breaks due to fire break-out, the pressure will drop down in the pipe line. The drop in pressure is being sensed by the pressure switch. The pressure switch is connected to the MCC. The MCC will trigger the prime movers to run when it get signal from the pressure switch.

DESIGN PARAMETERS

- At least one number sprinkler is to be provided per 12 sq.m of coverage area.
- Tapping is taken from the sprinkler riser for all the sprinklers at the respective floors.
- Isolating valve is considered at the tap off points, from maintenance point of view.
- The Automatic sprinkler system piping will be as per relevant IS standards.
- The Sprinkler mains will be sized based on the number of sprinklers.
- The sprinklers used will be of Pendant type with rosette plate and Upright type.
- The system will be automatic in operation.

- The power supply to the MCC & control panel of the firewater pumps will be independent and taken directly from the substation.

6. PIPE AND FITTINGS.

- Pipe for firefighting will be MS pipe conforming to IS: 1239 / IS: 3589 (Heavy grade for Wet riser / hydrant system and sprinkler system) including all fittings like bends, elbows, tees anchor fasteners, couplings etc., and will be of reputed make.
- Pipes 150 mm dia and below will conform to IS: 1239.
- For pipes below 50mm dia, welded joints shall not be permitted. For pipes above 50 mm dia, Butt welded joints will be used.
- Flanges will have appropriate number of holes as per the relevant IS Standard fastened with nuts, bolts and 3mm thick compressed rubber gasket.

7. PIPE PROTECTION

- All pipes above ground and in exposed locations will be painted with one coat of red oxide primer and two coats of synthetic enamel paint as per IS : 5 (Shade 536).
- All pipes under floors or below ground will be protected against soil corrosion by wrapping and coating.

8. PIPE SUPPORT

All pipes will be adequately supported from ceiling or walls from existing inserts by structural clamps fabricated from M.S. structural e.g. rods, channels, angles and flats or by using anchor fasteners type as per site conditions. All clamps will be painted with one coat of red oxide and two coats of black enamel paint.

9. PORTABLE FIRST-AID FIRE EXTINGUISHERS

The portable first-aid fire extinguishers shall be provided for all the buildings as per requirements of NBC 2016.

SYSTEM DESCRIPTION

The extinguishers are used to put-off small fires. The extinguishers will be used in the incipient stage of fire. Fire extinguishers are easy to handle. This is useful to put off the fire in the initial stage itself and thus avoiding major losses.

10. SAFETY SIGNGES

Safety signage shall be provided for exits & fire escape route.

11. FIRE ALARM SYSTEM – ADDRESSABLE TYPE

1. Standards

EN 54	fire detection and alarm system materials/manufacturing codes
BS 5839	material specifications and installation guide
NBC	fire detection & alarm system installation
CPWD	standards for wiring installations

2. Scope of work

Supply, installation, testing ,commissioning and handing over of addressable type fire detection and alarm system including all materials and manpower as per the specifications , bill of quantities , drawings, layout and schematic diagram to the satisfaction of client, consultant and local government approving authority.

Only authorized agency appointed by OEM has to carry out the work.
Contractor shall submit OEM's authorization letter before carrying out the work.

The contractor shall carry out the entire work of the system which consists of following devices/items/works:

Connecting the Alarm system to the existing Fire alarm panel

Addressable type smoke detectors

Addressable type multi sensor detectors

Response indicators

Addressable type interface modules

Addressable type control module

Addressable type fault isolator module

Addressable type manual call point

Addressable type horn/strobe –loop powered

2 core 1.5 sq mm twisted, shielded pair, armoured, FRLS copper cable

Cable support system

The make of the above items shall be the same as the make installed in the newly constructed building.

3. Intelligent Addressable Photoelectric Detectors

Smoke detectors shall be microprocessor based, intelligent and addressable devices, and shall connect with two wires to one of the Fire Alarm Control Panel loops. Minimum 125 to 159 detectors intelligent detectors should connect to one loop. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density. The detectors shall be ceiling mounted type and shall include a twist-lock base with built in fault isolation module.

The detectors shall provide a test means whereby will simulate an alarm condition and report that condition to the control panel. Such a test may be activated remotely on command from the control panel.

The detectors shall provide addressable-setting by automatic polling. Systems which use binary jumpers or DIP switches to set the detector address shall not be acceptable. The detectors shall also store an internal identifying code, which the control panel shall use to identify the type of detector.

The detector shall provide dual alarm power LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LEDs may be placed into steady illumination by the control panel, indicating that an alarm conditions has been detected. An output connection shall also be provided in the base to connect an external; remote alarm LED.

The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the data. Systems using central intelligence for

alarm decision shall not be acceptable.

The detector shall continually monitor any change in sensitivity due to the environmental affects of dirt, smoke, temperature, aging and humidity. The information shall be strode in the integral processor and transferred to the analog loop controller for retrieval using a laptop PC hand-held programming tool.

Using software in the FACP, the detectors shall compensate for dust accumulation and other slow environmental changes which may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72. The area covered by each smoke detector shall be as per IS – 2189

4. Addressable Manual Call points

The addressable manual call points shall monitor and signal to the FACP the status of a switch operated by a “break glass” assembly. They shall be red in colour and suitable for surface or flush mounting. The addressable call points shall be provided with an integral red LED to indicate activation.

One version of the addressable call point shall be available mounted in a weatherproof housing, affording protection to IP 66.

The addressable call points shall be capable of operating by means of thumb pressure and not require a hammer. They shall be capable of being tested using a special ‘key’ without the need for shattering the glass.

The addressable call points shall incorporate a mechanism to interrupt the normal addressable loop scan to provide an alarm response within 3 seconds and shall be field programmable to trigger either an alert or an evacuate response from the FACP.

5. Addressable horn/strobe – loop powered

The addressable horn/strobe shall be capable of making alarm sound & flashing on activation of any loop connected device. 24 V DC power to drive the sounders shall be derived from the FACP. Sounder circuits shall be capable of synchronization.

The addressable horn/strobe shall provide the facility to monitor the wiring to the sounders for open or short-circuit and transmit the necessary fault signal to the FACP. The addressable horn/strobe shall provide the facility to monitor for failure of the power supply for the sounders and transmit the necessary fault signal to FACP.

The addressable horn/strobe shall provide a green LED indication when the FACP is polling it. Horn/strobe shall have a minimum sound output of 95 dB (A) at 1 metre distance, and shall have a maximum current consumption at 24V DC

of 30 mA.

6. Addressable Control Module / interface Module / Monitor Module

The control module / Relay Module / Monitor Module shall provide address-setting and shall also store an internal identifying code which the control panel shall use to identify the type of device. Modules which use binary jumpers are not acceptable. An LED shall be provided which shall flash under normal conditions, indicating that the control module is operational and is in regular communication with the control panel. Power supply to the modules shall be provided from UPS source.

The addressable monitoring module shall be capable of monitoring two independent voltage free contacts, each either normally open or normally closed, using a single loop address.

The unit shall be powered directly from the addressable loop.

The addressable interface module shall be capable of switching two independent relays; either normally open or normally closed, each rated at 30V, 1Amp.

A single input shall provide open and short circuit monitoring facilities, set locally at the unit.

The addressable relay interface module shall use a single loop address.

The unit shall be powered directly from the addressable loop.

The addressable interface module shall provide an LED indication when the FACP is polling it.

The isolator module shall provide protection on the addressable loop by automatically disconnecting the section of wiring between two modules where a short circuit has occurred.

The short circuit isolator module shall derive power directly from the addressable loop and shall provide an LED indication that the module has tripped. A base mounted version is available.

7. Multi-Sensors – Analogue Addressable

The multi-sensor should be capable of monitoring two different sensing elements:

Photoelectric Thermal

The design of the point-type multi-sensor photoelectric smoke detector sensing chamber shall be optimized to minimize the effect of dust deposit over a period of time. The chamber cover shall be removable for ease of cleaning or

replacement.

The point-type multi-sensors shall incorporate screens designed to prevent all but the very smallest of insects from entering the sensing chamber, (50 holes per square centimeter or more).

The multi-sensors shall be designed to have high resistance to contamination and corrosion and shall include RFI screening to minimize the effect of radiated and conducted electrical interference.

The sensor should be able to operate in the following modes:

Combination Mode:

The sensor should be able to operate as a photoelectric sensor but when the ambient temperature reaches 40 degree C or above, the thermal elements should be capable of sensing the 'Rate of Rise' and adjust the sensitivity of the photoelectric element automatically. The sensitivity of the photoelectric should be increased via an internal algorithm. Photoelectric mode

The sensor should be able to return the analogue value for the photoelectric element during a normal polling sequence.

The sensor should also be able to signal to the FACP if the thermal sensing element exceeds a fixed temperature threshold.

Thermal mode:

The sensor should be able to return the analogue value for the thermal element during a normal polling sequence. The sensor should also be able to signal to the FACP if the photoelectric sensing element exceeds a pre-defined threshold.

The multi-sensor shall incorporate LED's, clearly visible from the outside, to provide indication of alarm actuation. The LED's should be controlled from the FACP if the LED's flash during the normal polling sequence.

The modes of the multi-sensor should be controlled by the FACP, when the FACP changes from one mode to another the FACP should re-calibrate the multi-sensor.

In locations where the detector is not readily visible, remote indicator units shall be provided.

The multi-sensor should have the capability of monitoring both sensing elements, if either and both of the elements fail it should be reported and displayed at the FACP.

8. Remote indicator

The remote indicator unit shall provide a remote indication for any detector that may be located in an enclosed or locked compartment.

The remote indicator unit shall be driven directly from its associated local

detector. It shall be either flush or surface mountable.

In addition to built-in response indicator of each detector, secondary response indicator of LED type shall be provided outside the room wherever asked for by the Consultant, for indication of fire through detector in the room.

9. Cable

The cable shall be 2Cx1.5 sq mm, twisted shielded, FRLS type, armoured double insulated copper cable

10. Installation

The entire fire alarm system shall be installed in accordance with BS 5839 / EN54 /NBC Standards, specifications, approved shop drawings, and to the satisfaction of client, consultant and local approving authority.

Armoured fire alarm cable shall be used to connect the devices in a loop system. Cable when used above false ceiling, shall be installed on brick/concrete walls by means of GI saddles of proper size at regular intervals of 60cm. Contractor must coordinate with other services before finalizing the cable route and ensure that radio interference is avoided by keeping safe distance from other communication/electrical cables as mentioned in the specifications. When cable needs to be terminated in any device located above false ceiling, suitably sized glands and check nuts must be used and fixed on the back box. When cable run on RCC slab, has to be taken to a device located on false ceiling, it shall be dropped down along MS channel fixed on the RCC slab. Cable must be properly attached to the channel by using cable tie.

When cable has to be terminated in devices located below false ceiling at lower levels (e.g., manual call points or in horn/strobe), cable must be drawn through a pvc pipe of minimum diameter 25mm from the nearest device above false ceiling. PVC pipe used to draw this cable must be concealed in block wall from a location 10 cm above false ceiling grid to the back box of horn or manual call points. When cable run along walls or concrete slabs the plumb and line must be maintained to ensure good workmanship.

When loop cable has to be taken from each floor to the central control room, cable trays must be used. Cable tray size must be decided based on the no of cable to be installed on the tray. Cable tray must be installed in the service shaft as shown in the layout. Cable tray must be installed on the wall by means of GI slotted C channels, threaded rods & anchor fasteners. Cables laid on the cable tray must be neatly dressed by means of cable saddles and bolts or by using heavy duty cable ties. Cable shall not run at angles other than 90 degree (vertical or horizontal) to the wall or slab.

When loop cables has to be connected to the control panel, it can be done in

one of the following methods:

Provide a GI glanding box of suitable size above false ceiling in the control room, terminate all cables in the box by using glands & lock nuts and drop the cables down in PVC pipes to the back box of the control panel. PVC adaptors must be used to connect the pipes in the back box.

Draw all cables through PVC pipes and terminate cable directly in the panel. PVC adaptors must be used to connect the pipes in the back box.

Contractor must submit method statement and inspection report before commencing any installation.

Contractor must submit shop drawings clearly indicating mounting heights of all devices used in the system, which is mentioned in the standard codes. For position/location of devices, contractor must coordinate with other services and architect. All devices of the system must be installed in neat manner keeping an eye on the aesthetic view.

Number of devices in a loop must be decided based on the specification clauses pertaining to the item.

Fault isolator module must be provided in each loop as per the requirement mentioned in the specification clause. It may isolate the faulty part of the loop and keep the other healthy part in the loop so that system may be put back in service.

Monitor module must be provided near fire hydrant/sprinkler shafts of the building to monitor the operation of flow switches/tamper switches provided in the fire protection system by the FPS contractor.

Interface module must be provided to activate close/open/start/stop commands for HVAC or lift equipments. In case of fire signal has initiated in the building, control panel shall generate triggering signal (usually volt free signal) to shut down motorized fire dampers located in HVAC ducts. Also, It will provide command signal (volt free signal) to lifts in the building.

HVAC & Lift contractor must ensure that necessary interfacing facility is provided in their control panels to enable the activation of their equipments in the appropriate mode under FIRE condition.

Contractor must submit and take approval of cause and effect matrix before commencement of the work.

Location of devices to be installed on false ceiling must be finalized after coordination with lighting/sprinkler/speakers/diffusers in HVAC/cctv cameras or any other services' contractors.

Fire alarm control panel shall be located in the central control room. Panel shall be installed flush in the wall. All loop cables must be concealed in the wall for exposed portion. Cable must be terminated in the panel by using properly sized glands and check nuts. Location of panel may be decided by coordinating with CCTV/Public address/Voice and Data services system installers and keeping an eye on the aesthetic view of the room.

11. Submittal

The contactor shall include the following information with their offer:

Power & battery calculations. Battery & power supply size will be a minimum of 125% of the calculated requirement.

Complete product catalogue with manufacturers' data including Quiescent & alarm power requirements, physical dimensions, and finish and mounting requirements.

All necessary installation drawings and as built drawings.

Complete floor plans in a CAD compatible format showing all equipment required to meet this specification as well as interconnecting wiring marked for size & quantity of conductors.

Fire alarm function matrix illustrating output events in relation to alarm, pre-alarm, drift application & fault signals.

Full list of all departures, exceptions, variances or substitutions from this specification.

Incomplete submittals shall be returned without review unless with prior written approval.

12. Quality Assurance

Manufacturer Qualifications:

The publications listed below form a part of this publication to the extent referenced. The publications are referenced in the text by the basic designation only. The latest version of each listed publication shall be used as a guide unless the authority having jurisdiction has adopted an earlier version.

- a. The manufacturer shall have a minimum of 15 years production experience in the manufacture and design of high sensitivity aspiration-type smoke detection systems.
- b. ISO 9002

- c. FM Global (Factory Mutual (FM)): FM Approval Guide

13. Supplier Qualifications

- a. The manufacturer of the supplied products must utilize product distribution on a national basis to be considered for this bid. The manufacturer must have factory branches as well as independent distributors to allow the end user with the ability to utilize factory trained and authorized competitive service providers after system installation and commissioning.
- b. Provide the services of a factory trained and certified representative or technician, experienced in the installation and operation of the type of system provided. The representative shall be licensed in the State if required by law.
- c. The technician shall supervise installation, software documentation, adjustment, preliminary testing, final testing and certification of the system. The technician shall provide the required instruction to the owner's personnel in the system operation and maintenance.
- d. The supplies shall furnish evidence they have an experienced service organization, which carries a stock of spare and repair parts for the system being furnished.
- e. The equipment supplier shall be authorized and trained by the manufacturer to calculate, design, install, test, and maintain the air sampling system and shall be able to produce a certificate stating such upon request.

14. Installer Qualifications

- f. Before commencing work, submit data showing that the manufacturer has successfully installed fire alarm systems of the same scope, type and design as specified.
- g. The contractor shall submit copies of all required Licenses and Bonds as required in the Country having jurisdiction.
- h. The contractor shall be qualified to certify fire alarm systems. Upon completion of the installation the contractor shall certify the final system meets the country regulation for ongoing maintenance.
- i. Contractors unable to comply with the provisions of Qualification of Installers shall present proof of engaging the services of a subcontractor qualified to furnish the required services.

Source Limitations for fire alarm equipment: Obtain fire alarm equipment from single source.

Electrical Components, Devices, and Accessories: Listed and labeled as defined by country regulation, by a qualified testing agency, and marked for intended location and application.

Pre installation Conference: Conduct conference at Project site.

15. Delivery, Storage and Handling

Deliver products to project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, and shelf life if applicable.

Store materials inside, under cover, above ground, and kept dry and protected from physical damage until ready for use. Remove from site and discard wet or damaged materials.

16. Project Conditions

Installed products or materials shall be free from any damage including, but not limited to, physical insult, dirt and debris, moisture, and mold damage.

Environmental Limitations: Do not deliver or install products or materials until spaces are enclosed and watertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

17. Identification

1.15.1 Permanently label or mark each conductor at both ends with permanent alphanumeric wire markers.

1.15.2 A consistent color code for fire alarm system conductors throughout the installation.

18. Commissioning

1.16.1 The entire system shall be inspected & tested to ensure that it operates in accordance with this specification and the country requirements. In particular that:

- a. All manual call points & automatic fire detectors function correctly.
- b. All devices carry an accurate identification label.
- c. All manual call points and automatic fire detectors when operated result in the correct text & zone indications at all necessary indicating equipment.
- d. That sound pressure levels meet the country requirements.
- e. That the systems cause and effects match the requirements of this specification.
- f. The siting of all manual call points & automatic fire detectors meet the country requirements.
- g. All auxiliary functions such as lift returns, boiler shut off's and door release mechanisms are functioning correctly.
- h. Secondary supply will be proven by:
 - 1. A full testing of the secondary power supply is performed by creating a mains failure for 24 hours & simulating a full alarm for 30 minutes.
 - 2. A full testing of the secondary power supply is performed by creating a mains failure for 48 hours & simulating a full alarm for 30 minutes.
 - 3. A full testing of the secondary power supply is performed by creating a mains failure for 72 hours & simulating a full alarm for 30 minutes.
- i. All fault indicators and their relevant circuits are checked by simulation of suitable fault conditions.
- j. Readings taken & recorded of all insulation resistance, earth continuity and circuit impedance.

12. STATUTORY AUTHORITIES' TESTS AND INSPECTIONS

The Tenderer shall be responsible for coordinating with the contractor executing the firefighting works of the newly constructed building for the submission of all necessary forms and drawings to the Statutory Authorities which shall conform to the latest architectural plans submitted to and kept by this Authorities.

13. FINAL ACCEPTANCE TESTS

Following commissioning and inspection of the entire installation, including the interconnection with the existing and newly laid down wet riser system, and prior to issue of the Completion Certificate, the Tenderer along with the existing fire contractor shall carry out final inspection from fire and rescue department and obtaining the Final NOC.

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

14. REJECTION OF INSTALLATION

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

After works have been accepted, the Tenderer may be required to carry out assist in carrying out additional performance tests as reasonably required by the Architect/Client/ Consultant/ Project Manager.

15. WARRANTY AND HANDOVER

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

16. HANDING OVER OF DOCUMENTS

All testing and commissioning shall be done by the Tenderer to the entire satisfaction of the Client/ HITES. And all testing and commissioning documents shall be handed over to the Client/ HITES.

The Tenderer shall also hand over all maintenance and operation manuals, all certificates and all other documentation as per the terms of the contract to the Client/ HITES.

LIST OF APPROVED MAKES OF FIRE FIGHTING SYSTEM INSTALLATION

S. No.	Details of Materials / Equipment	Manufacturer's Name
1	Fire Pump	Kirloskar, Wilo-Mather&Platt, Grundfoss
2	Diesel Engine	Cummins, Greaves, KOEL
3	Motor	ABB, Bharat Bijlee, Kirloskar, Siemens
4	G.I. / M.S. Pipes (IS : 1239 / IS : 3589)	Jindal, Prakash, Tata Steel
5	Standard M.S. Fittings	Seamless Fittings, Pipeline products
6	DI / CI / Forged Steel Fittings	Jainsons Industries, VS, SS fittings, BM fittings
7	Paints	Asian Paints, Berger, ICI, Shalimar Paints
8	Single Headed Landing Valve	New Age, Minimax, Aaag.
9	Fire Brigade Inlet	New Age, Tyco, Viking, Aaag.
10	Fire Hose	New Age, Safeguard, Minimax
11	First Aid Hose Reel	New Age, Safeguard, Minimax
12	Branch Pipe	New Age, Safeguard, Minimax
13	Fireman Axe	New Age, Safeguard, Minimax
14	Installation Control Valve	Tyco, Viking, Victaulic, HD
15	Sprinkler Heads	Reliable, Tyco, Victaulic, Viking, Newage, HD, Sharp
16	Water Flow Switch	Honeywell, Rapid Controls, System Sensor
17	Pipe Protection Wrapping	IWL – Pypkote, Rustech - Coatek

18	Pipe clamp & supports	Chilly, Euroclamp, Kanwal
19	GM / Forged Brass Valves	RB, Honeywell, Zoloto
20	Sluice Valves	Zoloto, Indian Valve Company, Kirloskar, Kalpana
21	Butterfly Valve	Audco, Zoloto, Tyco, Viking
22	Check Valve – Wafer Type	Advance, Zoloto, Kirloskar
23	Check Valve – Dual Plate	Advance, Audco, Honeywell
24	Air Release Valve	Arco, OR, RB, Zoloto
25	Mechanical Seal	Burgmann, Sealol
26	Y Strainer	Emerald, Sant, SKS, Zoloto
27	Couplings	Lovejoy
28	Anti Vibration Mounting & Flexible Connections	Cori, Dunlop, Flexionics, Kanwal industrial Corporation, Resistoflex
29	Pressure Gauge	Emerald, Fiebig, H Guru, Wika
30	Flexible hose for sprinkler	New Age, Tyco, Flexdrop
31	Welding Rods	ADOR, Esab
32	Fastener	Fisher, Hilti
33	Switch gears and control switches and other items for fire control panel	L&T, ABB, Schneider
34	GRP Tank	Exeed, Trident infratech, SStar Fibre Industries
35	Pressure Switch	Indfoss, Danfoss, Waaree
36	Air Vessel	Anergy, Armstrong
37	Power Cable	Finolex, Polycab, Havells
38	Hosebox	NewAge, Aaag, Friends
39	Fire Extinguishers	Minimax, Safefire, Safegaurd,

		Supremex
--	--	----------