ENGINEERING PROJECTS (INDIA) LTD
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VOL - II

TECHNICAL SPECIFICATIONS

FOR

FIRE PROTECTION WORKS
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I. SPECIFICATION FOR ADDRESSABLE FIRE DETECTION & ALARM SYSTEM
INTRODUCTION & SCOPE OF WORK:

The scope covers Supply, Erection & Testing, and Commissioning of Fire protection works such as Automatic Fire Hydrant system, Fire Alarm & Detection System & Fire Extinguishers at M/s.IISC, Bangalore site.

Specific requirements/ specification as deemed necessary by manufactures /suppliers / vendor considering service conditions but omitted in the document shall be duly incorporated and highlighted in deviation list.

Fire Protection works shall be new and identical in all technical respects. Various parts & associated accessories of this specification shall be read in conjunction with each other and in case where the different parts of this specification differ, the more stringent requirement shall govern.

The Fire Protection contractor/vendor’s scope is consists of following:

Following are the different items of work which have to be supplied, erected, tested, commissioned & obtain necessary approvals from the Local statutory bodies/Fire Force authorities wherever applicable.

Automatic Fire Hydrant system covers entire plant comprising of G.I Pipes, Hydrant valve, fire hose cabinet, Butterfly valves, Hose reel, Double hydrant valve, pressure gauge, pressure switch, Control cable, Branch pipe, RRL hose, valve chamber,MCC panel, Engine cranking panel, cable tray & other associated works & accessories.

Automatic Alarm & detection system covers office area comprising detectors, Hooters, Manual Call point, Fire Alarm control panel, Junction boxes, Cables, Conduit & wiring & other associated works & accessories.

Fire Extinguishers covers entire building comprising of DCP, Co2, Water Co2, & fire Buckets & other associated works & accessories.

Services of a competent team with qualified erection supervisor during installation, testing & commissioning of all Fire protection works.

Labour, tools & tackles, consumables required during installation/erection, testing & commissioning, loading & unloading of materials etc. are included in the Fire protection contractor/vendor scope.

All incidental charges, deposits etc Approval from any local statutory/ Fire force authorities is to be included in the quote rate. The official deposits so given to the any local statutory/ Fire force authorities will be reimbursed to the Fire protection contractor/vendor on production of the proof of payment by the Fire protection contractor/vendor.

Power & Water are to be including in the quoted rate. At any case power & water will not be in Client scope.

If any list of spares required after completion of Fire protection works & handing over (Fire protection contractor/vendor to give the list of minimum spares to be included).

The quoted rate shall include for all taxes, duties, octroi, service tax, entry tax, incidental expenses, transportation, insurance, labor charges, etc.
As BUILT Drawings, with O & M Manuals 2 sets in CD & 4 sets in Hard copy along with relevant Test certificates, Guarantee certificates, etc shall be given on completion of the project.

CODES AND STANDARDS:

REGULATIONS AND STANDARDS (As per NBC – 2005):

Unless specifically mentioned otherwise, all the applicable Codes and Standards published by the Bureau of Indian Standards and their subsequent revision / BS Standards shall govern in respect of design, workmanship, quality and properties of materials and method of testing; standards listed below shall be applicable, in particular:

- **NBC** ; National Building Code of India Part IV for Fire Protection System
- **NFPA 2001** : Standard on Clean agent fire extinguishing Systems
- **IS-1239 / IS 3589** : Specification for MS / GI Pipes
- **API 600 / BS 5163** ; **IS778/780/2906** : Specifications for Gun Metal gate, globe & check Valves for water supply.
- **IS-800** : Specifications for Structural steel
- **IS-814** : Specifications for covered electrodes for metal are Welding of structural steel.
- **IS-5155** : Specifications for C.I.butterfly valve.
- **IS-4927** : Specifications for Canvas Hose Pipes.
- **IS-903** : Specifications for Branch pipes Fire hose Couplings and auxiliary equipments
- **IS-5290** : Specifications for hydrant landing valves.
- **IS-1200** : Method of measuring of building & civil Engineering Works (Water supply, plumbing drain & sanitary fittings)
- **IS-4853** : Recommended practice for radiographic inspection of fusion welded butt joints in steel pipes.
- **IS-636** : Synthetic, jacketed hose pipes.
- **IS-2198** : Control Panels.
- **IS-2159** : Hot dip galvanizing of iron and steel
IS-5 : Specification for painting
IS 9137 : Specification for horizontal end suction centrifugal pump
IS 8423 : Controlled percolating hose for fire fighting.
IS 2871 : Branch pipe, universal for fire fighting purposes.
IS 884 : First aid hose reel for fire fighting
IS 2190 : Code of practice for selection, installation and maintenance of portable first aid fire extinguishers.
IS 937 : Specification for washers for water fittings for fire fighting system.
IS 9972 : Specification for automatic sprinkler heads.
IS 2171 : Dry chemical powder type Fire extinguishers
IS 940 : Water type CO2 Fire extinguishers
IS 2878 : Carbon – di – oxide type Fire extinguishers
IS-2189 : Installation & Maintenance of Fire Detection and Alarm System
IS-2175 : Detectors
IS-694 : Copper wire
IS-9968 (Pt-1) : Rubber Insulated Braided Wire
IS-1554 (Pt-1) : PVC Insulated Cables
Shade No.536 of IS-5 : Paint Shade for main Equipments/accessories
IS-10221 : Code of Practice for wrapping and coating of Welded Underground pipes
IS – 1536 : Centrifugal caste cast iron pipes
IS – 1538 : Cast iron fittings
C. INSPECTION AND APPROVAL: (NOT APPLICABLE)

C.1 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

List of data/document/drawings to be submitted along with bid shall as mentioned below,

List of Deviations (Technical) if any, as an Annexure.
Technical parameters of all equipment offered (catalogues, G.A. drawings etc).

C.2 DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT

List of data/document/drawings to be submitted after the award of contract shall be indicated. The list shall essentially contain the following:

Design and operation philosophy of the complete fire system
Piping layout
Schematic drawings,
Data sheets of all the equipment envisaged
Detailed Hydraulic calculation
Bar chart/network schedule covering all milestone activities.

C.3 INSTRUCTION MANUAL/COMPLETION DRAWING/TRAINING

The contractor shall be responsible for training of the Employer's personnel (minimum 6 rounds) in the period of operation and maintenance of the system and conduct Fire drill. The rates quoted shall inclusive of submitting 6 sets of the following documents (HARD COPIES) along with CDs (Soft copy) and the following,

1. Detailed equipment data in the approved proforma
2. Manufacture’s maintenance and operating instructions manuals
3. Set of as built drawings, layouts, piping, ducting, cable routing, cable schedules etc.
4. Approved test readings of all equipment and installations
5. Warranty / guaranty certificate for all equipments
6. List of recommended spares together with list of suppliers and their contact details.
7. Certificate from the main civil contractor that he has cleared the site of all debris and litter caused by him.
8. Submission of the above documentation shall form a precondition for final acceptance of the plant and installation and final payments.
D. EQUIPMENT SPECIFICATIONS

I. FIRE HYDRANT SYSTEM

1.0 Without restricting to the generality of the foregoing, the fire hydrant system shall include the following:

1.1. Mild steel (G.I.) Class "C" (heavy grade) ring mains / riser main within the building and as well outside the building.

1.2 Internal hydrants, external hydrant valves, hose reels, fire duct shutters. Hose cabinets, fire brigade connections and connections to pumps and appliances.

1.3 All materials shall be of the best quality and brand new, conforming to these specifications / standards and subject to the approval of the Client / consultant.

1.4 Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.,

1.5 Pipes and fittings shall be fixed to walls and ceilings by suitable clamps at intervals specified. Only approved types of anchor fasteners shall be used for RCC ceilings and walls.

1.6 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat manner. The pipes shall be supported by structural steel fabricated (like, channel / angle / flat / plate etc) supports with suitable anchor fasteners / suspended thread rods not less than M16 in size.

1.7 Valves and other appurtenances shall be as located that they are easily accessible for operation, repairs and maintenance. Valves / other equipments fitted above the false ceiling shall be provided with trap / access doors.

1.8 Pipes for wet risers within the Building shall be M.S. tubes conforming to IS 1239 & IS3589 (heavy duty 'C' class) with flanged/welded joints.

1.9 Fittings for steel pipes shall be malleable iron or forged iron fittings with screwed / welded joints.

1.9.1 All equipment should be confirmed with Technical data sheets as enclosed along with this tender. In case Technical data sheet for any of ht equipment is not enclosed Bidder shall consider reputed make of equipment, manufactured under good engineering practice for the same details to be furnished along with bid.

2.0 PIPING

All pipes inside the building and where specified, outside the building shall be G.I. tubes conforming to IS: 1239 - heavy duty. Fittings for pipes shall be as per IS: 1239, Part II (heavy grade / as per Data sheet) up to 150mm dia., Above 200 mm dia. shall be M.S. pipes as per IS: 3589 with minimum 6 mm wall thick & fittings shall be fabricated from pipes confirming to IS 3589.

Pipes shall be carefully laid to the alignment, levels and gradients shown on the plan and sections and great care shall be taken to prevent any sand, earth or other matter from entering the pipes during laying. Pipes shall be
kept thoroughly clean during the course of laying. The ends of pipes shall be blocked with wooden plugs wedged home, at the end of each days work to prevent dirt and rodents, insects etc., entering the pipe.

Pipes up to 50mm dia, tapered screwed / Socket welded type jointing shall be adopted, while for pipes above 50mm dia welded or flanged connections shall be used. Flanged joints shall be made with 3 mm thick insertion rubber washer / Gaskets. All bolt holes in flanges shall be drilled & making hole by using gas cutting is not acceptable. The drilling of each flange shall be in accordance with relevant Bureau of Indian Standards.

Flanged joints shall be used for connections to vessel equipment, flanged valves and also on suitable straight lengths of pipeline at strategic points to facilitate erection and subsequent maintenance work.

**The Bolts /Nuts / Washers used in the system (wherever required) shall be Galvanised as per IS 1367 and suitable length & not more than 15mm beyond the Nut.**

### 2.1 PIPE PROTECTION

#### 2.1.1 ABOVE GROUND PIPES

All pipes above ground and in exposed locations shall be painted with two coats of Etching type primer and two or more coats (minimum of 75 microns) of synthetic enamel paint of approved shade. The pipes should be initially brushed to remove all foreign matter before applying paint / primer.

#### 2.1.2 UNDER GROUND PIPES

The pipes (buried) should be initially brushed to remove all foreign matter and apply the primer over the pipe. Primer is allowed to dry until the solvent evaporates and surface becomes tacky. The tape 4mm thick and 150/250mm wide shall then be wound in a spiral fashion and bonded completely to pipe by thermo fusion process. The overlap is to be maintained at 15mm. The necessary flushing arrangements to be made on the piping loop with blank flanges, which shall open as and when required for flushing purposes.

### 2.2 EXCAVATION OF TRENCHES

#### 2.2.1 Excavation for pipelines shall be in open trenches to line and grade or as required at site including disposal outside of site at approved dumping yard with the prior approval of concerned authorities. Pipelines shall be buried to a minimum depth of 1M (top of the pipe) from the finished ground level.

#### 2.2.2 The contractor shall support all trenches or adjoining structures with adequate timber supports wherever required.

#### 2.2.3 On completion of testing and painting of the pipelines, trenches shall be refilled with excavated fine earth in 20cms. Layers and consolidated by ramming and watering.

### 2.3 THRUST BLOCKS

Contractor shall provide suitable PCC blocks of suitable dimensions at Change – in – direction and at “T” junctions (in case of filled earth or loose soil supports shall be provided at regular intervals of 6 meters) to support the pipes. Minimum Size of Blocks shall be 600mmx600mmx450mm.

### 2.4 PIPE SUPPORTS

Supports for above ground pipes of 65 mm dia and above shall be fabricated by structural steel of suitable sections with suitable fasteners. The spacing of supports shall be 3mts minimum and painted two coats of enamel paint of approved color over a coat of primer.
Suitable type hangers shall support pipes below 50 mm dia with clamps, anchor fasteners and suspended rods etc.

Fasteners (Anchor bolt, suspended rod, U bolts etc) shall not be less than 9.5 mm for pipes up to 100mm and 12.7mm for pipes 125mm & above.

Supports for Sprinkler pipes shall be extended from the Perlins of roof. Note no hot work (welding) is allowed on the Perlins after the roofing sheets are fixed. Vendor should weld an cleat (piece of angle / flat) to the perlin before sheeting and the same shall extended wherever supports required for pipes. Please refer the drawings for details.

3.0 VALVES

3.1 BUTTERFLY VALVES
Butterfly valves shall be as per BS 5155 & provided for pipes 50mm dia and above on down stream (delivery side) of the pumps. The valves shall be CI construction; seat shall be black nitrile rubber with insitu moulding. The valves shall be PN 1.6 rating. All valves shall be connected with supervisory switch for monitoring at Fire alarm panel. Cabling shall be measured and paid under Fire alarm system.

3.2 GATE VALVES
Gate valves shall be as per IS: 14846 / 780, with C.I. body and bronze / brass internal parts and shall be used on suction side of the pumps. Valve shall be flanged end type, PN 10 with Non-rising Spindle type with C.I hand wheel etc. Gate valves shall be connected with supervisory switch for monitoring at Fire alarm panel. Cabling shall be measured and paid under Fire alarm system.

3.3 NON–RETURN VALVES
Non-return valves shall be reflux swinging disc type with C.I. body and bronze / brass internals as per Technical data sheet enclosed and as per IS: 5312.

4.0 EXTERNAL HYDRANTS
External (yard) hydrant valves shall be single headed as per IS: 5290 (Type A). The valves should be complete with hand wheels, quick coupling connections, springs and blank caps. The hydrants shall be fixed to stand posts of 80mm dia for single headed hydrants at 1.0M from ground level. External hydrant valves shall be consisting with 2 nos. fire Hoses of 15m long 63 mm dia, One No. Gun metal Branch pipe with Nozzle housed in the M.S cabinet and cabinet shall be mounted (next to stand post) on free standing support fabricated by suitable structural steel / pipe of not less than 80 mm dia. Please refer the tender drawings for the details.

5.0 HOSE REEL
Hose reel shall be swinging type for 180 deg with mounting base plate. Hose reel shall consist with 19mm dia high-pressure rubber braided hose of 40 mts length with gunmetal nozzles. Hose reel water shall be tapped off from the wet riser with Ball valve. The hose reel shall be installed in fire hose duct inside the building.

6.0 INTERNAL HYDRANT VALVE
The landing valve (internal) shall be gunmetal Single-headed type conforming to IS: 5290 complete with hand wheel, quick coupling, spring and blank cap. 2 Nos. of RRL type hose pipe of 63mm dia and 15 mts. length as per IS: 636 with 63mm dia instantaneous type Gun metal heavy duty couplings & Gun metal Branch pipe and nozzle to be provided. Fire hoses and branch pipes shall be kept in the Hose cabinet. Internal hydrants shall located along with columns / walls in co – ordination with machinery layout.
7.0 **FIRE HOSE**

Fire hoses shall be Reinforced Rubber Lined (RRL) type as per IS: 636 & 63 mm dia and 15 mts long. Hoses shall be bounded by G.I wire to heavy-duty instantaneous gunmetal couplings as per IS 903.

8.0 **BRANCH PIPE WITH NOZZLE**

Branch pipe shall be gunmetal, 63 mm dia with Nozzle of 19 mm dia made as per IS: 903 and suitable fitted with hoses as specified elsewhere in this specifications.

9.0 **HOSE CABINET**

Hose cabinet shall be fabricated by M.S. sheet of 16 swg and size shall be 750mm x 600mm x 250mm. Hose cabinet shall have glass fronted door fitted with 4mm thick clear glass & powder coated finish of red out side & white inside. Cabinet shall be suitable for stand mounting and shall have built in breakable glass type feature to keep key.

9a **SHUTTER FOR FIRE SHAFT**

Fire shaft shall have shutter fabricated by M.S. sheet of 16 swg with glass-fronted door (glass shall be 4mm thick) and size of the shutter shall be 900mm x 1500mm minimum. The door shall be in two leaves with necessary stiffeners. Shutter shall be powder coated finish of red out side and white inside and on the glass label of “FIRE” shall be stick, the letter size shall be min. 75 mm height. Also there shall be built in breakable glass type feature to keep key.

10.0 **FIRE BRIGADE INLET CONNECTIONS (FBIC)**

FBIC shall be as per IS 5131 & gunmetal four away connecting head with 4 x 63 mm dia instantaneous type inlets with built in check valve and 150mm dia outlet connection to the fire main grid with 150mm dia Butterfly valve and non – return valve. The fire brigade inlet shall be fabricated in such a way that shall feed water in to the system as well as to the firewater tank, Isolation valves shall be used as required to direct the flow.

11.0 **AIR RELEASE VALVES**

Air release valve is 25mm screwed inlet GM single acting type and shall be fixed on all high points in the system (wet riser) with Ball valves or as shown on drawings.

12.0 **DRAIN VALVES**

Gun metal Gate / Ball valve of 15 / 25 / 40 / 50mm dia as per IS; 778 with fittings as required for instruments / draining any water in the system / Risers in low points.

13.0 **VALVE CHAMBERS**

Contractor shall provide suitable brick masonry chambers in cement mortar 1:5 (1 cement: 5 Coarse sand) on cement concrete foundations 150mm thick 1:5:10 mix (1 cement: 5 fine sand: 10 graded stone aggregate 20mm nominal size) 15mm thick cement plaster inside and outside finished with a floating coat of neat cement inside with cast iron surface box (OR top cover fabricated by M.S. chequered plate of 6 mm thick with frame / stiffeners etc) approved by local fire brigade including excavation, back filling and additional Iron rungs for entering in to valve chamber etc, complete. Valve chamber shall be raised at least 50mm above the finished ground level around it and cover shall be fixed in such a way when it opens / closes should not damage the wall.

Valve chambers shall be 1200mm x 1200mm x 1500mm depth.
14.0  TESTS AT SITE

14.1  PIPING

All piping in the system shall be tested to hydrostatic pressure of 1.5 times of the working pressure without drop in pressure for at least 120 minutes. The test should be made in the presence of and to the satisfaction of the Employers / consultants representatives. Any defects / leakage should be repaired or if necessary defective works / equipment should be replaced with new work / equipment. Tests should be repeated until work is done to the satisfaction of concern representatives.

After testing all pipes shall be flushed with portable water to remove foreign materials.

Under ground Pipes after lowered in to trenches shall be Holiday tested for damages of the anticorrosion treatment and damages should be rectified, bring it to the notice of the engineer – in –charge of site before closing the trenches.

Also the under ground pipes joints shall be tested for Radiographic for 10 % of the total under ground joints. The test results and films shall be submitted for approval and any defects found in the welding process shall be rectified the contractor with out any extra cost to the clients.

II.  AUTOMATIC SRINKLER SYSTEM

1.0  SCOPE OF WORK

Sprinkler alarm valves with trims, Sprinkler main, branch and internal piping complete with valves, alarms and supporting arrangements. Sprinkler heads with spare sprinklers, Flow switches, and Connections to risers etc., all material shall be of the best quality conforming to specifications and subject to the approval of the Engineer-in-Charge. Pipes and fittings shall be fixed truly vertical/horizontal or on slopes required in a neat manner. Pipes shall be fixed in such a manner so as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc., Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals specified. Only approved types of anchor fasteners shall be used for RCC ceilings and walls. Valves and other equipment shall be so located that they are easily accessible for operation, repairs and maintenance.

1.1  SPRINKLER HEADS

The sprinkler heads shall be UL listed 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. The spacing shall however conform to the detailed drawing, in Coordination with electrical and other allied services at the ceiling level. Sub-contractor shall supply spare sprinkler heads and spanners neatly installed in a steel box with glass shutter at an appropriate position approved by the Engineer-in-Charge.

A water motor gong and an inspection test connection shall be provided on the down streamside of the system.

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.
1.2 PIPES AND FITTINGS

Pipes for the sprinkler system shall refer to the clause No. 2.0 of Section - A above.

III. ADDRESSABLE ANALOGUE FIRE DETECTION AND ALARM SYSTEM

1.0 GENERAL

1.1. DESCRIPTION

a. This section of the specification includes the Design, engineering, furnishing, installation, and connection of a microprocessor controlled, analog addressable fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, auxiliary control devices, annunciators, power supplies, and wiring as per tender drawings and specified herein.

b. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate "UL" testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

1.2. SCOPE

a. A new addressable analogue reporting, microprocessor controlled fire detection system shall be installed in accordance with the specifications and approved shop drawings.

b. The system shall be designed such that each loop shall limited to only 80% of its total capacity at initial installation.

c. Basic Performance

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on type – A loop.

2. All Detectors shall be wired Class A, as part of an addressable device connected by the loop Circuit.

3. Notification Appliances shall be wired Class A, as part of an addressable device connected by the loop Circuit.

4. A single ground fault or open circuit on the system loop shall not cause system malfunction, loss of operating power or the ability to report an alarm.

5. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

d. BASIC SYSTEM FUNCTIONAL OPERATION

When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

1. The System (Detector) Alarm LED shall flash.
2. The LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.

3. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.

4. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.

5. The audio portion of the system shall sound the proper signal (tone or voice) to the appropriate zones.

e. INTEGRATION OF THE VARIOUS SYSTEMS

The integration of various systems is detailed below:

1. The monitoring of the status of various detectors/devices should be report at the Panel and at PC in Security room.

2. Alarms and trouble condition reporting at fire system central panel.

3. In the event of fire alarm, FAS shall directly trip the AHUs at Floor MCC, Toilet and all exhaust system should trip.

4. The fire system outputs shall be used to deactivate the Access controlled doors in fire condition.

5. All lifts should be landed in Ground floor.

6. All staircase pressurization fans should be switch ON, if any,

1.3. SUBMITTALS

a. General

1. Six copies of all submittals shall be submitted to the Architect/Engineer for review.

2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.

3. All substitute equipment proposed as equal to the equipment specified herein, shall meet or exceed the following standards. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.
b. **Shop Drawings**
   
   1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
   
   2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
   
   3. Show annunciator layout, configurations, and terminations.

c. **Manuals**
   
   1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
   
   2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
   
   3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.
   
   4. Approvals will be based on complete submissions of manuals together with shop drawings.
   
   5. Also contactor should submit operation and maintenance manuals with as built drawings in six sets. All test certificates, field test reports, and performance test reports etc on handing over of the system.

d. **Software Modifications**
   
   1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
   
   2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones / loops and changes to system operation and custom label changes for devices or zones / loops. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

e. **Certifications**
   
   Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.4. **GUARANTY**

   a. All work performed and all material and equipment supplied & installed under this contract shall be free from defects, Brand-new. The full cost of maintenance, labor and materials required to correct any defect during DLP / Warranty shall be included in the quoted prices.
1.5. **POST CONTRACT MAINTENANCE**

a. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.

b. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

c. Maintenance and testing shall be on a semiannual basis or as required by the facility maintenance team. A preventive maintenance schedule shall be provided by the contractor, describing the protocol for preventive maintenance. The schedule shall include:

1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, Sounders, strobe lights, voice alarm speakers, control panels, power supplies, relays, water flow switches, modules and all accessories of the fire alarm system.

2. Each circuit in the fire alarm system shall be tested semiannually.

3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 7.

1.6. **POST CONTRACT EXPANSIONS**

a. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.

b. As part of the Bid, include a quotation for all parts and material, and all installation and test labor of intelligent or addressable devices for ten percent (10%) as mentioned under spare parts list. This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).

c. Do not include cost of conduit or wire or the cost to install conduit or wire.

1.7. **APPROVALS**

a. The system shall have proper listing and/or approval from the following internationally recognized agencies:

   UL    Underwriters Laboratories Inc
   FM    Factory Mutual

b. The Fire Alarm Control Panel and all transponders shall meet the modular listing requirements of Underwriters Laboratories, Inc. Each subassembly, including all printed circuits, shall include the appropriate UL modular label. This includes all printed circuit board assemblies, power supplies, and
enclosure parts. Systems that do not include modular labels may require return to the factory for system upgrades, and are not acceptable.

PRODUCTS

2.1. EQUIPMENT AND MATERIAL, GENERAL

a. All equipment and components shall be brand new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling (fire alarm) system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

b. All equipment and components shall be installed in strict compliance with each manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation. Refer to the riser/connection diagram for all specific system installation/termination/wiring data.

c. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.2. CONDUIT AND WIRE

a. Conduit

1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.

2. Where possible, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

3. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors.

4. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

5. Conduit shall not enter the fire alarm control panel or any other remotely mounted control panel equipment or back boxes, except where conduit entry is specified by the FACP manufacturer.

6. Conduit shall be 3/4-inch (19.1 mm) minimum, all conduits / junction boxes / collars shall be painted before installation and there shall be marking (for identification) on the conduits at interval of 2m minimum.
b. **Wire**

1. All fire alarm system wiring must be new.

2. Wiring shall be in accordance with local, state and national codes and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for initiating device circuits and signaling line circuits, and 14 AWG (1.63 mm) for notification appliance circuits.

3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

4. If Wires / cables not installed in conduit shall have a fire resistance rating suitable for the installation, may be FRLS cables / wires used.

5. The system shall permit the use of Detectors and notification devices wiring in the same conduit with the multiplex communication loop.

6. All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring, a trouble signal will be activated until the system and its associated field wiring are restored to normal condition.

7. All voice speaker and telephone circuits shall use twisted/shielded pair to eliminate cross talk.

c. **Terminal Boxes, Junction Boxes and Cabinets:**

All boxes and cabinets shall be as approved by the client / consultants for their intended purpose.

d. Initiating circuits shall be arranged to serve like categories (manual, smoke, water flow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

e. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

2.3. **MAIN FIRE ALARM CONTROL PANEL (FACP)**

a. The main FACP Central Console shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system, addressable smoke and thermal (heat) detectors, addressable modules, panel modules including initiating circuits, control circuits, and notification appliance circuits, local and remote operator terminals, printers, annunciators, and other system controlled devices.

1. In conjunction with intelligent Loop Control Modules and Loop Expander Modules, the main FACP shall perform the following functions:

I. Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
II. Supervise all initiating signaling and notification circuits throughout the facility by way of connection to addressable monitor and control modules.

III. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed. In the event of CPU failure, all loop modules shall fallback to degrade mode. Such degrade mode shall treat the corresponding loop control modules and associated detection devices as conventional two-wire operation. Any activation of a detector in this mode shall automatically activate associated Notification Appliance Circuits.

IV. Visually and audibly annunciate any trouble, supervisory, security or alarm condition on operator's terminals, panel display, and annunciators.

1. When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:

   I. The system (Detector) alarm LED shall flash.
   II. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
   III. The backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
   IV. Printing and history storage equipment shall log and print the event information along with a time and date stamp. (Printing is Optional)
   V. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.

   VI. All related AHU’s / Access doors should be shutdown / deactivated.

2. When a trouble condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:

   I. The system trouble LED shall flash.
   II. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
   III. The backlit LCD display shall indicate all information associated with the trouble condition, including the type of trouble point and its location within the protected premises.
   IV. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
   V. All system outputs assigned via preprogrammed equations for a particular point in trouble shall be executed, and the associated system outputs (trouble notification appliances and/or relays) shall be activated.

3. When a supervisory condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:

   I. The system trouble LED shall flash.
II. A local piezo-electric audible device in the control panel shall sound a distinctive signal.

III. The backlit LCD display shall indicate all information associated with the supervisory condition, including the type of trouble point and its location within the protected premises.

IV. Printing and history storage equipment shall log and print the event information along with a time and date stamp.

V. All system outputs assigned via preprogrammed equations for a particular point in trouble shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.

4. When a security alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:

I. The system security LED shall flash.

II. A local piezo-electric audible device in the control panel shall sound a distinctive signal.

III. The backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.

IV. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.

5. When a pre-alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:

I. The system pre-alarm LED shall flash.

II. A local piezo-electric audible device in the control panel shall sound a distinctive signal.

III. The backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.

IV. Printing and history storage equipment shall log and print the event information along with a time and date stamp.

V. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.

a. Operator Control

1. Acknowledge Switch

I. Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall
advance the LCD display to the next alarm or trouble condition. In addition, the FACP shall support Block Acknowledge to allow multiple trouble conditions to be acknowledged with a single depression of this switch.

II. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

III. Signal Silence Switch

Depression of the Signal Silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition. The selection of notification circuits and relays that are silence able by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

1. Drill Switch

Depression of the Drill switch shall activate all programmed notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

2. System Reset Switch

Depression of the System Reset switch shall cause all electronically latched initiating devices to return to their normal condition. Initiating devices shall re-report if active. Active notification appliance circuits shall not silence upon Reset. Systems that de-activate and subsequently re-activate notification appliance circuits shall not be considered equal. All programmed Control-By-Event equations shall be re-evaluated after the reset sequence is complete if the initiating condition has cleared. Non-latching trouble conditions shall not clear and re-report upon reset.

3. Lamp Test

The Lamp Test switch shall activate all local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personal.

4. Scroll Display Keys

There shall be Display keys for FIRE ALARM, SECURITY, SUPERVISORY, TROUBLE, and OTHER EVENTS. Depression of the Display key shall display the next event in the selected queue allowing the operator to view events by type.

5. Print Screen

Depression of the PRINT SCREEN switch shall send the information currently displayed on the display to the printer.

d. System Capacity and General Operation

1. The control panel shall be capable of expansion up to 6 loops. Each loop shall support analog/addressable devices for a maximum system capacity (Minimum 120 detectors).

2. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit liquid crystal display, individual, color coded system status LEDs,
and a alphanumeric keypad for the field programming and control of the fire alarm system. Said LCD shall also support graphic bit maps capable of displaying the company name and logo of either the owner or installing company.

3. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel.

4. The FACP shall be able to provide the following software and hardware features:

I. Pre-signal and Positive Alarm Sequence: The system shall provide means to cause alarm signals to only sound in specific areas with a delay of the alarm from 60 to up to 180 seconds after start of alarm processing. In addition, a Positive Alarm Sequence selection shall be available that allows a 15-second time period for acknowledging an alarm signal from a fire detection/initiating device. If the alarm is not acknowledged within 15 seconds, all local and remote outputs shall automatically activate immediately.

The time delay shall be adjustable at site if the end users require it.

II. Smoke Detector Pre-alarm Indication at Control Panel: To obtain early warning of incipient or potential fire conditions, the system shall support a programmable option to determine system response to real-time detector sensing values above the programmed setting. Two levels of Pre-alarm indication shall be available at the control panel, alert and action.

III. Alert: It shall be possible to set individual smoke detectors for pre-programmed pre-alarm thresholds. If the individual threshold is reached, the pre-alarm condition shall be activated.

IV. Action: If programmed for action, and the detector reaches a level exceeding the pre-programmed level, the control panel shall indicate an action condition. Sounder bases installed with either heat or smoke detectors shall automatically activate on action Pre-Alarm level, with general evacuation on alarm level.

V. The system shall support a detector response time to meet world annunciation requirements of less than 3 seconds.

VI. Device Blink Control: Means shall be provided to turn off detector/module LED strobes for special areas.

VII. NFPA 72 Smoke Detector Sensitivity Test: The system shall provide an automatic smoke detector test function that meet the requirements of NFPA 72.

VIII. Programmable Trouble Reminder: The system shall provide means to automatically initiate a reminder that troubles exist in the system. The reminder will appear on the system display and (if enabled) will sound a piezo alarm.

IX. On-line or Off-line programming: The system shall provide means to allow panel programming either through an off-line software utility program away from the panel or while connected and on-line. The system shall also support upload and download of programmed database and panel executive system program to a Personal Computer/laptop.

X. History Events: The panel shall maintain a history file at least 4000 events, each with a time and date stamp. History events shall include all alarms, troubles, operator actions, and programming entries.
The control panels shall also maintain a 1000 event Alarm History buffer, which consists of the 1000 most recent alarm events from the 4000 event history file.

XI. Smoke Control Modes: The system shall provide means to perform Smoke Control to meet NFPA-92A and 90B and HVAC mode to meet NFPA 90A.

XII. The system shall provide means for all devices on any loop to be auto programmed into the system by specific address. The system shall recognize specific device type ID’s and associate that ID with the corresponding address of the device.

XIII. Drill: The system shall support means to activate all silenceable fire output circuits in the event of a practice evacuation or “drill”. If enabled for local control, the front panel switch shall be held for a minimum of 2 seconds prior to activating the drill function.

XIV. Passwords and Users: The system shall support two password levels, master and user. Up to 5 (minimum) user passwords shall be available, each of which may be assigned access to the programming change menus, the alter status menus, or both. Only the master password shall allow access to password change screens.

XV. Two Wire Detection: The system shall support standard two wire detection devices.

XVI. Block Acknowledge: The system shall support a block Acknowledge for Trouble Conditions.

XVII. Sensitivity Adjust: The system shall provide Automatic Detector Sensitivity Adjust based on Occupancy schedules including a Holiday list of up to 15 days. The panel should have the feature to adjust the sensitivity at site.

XVIII. Environmental Drift Control: The system shall provide means for setting Environmental Drift Compensation by device. When a detector accumulates dust in the chamber and reaches an unacceptable level but yet still below the allowed limit, the control panel shall indicate a maintenance alert warning. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.

XIX. Custom Action Messages: The system shall provide means to enter up to 100 custom action messages of up to 160 characters each. It shall be possible to assign any of the 100 messages to any point.

XX. Print Functions: The system shall provide means to obtain a variety of reports listing all event, alarm, trouble, supervisory, or security history. Additional reports shall be available for point activation for the last Walk Test performed, detector maintenance report containing the detector maintenance status of each installed addressable detector, all network parameters, all panel settings including broadcast time, event ordering, and block acknowledge, panel timer values for Auto Silence, Silence Inhibit, AC Fail Delay time and if enabled, Proprietary Reminder, and Remote Reminder timers, supervision settings for power supply and printers, all programmed logic equations, all custom action messages, all non-fire and output activations (if pre-programmed for logging) all active points filtered by alarms only, troubles only, supervisory alarms, prealarms, disabled points and activated points, all installed points filtered by loop points, panel circuits, logic zones, annunciators, releasing zones and trouble zones.

XXI. Local Mode: If communication is lost to the central processor the system shall provide added survivability through the intelligent loop control modules. Inputs from devices connected to the loop.
Control modules shall activate outputs on the same loop when the inputs and outputs have been set with point programming to participate in local mode or when the type codes are of the same type: that is, an input with a fire alarm type code shall activate an output with a fire alarm type code.

XXII. Resound based on type for security or supervisory: The system shall indicate a Security alarm when a monitor module point programmed with a security Type Code activates. If silenced alarms exist, a Security alarm will resound the panel sounder. The system shall indicate a Supervisory alarm when a monitor module point programmed with a supervisory Type Code activates. If there are silenced alarms, a Supervisory alarm will resound the panel sounder.

XXIII. Read status preview - enabled and disabled points: Prior to re-enabling points, the system shall inform the user that a disabled device is in the alarm state. This shall provide notice that the device must be reset before the device is enabled thereby avoiding activation of the notification circuits.

XXIV. Custom Graphics: When fitted with an LCD display, the panel shall permit uploading of a custom bit-mapped graphic to the display screen.

XXV. Multi-Detector and Cooperating Detectors: The system shall provide means to link one detector to up to two detectors at other addresses on the same loop in cooperative multi-detector sensing. There shall be no requirement for sequential addresses on the detectors and the alarm event shall be a result or product of all cooperating detectors chamber readings.

XXVI. Tracking/Latching Duct (ion and photo): The system shall support both tracking and latching duct detectors either ion or photo types.

XXVIII. ACTIVE EVENT: The system shall provide a Type ID called FIRE CONTROL for purposes of air-handling shutdown, which shall be intended to override normal operating automatic functions. Activation of a FIRE CONTROL point shall cause the control panel to (1) initiate the monitor module Control-by-Event, (2) send a message to the panel display, history buffer, installed printer and annunciators, (3) shall not light an indicator at the control panel, (4) Shall display ACTIVE on the LCD as well a display a FIRE CONTROL Type Code and other information specific to the device.

XXVIII. NON-FIRE Alarm Module Reporting: A point with a type ID of NON-FIRE shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display a message at the panel loop. Activation of a NON-FIRE point shall activate control by event logic but shall not cause any indication on the control panel.

XXIX. Security Monitor Points: The system shall provide means to monitor any point as a type security.

XXX. One-Man Walk Test: The system shall provide both a basic and advanced walk test for testing the entire fire alarm system. The basic walk test shall allow a single operator to run audible tests on the panel. All logic equation automation shall be suspended during the test and while annunciators can be enabled for the test, all shall default to the disabled state. During an advanced walk test, field-supplied output point programming will react to input stimuli such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch the input. The advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/verification.

XXXI. Control By Event Functions: CBE software functions shall provide means to program a variety of output responses based on various initiating events. The control panel shall operate CBE through lists
of zones. A zone shall become listed when it is added to a point’s zone map through point programming. Each input point such as detector, monitor module or panel circuit module shall support listing of up to 10 zones into its programmed zone map.

XXXII. Permitted zone types shall be general zone, releasing zone and special zone. Each output point (control module, panel circuit module) can support a list of up to 10 zones including general zone, logic zone, releasing zone and trouble zone. It shall be possible for output points to be assigned to list general alarm. Non-Alarm or Supervisory points shall not activate the general alarm zone.

XXXIII. 1000 General Zones: The system shall support up to 1000 general purpose software zones for linking inputs to outputs. When an input device activates, any general zone programmed into that device’s zone map will be active and any output device that has an active general zone in its map will be active. It shall also be possible to use general zone as arguments in logic equations.

XXXIV. 1000 Logic Equations: The system shall support up to 1000 logic equations for AND, OR, NOT, ONLY1, ANYX, XZONE or RANGE operators that allow conditional I/O linking. When any logic equation becomes true, all output points mapped to the logic zone shall activate.

XXXV. 10 trouble equations per device: The system shall provide support for up to 10 trouble equations for each device, which shall permit programming parameters to be altered, based on specific fault conditions. If the trouble equation becomes true, all output points mapped to the trouble zone shall activate.

XXXVI. Control-By-Time: A time based logic function shall be available to delay an action for a specific period of time based upon a logic input with tracking feature. A latched version shall also be available. Another version of this shall permit activation on specific days of the week or year with ability to set and restore based on a 24 hour time schedule on any day of the week or year.

XXXVII. Multiple agent releasing zones: The system shall support up to 10 releasing zones to protect against 10 independent hazards. Releasing zones shall provide up to three cross-zone with four abort options to satisfy any local jurisdiction requirements.

XXXVIII. Alarm Verification, by device, with timer and tally: The system shall provide a user-defined global software timer function that can be set for a specific detector or indicating panel module input. The timer function shall delay an alarm signal for a user-specified time period and the control panel shall ignore the alarm verification timer if another alarm is detected during the verification period. It shall also be possible to set a maximum verification count between 0 and 20 with the “0” setting producing no alarm verification. When the counter exceeds the threshold value entered, a trouble shall be generated to the panel.

e. modules within the control panel. Removal, disconnection or failure of any control panel module shall be detected and reported to the system display by the Central Processing Unit.

2. The Central Processing Unit shall contain and execute all control-by-event (including Boolean functions including but not limited to AND, OR, NOT, and CROSSZONE) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost with system primary and secondary power failure.
3. The Central Processing Unit shall also provide a real-time clock for time annotation, to the second, of all system events. The time-of-day and date shall not be lost if system primary and secondary power supplies fail.

4. The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.

5. Consistent with UL standards, the CPU and associated equipment are to be protected so that voltage surges or line transients will not affect them.

6. Each peripheral device connected to the CPU shall be continuously scanned for proper operation. Data transmissions between the CPU and peripheral devices shall be reliable and error free. The transmission scheme used shall employ dual transmission or other equivalent error checking techniques.

7. The CPU shall provide an (RS 232) interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals.

8. The CPU shall provide two ports (RS 485) for the serial connection to annunciation and control subsystem components.

9. The RS 232 serial output circuit shall be optically isolated to assure protection from earth ground.

10. The CPU shall provide one high-speed serial connection for support of network communication modules.

11. The CPU shall provide double pole relays for FIRE ALARM, SYSTEM TROUBLE, SUPERVISORY, and SECURITY. The SUPERVISORY and SECURITY relays shall provide selection for additional FIRE ALARM contacts.

**Display**

1. The system display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.

2. The display assembly shall contain, and display as required, custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.

3. The system display shall provide a backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide ten Light-Emitting-Diodes (LEDs), that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM, SECURITY, SUPERVISORY, SYSTEM TROUBLE, OTHER EVENT, SIGNALS SILENCED, POINT DISABLED, and CPU FAILURE.

4. The system display shall provide a keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels with up to ten (one Master and nine User) passwords shall be accessible through the display interface assembly to prevent unauthorized system control or programming.

5. The system display shall include the following operator control switches: ACKNOWLEDGE, SIGNAL SILENCE, RESET, DRILL, and LAMP TEST. Additionally, the display interface shall allow scrolling of events by event type including, FIRE ALARM, SECURITY, SUPERVISORY,
TROUBLE, and OTHER EVENTS. A PRINT SCREEN button shall be provided for printing the event currently displayed on the 640-character LCD.

g. **Loop Control Module**

1. The Loop Control Module shall monitor and control addressable devices. This includes intelligent detectors (Ionization, Photoelectric, or Thermal) and fault isolation / monitor / control / control relay modules.

2. The Loop Control Module shall contain its own microprocessor and shall be capable of operating in a local/degrade mode (any addressable device input shall be capable of activating any or all addressable device outputs) in the unlikely event of a failure in the main CPU.

3. The Loop Control Module shall provide power and communicate with all intelligent addressable detectors and modules on a single pair of wires.

4. The loop interface board shall be able to drive an NFPA Style 4 twisted shielded circuit up to maximum length. The loop Interface shall also be capable of driving an NFPA Style 4, no twist, no shield circuit up to maximum length. In addition, loop wiring shall meet the listing requirements for it to exit the building or structure. "T"-tapping shall be allowed in either case.

5. The loop interface board shall receive analog or digital information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular device. Each Loop shall be isolated and equipped to annunci ate an Earth Fault condition. The loop interface board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information may also be used for automatic detector testing and the automatic determination of detector maintenance requirements.

h. **Enclosures**

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.

2. The back box and door shall be constructed of steel with provisions for electrical conduit connections into the sides and top.

3. The door shall provide a key lock and include a transparent opening for viewing all indicators. For convenience, the door shall have the ability to be hinged on either the right or left-hand side.

4. The control unit shall be modular in structure for ease of installation, maintenance, and future expansion.

I. **Power Supply**

1. The Addressable Main Power Supply shall operate on 120/240 VAC, 50/60 Hz, and shall provide all necessary power for the FACP.
2. The Addressable Main Power Supply shall provide sufficient amps of power to the CPU, using a switching 24 VDC regulator and shall incorporate a battery charger for 24 hours of standby power using dual-rate charging techniques for fast battery recharge.

3. The Addressable Main Power Supply shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. The supply shall be capable of charging batteries ranging in capacity from 25-200 amp-hours within a 48-hour period.

4. The Addressable Main Power Supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.

5. The Addressable Main Power Supply shall be power-limited per UL requirements.

j. System Circuit Supervision

1. The FACP shall supervise all circuits to intelligent devices, transponders, annunciators and peripheral equipment and annunciate loss of communications with these devices. The CPU shall continuously scan these devices for proper system operation and upon loss of response from a device shall sound an audible trouble, indicate which device or devices are not responding and print the information in the history buffer and on the printer.

2. Transponders that lose communication with the CPU shall sound an audible trouble and light an LED indicating loss of communications.

3. Transponder Circuit Supervision: Transponders shall be designed such that they continuously scan all of their initiating and notification circuits. With normal communications between the FACP and the transponders, the transponders shall transmit initiating and notification circuit trouble conditions to the FACP for audible annunciation and printout. With or without communication with the FACP, the transponders shall supervise their circuits and annunciate any initiating circuit and notification circuit failures on LEDs located on the transponder.

4. Sprinkler system valves, standpipe control valves, and main gate valves shall be supervised for off-normal position.

5. All speaker and emergency phone circuits shall be supervised for opens and shorts. Each transponder speaker and emergency phone circuit shall have an individual ON/OFF indication (green LED).

k. Field Wiring Terminal Blocks

All wiring terminal blocks shall be the plug-in/removable type and shall be capable of terminating up to 1.5 sq.mm wire. Terminal blocks that are permanently fixed to the PC board are not acceptable.

l. Printer (Optional)

1. Printers shall be of the automatic type, printing code, time, date, location, category, and condition.

2. The printer shall provide hard-copy printout of all changes in status of the system and shall time-stamp such printouts with the current time-of-day and date. The printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. The printer shall be enclosed in a separate cabinet suitable for placement on a desktop or table.

3. Thermal printers are not acceptable.
4. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery back up if AC mains are lost.

m. **Remote Transmissions**

1. Provide local energy or polarity reversal or trip circuits as required.

2. The system shall be capable of operating a polarity reversal or local energy or fire alarm transmitter for automatically transmitting fire information to the fire department.

3. Provide capability and equipment for transmission of zone alarm and trouble signals to remote operator's terminals, system printers and annunciators.

4. Transmitters shall be compatible with the systems and equipment they are connected to such as timing, operation and other required features.

N. **System Expansion:** Design the main FACP and transponders so that the system can be expanded in the future (to include the addition of twenty percent more circuits or zones) without disruption or replacement of the existing control panel. This shall include hardware capacity, software capacity and cabinet space.

o. **Field Programming**

1. The system shall be programmable, configurable and expandable in the field without the need for special tools, laptop computers, or other electronic interface equipment. There shall be no firmware changes required to field modify the system time, point information, equations, or annunciator programming/information.

2. It shall be possible to program through the standard FACP keyboard all system functions.

3. All field defined programs shall be stored in non-volatile memory.

4. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level shall be used for status level changes such as point/zone disable or manual on/off commands (Building Manager). A second (higher-level) shall be used for actual change of the life safety program (installer). These passwords shall be five (5) digits at a minimum. Upon entry of an invalid password for the third time within a one minute time period an encrypted number shall be displayed. This number can be used as a reference for determining a forgotten password.

5. The system programming shall be "backed" up on a 3.5" floppy diskette (CD ROM preferred) utilizing an upload/download program. This system back-up disk shall be completed and given in duplicate to the building owner and/or operator upon completion of the final inspection. The program that performs this function shall be "non-proprietary", in that, it shall be possible to forward it to the building owner/operator upon his or her request.

p. The installer's field programming and hardware shall be functionally tested on a computer against known parameters/norms, which are established by the FACP manufacturer. A software program shall test Input-to-Output correlations, device Type ID associations, point associations, time
equations, etc. This test shall be performed on an compatible PC with a verification software package. A report shall be generated of the test results and two copies turned in to the engineer(s) on record.

q. Specific System Operations

1. Smoke Detector Sensitivity Adjust: Means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the system keypad or from the graphic software. Sensitivity range shall be within the allowed UL window.

2. Alarm Verification: Each of the Intelligent Addressable Smoke Detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification function shall be programmable from 5 to 50 seconds and each detector shall be able to be selected for verification during the field programming of the system or anytime after system turn-on. Alarm verification shall not require any additional hardware to be added to the control panel. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

3. System Point Operations:

I. Any addressable device in the system shall have the capability to be enabled or disabled through the system keypad or graphic software.

II. System output points shall be capable of being turned on or off from the system keypad or the video terminal.

4. Point Read: The system shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point shall be annunciated for the parameters listed:

I. Device Status.
II. Device Type.
III. Custom Device Label.
IV. Software Zone Label.
V. Device Zone Assignments.
VI. Analog Detector Sensitivity.
VII. All Program Parameters.

5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system statuses:

6. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 4000 (min) system events. Each of these events will be stored, with time and date stamp, until an operator requests that the contents be either displayed or printed. The contents of the history buffer may be manually reviewed; one event at a time, and the actual number of activations may also be displayed and or printed. History events shall include all alarms, troubles, operator actions, and programming entries.

The history buffer shall use non-volatile memory. Systems which use volatile memory for history storage are not acceptable.
7. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.

If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the trouble mode, and the particular Intelligent Detector will be annunciated on the system display, and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

8. The system shall include the ability (programmable) to indicate a "pre-alarm" condition. This will be used to alert maintenance personal when a detector is at 80% of its alarm threshold in a 60 second period.

2.4. SYSTEM COMPONENTS

a. Programmable Electronic Sounders:

1. Electronic sounders shall operate on 24 VDC nominal.

2. Electronic sounders shall be field programmable without the use of special tools, at a sound level of at least 90 dBA measured at 10 feet from the device.

3. Shall be flush or surface mounted as shown on plans.

b. Audible/Visual Combination Devices:

1. Shall meet the applicable requirements of Section A listed above for audibility.

2. Shall meet the requirements of Section B listed above for visibility.

c. Addressable Devices - General

1. Addressable devices shall provide an address-setting means using rotary decimal switches.

2. Addressable devices shall use simple to install and maintain decade (numbered 0 to 9) type address switches. Devices which use a binary address or special tools for setting the device address, such as a dip switch are not an allowable substitute.

3. Detectors shall be Analog and Addressable, and shall connect to the fire alarm control panel's Signaling Line Circuits.

4. Addressable smoke and thermal detectors shall provide single / dual (2)status LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs can be programmed off via the fire control panel program.

5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity can be automatically adjusted by the panel on a time-of-day basis.
6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements.

7. The detectors shall be ceiling-mount and shall include a separate twist-lock base which includes a tamper proof feature.

8. The following bases and auxiliary functions shall be available:

   I. Sounder base rated at 85 DBA minimum.

   II. Form-C Relay base rated 30VDC, 2.0A

   III. Isolator base

9. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.

10. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

d. **Addressable Pull Box (manual station)**

   1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

   2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

   3. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

e. **Addressable Multi Sensor Detector**

   1. The intelligent multi criteria detector shall be an addressable device that is designed to monitor a minimum of photoelectric and thermal technologies in a single sensing device. The design shall include the ability to adapt to its environment by utilizing a built-in microprocessor to determine its environment and choose the appropriate sensing settings. The detector design shall allow a wide sensitivity window, no less than 1 to 4% per foot obscuration. This detector shall utilize advanced electronics that react to slow smoldering fires and thermal properties all within a single sensing device.

   2. The microprocessor design shall be capable of selecting the appropriate sensitivity levels based on the environment type it is in (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes (as walls are moved or as the occupancy changes).
3. The intelligent multi criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.

d. **Addressable Heat detector**

Heat detector shall provide temperature measurement when it reaches pre-alarm in normal course. However the operator shall have the option of calling up the temperature measured by the specific detector as and when required.. (For Kitchen/Boiler room/D.G room)

It shall have in-built locking mechanism to check the removal and pilferage of the detector. The quiescent current flow must not exceed 400 micro amps and alarm condition current shall be maximum 40 milli amps.

The heat detector shall be Analogue Addressable type and be able to send analogue output to the FACP regarding its condition. It shall be able to communicate with the FACP by the pulses emitted from the FACP. The detector shall be programmed using a hand-held programmer and address stored in a non-volatile memory within the sensor or by a decade/Rotary switch or shall be thro an electronic addressing.

The base of the Detector shall be electronics free and interchangeable with other smoke or heat detectors. The enclosure shall meet IP 42 protection grade.

It shall be able to withstand temperature variations from -10 degree centigrade to 50 degree centigrade. Further, Relative Humidity (non-condensing type) up to 80% shall not hamper its performance. The voltage rating shall be from 17V - 31V DC though the voltage may be changed depending upon the working voltages of a proprietary FACP.

The Detector shall have UL/FM approval. It shall be possible to test the Detectors working from the FACP.

The detector shall have twin LEDs and shall have 360 degree viewing angle. LED on the detector shall blink each time the sensor is scanned by the IFAS. If the FACP determines that the sensor is in alarm, the FACP will command the sensor LED to remain on to indicate the same. Each sensor will be capable of being tested for alarm via command from the FACP. Each sensor shall respond to FACP scan with the information about its type for identification.

g. **Two Wire Detector Monitor Module**

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).

2. The two-wire monitor module shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box or with an optional surface backbox.

3. The IDC zone shall be wired for operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

h. **Addressable Control Module**

1. Addressable control modules shall be provided to supervise and control the operation of one conventional devices of compatible, 24 VDC powered, polarized audio/visual notification appliances.
For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.

2. The control module shall mount in a standard 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box, or to a surface mounted backbox.

3. The control module shall be wired with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay may be energized at the same time on the same pair of wires.

4. Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised, UL listed remote power supply.

5. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

i. **Addressable Relay Module**

1. Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall be rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay may be energized at the same time on the same pair of wires.

j. **Isolator Module**

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an loop Class A. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.

2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the loop. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.

3. The isolator module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.

4. The isolator module shall mount in a standard 4-inch (101.6 mm) deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

k. **Repeater Panel**

Passive Repeater Panel shall be provided in the guard house near the main gate. The Repeater panel shall be connected to the FACP thro a RS485 communication. It shall be powered from the Main FACP & shall be supplied with necessary interface cards for connecting to FACP The Panel shall have minimum 2 x 40 characters back lit LCD display which will repeat all the events, alarms, messages displayed by the FACP. LCD display annunciators shall mimic the main control panel 80 character display and shall not require special programming.
The Repeater Panel shall have the following LEDs for displaying System Status DC Power, Fault, Fire

2.5. BATTERIES AND CHARGER

a. Battery:
   1. Shall be 12 volt, Gell-Cell type.
   2. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 15 minutes of alarm upon a normal AC power failure.
   3. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

b. External Battery Charger:
   1. Shall be built in to FACP & completely automatic, with constant potential charger maintaining the battery fully charged under all service conditions. Charger shall operate from a 120/240-volt 50/60 hertz source.
   2. Shall be rated for fully charging a completely discharged battery within 48 hours while simultaneously supplying any loads connected to the battery.
   3. Shall have protection to prevent discharge through the charger.
   4. Shall have protection for overloads and short circuits on both AC and DC sides.

3.0 EXECUTION

3.1. INSTALLATION:

a. Installation shall be in accordance with the NEC, NFPA 72, local and state codes and as recommended by the major equipment manufacturer.

b. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage. Conduits shall be marked in color for easy identification OR colored conduits shall be used.

c. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

d. Manual Pull Stations shall be suitable for surface mounting or semiflush mounting and shall be installed not less than 1200 mm above the finished floor.

e. Sounders cum strobes / strobes shall be suitable for surface / flush mounting and shall be installed at 2200 mm above the finished floor.
f. All Voice alarm Speakers shall be ceiling mounted type round in shape (color / finish shall be as approved by Architects / clients).

3.2. **TYPICAL OPERATION**

a. Actuation of any manual station, smoke detector / heat detector or water flow switch shall cause the following operations to occur unless otherwise specified:

1. Activate all programmed speaker circuits.
2. Actuate all strobe units until the panel is reset.
3. Light the associated indicators corresponding to active speaker circuits.
4. Release all magnetic door holders to doors to adjacent zones on the floor from that the alarm was initiated.
5. Return all elevators to the primary or alternate floor of egress.
6. A smoke detector in any elevator lobby shall, in addition to the above functions, return all elevators to the primary or alternate floor of egress.
7. Smoke detectors in the elevator machine room or top of hoistway shall return all elevators in to the primary or alternate floor. Smoke detectors or heat detectors installed to shut down elevator (if any) power and be coordinated with the electrical contractor.
8. Duct type smoke detectors shall, in addition to the above functions shut down the ventilation system or close associated control dampers as appropriate.
9. Activation of any sprinkler system low-pressure switch or valve tamper switch shall cause a system supervisory alarm indication.

3.3. **TEST**

Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
3. Verify activation of all flow switches.
4. Open initiating device circuits and verify that the trouble signal actuates.
5. Open signaling line circuits and verify that the trouble signal actuates.
6. Open and short notification appliance circuits and verify that trouble signal actuates.
7. Ground initiating device circuits and verify response of trouble signals.
8. Ground loop circuits and verify response of trouble signals.
10. Check presence and audibility of tone at all alarm notification devices.
11. Check installation, supervision, and operation of all intelligent smoke detectors during a walk test.
12. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
13. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.4. FINAL INSPECTION

At the final inspection a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

3.5. INSTRUCTION

a. Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

b. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

c. The contractor / supplier should furnish the Operation and maintenance manuals along With as built drawings in six sets of hard copies and a soft copy in CD.

F FIRST AID FIRE EXTINGUISHERS:

1 Work under this section shall consist of furnishing all labour material appliances and equipment necessary and required to install fire extinguishing hand appliances.

2 Without restricting to the generality of the foregoing, the work shall consist of the following.

GENERAL REQUIREMENTS:

Fire Extinguishers shall conform to the following Indian Standard Specifications as revised and amended up to date.

Soda Acid Type    : IS 934-1967
Foam Type         : IS 933-1967
Dry Powder Type : IS 2171-1999
Fire Buckets : As per ISI
Carbon Di-oxide : IS 2878/2004
Water Based ABV : IS 940/1989
Mech Foam Type : IS 10204-1982
FE – 36 (clean agent type)

3 Fire Extinguishers shall be installed as per Indian Standard Code of practice for selection, installation and maintenance of portable first aid appliances IS 2190-1971.

4 The appliances shall be installed in readily accessible locations with the appliances brackets fixed to wall by suitable anchor fasteners.

5 Each appliance shall be provided with an inspection card indicating the date of illuminated and caused all reset or silenced, the control panel trouble buzzer will sound until such time as the manual station or automatic initiating device is returned to normal and the control reset switch is operated.

6 Operating instruction shall be provided and mounted in a brushed stainless steel frame with a clear plastic cover adjacent to the control panel. The instructions shall include the following:-

6.1 Procedure to follow when fire is detected.

6.2 How to reset and test the entire system after trouble or fire is detected.

6.3 Scaled sketch of the building showing location, type and the zone to which all detector and manual pull stations are connected.
### TECHNICAL DATA SHEETS

**SMOKE DETECTOR**

1. Type, make and model No. : 

2. No. of chambers : 

3. Radio active source : 

4. Operating voltage : 

5. Alarm voltage : 

6. Is the detector dual chamber dual source: 

7. If detector is not an ionization type, give working principal details. 

8. Operating temperature : 

9. Whether circuit diagram is enclosed : 

10. Can sensitivity be set at site : 

11. Coverage area of each detectors in Sqmt: 

   11.1 At 5 – 6 Mtrs : 

   11.2 At 8 – 10 Mtrs : 

12. Response time in Seconds and Range of adjustment. : 

13. Max. allowable air velocity Mtr/Sec. : 

14. Max. allowable relative humidity : 

15. Is the electronic circuitry Completely solid state? : 

16. Can a response indicator be put With a group of detector : 

17. How many response indicators can be put in the same zone : 

18. Are you approved installators of these detectors in India? Attach certificate copy) :
19. Mounting arrangement :  

20. Approximate dimensions and weight : 

**B. HEAT DETECTORS:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Type, make and Model No. :</td>
</tr>
<tr>
<td>2.0</td>
<td>Does the detector conform to IS 2175-1977 :</td>
</tr>
<tr>
<td>3.0</td>
<td>Sensing element :</td>
</tr>
<tr>
<td>4.0</td>
<td>Coverage area in Sq. mtrs :</td>
</tr>
<tr>
<td>5.0</td>
<td>Operating voltage :</td>
</tr>
<tr>
<td>6.0</td>
<td>Quiescent current in mA :</td>
</tr>
<tr>
<td>7.0</td>
<td>Alarm current in mA :</td>
</tr>
<tr>
<td>8.0</td>
<td>Operating temperature :</td>
</tr>
<tr>
<td>8.1</td>
<td>Fixed temperature in C :</td>
</tr>
<tr>
<td>8.2</td>
<td>Rate of rise in C/min. :</td>
</tr>
<tr>
<td>9.0</td>
<td>Range of temperature adjustment :</td>
</tr>
<tr>
<td>10.0</td>
<td>Can operating temperature be Adjusted at site. :</td>
</tr>
<tr>
<td>11.0</td>
<td>Maximum allowable relative humidity :</td>
</tr>
<tr>
<td>12.0</td>
<td>Material of enclosure :</td>
</tr>
<tr>
<td>13.0</td>
<td>Mounting arrangement :</td>
</tr>
<tr>
<td>14.0</td>
<td>Whether locking arrangement provided :</td>
</tr>
<tr>
<td>15.0</td>
<td>Response time seconds and range of adjustment. :</td>
</tr>
<tr>
<td>16.0</td>
<td>Can a response indicator be put with a Single or group of detectors? :</td>
</tr>
<tr>
<td>17.0</td>
<td>Is the detector Fire Officers Committee approved? :</td>
</tr>
<tr>
<td>18.0</td>
<td>Is the detector Tariff Advisory Committee approved? :</td>
</tr>
</tbody>
</table>
19.0 Is the detector UL approved : 

20.0 Give a list of installations done by you : 
   Using this particular type of : 
   Detectors (having more than 25 : 
   Numbers) with name of authority to : 
   Whom reference can be made. 

C. **MANUAL CALL POINT (MCP):**

1.0 Make : 

2.0 Type of Enclosures : 

3.0 Material of construction : 

4.0 Dimensions and weight : 

D. **ELECTRONIC HOOTER**

1.0 Make : 

2.0 Operative voltage : 

3.0 Sound audible range : 

4.0 Material of construction : 

5.0 Current required in watts : 

**QUARTZOID BULB SPRINKLER**

1. Name of manufacturer / Approval : 

2. Type : Pendent / Upright 

3. Design Particulars : 

3.1. End connection : ½ inch BSPT 

3.2. Operating Temperature : Deg. C 

3.3. Colour coding of bulb : 

4. Material of construction : 
4.1. Housing : 
4.2. Glass bulb : 
4.3. Deflector : 
5. Painting : 
5.1. Finish : 
6. Testing and Inspection : 
6.1. Visual : 
7. Marking on equipment : 
7.1. Manufacture’s name : 
7.2. Year of manufacture : 
7.3. Operating temperature : 

**FIRE HOSES**

1. Manufacturer : 
2. Type : RRL 
3. Code : 
5. Working pressure : 
6. Test pressure : 
7. Burst Pressure : 

8. Coil diameter for 45 m length : 
9. Weight gm/m : Kg/mtrs. 
10. General Construction : 
11. End fittings (quick coupling end) : 
12. Material of Construction 
12.1. Hoses :
12.2. Quick coupling : 

13. Approval : 

14. Testing and Inspection : 

15. Catalogues : 

Note: 
1. Each hose shall be fitted with instantaneous spring lock type GM coupling at both ends. Hoses shall be fixed with quick coupling by copper rivets and the joints shall be reinforced by 1.5 mm galvanized mild steel Wires and leather bends. 

**HYDRANT VALVE**

1. Manufacturer / Approval : 
2. Size / Model : 
3. Type : 
4. Spring / washer : 
5. Material of construction : 
5.1. Body : 
5.2. Bonnet : 
5.3. Stop vale : 
5.4. Instantaneous Female outlet : 
5.5. Blank Cap : 
5.6. Hand wheel : 
5.7. Spindle : 
6. Document for approval : 
7.1. Testing / inspection : 

**GATE VALVES**

1. Manufacturer 
2. Size :
3. Type : 
4. Code : 
5. Pressure class : 
6. End connection : 
7. Material of construction : 
   7.1. Body : 
   7.2. Bonnet : 
   7.3. Wedge : 
   7.4. Stuffing box : 
   7.5. Gland : 
   7.6. Hand wheel : 
   7.7. Stem : 
   7.8. Body seat ring : 
   7.9. Wedge seat ring : 
   7.10. Wedge nut : 
   7.11. Gasket : 
   7.12. Gland pack : 
   7.13. Thrust plate : 
   7.14. Bolt and nuts : 
8. Test Pressure : 
   8.1. Body : 
   8.2. Seat : 
9. Model of operation : 
10. Testing & Inspection : 

BUTTERFLY VALVE
1. **Manufacturer**: 

2. **Type**: flow control lever operated, wafer type 

3. **Code/ Standard**: 

4. **Material of construction** 

   4.1. **Body**: 

   4.2. **Disc**: 

   4.3. **Shaft**: 

   4.4. **Shaft Seal**: 

   4.5. **Control lever**: 

   4.6. **Test Pressure**: 

   4.7. **CATALOGUE**: 

   4.8. **Inspection & Testing**: 

---

**PIPPES**

1. **Manufacturer**: 

2. **Standard**: 

3. **Type**: 

4. **Material**: 

   4.1. **Class & Grade**: 

   4.2. **End type**: 

   4.3. **Type of End connection**: 

   4.4. **Type of protective coating**: 

   4.4.1 under Ground: 

   4.4.2 above Ground: 

   4.3. **Testing Pressure**: 

---
5. Working Pressure:

6. Inspection & Testing:

7. Welding Electrodes:

   7.1 Type / make:

---

**PIPE FITTINGS**

1. Manufacturer:

2. Type:

3. Code/ Standard:

4. Flanges:

   4.1 Bolts & Nuts:

   4.2 Gaskets:

---

**FIRE BRIGADE INLET**

1. Manufacturer:

2. Standard:

3. Material of Construction:

   3.1 Inlet:

   3.2 Outlet:

4. Spring:

   4.1 Seat washer:

   4.2 Flange:

5. Blackcap:
6. Hydro test pressure

7. Mounting

BRANCH PIPE WITH NOZZLE

1. Manufacturer

2. Standard

2.1. Branch pipe

2.2. Nozzle

3. Material of construction

3.1. Branch pipe

3.2. Nozzle

3.3. Coupling

5. Size

5.1. Branch pipe

5.2. Nozzle

6. Hydro test pressure

7. Flow

HOSE CABINET

1. Manufacturer

2. Standard
3. Material of Construction
   :

4. Finish
   :

4.1. Glass thickness
    :

4.2. Size
    :

5. Color
   :

6. Marking
   :

7. Locking arrangement
   :

8. Type
   :

**HOSE REEL**

1. Manufacturer
   :

2. Standard
   :

2.1. Type
    :

3. Material of Construction
   :

3.1. Drum
    :

3.2. Base plate
    :

3.3. Bearing
    :

3.4. Hose
    :

4. Finish
   :

4.1. Size
    :

5. Color
   :

6. Marking
   :
7. Accessories:
8. Hose length and dia:

PRESSURE SWITCH

1. Manufacturer:
2. Model No. / Standard:
2.1. Type of Mounting Direct:
3. Material of Construction:
3.1. Casing & Body:
3.2. Sensing Element:
3.3. Enclosure:
4. Switching elements details:
4.1. Type of contact:
5. No. of Contacts:
6. Size of Process connection:
7. Pressure Setting:
8. Max. over Pressure:
9. Adjustment:

PRESSURE GAUGE

1. Manufacturer / Standard:
2. Type:
3. Range:
4. Accuracy : 
5. Size of Dial : 
6. Dial Material & Colour : 
7. Window : 
8. Material of Construction : 
8.1. Enclosure : 
8.2. Movement, Shank, Burdon : 
9. Connection size : 
10. Mounting & Entry : 
11. Cock : 
12. Siphon tube : 

**FIRE EXTINGUISHERS**

**CO2 type**

1. Manufacturer : 
2. Type : C02 4.5 kgs & 2 kgs 
3. Standard : 
4. Size : 4.5KGS 2KGS 
5. Diameter : 
6. Height : 
7. Weight : 
8. Quantity : 

**Mechanical Foam type**
1. Manufacturer : 
2. Type : Mechanical Foam 9 lets. Capacity 
2. Standard : 
4. Size : 
5. Diameter : 
6. Height : 
7. Weight : 
8. Quantity : 

DCP type

1. Manufacturer : 
2. Type : DCP 5 Kgs 
3. Standard : 
4. Size : 
5. Diameter : 
6. Height : 
7. Weight : 
8. Quantity : 

Water CO2 type

1. Manufacturer : 
2. Type : 
3. Standard : 
4. Size : 
5. Diameter : 
6. Height : 
7. Weight : 
8. Quantity :
RECOMMENDED MAKES FOR MECHANICAL WORKS

1. G.I. PIPES: JINDAL STAR / TATA / SURYA
2. PIPE FITTINGS: BHARAT FORGE / TUBE PRODUCTS
3. BUTTERFLY VALES: AUDCO / ZOLOTO / BDK
4. NON-RETURN VALES: H. SARKER / CRESENT / KALPANA /
5. GATE VALVES (Screwed end): LEADER / ZOLOTO / ITAP / IGRIS
6. BALL VALES (Screwed end): LEADER / ZOLOTO / ITAP / IGIRS
7. STRAINERS: GUJRAT OTO FILT / GRAND FRIX / TEL FLOW
8. C.I. GATE VALVES: H. SARKER / CRESENT / KALPANA / VENUS / UPADHAYA / KIRLOSKAR
9. FLOW METRE: FORBES MARSHALL / EUREKA
10. PRESSURE SWITCH: INDFOS / SWITZER / DELTA CONTROL
11. PRESSURE GAUGE: H. GURU / FIEBIG / PRICOL / BELS CONTROL
12. ANTICORROSIVE MATERIAL: I W L / RUSTECH
13. HYDRANT VALES: NEWAGE / WINCO / SHAHBHOGILAL / MINIMAX / VIJAY
14. BRANCH PIPE WITH NOZZLE: NEWAGE / WINCO / SHAHBHOGILAL / MINIMAX / VIJAY
15. FIRE HOSES: NEWAGE / CRC
16. HOSE COUPLINGS: NEWAGE / WINCO / SHAHBHOGILAL / MINIMAX / VIJAY
17. HOSE REEL: EVERSAFE / TYCO / KIDDE / MINIMAX
18. HOSE BOX / FIRE DUCT SHUTTER: EVERSAFE / TYCO / KIDDE / MINIMAX
19. FIRE EXTINGUISHERS: CEASIFIRE/SAFEX / ALERT / MINIMAX
20. SPRINKLERS: TYCO / VIKING / KIDDE
21. SPRINKLER ALARM VALVE : HD / TYCO / VIKING / KIDDE
22. FLOW SWITCH : SYSTEM SENSOR / POTTER / SWITZER
27. PAINT : ASIAN / BERGER
28. AIR RELEASE VALVES : LEADER / BAJAJ / HAWA
29. WELDING ELECTRODES : ESAB / ADVANI / SUN ARC
30. FOAM SPRINKLER SYSTEM : TYCO / KIDDE

I. FIRE DETECTION & ALARM SYSTEM

1. SMOKE DETECTORS : NOTIFIER / EST / SIMPLEX / APPolo / HONEYWELL / SIEMENS / NOVAR / BOSCH / MIRTONE
2. HEAT DETECTORS : NOTIFIER / EST / SIMPLEX / APPolo / HONEYWELL / SIEMENS / NOVAR / BOSCH / MIRTONE
3. MAIN CONTROL PANEL : NOTIFIER / EST / SIMPLEX / APPolo / HONEYWELL / SIEMENS / NOVAR / BOSCH / MIRTONE
4. MANUAL PULL STATIONS : NOTIFIER / EST / SIMPLEX / APPolo / HONEYWELL / SIEMENS / NOVAR / BOSCH / MIRTONE
5. HOOTERS / STROBES : NOTIFIER / EST / SIMPLEX / APPolo / HONEYWELL / SIEMENS / NOVAR / BOSCH / MIRTONE
6. MODULES : NOTIFIER / EST / SIMPLEX / APPolo / HONEYWELL / SIEMENS / NOVAR / BOSCH / MIRTONE
7. BATTERY : HITACHI / DRYsil / JOHNSON
8. COPPER CONDUCTOR CONTROL : POLycAB / VARSHA
10. PVC CONDUITS : VIP / PRECISION / NELCO
12. COMPUTER : IBM / COMPAQ / HP / DELL / EQUI.

13. PRINTER : TVSE / HP / WIPRO / EQUI.

O. BILL OF QUANTITIES – SEPARATE EXCEL DOCUMENT ATTACHED

P. TENDER DRAWINGS:

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