ANNEXURE – A

Bill of material

[Main Supply + Mandatory Spares]

	Bill of material [for Main Supply]	Annexure -[A] of PY 51842
	Fire Detection & Alarm System	Rev 00
	Project: 2 x 660MW Udangudi STPP	

BHEL MATERIAL CODE: PY9751842018

S. No.	Item Description	Quantity [A]	Unit	Remarks
1	Fire Alarm Panel (Each panel shall have 12 Loops) Floor Mounted	5	No.'s	Refer Note-1,2,3 & 6
2	Fire Alarm Panel (Each panel shall have 8 Loops) Floor Mounted	2	No.'s	Refer Note-1,2,3 & 6
3	Fire Alarm Panel (Each panel shall have 4 Loops) Floor Mounted	3	No.'s	Refer Note-1,2,3 & 6
4	Loop Card	2	No.'s	Refer Note-3
5	Repeater Panel	1	No.'s	
6	Multisensor Detectors with detector base and mounting back box (Analogue addressable) along with PVC cable glands	2000	No.'s	
7	Heat Detectors with detector base and mounting back box (Analogue addressable) along with PVC cable glands	235	No.'s	
8	Probe Detectors (ROR type) with Flameproof Junction box for Fuel tanks *(Min. 50 ft x 50 ft coverage for each detector along with counter flange and gasket) (Addressable)*	12	No.'s	If addressable detector is not available in offered make, then Module (1 Input) with IP-65 enclosure to be provided along with detector.
9	Beam Detectors (Addressable) along with PVC cable glands	8	No.'s	If addressable detector is not available in offered make, then Module (2 Input + 1 Output) with IP-65 enclosure to be provided along with detector.
10	IR Ember Detectors with inbuilt Air Purge Unit & accessories (Addressable) along with PVC cable glands	87	No.'s	If addressable detector is not available in offered make, then Module (1 Input) with IP-65 enclosure to be provided along with detector.
11	Indoor Manual Call Points with mounting back box (Addressable type) along with PVC cable glands	300	No.'s	
12	Outdoor Manual call points with mounting back box (IP-65 min.) (Addressable type) along with PVC cable glands	25	No.'s	
13	Flameproof Manual call points with mounting back box (Addressable type) along with PVC cable glands	60	No.'s	If addressable MCP (Flameproof) is not available in offered make, then Module (1 Input) with flameproof enclosure to be provided along with detector.
14	Indoor Hooter cum Strobe with mounting back box (Addressable type) along with PVC cable glands	260	No.'s	Loop powered Hooter only
15	Exit Sign (Self illuminating)	290	No.'s	
16	Response Indicators	370	No.'s	
17	Siren (3 km) with Siren Control panel	1	No.'s	230 V, 1-Phase Operated Siren and 230V, 1-Phase Operated Siren Control Panel
18	Interface module for Siren Operation with IP-65 enclosure	1	No.'s	
19	Digital LHS Cable for Cable Galleries	38000	Meter	
20	Digital LHS Cable for Coal Conveyors	25000	Meter	
21	Digital LHS Controllers (2 km range)	1	Lot	Refer Note-12 below
22	End of Line Resistance with Terminal Box for LHS cable termination (IP-65)	210	No.'s	
23	Cable Junction Box for 2P x 2.5 sqmm MICC Cable	0	No.'s	

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24	LHS Cable Jointing Box	30	No.'s	
25	Module for LHS Cable (1 Input) with IP-65 enclosure along with PVC cable glands	200	No.'s	
26	Module for Deluge Valve (2 Input + 1 Output) with IP-65 enclosure along with PVC cable glands	245	No.'s	
27	Module for Limit Switches (2 Input + 1 Output) with IP-65 enclosure along with PVC cable glands	0	No.'s	
28	Module for Tripping (1 Output) along with PVC cable glands	20	No.'s	
29	Module for Monitoring Pumps Status (1 Input) with IP-65 enclosure along with PVC cable glands	15	No.'s	
30	Module for Interface with DCS (1 Output) with IP-65 enclosure along with PVC cable glands	15	No.'s	
31	Module for Interface with IGES (1 Input + 1 Output) with IP-65 enclosure along with PVC cable glands	5	No.'s	
32	24 V DC Power Supply Modules with Battery Back Up	30	No.'s	5A, 24V DC with battery backup of 30 min. Refer attached specification (Annexure-[M]) for technical details.
33	Operator Workstation & A4 size color laser Printer along with Commissioning software, Graphic software i.e., (GUI) Software with License /Dongle	1	No.'s	
34	Laptop along with Fire Alarm Panel Commissioning Software with License /Dongle	1	No.'s	
35	Furniture for Operator Workstation & Printer	1	Sets	
36	Mini-UPS for Operator Workstation & Printer (To be sized by bidder)	1	No.'s	
37	8 Fiber Armoured single mode Optical Fiber Cable with 2" rodent proof HDPE conduits (for fire alarm panels and PC networking)	10000	Meter	Refer Note-10, 11 below
38	Erection & Termination hardware for Optical Fibre cables	1	Lot	For BOQ refer Note-10, 11
39	All hardware & Software required required for establishing the networking between all fire alarm panels, repeater panels, DCS, PCs, Printers etc shall be considered.	1	Lot	
40	Cable Tags for 1P x 1.5 Sqmm Cable	360	No.'s	
41	Cable Tags for 2C x 2.5 Sqmm Cable	170	No.'s	
42	Cable Saddle + Saddle Bars along with fixing screws and rawl plugs for 1P x 1.5 sqmm Cable	105000	Sets	
43	Cable Saddle + Saddle Bars along with fixing screws and rawl plugs for 2C x 2.5 sqmm Cable	62000	Sets	
44	Nylon Cable Tie for 1P x 1.5 sqmm Cable	42000	No.'s	
45	Nylon Cable Tie for 2C x 2.5 sqmm Cable	24000	No.'s	
46	Cable Lugs for 1P x 1.5 Sqmm Cable (Tinned Copper)	13648	No.'s	
47	Cable Lugs for 2C x 2.5 Sqmm Cable (Tinned Copper)	710	No.'s	

	Bill of material [for Main Supply]	Annexure -[A] of PY 51842
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48	Cable Glands for 1P x 1.5 Sqmm Cable (Double Compression Ni-plated Brass)	6824	No.'s	
49	Cable Glands for 2C x 2.5 Sqmm Cable (Double Compression Ni-plated Brass)	355	No.'s	
50	Mounting Accessories & Erection Hardware for all above items	1	Lot	Refer Note-7 below

Technical Notes:

1)	Battery sizing of FDA panels is in the scope of bidder. Bidder to considering the panels as fully loaded for sizing purpose. The standby power source (battery bank to power fire detection and alarm system) should be sized for 24 hours of continuous load or 30 minutes in alarm condition (at least 25% devices considered active in alarm condition).
2)	Power supply to all the detectors/components specified in the BOQ above, should be extended from the Fire alarm Panels Only. Sizing of powersupply modules, batteries size for secondary power, calculation of notification appliance circuit voltage drops, selection of internal components of FDA Panels etc. to be carried out by bidder & panel model need to be selected accordingly. Battery & Power supply calculation sheet verified by OEM and to be submitted to BHEL during detailed Engg for approval.
3)	In case the bidder offered system is having multiple variants of loop cards, bidders are advised to select loop cards which cater to largest/longest distance.
4)	Bidder to note that all the above detectors/devices shall be loop powered. In case loop powered devices are not available in the make offered, bidder shall consider the necessary modules as per above BOM.
5)	Each addressable loop device (Detectors, MCP, Module etc) shall have inbuilt short circuit isolator suitable for Class A wiring.
6)	Fire alarm panels shall be floor mounted only.
7)	All erection hardware including back box, fixing screws, lugs, glands, clamps, structural steel, anchor fastner, chains, J-bolts/J-hook, nuts, bolts, flanges etc. for the above items shall be considered in the offer by the bidder. Refer Annexure-[N] for typical erection drawings. In addition to this, an additional 10% of all erection hardware shall be considered in the scope of bidder.Post order, the vendor need to submit detailed erection document indicating BOQ of erection hardware for each variety of detector/device etc. i.e., Erection hardware for detectors/devices -calculation sheet to be furnished during detailed Engg stage.
8)	All interface modules shall be provided with enclosure suitable for outdoor application.
9)	Unit rates for addition/deletion (+10% to -20%)for Main and mandatory spares shall be applicable
10)	Also necessary erection hardware (jointing kits, termination kits, LIU, patch card, media converter, pit tails, etc) for FO cable shall be considered in the scope bidder. In addition, splicing and termination of FO cable and it's accessories are in bidder scope. Minimum BOM for meeting this reuqirement is: Splicing tool kit=1 Set, LIU (along with pigtails based on FO cable) =60 No's, Patch Cords = 60 No's, Media converters= 30 No's, bidder to add other items (if any) for completeness of the system.
11)	Fire alarm panels, repeater panels specified in the BOM are to be connected in ring topology using fiber optic cable. Quantity of Single Mode Optical Fiber cable (for networking of Fire Alarm Panels, Repeater Panels, Workstations, Printers etc) is indicated in the BOQ
12)	In case, bidder offers digital LHS controller of 2-Channels with 2 kms range then the quantity shall be 27 nos. However in case bidder offers digital LHS controller of 1-Channel with 2 kms range then the quantity shall be 45 nos.
13)	NIL
14)	LIUs (Fiber Patch Panels / Light interface units) - are to be used for routing, terminating and managing optical cable terminations and should be mounted inside the FAPs & Repeater Panel enclosures
15)	Please consider alarm Temperature of LHS cable as 60 Deg (min.) for cable galleries and 80 Deg (min.) for coal conveyors.
16)	Supply items for which no definite “make/brand” is indicated, shall be procured only from reputed makes & models having proven records of accomplishmet and requires purchaser approval.
17)	FAP, Repeater panel, Detectors, Devices, Modules etc. shall be under regular manufacturing range of OEM and have proven track record.
18)	Information/Status of all panels shall be available in all the workstations using GUI Software
19)	All the network switches shall be of high quality and shall be sized to meet the functional requirements as specified. The common switch to which all networks are connected shall be Layer-III switch/router. All the interconnecting cables between network switches shall be fiber optic only. All fiber optic cables shall be terminated directly to network switches through optical fiber port without using media converters.
20)	Bidder to derive the BOM for hardware material based on the make and model components selected for main FDA panel. Accordingly, mandatory spares quantities shall be derived / populated based on defintion against mandatory spares sheet . The quantities will be verified during detailed Engg.

	Bill of material [for Mandatory Spares Supply]	Annexure -[A] of PY 51842
	Fire Detection & Alarm System	Rev 00
	Project: 2 x 660MW Udangudi STPP	

BHEL MATERIAL CODE: PY9751842026

S. No.	Item Description	Quantity [B]	Unit	Remarks
1	Multisensor Detectors with detector base and mounting back box (Analogue addressable)	200	No.'s	
2	Heat Detectors with detector base and mounting back box (Analogue addressable)	24	No.'s	
3	Probe Detectors (ROR type) with Flameproof Junction box for Fuel tanks *(Min. 50 ft x 50 ft coverage for each detector along with counter flange and gasket) (Addressable)*	2	No.'s	
4	Beam Detectors (Addressable)	1	No.'s	
5	IR Ember Detectors with inbuilt Air Purge Unit & accessories (Addressable)	9	No.'s	
6	Response Indicators	19	No.'s	
7	Digital LHS Cable for Cable Galleries	3800	Meter	
8	Digital LHS Cable for Coal Conveyors	2500	Meter	
9	LHS Cable Jointing Box	3	No.'s	

ANNEXURE – B

Technical Specification for FDA System

VOLUME II

SUB-SECTION - 2.15

FIRE PROTECTION SYSTEM

1.0.0 GENERAL

This section covers minimum requirements for design, engineering, fabrication, manufacture & assembly, inspection, erection, testing and commissioning of the fire protection system.

2.0.0 SCOPE OF SUPPLY

The scope of supply shall include, but not limited to, the following:

- Fire water pumping system combined for Hydrant system and MVWS system – The fire hydrant and MVW spray system shall have a dedicated adequate number of electrical motor driven main fire water pumps (minimum 3 Nos.) and 50% standby diesel engine driven pumps (minimum 2 Nos.).

- Fire water pumping system for HVW Spray system – The spray system shall be provided with dedicated pumping system comprising of adequate number of electric motor driven pumps and 100% standby diesel engine driven pumps.

- The common pressurization unit shall be provided for hydrant and spray water system network. Pressurization unit shall consist of Two (2) nos. of electric motor driven fire water jockey pumps (one working + one standby), One (1) no. hydro-pneumatic tank and Two (2) nos. air compressors (one working + one standby) of adequate rating for pressurization of hydro-pneumatic tank shall be provided.

- Fire water booster pumping system - Dedicated fire water booster pumps comprising of adequate number of electric motor driven main pumps and 100% diesel engine driven standby pumps shall be provided for higher elevation of boiler units/transfer towers/bunker floors.

- The seawater intake pump house shall be provided with one (1) no of Diesel Engine driven vertical turbine pump of capacity 410 m3/hr for supplying fire water to the coal stockpile area ring main header for fighting large coal stockpile fire. The material of construction for the pumps, piping and isolation gate valves (Duplex stainless steel) shall be rated for seawater duty. The sea water fire water pump outlet shall be connected to the main fire hydrant network near the coal stockpile through a normally closed isolation (Duplex stainless steel) gate valve.

- Hydrant system shall be provided for all the buildings, equipments and entire area of inside the power plant boundary including Boiler and ESP Areas, Mill Reject Handling System compressor house, ESP Control Building, Fly ash equipment building, HFO & HSD Pump House Area, HFO & HSD storage tanks and dyke area, Compressor House, Diesel Generator Area, Generator, Station, Unit transformers and all auxiliary Transformers, CW Pump House,Electrochlorination building (CW), Water Pretreatment Plant, Sludge Pump House, FIltered Water Reservoir and Pump House, Sea Water Intake Pump House, DM Plant with acid and alkali bulk storage tanks, Chemical House, Coal Handling Plant and Coal Storage Yards including all transfer points, bunker bay conveyors, sub-stations and control room, office building(Coal handling shall include complete ECHS & ICHS) Crusher House, Coal Handling Control Building, Ash Handling Plant Area including Ash Slurry Pump House, Ash Water Pump House, FA Conveying Blower Room, MCC rooms, All storage areas including O & M Store, Effluent treatment Plant, Open Storage Yard, Transformer Yard, GIS Switchyard & Grid Control Room Building, Service Building, Administrative building, CPU Regeneration building, All gate

houses, Canteen, Workshop, Chimney area, Diesel filling station, Fire water pump house, Cooling Tower Area, Fire Station, Ash silo area and any other building equipments inside power plant boundary.

- High Velocity Water Spray System (HVWS) for Generator transformers, Unit Auxiliary Transformers, Unit Transformers, Station Auxiliary Transformers, Standby/ Maintenance transformers, Bus reactors, CHP auxiliary transformers, AHP auxiliary transformers and Station transformers (All oil filled transformer of rating 10 MVA and above), turbine oil canal pipe lines in main plant, Boiler feed pumps lube oil tanks, coolers, consoles etc, Boiler burner front, main lube oil tank, clean and dirty lube oil tanks, and Generator seal oil system tanks and its coolers.
- Water spray system for steam turbine bearing housing and air pre-heaters or any other fire protection system as recommended by equipment supplier.
- Nitrogen injection based fire protection system in addition to automatic high velocity spray system shall be provided for transformers of 220Kv or higher voltage.
- Medium Velocity Water spray system – Cable gallery/Cable spreader rooms in the whole plant such as main plant area, ESP, AHP, CHP, WTP, CW, Sea water intake, FOPH and Switchyard control building etc, All Coal conveyor gallery in tunnels/underground and above ground, Transfer points, Junction tower and crusher house entire coal handling system of inside the plant boundary, Fuel oil pump house (Unloading and Forwarding pump house), Fuel oil storage tanks and Emergency DG building.
- Foam system shall comprises of SS foam tank, foam pumps foam inductors, balance proportioners, foam makers with discharge outlets, associated interconnection (SS and GI) piping, valves, fittings, instrumentation etc. for Fuel oil storage tanks.
- Portable and mobile fire extinguishers for entire plant buildings, equipment area, entire area.
- Fire tenders (One no. water type fire tender and One no. foam tender) with all equipments as per TAC norms with bay to station all fire vehicles.
- Two (2 nos.) numbers of fully equipped ambulance (Ventilators, oxygen cylinder, first aid kid, etc.) with all fittings and Fire Jeep.
- Fire tenders, Ambulance and Fire Jeep, All the vehicles (5 Nos.) shall be registered, permit and tax paid before handing over to TANGEDCO with name transfer.
- Clean agent (Automatic inert gas) gas flooding system for Central Control Room, Control Equipment Room, Computer Room and UPS & inverters Room in the TG building.
- Fire Detection and Alarm system for all Central Control rooms, Control Equipment Room, battery rooms, all switchgear rooms / MCC rooms, Computer rooms, Cable spreader rooms in whole plant such as main plant area, ESP, AHP, CHP, WTP, CW, Sea water intake, FOPH and Switchyard control building etc, Detection system for various equipments and in other auxiliary buildings cable spreader, MCC room and Control room.
- All necessary instruction and warning plates.
- All necessary facemasks, fire jackets, breathing and resuscitation apparatus and/or other protection devices for optimal protection of the personnel of fire station equipments. Fire service station with all equipments as per TAC norms with bay to station all fire vehicles
- Passive fire protection measures such as fire barriers for cable galleries and shafts etc., fire retardant coatings, fire resistant penetration sealing for all openings in floors, ceilings, walls etc., fire proof doors etc., shall be provided to prevent spreading and for containment of fire.

3.0.0 DESIGN REQUIREMENTS

The Power Plant is classified as Ordinary Hazard Occupancy as per TAC. The design and installation of complete fire protection system shall comply with regulations of Tariff Advisory Committee (TAC) of India. In the absence of TAC regulations, the National Fire Protection Association (NFPA) standard shall be adopted. All equipment, special purpose fittings, couplings or accessories shall be approved and certified for use in fire protection system application by TAC/UL/FM.

Fire water reservoir

The source of water required for hydrant and spray system shall be from the reserve storage provided in the desalination water storage tank. The tank shall have two equal compartments and both the compartments shall be connected to a common suction header of fire water pumps so that any fire pump can be fed by either fire water storage compartment as per TAC regulations. At least two (2) headers shall be taken out of pump house for making loops around various risks. Each loop shall be interconnected for better reliability of the system. To isolate the system due to damage/repair, suitable nos. of gate valves should be provided.

Pump house equipments

Dedicated fire water pumps shall be provided for the fire hydrant and spray system. Blind flange with valve connection for future expansion to be provided in the fire hydrant and spray system network. The fire water pump capacity and head will be designed as per the system requirement/TAC recommendation. The adequate number of fire water pumps (No. of Pumps, pump capacity and head will be firmed up during the detail engineering) shall be provided.

The fire hydrant and MVW spray system shall have a dedicated electrical motor driven main fire water pumps (minimum 3 Nos.) and 50% standby diesel engine driven pumps (minimum 2 Nos.).

Separate fire water pumping system with electric motor driven spray pumps and 100% standby diesel engine driven pumps shall be provided for HVWS system. The electrical power supply scheme for the motor driven fire pumps shall be in line with the TAC requirements.

All standby diesel engine driven pumps shall be provided with 2 x 100% Battery chargers and Batteries.

The fire water pumping system equipments are located in the comprehensive pump house, adjacent to the desalination water storage tank.

The common pressurization unit shall be provided for hydrant and spray water system network. Pressurization unit shall consist of Two (2) nos. of electric motor driven fire water jockey pumps (one working + one standby), One (1) no. hydro-pneumatic tank and Two (2) nos. air compressors (one working + one standby) of adequate rating (Initial filling of compressed air shall be provided within 2 hours) for pressurization of hydro-pneumatic tank shall be provided.

Interconnection between hydrant and spray system headers shall be provided by means of providing a normally closed isolation valve and non-return valve which permits flow from hydrant system to spray system and not vice versa.

Dedicated fire water booster pumps comprising adequate number of electric motor driven main pumps and 100% diesel engine driven standby pumps shall be provided for higher elevation of boiler units/transfer towers/bunker floors. The pumps and the drivers shall be complete with all accessories and appurtenances.

Above-ground piping shall be duly painted and complete with all fittings, isolation gate valves, check valves, globe valves, vent valves, drain valves and instrument isolation valves including check valve, etc. as required for the completeness of the system.

Pumps shall have continuously rising head characteristic curve towards shut-off with the highest head at shut off. Pumps shall be suitable for parallel operation. Pumps shall have non-overloading characteristics to avoid motor overload.

Pumps shall be capable of furnishing not less than 150% of rated capacity at a head of not less than 65% of rated head. The shut off head shall not exceed 120% of rated head for horizontal centrifugal pumps and 140% of rated head for vertical pumps.

The rating of electric motor shall be selected to provide the power required to drive the pump at 150% of its rated discharge. The rating and design of motors and switchgears shall conform to the relevant Indian Standards Specification. The motor shall be of continuous rating type and its rating shall be at least equivalent to the horsepower required to drive the pump at 150 % of its rated discharge.

The diesel engine drive of fire pump shall be rated at 120% of power required at duty point or at least equal to the power required by pump at 150% discharge at 65% head, whichever is higher after necessary correction for altitude and ambient temperature. The engine driven fire pumps shall be provided with redundant starting batteries.

Hydrant system

Hydrant system shall consist of a fire water ring main network of piping along with Isolation gate valves installed above ground (on RCC pedestals) around areas to be protected, hydrant valves (external / internal), hoses (15M/7.5M long hoses), hose cabinets, couplings, branch pipe, nozzles and water monitors along with all accessories. All accessories such as MS painted hose boxes etc. shall be provided as per TAC. External hydrants 'Hose houses or hose boxes' shall be located all around the periphery of buildings and internal hydrants 'Hose boxes' shall be provided at each landing floor of staircases through above ground main. Outdoor type fixed water monitors shall be provided for ESP areas, Boiler house, tall buildings, Coal stock pile area, bunker building, junction towers/transfer towers and other areas in the coal conveyors at locations where water cannot reach from hydrant system. When height of structure, tower exceeds 15M, the concerned hydrants shall be replaced by water monitors.

- The hydrant network shall be sized to ensure that about 3.5 kg/cm2 pressures are available at the hydraulically remotest point (As per TAC) in the system with the hydrant pump discharging at rated head and capacity.
- The velocity in the hydrant main shall not exceed 5.0 m/s.
- At least two hydrant ring mains shall be provided with separate ring main for the main plant.
- Spacing of each outdoor hydrants shall be provided 45Mts.distance. The Internal hydrant//Landing valves shall be provided 45M distance in case of TG Hall, Mill Bay, Boiler and other area 30M distance in each floor space.
- Hydrants shall not be located less than 2M from building. No building shall be deemed to be protected by a hydrant unless such hydrant is within 15M of the building.
- Each of the landing valves and external hydrant valves associated with the main plant (Transformer yard, TG building and Boiler area) areas be provided with a hose box.
- Each ring mains be terminated with an isolation valve and a blind flange at all the corners to enable future expansion/modification by the client.
- Fire water booster system pump head shall be designed for internal hydrant of the farthest top most floor (boiler drum) of the boiler and pressure will be tested at that elevation.
- Fire brigade connection shall be provided.
- All the landings of boiler staircases, turbine buildings and other multi-storied structures, Coal handling plant transfer points/junction towers, crusher house, bunker floors and other Auxiliary buildings/non-plant buildings shall be provided with landing valves with hose box including the hose reels.

High velocity water spray system

HVWS system shall be designed as per TAC regulations. HVWS shall consist of above ground piping, along with relevant fittings, Deluge valves, Strainers, isolation gate valves, spray nozzles, quartzoid bulb detector and pressure switches. HVWS system shall automatically detect, control and extinguish any out-break or fire and simultaneously give audible alarm. This shall hydraulically open the deluge valve thus allowing water to be sprayed on to the equipment/area through projector nozzles in the form of a solid conical emulsifying spray. Local audible alarm shall be produced by water motor alarm gong. The operation of the Deluge Valve shall be annunciated in the Local Zonal Fire Alarm Panel as well as in the Central Fire Detection and Alarm Panel. The system shall also have a manual over riding facility along with regular testing facility.

Isolation gate valve and y-type strainer shall be provided on upstream and downstream side of deluge valve. Fast acting butterfly vales shall be provided as a bypass to deluge valve, so that this valve can be kept closed and can be operated manually, if there is any malfunction of deluge valves.

The density of spray for various high velocity water spray system shall be as follows:

Area/ Equipment	Spray density for each area	Applicable code
Generator transformers, Unit Auxiliary Transformers, Unit Transformers, Station Auxiliary Transformers, Standby/ Maintenance transformers, Bus reactors, CHP auxiliary transformers, AHP auxiliary transformers, Station transformers and All other oil filled transformer of rating 10 MVA and above, turbine oil canal pipe lines in main plant, Boiler feed pumps lube oil tanks, coolers, consoles etc, Boiler burner front, main lube oil tank, clean and dirty lube oil tanks, and Generator seal oil system tanks and its coolers.	10.2 lpm/m^2	TAC

- The pressure at the hydraulically most remote projector in the network shall not be less than 3.5 bars for outdoor transformers as per TAC manual.
- Boiler burner front detection and spray distribution pipe shall be flanged connection with no leakage including with all accessories.
- A pressure switch shall be provided at the down streamside of the deluge valve for remote annunciation of “Deluge Valve Open” alarm in the main Fire Alarm panel in central Control Room. Another pressure switch shall be provided in the detection line of the system for remote annunciation of “Detection circuit operated” alarm in the main Fire Alarm panel in central Control Room.
- Placing of spray nozzles shall be such that their spray cones overlap each other.

Medium velocity water spray system

MVWS system shall be designed as per TAC regulations. The medium velocity spray system shall consist of a network of open spray nozzles fitted with a special deflector to give required angle of discharge for the water around the area to be provided. The sprayers shall discharge a cone of water spray consisting of medium size droplets of water. The water supply to the MVWS system shall be controlled by a deluge valve which shall operate electrically actuated solenoid valve on release of water pressure.

Local audible alarm shall be produced by water motor alarm gong. The operation of the Deluge Valve shall be annunciated in the Local Zonal Fire Alarm Panel as well as in the Central Fire Detection and Alarm Panel. The system shall also have a manual over riding facility along with regular testing facility.

In order to avoid total flooding of the entire area of cable gallery / coal conveyor system, the area to be protected by MVWS system shall be divided into number of zones. Each zone shall have separate water supply network controlled by a deluge valve. A fire detection system provided for the MVWS protected area shall sense fire and shall actuate the deluge valve. In the event of fire in one zone, the deluge valve of corresponding zone and those of adjacent zones on either side shall be opened.

The cable galleries shall have number of rows of cable trays and each row will have number of tiers of cable trays. Each of the cable rows shall be provided with a network of water distribution piping and nozzles. The distribution network shall consist of distribution header for each row of cable tray and on these headers drop pipes shall be provided so as to cover all the tiers. Fire in the cable gallery/cable spreader room, addressable multi-sensor detector supplemented with linear heat sensing cable of digital type shall be used for detection of fire. Upon detection of fire MVW spray system shall be brought into operation by automatically opening of deluge valve, which shall allow the projectors located in that areas to direct water in the form of spray, which will cut off oxygen supply and extinguish the fire.

The MVWS system for coal conveyors shall be provided for both top and return conveyors. Junction towers/Transfer towers, Crusher house, and all other area shall also be covered. Fire in the coal conveyor will be detected by the linear heat sensing cables and infrared ember detectors which shall provide signal for electrical actuation of deluge valve. MVWS system spray nozzles shall be provided in row centre of the conveyor belt for top conveyor (The sprayers shall be installed in rows at the ceiling level above the centre of each conveyor belt and spaced at not more than 4M) and on either side of the conveyor at 4m intervals. Staggering of sprayers is recommended for bottom conveyors. Conveyor walk way shall not be affected by MVWS system pipe routing.

The MVWS system for fuel oil pump house and EDG building shall be designed considering the pump house as a single zone. A network of pipes with spray nozzles shall be located near the roof of the pump house which shall be connected to a deluge valve. The fire in the fuel oil pump house and EDG building shall be detected by a detection system comprising of quartzoid bulb detectors which shall actuate the deluge valve.

Isolation gate valve and y-type strainer shall be provided on upstream and downstream side of deluge valve. Fast acting butterfly vales shall be provided as a bypass to deluge valve, so that this valve can be kept closed and can be operated manually, if there is any malfunction of deluge valves.

Probe type heat detectors shall be used for detection of fire in the fuel oil storage tanks.

- For MVW spray system of cable galleries, the density of spray shall be 12.2 lpm/m2 of the surface area as per TAC rules for spray system. The pressure at the hydraulically most remote projector in the network shall not be less than 2.8 bar.
- For MVW spray system of coal conveyors, the density of spray shall be 10.2 lpm/m2 of the surface area as per TAC manual. The minimum pressure of 1.4 bars shall be achieved at the hydraulically remotes sprayer. However pressure at the hydraulically favorable sprayer shall not exceed 3.5 bars.
- For MVW spray system of fuel oil pump house and Emergency DG set building the density of spray shall be 10.2 lpm/m2 of the surface area as per TAC rules for spray system. The pressure at the hydraulically most remote projector in the network shall not be less than 1.4 bar and 2.8 bar.
- For MVW spray system of fuel oil storage tank, the density of spray shall be 3 lpm/m2 of the surface area same as adopted for fuel oil storage tank.
- Placing of spray nozzles shall be such that their spray cones overlap each other.
- A pressure switch will be provided at the down streamside of the deluge valve for remote annunciation of “Deluge Valve Open” alarm in the main Fire Alarm panel in central Control Room. Another pressure switch will be provided in the detection line of the system

for remote annunciation of "Detection circuit operated" alarm in the main Fire Alarm panel in central Control Room.

- The MVWS system shall be connected with fire hydrant line and tapping shall be provided wherever required from the fire water hydrant and MVWS system ring main network.

Fixed Foam System

Fixed foam system is provided for fuel oil storage tanks. The water for the foam system shall be tapped from the Hydrant system. The system will consist of at least two nos. of AFFF foam concentrate tank (2 x 100% capacity of SS foam tank), foam pumps, foam inductors, balance proportioners, foam makers with discharge outlets, associated interconnection (SS and GI) piping, valves, fittings, instrumentation etc. It will be discharged to the foam inductors through 2x100% capacity foam (One (1) Motor driven and One (1) diesel engine driven) pumps through balancing line, with control valves, flow controllers etc. along with deluge valves, strainers and isolating valves fixed piping valves and other accessories, etc.

- The system shall be designed for a foam application rate of 4.1 LPM per sq. meter. The duration of discharge shall be 30 minutes as per NFPA-11.
- The type of fire detection for the fuel oil tank will be tank mounted minimum 2 nos. of probe type heat detector with different temperature setting for fuel oil storage tanks.
- The foam concentrate pipe line pipe and fitting shall be SS material and all other pipes (foam water pipes) shall be GI pipes.

Automatic Clean Agent Fire Suppression System

The system shall be manufactured, designed, installed & commissioned in conformance with the stipulations of NFPA-2001.

At least 2 x 100% capacity Inert Gas cylinder batteries with each slave cylinder complete with non-return valve and control valve and each master cylinder having a pilot solenoid valve. Frame work support for cylinders for each area, Discharge manifolds, hoses, nozzles, and pneumatic horn for each area. Seamless pipe work, discharge nozzles, along with evacuation & gas release alarms and Warning sign boards shall be provided. Discharge nozzles will be provided on the gas distribution pipe network will be connected to a gas manifold, through a manually operated valve. The manifold will be connected to a group of inert gas cylinders.

Portable & Mobile Fire Extinguishers

Portable CO2, Dry Chemical Powder, Foam type extinguishers and stored pressure type fire extinguisher (ABC fire) as per TAC requirements shall be provided. Stored pressure type fire extinguisher (ABC fire) 5 kg, Carbon Di-Oxide Type Portable Fire Extinguishers 9 kg, Dry Chemical Powder Type Portable Fire Extinguishers 10 kg, 22.5 kg carbon di-oxide type, trolley wheel mounted unit one each and Chemical powder type, trolley wheel mounted unit one each for TG control room, Switch yard control room, ESP control room and Fire station shall be provided. 50Lts foam type, trolley wheel mounted unit for TG building lube oil tank area, Fuel oil Pumping area, Fuel oil storage tank area and Transformer area shall be provided.

Fire Tenders

The chassis for carrying out fabrication work of fire water/foam tender shall be of Make TATA1109/TATA 2518 or Ashok Leyland Taurus/Beaver or Volvo. The chassis shall be equipped with power assisted steering. It shall carry an extension ladder of 10.5M length including with hydraulic platform to operate the water monitor and shall be capable of towing a trailer pump.

Water tender

One (1) number of water type fire tender consist of 4500Lts. capacity water tank with rear mounted multistage high pressure pump, DCP and CO_2 extinguishers including all accessories shall be fabricated as per IS:950.

Foam tender
One (1) number of foam fire tender consist of 3000Lts. capacity water tank, 500 Lts. Capacity foam tank with rear mounted multistage high pressure pump, DCP and CO_2 extinguishers including all accessories shall be fabricated as per IS:951/87 and IS:10460.

Electrical
HT and LT Motors, MCC, Cabling system complete with cable trays, supports, conduits, glands, lugs etc (for the cables of all the motors, push button stations, MCC/ Control panel, Auxiliaries etc including HT motors). Earthing system, Rubber mats, First aid box, Danger plate and any other electrical equipment and accessories required to complete fire protection system.

Control and operation philosophy

Fire water pumping system
The fire water ring main network shall be a pressurised system provided with automatic starting of fire water pumps. The mode of operation of fire water pumping system shall be as follows:

Hydrant and MVWS System

The hydrant and MVWS system shall be a pressurised system provided with automatic starting of fire water pumps. The mode of operation of hydrant system shall be as follows:

a) In the event of fire when hydrant valves and MVWS system deluge valves are opened, the pressure in the header will drop due to the resulting flow and at a preset low pressure in the header, the electric motor driven pumps shall start automatically by getting an impulse from a pressure transmitters mounted on the header.

b) In case the electric motor driven pump fails to start, the pressure in the mains will drop further and sequentially start the other electric motor driven pumps. There will be a provision to start the pump manually in case of emergency.

c) In case the electric motor driven pump fails to start, the pressure in the mains will drop further and sequentially start the standby diesel engine driven pumps shall come into operation by getting in impulse from a pressure switch provided at a preset low pressure. There will be a provision to start the pump manually in case of emergency.

d) Stopping of all the above pumps shall be manual.

e) Jockey pumps shall not be running when main pumps are in operation.

HVW Spray System

The mode of operation of hydrant system shall be as follows:

a) On detection of fire the deluge valve is opened and water will be released from the projectors. This will cause a drop in pressure in the HVWS mains due to the resulting flow through the deluge valve. At a pre-set low pressure in the header, the motor driven pump shall start automatically by getting in impulse from a pressure transmitters provided on the header. A manual emergency release is also provided for manual local operation. Remote / manual operation will be possible from the deluge valve local control panel.

b) In case the electric motor driven pump fails to start automatically pressure in the mains will drop further and the diesel engine driven pump shall come into operation by getting an impulse from pressure transmitter provided at a preset low pressure.

c) Stopping of all the above pumps shall be manual.

d) Jockey pumps shall not be running when main pumps are in operation.

Pressurization System

The mode of operation of the pressurization system shall be as follows:

a) This system shall keep the hydrant system under pressurised state under all conditions.

b) The pressurisation in the hydro-pneumatic tank is achieved by means of two air compressors. Two (2) nos. jockey pumps will assure that the volume of water inside the hydro-pneumatic tank will be refilled after reaching the minimum level.

c) Small system leakages are met by make up water supply from hydro-pneumatic tank and electric driven jockey pump located in the firewater pump house. When the water level in the hydro-pneumatic tank falls to a predetermined low level the jockey pump starts automatically through an impulse from a level switch and pumps water to the hydro-pneumatic tank. The jockey pump will stop when predetermined high level is reached in the tank through an impulse from a level switch. However compressor shall start only when the water level has reached a high set point and the pressure in the tank falls below the determined set point and stops when the pressure in the tank reaches the determined set point sensed through a pressure switch. While deciding the settings it will be ensured that the jockey pump and compressor do not start simultaneously. The jockey pump and compressors are capable of both start and stop in either auto or manual modes.

Booster Fire Water Pumping System

The Booster Fire Water Pumping system will operate as follows:

a) In the event of fire when hydrant valves of boiler upper elevations are opened, the pressure in the header will drop due to the resulting flow and at a preset low pressure in the header, the electric motor driven pump will start automatically by getting an impulse from a pressure switch mounted on the header on the down steam / discharge end of booster pumps.

b) In case the electric motor driven pump fails to start, the pressure in the mains will drop further and sequentially start diesel engine driven pump. There will be a provision to start the pump manually in case of emergency.

c) Stopping of all the above pumps will be manual.

Fixed foam system

Fixed foam extinguishing system shall be provided for the HFO/HSD storage tanks. The probe type heat detectors provided for the fuel oil system shall be part of the fire alarm addressable analog loop of MFAP. On receiving the signal from the probe type heat detector, MFAP will send a signal to the local control panel of foam pump and deluge valve, which will electrically actuate the foam system. A manual emergency release is also provided for manual local operation.

Control and instrumentation

The system will be designed for automatic operation. Control and operations are realized in the main plant DCS with all necessary interlocks for starting the fire water pumps in sequence.

All the fire protection equipments that includes the electric motor driven main fire pump sets, standby diesel engine driven fire pump and associated systems are interfaced with the DCS through the DCS remote I/O panel located at fire water pump house.

Fire water pump house shall be provided with One(1) no. 24" LCD TFT type Operator station for control and monitoring the FPS locally in addition to remote monitoring from the central control room in the main plant DCS.

In addition to the above, the control cum annunciation panel shall be provided with Auto/manual selection in fire water pump house. Control cum annunciation panel shall be connected to the MFAP for monitoring. Local control panel of booster fire pumps and foam pumps shall be connected to MFAP for monitoring

In case of power failure, the control system remains operative by being connected to the UPS system. It shall assure that the plant shall be shutdown according to the safety requirements.

Local Control Panels for all deluge valves shall be provided. Local control panels shall be provided for each diesel engine driven pumps and fire water booster pumps in the respective pump house. All the pump status annunciation in this panel/operator station shall be repeated to the Main Fire Alarm Panel in the Central Control Room.

Fire Detection and Alarm System

Two (2) nos Main Fire alarm panel (MFAP). One (1) shall be located in the main plant central control room and one in coal handling plant control room. The MFAP shall be Microprocessor based analogue addressable type complete with power supply, LCD colour monitoring display unit, matrix key pad, all input, output & control modules, 24 V sealed maintenance free battery & battery charger, built-in hooters etc.

One (1) no Repeater Fire alarm panel (RFAP) shall be located in Fire Station. The RFAP shall be microprocessor based analog addressable type complete with power supply, LCD display, matrix key pad, all input, output & control modules, 24 V sealed maintenance free battery & battery charger, built-in hooters etc.

One (1) no of Repeater Fire alarm panel (RFAP) shall be provided in the Switch Yard Control Building.

All interface cabling between fire alarm system and DCS system for HVAC equipment interlocks shall be complete with double compression glands, lugs, ferrules, markers etc.

Control Units, Heat detectors, Quartzoid bulb detectors, Operation work station, Addressable analogue photo electric smoke detectors, addressable analogue fixed temperature cum rate of rise heat detectors, indoor and outdoor manual call points hooters, response Indicators, addressable interface units, infra red detectors emergency exit and warning signs etc. shall be provided. Minimum one (1) no of siren (3 kM range) complete with power supply and control unit including with all accessories. Loop cabling, interface modules etc. required for hooking up the system for annunciation in the main fire alarm panel and supply of all erection hardware shall be provided.

The type of detectors shall be provided in the following areas / equipments are given below:

Equipment to be protected	Type of Detection System Provided
Generator transformers, Unit Auxiliary Transformers, Unit Transformers, Station Auxiliary Transformers, Standby/ Maintenance transformers, Bus reactors, CHP auxiliary transformers, AHP auxiliary transformers, Station transformers and All other oil filled transformer of rating 10 MVA and above, turbine oil canal pipe lines in main plant, Boiler feed pumps lube oil tanks, coolers, consoles etc, Boiler burner front, main lube oil tank,	Water filled quartzoid bulb detectors and Manual call points.

Equipment to be protected	Type of Detection System Provided
clean and dirty lube oil tanks, and Generator seal oil system tanks and its coolers.	
All Cable galleries/cable spreader rooms/Cable vaults	Addressable multisensor smoke detectors and manual call points. Multisensor detector and digital LHS cable (LHS cables shall be provided in zigzag fashion (with an included angle of minimum 90 degree) each of the top tray, bottom tray and in every alternate tray)along with necessary number of interface units in the cable gallery will be cross zoned to actuate the water spray system.
All Switchgear rooms/MCC room, SWAS room, UPS room, Computer rooms, Engineers room, Air-conditioning equipment room, Control room, Control equipment room. Air washer room	Addressable multisensor detectors (Below the true ceiling, below the false ceiling and false floor as the case may be) and manual call points.
Battery and Battery charger room,	Addressable corrosion resistant rate of rise of temperature detector with fixed temperature element (Heat Detectors)
Fuel oil Storage tanks and dyke area	Minimum 2 nos. of probe type heat detector with different temperature setting and flame proof manual call points.
Auxiliary buildings/non-plant buildings	Addressable multisensor detectors (Below the true ceiling, below the false ceiling and false floor as the case may be) and manual call points.
Emergency Diesel Generator Building	Water filled quartzoid bulb detectors. Manual call point
Fuel oil pump house	Water filled quartzoid bulb detectors and Flame proof Manual call point
Coal conveyors	Linear heat sensor cables (Minimum 3 runs shall be provided one for top conveyor centre and (2 runs) each one run either side of the bottom conveyors), Minimum 3 nos Infra red type detectors for each coal conveyor: one each at a distance of 1-2 m from tail end and head end and one at the middle with Continuous air-blow system for cleaning of detectors and flame proof manual call points.
Entire Coal handling system area	Flame proof manual call points.
Hydrogen generation plant room	Gas detector and flame proof manual call points.
All Plant Buildings and entire plant area	Manual call points strategically located

4.0.0 CONSTRUCTION REQUIREMENTS

Two separate dedicated fire water ring main distribution network shall be provided for Hydrant, MVWS system and HVW Spray system as per TAC requirement

- All Hydrant, Spray and foam system pipe mains/pipes shall be routed aboveground on top of the concrete pedestals at regular intervals. In main plant area and coal (yard) stock pile area pipelines shall be routed in RCC pipe trenches filled with sand and covered with pre-cast RCC removable covers. Pipe trenches crossing through road or rail shall be through hume pipes.
- In case of requirement for modification in pipe routing during detailed engineering due to plant layout constraints, Contractor shall carry out such modifications at no extra cost to Purchaser.
- Fire water pipes shall be of Carbon Steel conforming to IS: 1239 (medium grade) and IS: 3589 (6.35mm thick).
- All aboveground piping shall be adequately supported by concrete pedestals at regular intervals.
- All buried pipes shall be double coated and wrapped as per IS: 10221 and/or IS: 15337.
- Over ground pipe normally empty but periodically charged shall be Galvanized pipes.
- The entire pipe network shall be hydraulically designed in such a way that the velocity of water in any section does not exceed 5.0 m/s at any segment of pipe network.
- All outdoor piping shall be buried such that the top of the pipe is atleast 1.0 M below the finished ground level.
- RCC hume pipes shall be provided as IS:458 NP class II for road crossings and NP class III for rail crossings.
- The yard piping shall be provided with strategically located sectioalising isolation gate valves to enable maintenance of defective pipeline and also to achieve maximum pressure at the remotest and highest hydrant at the time of fire as per TAC requirement.
- All fire hose connection branch pipe and couplings shall be of SS 304construction and in accordance with IS: 903.
- The pipe work shall be provided with gate valves IS:14846 at suitable location to facilitate repairs or other necessary work on the system, all above ground valves shall be rising stem type. All above ground Gate valves, check valves and globe valves shall confirm to IS:778.
- The hydrant valve shall be of SS 304construction conforming to IS : 5290.
- The water monitors provided shall be of fixed type with Swiveling joints, SS 304 Nozzle and conforming to IS:8442.
- Deluge valve shall be quick release, hydraulically operated diaphragm actuated type of valve, set in closed position, by water pressure through external bypass check valve and restriction orifice from the inlet chamber to top chamber. The Deluge valve shall be of cast iron construction complete with all accessories.
- All the deluge valves shall be provided inside the deluge valve shed.
- Holiday test for wrapping and coating shall be provided.
- The medium/high velocity spray nozzle shall be of SS 304construction.
- Hose cabinets shall be provided with 16 SWG thick body and 3 mm glass. The hose shall be provided with key box with break glass and pedestal where required. Fire hoses shall be of IS 636 type-A.

5.0.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED ALONG WITH THE PROPOSAL

a) Master drawing/document list

b) Time schedule for design, manufacture, delivery, erection, testing and commissioning.

c) Duly filled-in technical data, bill of material and prices as per specified schedules.

d) Technical write-up for the entire fire protection, detection and alarm system.

e) Schedule for all type of fire protection, detection and alarm system for each type for various buildings, equipment and entire plant area.

f) Flow diagram for fire water pumping system

g) Flow diagram for fire water booster pumping system

h) Flow diagram for foam pumping system

i) Flow diagram for fire water from sea water make-up pumping system

j) Schematic layout for hydrant system

k) Schematic layout for spray system

l) Flow diagram for foam system

m) Schematic diagram for inert gas flooding system

n) Schematic diagram for fire detection and alarm system

o) Schedule of portable and mobile fire extinguishers

p) Fire tender equipment details

q) Ambulance equipment details

r) Fire jeep equipment details

s) Preliminary layout drawings for the complete scope of work

t) Manufacturer's catalogue for Fire, Protection Detection and Alarm system.

u) List of tests the Bidder proposes to carry out in shop and at site after installation including those pertaining to their sub-contractor.

v) List of all tools, tackles and accessories required for maintenance of the offered equipment including bought out components.

w) List of all recommended spare parts for all equipment offered including bought out components of the offered fire protection system.

x) List of all mandatory spares for all the equipment as per TAC/technical specification

y) Power consumption list and feeder list.

6.0.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT

a) Final version of Master Drawing/document submission schedule

b) Technical write-up for the entire fire protection, detection and alarm system.

c) Schedule for all type of fire protection, detection and alarm system for each type for various buildings, equipment and entire plant area.

d) P&ID for fire water pumping system

e) P&ID for fire water booster pumping system

f) P&ID for foam pumping system

g) P&ID for fire water from sea water make-up pumping system

h) P&ID for foam system

i) Piping and equipment layout for fire water pump house

j) Piping and equipment layout for fire water booster pump house

k) Piping and equipment layout for fire water in sea water make pump house

l) Piping and equipment layout for foam system pump house

m) Foundation drawings with dead load as well as operating load and other data as required.

n) GA drawings of the equipment, dimensional and sectional drawings of all equipment giving details of materials.

o) Cross sectional drawings indicating the assembly of all the major equipment.

p) Piping layout drawings and isometric drawings including pipe support drawings for all automatic high velocity / medium velocity spray / foam system.

q) Hydraulic calculations for Hydrant system, high velocity spray system, medium velocity spray system and foam system.

r) Composite layout for hydrant system

s) Area wise fire water piping layout for hydrant and spray system

t) Schematic diagram for inert gas flooding system

u) Piping and equipment layout for inert gas flooding system

v) Schematic diagram for fire detection and alarm system

w) Fire detection and alarm system layout for each area

x) GA and wiring diagrams for control cum annunciation panel, PLC panel, MFAP, RAP, local control panels etc.

y) Instrument hook-up diagram for all type of instruments

z) Protection and interlocking logics for Fire protection, detection & alarm system.

aa) Portable fire extinguisher layout for the entire plant

bb) Detailed and final drawing of fire tender equipment

cc) Ambulance equipment details

dd) Fire jeep equipment details

ee) QAP for all manufactured and sub contracted items.

ff) Comprehensive quality assurance plan.

gg) Instruction manuals for the operation, maintenance, repair, replacement and spare parts ordering.

hh) Training manual

ii) Test procedures and details of test to be conducted.

jj) Type and Routine Test certificates, material test certificates for major components.

kk) Technical data sheet, GA drawing for motor

ll) Power consumption list and feeder list.

mm) Performance and characteristics curves for motor

nn) As-built drawings for all equipment/systems supplied under this contract and all buildings / structures / works executed under this contract incorporating all changes/modifications upto the time of commissioning / handling over to the Owner/consultant.

oo) Drawings/data to be required/submitted to statutory authorities

pp) List of all tools, tackles and accessories required for maintenance of the offered equipment including bought out components.

qq) List of all recommended spare parts for all equipment offered including bought out components of the offered fire protection system.

rr) List of all mandatory spares for all the equipment as per TAC/technical specification

ANNEX 2.15.1

SPECIFIED DESIGN DATA

A. Fire Water Pumps for Hydrant System and Spray System

S.No.	Description	Electrical Motor Driven Pump	Diesel Engine Driven Pump	Jockey Pump
1.0	**General Information**			
1.1	Duty	Continuous	Continuous	Intermittent
1.2	Rated capacity (m^3/hr.) / Nos.	By Contractor / (Minimum 3 nos. for Hydrant cum MVWS system and minimum 1 no for HVWS system)	By Contractor / (Minimum 2 nos. for Hydrant cum MVWS system and minimum 1 no for HVWS system)	By Contractor
1.3	Rated speed (RPM)	1500	1500	2900
1.4	Total head at discharge of the pump MWC	By Contractor	By Contractor	By Contractor
1.5	TAC Approved	Yes	Yes	Yes
1.6	Services	Hydrant and Spray System	Hydrant and Spray System	Common for Hydrant and Spray system
1.7	End connection	Side suction Side discharge	Side suction Side discharge	End suction
2.0	**Material of Construction**			
2.1	Casing	SS 304	SS 304	SS 304
2.2	Impeller	Stainless steel	Stainless steel	Stainless steel
2.3	Shaft	Stainless steel	Stainless steel	Stainless steel
2.4	Gland Packing	Graphite	Graphite	Graphite
2.5	Counter flange	Carbon Steel IS – 2062	Carbon Steel IS - 2062	Carbon Steel ASTM A 105
2.6	Base plate	Carbon Steel IS 2062	Carbon Steel IS 2062	Carbon Steel IS - 2062

B. Hydro-Pneumatic Tank

S.No.	Description	Hydro-pneumatic Tank
1	Type	Vertical cylindrical with dished end supported.
2	Capacity and Quantity	By Contractor and 1 No.
3	Code / Standard	IS : 2825
4	Working Pressure	By Contractor
5	Design Temperature	60 Degree.

C. Air compressor for Hydro-Pneumatic Tank

S.No.	Description	Air compressor
1	Type	Air Cooled Reciprocating Compressor
2	Quantity	2 Nos.
3	Application	For Hydro-pneumatic Tank Pressurisation
4	Free Air Delivery and Pressure rating	By Contractor

D. Fire Water Booster Pumps

S.No.	Description	Electrical Motor Driven Booster Pump	Diesel Engine Driven Booster Pump
1.0	**General Information**		
1.1	Duty	Continuous	Intermittent
1.2	Rated capacity (m^3/hr.) / Nos.	As per system requirement / One (1)	As per system requirement / One (1)
1.3	Rated speed (RPM)	1500	1500
1.4	Total head at discharge of the pump MWC	As per system requirement	As per system requirement
1.5	TAC Approved	Yes	Yes
1.6	End connection	Side suction Side discharge	Side suction Side discharge
2.0	**Material of Construction**		
2.1	Casing	SS 304	SS 304
2.2	Impeller	Stainless steel	Stainless steel
2.3	Shaft	Stainless steel	Stainless steel
2.4	Seal	Mechanical seal	Mechanical seal
2.5	Gland Packing	Graphite	Graphite
2.6	Counter flange	Carbon Steel IS –2062	Carbon Steel IS -2062
2.7	Base plate	Carbon Steel IS 2062	Carbon Steel IS 2062

E. Foam Pumps

Sl. No.	Description	Electrical Motor Driven Foam Pump	Diesel Engine Driven Foam Pump
1.0	**General Information**		
1.1	Type	Gear	Gear
1.2	Service	Foam	Foam
1.3	Duty	Continuous	Intermittent
1.4	Location	In-door	In-door
1.5	End connection	Side suction Side discharge	Side suction Side discharge
1.6	Rated capacity (m^3/hr.) / Nos.	By Contractor	By Contractor
1.7	Rated speed (RPM)	1500	1500
1.8	Total head at discharge flanged of the pump MWC	By Contractor	By Contractor
1.9	TAC Approved	Yes	Yes
2.0	**Material of construction**		
2.1	Casing	CF8M	CF8M
2.2	Rotor Gears	SS 316	SS 316
2.3	Rotor Shafts	SS 431	SS 431

Sl. No.	Description	Electrical Motor Driven Foam Pump	Diesel Engine Driven Foam Pump
2.4	End Covers	SS 316	SS 316
2.5	Stuffing Box Packing	Mechanical Seal	Mechanical Seal
2.6	Gland	SS316	SS316
2.7	Base Plate	M.S Fabricated	M.S Fabricated
2.8	Integral Relief Valve	SS 316	SS 316

F. Pipes and Fittings

Description	Data
Above Ground Piping (Normally Filled with Water)	
Pipe specification	IS : 1239 (part I) – Heavy class ERW MS Black pipes for sizes 150 NB and below.
	IS : 3589 – Grade 410 (wall thickness min – 6.35mm) ERW MS Black pipes for sizes above 150 NB
Pipe to pipe joint	Butt welded for size 65 mm NB & higher as per ANSI B16.9 and socket. welded for sizes upto 50 mm NB as per ANSI B16.11
Pipe to valve joint	Flanged and drilled to ANSI 150# B16.5 with neoprene gaskets between flanges for sizes 50NB & above. Screwed for sizes below 50NB.
Pipe fittings	IS 1239 (Part II) – heavy grade MS for sizes upto 150 NB Fabricated from parent material for sizes above 150 NB. Butt welded as per ANSI B 16.25 for sizes 65 NB and above and socket welded as per ANSI-B-16.11
Bolts, nuts & washers	Hot dip galvanised MS.
Corrosion protection	Refer relevant page of painting clause.
Above Ground Piping (Normally Empty)	
Pipe specification	IS : 1239 (Part I) – Heavy class galvanised ERW MS pipes.
Pipe to pipe joint	Screwed flange as required for sizes 65 mm NB & above and screwed socket for sizes 50 mm NB and below.
	Welding on GI Pipes shall not be carried out. All GI Pipe joint connections shall be threaded type only with sealant Teflon
Pipe to valve joints	Flanged for sizes 50NB & above, screwed for sizes below 50NB.
Pipe fittings	IS 1239 (Part II) Heavy grade galvanised MS Screwed flanged for sizes 65mm NB & above and screwed socketed as per ANSI B 16.11 or IS 1239, Part II for sizes 50 mm NB and below. All fittings and flanges for galvanized pipes shall be galvanized.
Bolts nuts & washers	Hot dip galvanised MS.
Pipe protection	Refer relevant page of painting clause.
Foam System	
Foam tank MOC	SS tank

Description	Data
Stainless steel seamless pipes upto 80NB	Stainless steel to ASTM A-312, TP-304, Sch.- 40s.
Fittings	Stainless Steel pipe fittings
15 NB to 40 NB	SS forged to ASTM A-182, F-304, 3000#
50 NB & above	SS Seamless to ASTM A-403, WP-304, Sch.- 40
SS flanges	Plate fabricated to ASTM A-240, TP-304
Gaskets	CAF as per IS:2712, Gr.W3.

G. Valves and Specialties

Cl.No.	Description	Specification Requirement
1.0	**C.I Gate Valves**	
1.1	Type	Rising spindle type
1.2	Sizes	50 NB to 600 NB
1.3	Rating	PN 1.6
1.4	End connection	Flanged and drilled to ANSI 150# B 16.5
1.5	Code / Standard	CI:IS 14846 rising spindle TAC approved
1.6	Material of construction	
	Body	CI IS : 210 Gr. FG 260
	Bonnet	CI IS : 210 Gr. FG 260
	Stem	Gun metal IS : 315 CTB2 or IS:320 HT2
1.7	Testing	As per IS : 14846
1.8	Test pressure	Body - 24 kg/cm^2
		Seat - 16 kg/cm^2
1.9	Approval	ISI marked/ TAC approved
2.0	**Gun Metal Globe Valves**	
2.1	Type	Rising spindle
2.2	Sizes	50 NB to 100 NB
2.3	Rating	PN 1.6
2.4	End connection	Flanged to B16.5
2.5	Code / Standard	IS : 778

Cl.No.	Description	Specification Requirement
2.6	Material of construction	
	Body	GM, IS:318 Gr.2, Casting
	Bonnet	GM, IS:318 Gr.2
	Disc	GM, IS:318 Gr.2, Guided
	Stem	HT brass, IS:320, OS & Y, Forged
	Hand wheel / lever	CI IS 210 Gr. 260
2.7	Testing	As per IS : 778
2.8	Test pressure	Body - 24 kg/cm^2
		Seat - 16 kg/cm^2
2.9	Approval	ISI marked / TAC approved
3.0	**C-I Check Valves**	
3.1	Type	Swinging disc type
3.2	Size	50 NB to 600 NB
3.3	Rating	PN 1.6
3.4	End connection	Flanged and drilled to ANSI 150# B 16.5
3.5	Code / Standard	As per latest BS / IS code.
3.6	Material of construction	
	Body	CI IS:210 Gr. FG 260
	Cover	CI IS:210 Gr. FG 260
	Disc	CI IS:210 Gr. FG 260
	Hinge pin	H.T brass IS : 320 HT-2
	Gasket	CAF IS 2712
3.7	Testing	As per latest BS / IS code.
3.8	Test pressure	Body : 24 kg/cm^2
		Seat : 16 kg/cm^2
3.9	Approval	ISI marked and TAC approved
4.0	**Butterfly Valves**	
4.1	Type	Wafer upto 300 NB, lug type upto 500 NB
4.1	Sizes	100 NB and above

Cl.No.	Description	Specification Requirement
4.3	Rating	PN 1.6
4.4	End connection	Flanged and drilled to ANSI 150# B 16.5
4.5	Code / Standard	IS: 13095
4.6	Material of construction	
	Body	SA 216 Gr. WCB, casting
	Shaft	SS 40, stub shaft
	Disc	SA 216 Gr. WCB, casting
	Hand wheel / lever	CS
4.7	Testing	AWWA-C 504
4.8	Test pressure	Body - 24 kg/cm^2
		Seat - 16 kg/cm^2
4.9	Approval	ISI marked / TAC approved
5.0	**Hydrant Valve**	
5.1	Type	Single / Double headed, female oblique type
5.2	Code / Standard	IS : 5290
5.3	End connection	
	Inlet	Flanged and drilled to ANSI 150# B 16.5
	Outlet	Female instantaneous coupling with spring lock type coupling with blank cap & chain.
5.4	Size	63 mm
5.5	Flow	Contractor to indicate
5.6	Testing	As per IS : 5290
5.7	Test pressure	Body - 21 kg/cm^2
		Seat - 14 kg/cm^2
5.10	Material of construction	
	Body	SS 304
	Female outlet	SS 304
	Stop valve	SS 304
	Blank cap	SS 304
	Bonnet	SS 304

Cl.No.	Description	Specification Requirement
	Gland	SS 304
	Hand wheel	CI IS 210 Gr. 260
	Spring	Phosphor bronze to IS : 7608
5.11	Approval	ISI marked / TAC approval
6.0	**Water Monitor**	
6.1	Type	Horizontal and vertical swivel type
6.2	Size	63mm / 75mm / 100mm
6.3	Code / Standard	IS : 8442 Type-I
6.4	Working pressure	9.0 kg/cm^2
6.5	Design pressure	10.5 kg/cm^2
6.6	Testing	
6.6.1	Test pressure	23 kg/cm^2
6.6.2	Flow & throw test	63mm 75mm 100mm
	With water	
	Flow at 7 kg/cm^2 (LPM)	1750 2580 3500
	Horizontal throw (m)	53 60 64
6.7	Discharge capacity at	63mm 75mm 100mm
	7 kg/cm^2 pressure (LPM)	1750 2580 3500
6.8	Throw	63mm 75mm 100mm
	With water	
	Min. Horizontal (M)	53 60 64
	Min. Vertical (M)	Contractor to indicate
6.9	Rotation	360°
	Horizontal	Contractor to indicate
	Vertical	
6.10	End connection	Flanged and drilled to ANSI 150# B 16.5
6.11	Material construction	
	Water barrel	IS : 1239 (Part I)
	Wire braided hose	PVC

Cl.No.	Description	Specification Requirement
	Nozzle	SS 304
	Handle	MS to IS 2062
	Base flange	MS IS 2062. Drilled to ANSI 150# B 16.5
	Reducer & 90° Elbow	Seamless ANSI B 16.9 / IS:1239 (Part II) / IS 4310
	Swivel joints (horizontal & vertical)	SS 304
	(Horizontal / vertical) rotation lock	SS 304
	Grease nipple	SS 304
	Drain cock	SS 304
6.12	Approval	ISI marked & TAC approved
7.0	**Branch Pipe & Nozzle**	
7.1	Size	63 NB with 20 NB nozzle
7.2	Nozzle Type	Hexagonal, detachable
7.3	Code / standard	IS : 903-1995
7.4	Material of construction	
	Branch pipe / nozzle	SS 304
	Spanner	Steel of grade C-40 to IS:1570 (Part 5) chromium or zinc plated.
7.5	Testing	As per IS : 903
7.6	Approval	ISI marked/ TAC approved
8.0	**Hose Coupling**	
8.1	Type	Instantaneous male and female
8.2	Size	63 NB
8.3	Code / standard	IS : 903
8.4	Material of construction	
	Female half coupling	SS 304
	Male half coupling	SS 304
	Seal washer	Rubber
	Outer disc	SS 304
	Self locking nut	SS 304
	Locking latch	SS 304

Cl.No.	Description	Specification Requirement
	Spring	Phosphor bronze
	Guide disc	SS 304
	Knob	SS 304
8.5	Testing	As per IS : 903
8.6	Approval	ISI marked/ TAC approved
9.0	**Fire Hose**	
9.1	Type	Reinforced Rubber lined
9.2	Size	63 mm
9.3	Code / standard	IS:636 Type A
9.4	Length	15 m for external & internal hydrant
9.5	End fittings	Instantaneous spring lock type coupling at both ends.
9.6	Testing	As per IS : 636
9.7	Hose weight (gm/m)	IS : 636
9.8	Bursting pressure	IS : 636
9.9	Proof pressure	IS : 636
9.10	Kink test pressure	IS : 636
9.11	Change in length test pressure	IS : 636
9.12	Change in diameter test pressure	IS : 636
9.13	Approval	ISI marked/ TAC approved
10.0	**Hose Cabinet**	
10.1	Type	Fabricated out of 16 G MS sheet
10.2	Size	Approx. 750 x 600 x 250
10.3	Mounting	- Wall / column mounted for internal hydrant pedestal mounted for external hydrant
10.4	Special requirement	(i) Each cabinet shall accommodate 2 nos. of 15 m long hoses and 1 no. branch pipe & nozzle.
		(ii) Cabinet to have double door having toughened glass panel (3 mm) with rubber lining and marked `Fire' on it in 80 mm size letters.
		(iii) Approved lock with duplicate keys kept wired in a break glass key cabinet in the hose box itself.
		(iv) A spanner and a set of spare rubber rings packed in fresh chalk to be kept inside the hose box.
		(v) Clamp for holding branch pipe to be provided.

Cl.No.	Description	Specification Requirement
10.5	Accessories	-Fastening nuts, bolts and hardware - Hammer for breaking the glass to take out the keys
11.0	**Deluge Valve**	
11.1	Type	Quick release, diaphragm/ piston actuated
11.2	Size	80 NB, 100 NB & 150 NB
11.3	Design data	Normal working pressure : 7 kg/cm^2
		Design pressure : 10.5 kg/cm^2
		Test Pressures:
		Body = 24 kg/cm^2
		Seat = 16 kg/cm^2
11.4	End connection	Flanged, Flat Faced to ANSI B 16.5 #150
11.5	Type of operation	Hydraulic (wet pilot)
11.6	All Trims and accessories	
11.9	Material of construction	
	For Diaphragm type	
	Housing	CI IS 210 Gr. 260
	Cover	CI IS 210 Gr. 260
	Clapper	Cast bronze IS 318 LTB-2
	Clamp ring	Cast bronze IS 318 LTB-2
	Seat	Cast bronze IS 318 LTB-2
	Diaphragm	Neoprene
	Seat rubber	Neoprene
	For Piston type	
	Housing	CI IS 210 Gr. 260/ eqvl.
	Top & side Cover	CI IS 210 Gr. 260/ eqvl.
	Piston rod	GM, IS : 318 Gr. 2
	Piston seat	GM, IS : 318 Gr. 2
	Piston	GM, IS : 318 Gr. 2
	Valve seat	GM, IS : 318 Gr. 2
	Guide way	GM, IS : 318 Gr. 2

Cl.No.	Description	Specification Requirement
	Comp. Spring	SS 304
	'O' Ring	Nitrile Rubber
	Valve disc	Nitrile Rubber
	NRV, ball	Brass, IS : 319
	Bolts	Stainless (wet parts) Hot dip galvanised MS (dry parts)
11.10	Testing	As per UL (Type test report to be enclosed)
11.11	Approval	TAC approval
12.0	**Spray Nozzles(HVWS)**	
12.1	Type	Open type, solid cone
12.2	Working pressure	3.5 bar
12.3	Material	SS304
12.4	K factor/Orifice size (mm)	17.5 / 7 & 33/10
12.5	Spray angle	Contractor to indicate
12.6	Approval	TAC approved
12.7	End connector	Screwed, 3/4" BSP
12.8	Marking	K – factor to be marked on hexagonal face.
13.0	**Spray Nozzles (Medium Velocity Water Spray System)**	
13.1	Type	Open type
13.2	Working pressure	1.4 – 2.8 bar
13.3	Material	
	Body, deflector & deflector pin	SS304
13.4	K factor / orifice size	21.05 / 6.6 mm
13.5	Spray angle	120°
13.6	Approval	TAC approved
13.7	End connector	½" BSP, Screwed
13.8	Marking	K – Factor to be marked on hexagonal face
14.0	**Quartzoid Bulb Detector**	
14.1	Material	SS304

Cl.No.	Description	Specification Requirement
14.2	Sensitive element	Heat sensitive bulb
14.3	Set temperature	79℃
14.4	Response time	Less than 20 seconds
14.5	End connector	½" BSP, Screwed
14.6	Approval	TAC approved
15.0	**Y-Strainers**	
15.1	Manufacture	As per approved vendor list
15.2	Sizes	80 NB to 300NB
15.3	End connector	Flanged and drilled to ANSI 150# B 16.5
15.4	Screen open area to pipe room sectional area ratio	4 : 1
15.5	Material of construction	
	Body	MS to IS : 2062
	Screen	AISI : 316, 18 BWG
15.6	Screen mesh	30 mesh
15.7	Testing pressure	Two times working pressure or 1.5 times design pressure whichever is higher.
16.0	**Gate Valves**	
16.1	Type	Rising spindle type
16.2	Sizes	50 NB to 600 NB
16.3	Rating	PN 1.6
16.4	End connection	Flanged and drilled to ANSI 150# B 16.5
16.5	Code / Standard	IS 14846 rising spindle TAC approved
16.6	Material of construction	
	Body	Duplex Stainless Steel
	Bonnet	Duplex Stainless Steel
	Stem	Duplex Stainless Steel
16.7	Testing	As per IS : 14846
16.8	Test pressure	Body - 24 kg/cm^2
		Seat - 16 kg/cm^2
16.9	Approval	ISI marked/ TAC approved

H. PORTABLE AND MOBILE FIRE EXTINGUISHERS

Sl.No.	Parameter	Unit	Description
	Pressurised Water Type Fire Extinguishers		
1	Type		Stored pressure type fire extinguisher (ABC fire) 5 kg
2	Design Standard		IS : 940
3	Quantity	Nos.	DDE
4	Guaranteed performance		
a	Capacity	lts	5
b	Max. effective range when tested in still air	M	7 – 9
c	Min. period during which the continuous jet shall be maintained.	S	75
d	Maximum period for discharge of 95% of the charge.	S	90
5	Constructional features		As per design code
6	Material of construction		As per design code
7	Physical data		DDE
8	Accessories		
a	Chemical charge		Yes
b	Mounting brackets complete with all hardware		Yes
c	Carrying Handle		Yes
d	Liquid level indicator		Yes
e	Any other as per design code		Yes
9	Approvals		ISI
10	Painting and testing		As per manufacturer.
	Carbon Di-Oxide Type Portable Fire Extinguishers		
1	Type		Carbon Di-Oxide type
2	Design standard		IS : 2878
3	Quantity	Nos.	DDE
4	Guaranteed performance		
a	Capacity	Kg	9
b	Max. effective range when tested in still air	m	2

Sl.No.	Parameter	Unit	Description
c.	Min. period during which the continuous jet shall be maintained.	S	8
d	Maximum period for discharge of 95% of the charge	S	18
5	Constructional features		As per design code
6	Material of construction		As per design code
7	Physical data		DDE
8	Accessories		
a	Chemical charge		Yes
b	Mounting Brackets complete with all hardware		Yes
c	Carrying handle		Yes
d	Liquid level indicator		Yes
e	Any other as per design code		Yes
9	Approvals		ISI
10	Painting and testing		As per manufacturer.
	Dry Chemical Powder Type Portable Fire Extinguishers		
1	Type		Dry chemical powder type
2	Design standard		IS : 2171
3	Quantity	Nos.	DDE
4	Guaranteed performance		
a	Capacity	kg	10
b	Max. effective range when tested in still air	m	4
c	Min. period during which the continues jet shall be maintained.	S	15
d	Maximum period for discharge of 95% of the charge	S	20
5	Constructional features		As per design code
6	Material of construction		As per design code
7	Physical data		DDE
8	Accessories		
a	Chemical charge		Yes
b	Mounting brackets complete		Yes

Sl.No.	Parameter	Unit	Description
	with all hardware		
c	Carrying handle		Yes
d	Liquid level indicator		Yes
e	Any other as per design code		Yes
9	Approvals		ISI
10	Painting and testing		As per manufacturer.
	Foam Type Portable Fire Extinguishers		
1	Type		Mechanical Foam type
2	Design standard		IS : 10204
3	Quantity	Nos.	DDE
4	Guaranteed performance		
a	Capacity	lts	9
b	Max. effective range when tested in still air	m	5 - 7
c	Min. period during which the continuous jet shall be maintained	S	50
d	Maximum period for discharge of 95% of the charge	S	60
5	Constructional features		As per design code
6	Material of construction		As per design code
7	Physical data		DDE
8	Accessories		
a	Chemical charge		Yes
b	Mounting brackets complete with all hardware		Yes
c	Carrying handle		Yes
d	Liquid level indicator		Yes
e	Any other as per design code		Yes
9	Approvals		ISI
10	Painting and testing		As per manufacturer.
	Trolley Mounted Carbon Di-Oxide Type Mobile Fire Extinguishers		
1	Type		Carbon Di-Oxide mobile type
2	Design standard		IS : 2878

Sl.No.	Parameter	Unit	Description
3	Quantity	Nos.	DDE
4	Guaranteed performance		
a	Capacity	kg	22.5
b	Max. effective range when tested in still air	m	5
c	Min. period during which the continuous jet shall be maintained	S	20
d	Maximum period for discharge of 95% of the charge	S	60
5	Constructional features		As per design code
6	Material of construction		As per design code
7	Physical data		DDE
8	Accessories		
a	Chemical charge		Yes
b	Mounting brackets complete with all hardware		Yes
c	Carrying handle		Yes
d	Liquid level indicator		Yes
e	Any other as per design code		Yes
9	Approvals		ISI
10	Painting and testing		As per manufacturer.
	Trolley Mounted Dry Chemical Powder Type Mobile Fire Extinguishers		
1	Type		Dry Chemical Powder Mobile type
2	Design standard		IS : 10658
3	Quantity	Nos.	DDE
4	Guaranteed performance		
a	Capacity	kg	50
b	Max. effective range when tested in still air	m	8 – 10
c	Min. period during which the continuous jet shall be maintained at length not less than 6 m	S	85
d	Maximum period for discharge of 95% of the charge	S	95
5	Constructional features		As per design code

Sl.No.	Parameter	Unit	Description
6	Material of construction		As per design code
7	Physical data		DDE
8	Accessories		
a	Chemical charge		Yes
b	Mounting brackets complete with all hardware		Yes
c	Carrying handle		Yes
d	Liquid level indicator		Yes
e	Any other as per design code		Yes
9	Approvals		ISI
10	Painting and testing		As per manufacturer.
	Trolley Mounted Foam Type Mobile Fire Extinguishers		
1	Type		Foam mobile type
2	Design standard		IS : 13386
3	Quantity	Nos.	DDE
4	Guaranteed performance		
a	Capacity	lts	50
b	Max. effective range when tested in still air	m	10
c	Min. period during which the continuous jet shall be maintained at length not less than 6 m	S	40
d	Maximum period for discharge of 95% of the charge	S	180
5	Constructional features		As per design code
6	Material of construction		As per design code
7	Physical data		DDE
8	Accessories		
a	Chemical charge		Yes
b	Mounting brackets complete with all hardware		Yes
c	Carrying handle		Yes
d	Liquid level indicator		Yes
e	Any other as per design code		Yes

Sl.No.	Parameter	Unit	Description
9	Approvals		ISI
10	Painting and testing		As per manufacturer.

ANNEXURE – C

Price Bid format

[Main Supply + Mandatory Spares + Services]

	Price Bid format [for Main Supply + Mandatory Spares+Services]	Annexure -[C] of PY51842
	Fire Detection & Alarm System	Rev.00
	Project: 2 x 660MW Udangudi STPP	

BHEL ENQUIRY NO : Vendor Offer ref no:

Ref. date: Ref. date:

NOTES ::

1	This document details the price schedule format for the enquiry. **No other format will be entertained.** Applicable taxes and duties shall be indicated separately in commercial offer.
2	Duly signed & stamped un-priced price schedule format indicatinf "QUOTED" shall be submitted by vendor in the technical offer as a token of concurrence that price schedule would be submitted in this format. Any tampering / modification / additions, etc. are NOT allowed and not considered binding and is liable for rejection of the offer.
3	**Bidders shall be evaluated on overall L1 basis.**
4	For addition/reduction of quantity, unit rate quoted in the present offer shall be considered during order execution and shall be valid up to execution of the contract to the extent of + 10%, - 20% of overall order Value. These would include the cost up to engineering, installation of the item, wiring up in the panel and seamless integration with main system at works/site without any cost implications. All accessories as required for this purpose also shall be included in the Price Quoted
5	Components/Items for addition/deletion, spares shall be identical to the main equipment.
6	Billing will be as per BOM of actual supplied main equipment (including accessories) & spares.
7	Unit Rates of the individual package items shall be derived by multiplying the "% Weightage" with the Grand Total BASIC Price quoted. Unit Rates of the Individual items thus arrived, shall be binding on the bidder, in case of any repeat order/Amendment of Purchase Order as per this specification and BHEL policies. Please refer sheet 3 & 4 for this purpose and information.
8	Nil
9	The Bid Evaluation is on Overall L1 Basis. Partial offers will not be considered for evaluation and the same are liable for rejection.
10	Bidders will be required to quote Grand Total BASIC Price only in Price Bid Form in the e-procurement portal, considering all items as per this Price Format. Basic Prices of various line items shall be calculated by BHEL by multiplying the quoted Total Basic Price with the Weightages mentioned in this Price Format against the respective line items.

	Price Bid format [for Main Supply + Mandatory Spares+Services]					Annexure -[C] of PY51842	
	Fire Detection & Alarm System					Rev.00	
	Project: 2 x 660MW Udangudi STPP						
S. No	**Material Code**	**Item Description**	**Quantity [I]**	**Unit**	**TOTAL PRICE (Rs.) [I*II]**	**Weightage (%) for Calculation of Line Item Prices**	**REMARKS**
[A]	**MAIN SUPPLY**						
	PY9751842018	Main Supply- Fire Detection & Alarm System Components	1	Set	**Not to be filled by Bidder**	**92.31%**	
[B]	**MANDATORY SPARE**						
	PY9751842026	Mandatory Spares- Fire Detection & Alarm System Components	1	Set	**Not to be filled by Bidder**	**5.77%**	
[C]	**SERVICES**						
(i)	PY9751842034	Supervision of Erection & Commissioning Services charges at site including lodging, boarding, local travel, insurance, etc. [Unit Rate = Per man day charges]	55	Days	**Not to be filled by Bidder**	**1.73%**	
(ii)	PY9751842042	Supervision of Erection & Commissioning visit charges [i.e. travel expenses like travel to & fro from vendors work to site, clearance charges like visa fee, etc.] [Unit rate = per visit travel expenses]	5	Visits	**Not to be filled by Bidder**	**0.19%**	
Grand Total Basic price for overall L1 evaluation ([A]+[B]+[C]) (Rs.) ::					**Refer Note-10; To be filled by Bidder**	**100.00%**	

	Price Bid format [for Main Supply]	Annexure -[C] of PY51842
	Fire Detection & Alarm System	Rev.00
	Project: 2 x 660MW Udangudi STPP	

S. No	Type of instrument	% Weightage for calculation of Line Item Unit Price (Refer Note-7)	
1	Fire Alarm Panel (Each panel shall have 12 Loops) Floor Mounted	0.93399%	
2	Fire Alarm Panel (Each panel shall have 8 Loops) Floor Mounted	0.81590%	
3	Fire Alarm Panel (Each panel shall have 4 Loops) Floor Mounted	0.76580%	
4	Loop Card	0.10432%	
5	Repeater Panel	0.42637%	
6	Multisensor Detectors with detector base and mounting back box (Analogue addressable) along with PVC cable glands	0.00482%	
7	Heat Detectors with detector base and mounting back box (Analogue addressable) along with PVC cable glands	0.00458%	
8	Probe Detectors (ROR type) with Flameproof Junction box for Fuel tanks *(Min. 50 ft x 50 ft coverage for each detector along with counter flange and gasket) (Addressable)*	0.06066%	
9	Beam Detectors (Addressable) along with PVC cable glands	0.08629%	
10	IR Ember Detectors with inbuilt Air Purge Unit & accessories (Addressable) along with PVC cable glands	0.18449%	
11	Indoor Manual Call Points with mounting back box (Addressable type) along with PVC cable glands	0.00550%	
12	Outdoor Manual call points with mounting back box (IP-65 min.) (Addressable type) along with PVC cable glands	0.01355%	
13	Flameproof Manual call points with mounting back box (Addressable type) along with PVC cable glands	0.01659%	
14	Indoor Hooter cum Strobe with mounting back box (Addressable type) along with PVC cable glands	0.00996%	
15	Exit Sign (Self illuminating)	0.00097%	
16	Response Indicators	0.00019%	
17	Siren (3 km) with Siren Control panel	0.49924%	
18	Interface module for Siren Operation with IP-65 enclosure	0.00619%	
19	Digital LHS Cable for Cable Galleries	0.00032%	
20	Digital LHS Cable for Coal Conveyors	0.00064%	
21	Digital LHS Controllers (2 km range)	1.59981%	

S. No	Type of instrument	% Weightage for calculation of Line Item Unit Price (Refer Note-7)	
22	End of Line Resistance with Terminal Box for LHS cable termination (IP-65)	0.00086%	
23	Cable Junction Box for 2P x 2.5 sqmm MICC Cable	0.00722%	
24	LHS Cable Jointing Box	0.00090%	
25	Module for LHS Cable (1 Input) with IP-65 enclosure along with PVC cable glands	0.00586%	
26	Module for Deluge Valve (2 Input + 1 Output) with IP-65 enclosure along with PVC cable glands	0.00588%	
27	Module for Limit Switches (2 Input + 1 Output) with IP-65 enclosure along with PVC cable glands	0.00588%	
28	Module for Tripping (1 Output) with IP-65 enclosure along with PVC cable glands	0.00585%	
29	Module for Monitoring Pumps Status (1 Input) with IP-65 enclosure along with PVC cable glands	0.00587%	
30	Module for Interface with DCS (1 Output) with IP-65 enclosure along with PVC cable glands	0.00598%	
31	Module for Interface with IGES (1 Input + 1 Output) with IP-65 enclosure along with PVC cable glands	0.00606%	
32	24 V DC Power Supply Modules with Battery Back Up	0.07174%	
33	Operator Workstation & A4 size color laser Printer along with Graphic software i.e., (GUI) Software with License /Dongle	0.61229%	
34	Laptop along with Fire Alarm Panel Commissioning Software with License /Dongle	0.13417%	
35	Furniture for Operator Workstation & Printer	0.01070%	
36	Mini-UPS for Operator Workstation & Printer (To be sized by bidder)	0.05602%	
37	8 core Armoured single mode Optical Fiber Cable with 2" rodent proof HDPE conduits (for fire alarm panels and PC networking)	0.00015%	
38	-NIL-	0.00000%	
39	-NIL-	0.00000%	
40	-NIL-	0.00000%	
41	-NIL-	0.00000%	
42	Cable Saddle + Saddle Bars along with fixing screws and rawl plugs for 1P x 1.5 sqmm Cable	0.00001%	

S. No	Type of instrument	% Weightage for calculation of Line Item Unit Price (Refer Note-7)	
43	Cable Saddle + Saddle Bars along with fixing screws and rawl plugs for 2C x 2.5 sqmm Cable	0.00001%	
44	Nylon Cable Tie for 1P x 1.5 sqmm Cable	0.00001%	
45	Nylon Cable Tie for 2C x 2.5 sqmm Cable	0.00001%	
46	Cable Lugs for 1P x 1.5 Sqmm Cable (Tinned Copper)	0.00001%	
47	Cable Lugs for 2C x 2.5 Sqmm Cable (Tinned Copper)	0.00001%	
48	Cable Glands for 1P x 1.5 Sqmm Cable (Double Compression Ni-plated Brass) for all FDA Components/devices	0.00037%	
49	Cable Glands for 2C x 2.5 Sqmm Cable (Double Compression Ni-plated Brass)	0.00037%	
50	Mounting Accessories & Erection Hardware for all above items	6.56067%	
51	Services charges at site including lodging, boarding, local travel, insurance, etc.	0.03146%	
52	Visit charges [i.e. travel expenses like travel to & fro from vendors work to site, clearance charges like visa fee, etc.]	0.03826%	

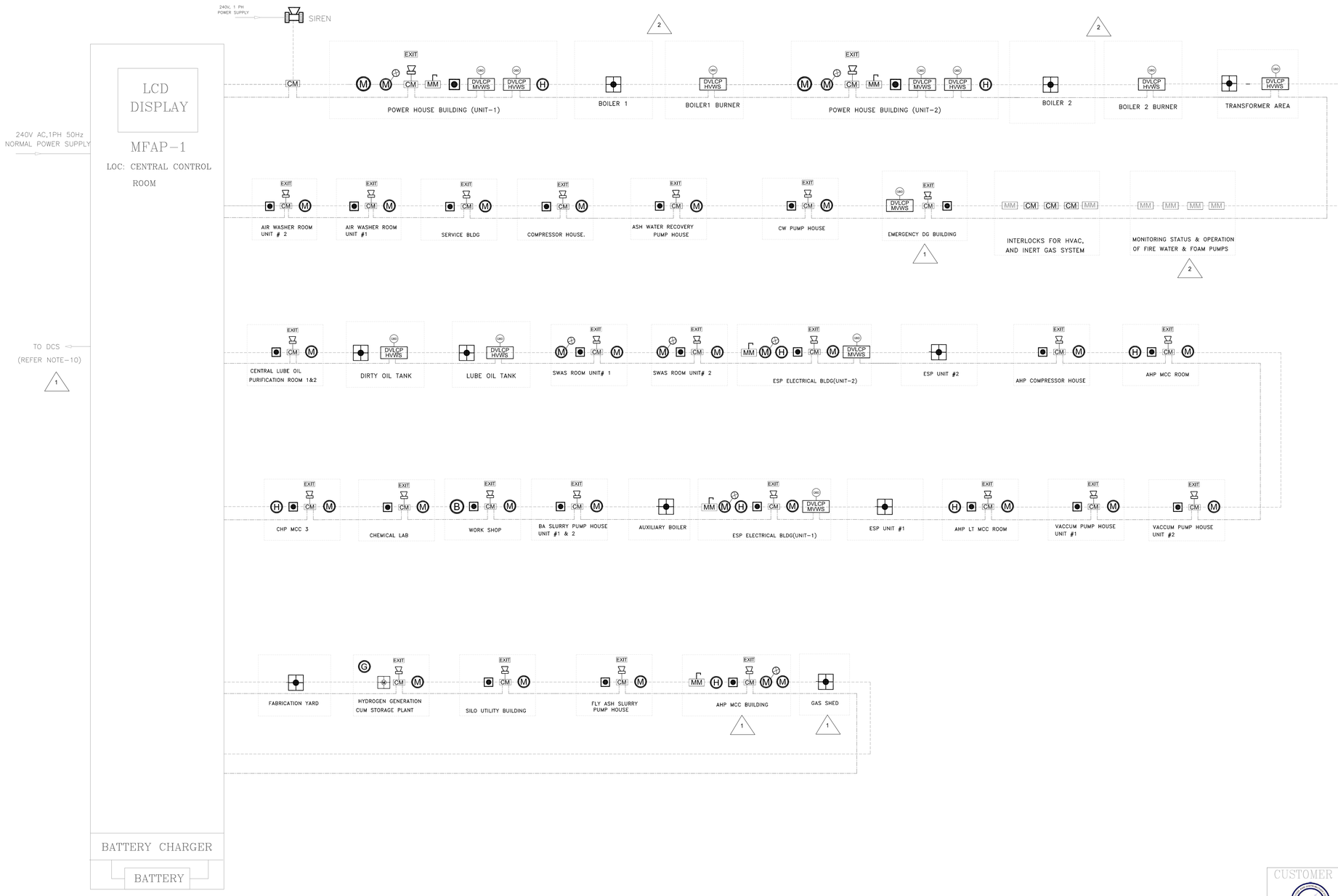
ANNEXURE – D

Schematic Diagram for Fire Detection & Alarm System

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. PY-FL-1-M109-8663-01 OF 03 SH. 01



INVENTORY NO	SIGN. AND DATE	REF. DRG. NO.	COMPUTER FILE NAME
			13831600253-S00-R00

REV.	DATE	ALTERED	CHD/APPD	ZONE
04	30.09.20	REVISED INLINE WITH CUSTOMER/CONSULTANT COMMENTS		
03	03.04.20	REVISED INLINE WITH CUSTOMER/CONSULTANT COMMENTS	ARAVIND PRASHANT	
02	31.08.19		ARAVIND PRASHANT	
01	02.05.19		ARAVIND PRASHANT	

JCS

CUSTOMER: TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION LIMITED,
TANGEDCO HEAD QUARTERS, 1ST FLOOR, NEW EB QTRS., 144,ANNASALAI, CHENNAI 600002.

CONSULTANT: TATA CONSULTING ENGINEERS LIMITED BENGALURU

PROJECT: 2X660MW UDANGUDI SUPERCRITICAL TPS, STAGE-I

	NAME	SIGN	DATE
DRN.	POORNIMA	-SD-	30.01.19
DESN.	ARAVIND	-SD-	30.01.19
CHD.	PRASHANT	-SD-	30.01.19
APPD.	PCS	-SD-	31.01.19

BHARAT HEAVY ELECTRICALS LTD.
R.C.PURAM HYDERABAD-32

BHEL - PESD HYDERABAD

TITLE : SCHEMATIC OF FIRE DETECTION & ALARM SYSTEM

UNIT : | SCALE : | BHEL DWG. NO. : PY-FL-1-M109-8663-01 | SHEET NO. 01 NO. OF SHEET 03 | REV. 04

240V AC,1PH 50Hz NORMAL POWER SUPPLY

LCD DISPLAY

MFAP–2

LOC: COAL HANDLING PLANT CONTROL ROOM

BATTERY CHARGER

BATTERY

CRUSHER HOUSE

COMPRESSOR HOUSE FOR DE SYSTEM

CANTEEN

FIRE STATION

CANTEEN AND DORMITORY

DISPENSARY

ADMIN BUILDING

CHP UTILITY BUILDING

COAL STORAGE AREA

DUST SUPPRESSION PUMP HOUSE

CHP MCC BUILDING–2

TRANSFER POINTS

INTERLOCKS FOR CONVEYOR TRIPPING

MAIN GATE & SECURITY OFFICE

SEA WATER OUTFALL STORAGE TANK PUMPHOUSE

SEA WATER INTAKE PUMP HOUSE

ELECTRO CHLORINATION BUILDING

PERMANENT STORES

ETP

STP

FUEL OIL PUMP HOUSE

FUEL OIL STORAGE TANKS HSD/HFO TANKS

DIESEL BUNK

FGD PLANT

DESALINATED WATER PUMP HOUSE

DESAL AND DM PLANT

CPU REGENERATION

COAL CONVEYOR

FOAM PUMP HOUSE

BOOSTER PUMP HOUSE

TO DCS (REFER NOTE–10)

LCD DISPLAY

MFAP–1

LOC: MAIN PLANT CENTRAL CONTROL ROOM–1

BATTERY CHARGER

BATTERY

RS–232/485

240V AC, UPS POWER SUPPLY

240V AC, UPS POWER SUPPLY

PRINTER

COLOUR MONITOR

CENTRAL CONTROL ROOM–1

NETWORK CABLE (OFC)

LCD DISPLAY

MFAP–2

LOC: CHP CONTROL ROOM

BATTERY CHARGER

BATTERY

LCD DISPLAY

REPEATER PANEL

LOC: SWITCHYARD CONTROL ROOM

BATTERY CHARGER

BATTERY

BY BHEL–TBG

LCD DISPLAY

REPEATER PANEL

LOC: FIRE STATION

BATTERY CHARGER

BATTERY

NETWORKING OF FIRE ALARM PANELS

REV.	DATE	ALTERED	CHD/APPD
04	30.09.20	REVISED INLINE WITH CUSTOMER/CONSULTANT COMMENTS	
03	03.04.20	REVISED INLINE WITH CUSTOMER/CONSULTANT COMMENTS	ARAVIND PRASHANT
02	31.08.19		ARAVIND PRASHANT
01	02.05.19		ARAVIND PRASHANT

JCS

CUSTOMER: TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION LIMITED, TANGEDCO HEAD QUARTERS, 1ST FLOOR, NEW EB QTRS., 144,ANNASALAI, CHENNAI 600002.

CONSULTANT: TATA CONSULTING ENGINEERS LIMITED BENGALURU

PROJECT: 2X660MW UDANGUDI SUPERCRITICAL TPS, STAGE–I

BHARAT HEAVY ELECTRICALS LTD. R.C.PURAM HYDERABAD–32

BHEL – PESD HYDERABAD

	NAME	SIGN	DATE
DRN.	POORNIMA	–SD–	30.01.19
DESN.	ARAVIND	–SD–	30.01.19
CHD.	PRASHANT	–SD–	30.01.19
APPD.	PCS	–SD–	31.01.19

TITLE : SCHEMATIC OF FIRE DETECTION & ALARM SYSTEM

UNIT :

SCALE :

BHEL DWG. NO. : PY–FL–1–M109–8663–01

SHEET NO. 02 NO. OF SHEET 03

REV. 04

NOTES:-

1. FIRE ALARM PANEL SHALL BE PROVIDED WITH 24 V SEALED MAINTENANCE FREE D.C BATTERY BACKUP, COMPRISING OF 2x100% CHARGERS AND 1x100% SMF BATTERIES AS PER OEM RECOMMENDATION.
2. FIRE ALARM PANELS SHALL HAVE A BATTERY BACK UP FOR 24 HRS NORMAL OPERATION AND 30 MIN. OF ALARM CONDITION.
3. ALL FIRE ALARM PANELS AND REPEATER PANELS SHALL BE WALL MOUNTED.
4. DELUGE VALVES ARE INTERFACED WITH THE FIRE ALARM SYSTEM THROUGH MODULES.
5. SIREN SHALL HAVE CAPACITY TO COVER 3 KM RANGE WITH SINGLE PHASE DESIGN.
6. FIRE ALARM PANELS SHALL BE PROVIDED WITH NECESSARY CONTACTS / INTERFACING MODULES FOR INITIATING REQUIRED ALARM / OPERATION OF DELUGE VALVE AND TRIPPING OF HVAC, PACKAGE AIR CONDITIONER, CONVEYOR MOTOR, INERT GAS EXTINGUISHING SYSTEM, ETC.
7. THE NUMBER OF LOOPS AND DEVICES/DETECTORS CONNECTED TO THE FIRE ALARM PANEL ARE INDICATIVE ONLY. ACTUAL DETAILS OF BUILDINGS COVERED BY EACH FIRE ALARM PANEL SHALL BE FURNISHED DURING DETAIL ENGINEERING
8. SPACING OF DETECTORS AND MANUAL CALL POINTS SHALL BE AS PER CL.NO.6 OF IS 2189. △1
9. OPERATOR WORKSTATION AND PRINTER SHALL BE OF THE FOLLOWING CONFIGURATION:-
   (a) 24" LED MONITOR
   (b) I5 PROCESSOR OR EQUIVALENT
   (c) ONE 4 GB RAM
   (d) ONE 500 GB HARD DISK
   (e) ONE DVD(RW) DRIVE
   (f) TWO NOS. OF USB PORTS
   (g) BLACK & WHITE LASER PRINTER (A4 SIZE), QWERTY KEYBOARD AND OPTICAL MOUSE
10. THE FOLLOWING SIGNALS SHALL BE TAKEN FROM MAIN FIRE ALARM PANEL TO DCS:-
   (a) SYSTEM HEALTHY
   (b) SYSTEM FAULT
   (c) SYSTEM UNDER FIRE
11. IN COAL CONVEYORS DIGITAL LHS CABLE SHALL BE LAID IN STRAIGHT FASHION (3 RUNS SHALL BE PROVIDED- ONE FOR TOP CONVEYOR CENTER AND TWO RUNS EACH ONE EITHER SIDE OF THE BOTTOM CONVEYORS. FOR CABLE GALLERIES LHS CABLE SHALL BE LAID IN ZIG-ZAG FASHION IN EACH OF THE TOP TRAY, BOTTOM TRAY AND ALTERNATE TRAY ON THE CENTER OF CABLE TRAY.
12. EACH COAL CONVEYOR SHALL BE PROVIDED WITH 3 INFRARED DETECTORS. (ONE DETECTOR EACH AT A DISTANCE OF 1-2M FROM TAIL END, HEAD END & AT MIDDLE.)
13. FIRE ALARM CABLES SHALL BE AS FOLLOWS:
    LOOP CABLE : 1P x 1.5 SQ.MM COPPER CONDUCTOR, PVC/FRLS PVC LOOP CABLE, ARMOURED, TWISTED, OVERALL SHIELDED.
    POWER CABLE : 2C x 2.5 SQ.MM COPPER CONDUCTOR XLPE INSULATED PVC INNERSHEATH, FRLS, PVC OUTERSHEATH, ARMORED CABLE.
14. FIRE ALARM PANEL IN SWITCHYARD AREA SHALL BE SUPPLIED BY BHEL-TBG. INTERCONNECTION OF THIS PANEL IN THE RING ALONG WITH CABLE SHALL BE IN THE SCOPE OF BHEL-TBG. PLEASE REFER △3 "SCHEMATIC OF FIRE DETECTION SYSTEM (Doc. No: TB-400-552-126-03)"
15. GAS DETECTION SYSTEM SHALL BE PROVIDED BY OUR SISTER UNIT BHEL-PEM. FOR DETAILS, PL REFER THE DOCUMENT "DESIGN MEMORANDUM FOR DESIGN PHILOSOPHY OF HYDROGEN PLANT ALONG WITH SINGLE LINE FLOW DIAGRAM" -DRG NO: PE-DC-435-168-A001. AS GAS DETECTION SYSTEM & FIRE DETECTION SYSTEM ARE TWO INDEPENDENT SYSTEMS, THERE IS NO INTERFACE BETWEEN FIRE DETECTION SYSTEM & GAS DETECTION SYSTEM. △2
16. EXIT SIGNS SHALL BE SELF-ILLUMINATING TYPE. △4
17. CONVEYORS SHALL COVER ALL THE CONVEYORS I.E, BCN-1A/B, BCN-2A/B, BCN-3A/B, BCN-4, BCN-5A/B, BCN-6, BCN-7A/B, BCN-8, BCN-9A/B, BCN-10A/B, BCN-11A/B, BCN-12A/B, BCN-13A/B, BCN-14A/B, BCN-15A/B & BCN-16A/B AS PER CONTRACT. △4

LEGEND:-

SL NO	SYMBOL	DESCRIPTION
1	----------	POWER CABLE (2Cx2.5 SQMM)
2	- - - - - - -	LOOP CABLE (2Cx1.5 SQMM)
3	– – –	NETWORK CABLE / OPTICAL FIBER CABLE
4		DIGITAL LHS CABLE
5		HOOTER CUM STROBE
6	CM	CONTROL MODULE
7	MM	MONITOR MODULE
8	EXIT	SELF-ILLUMINATING EXIT SIGN BOARD
9	B	BEAM DETECTOR
10		MULTISENSOR DETECTOR WITH RESPONSE INDICATOR (ABOVE FALSE CEILING & BELOW FALSE FLOORING)
11	M	MULTISENSOR DETECTOR
12	IR	INFRA RED DETECTOR
13	H	HEAT DETECTOR
14	BC-1,2	BATTERY CHARGER
15	DVLCP	DELUGE VALVE LOCAL CONTROL PANEL
16		SIREN
17	MFAP	MAIN FIRE ALARM PANEL
18	RP	REPEATER PANEL
19		MANUAL CALL POINT (INDOOR)
20		MANUAL CALL POINT (OUTDOOR)
21		MANUAL CALL POINT (FLAMEPROOF)
22	G	GAS DETECTOR (BY PEM)

△1 △2

REV.	DATE	ALTERED	CHD/APPD
04	30.09.20	REVISED INLINE WITH CUSTOMER/CONSULTANT COMMENTS	CHD/APPD
03	03.04.20	REVISED INLINE WITH CUSTOMER/CONSULTANT COMMENTS	ARAVIND PRASHANT
02	31.08.19		ARAVIND PRASHANT
01	02.05.19		ARAVIND PRASHANT

CUSTOMER: TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION LIMITED, TANGEDCO HEAD QUARTERS, 1ST FLOOR, NEW EB QTRS., 144,ANNASALAI, CHENNAI 600002.

CONSULTANT: TATA CONSULTING ENGINEERS LIMITED BENGALURU

PROJECT: 2X660MW UDANGUDI SUPERCRITICAL TPS, STAGE-I

	NAME	SIGN	DATE
DRN.	POORNIMA	-SD-	30.01.19
DESN.	ARAVIND	-SD-	30.01.19
CHD.	PRASHANT	-SD-	30.01.19
APPD.	PCS	-SD-	31.01.19

BHARAT HEAVY ELECTRICALS LTD.
R.C.PURAM HYDERABAD-32

BHEL - PESD HYDERABAD

TITLE : SCHEMATIC OF FIRE DETECTION & ALARM SYSTEM

UNIT : | SCALE : | BHEL DWG. NO. : PY-FL-1-M109-8663-01 | SHEET NO. 03 | NO. OF SHEET 03 | REV. 04

JCS

ANNEXURE – E

Pre Bid Query Format

BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING & SYSTEMS DIVISION

PROJECT: - 2 x 660MW Udangudi STPP

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ANNEXURE-E

PREBID QUERIES FORMAT					
Sl. No.	**Bidding document Reference**			**Subject**	**Bidder's Query**
	Spec/Annexure	**Page No**	**Clause No**		

ANNEXURE – F

Master Document Schedule

Master Document Schedule

Annexure-F of PY51842

Project: 2 x 660MW Udangudi STPP

S. NO	Drawing / Document Name	VENDOR Drg/ Document No	Category (A/I)	Schedule of submission from P.O. Date	First Submission (Rev -00)			Current Revision			Current Status (Approved / commented)	BHEL APPD CATEGORY
					Rev No	Actual Date of Submission	Return Date	Rev No	Actual Date of Submission	Return Date		
A.	**Project Execution Plan**											
1	Project Organization Chart		I	2 WEEKS								
2	Project Schedule		A	2 WEEKS								
3	Document Schedule & Control Register		A	2 WEEKS								
4	Quality Plan		A	2 WEEKS								
5	Billing Schedule		A	2 WEEKS								
6	Sub-vendor List		A	2 WEEKS								
7	Progress report monthlywise		I	2 WEEKS								
B.	**Design Output documents**											
1	Project Overview		I	2 WEEKS								
2	Operation write up of FDA & LHS System		I	2 WEEKS								
3	FDA Block Diagram (Field + Network + Loops)		A	2 WEEKS								
4	Complete Bill of Material		A	2 WEEKS								
5	Boughtout Items List		I	2 WEEKS								
6	Power Consumption & Heat Load Calculation		I	2 WEEKS								
7	Power Distribution Diagram		A	2 WEEKS								
8	System Grounding Diagram		A	2 WEEKS								
9	Detailed GA drawings		A	2 WEEKS								
10	Software Deisgn Manual		A	3 WEEKS								
11	Software Licenses		I	2 WEEKS								
12	FAT procedures		I	2 WEEKS								
13	SAT procedures		I	2 WEEKS								

	Master Document Schedule	Annexure-F of PY51842
	Project: 2 x 660MW Udangudi STPP	

S. NO	Drawing / Document Name	VENDOR Drg/ Document No	Category (A/I)	Schedule of submission from P.O. Date	First Submission (Rev -00)			Current Revision			Current Status (Approved / commented)	BHEL APPD CATEGORY
					Rev No	Actual Date of Submission	Return Date	Rev No	Actual Date of Submission	Return Date		
14	Logic diagram (If any)		I	8 WEEKS								
15	Cable Schedule with in vendor scope of items		I	10 WEEKS								
	Data Sheets											
1	Technical Datasheet of Fire Alarm Control Panel		A	2 WEEKS								
2	Technical Datasheet of Repeater Panel		A	2 WEEKS								
3	Technical Datasheet of Multisensor Detector with detector base		A	2 WEEKS								
4	Technical Datasheet of Heat Detectors with detector base		A	2 WEEKS								
5	Technical Datasheet of Probe Detectors (ROR type) for Fuel tanks with Flameproof Junction box		A	2 WEEKS								
6	Technical Datasheet of Beam Detector		A	2 WEEKS								
7	Technical Datasheet of IR Ember Detector with Air purge Unit		A	2 WEEKS								
8	Technical Datasheet of Manual Call Point (Indoor, Outdoor & Flame Proof)		A	2 WEEKS								
9	Technical Datasheet of Hooter cum strobe		A	2 WEEKS								
10	Technical Datasheet of Monitor Module		A	2 WEEKS								
11	Technical Datasheet of Control module		A	2 WEEKS								
12	Technical Datasheet of Isolator module		A	2 WEEKS								
13	Technical Datasheet of Response Indicator		A	2 WEEKS								
14	Technical Datasheet of Digital LHS Controller		A	2 WEEKS								
15	Technical Datasheet of Digital LHS Cables (For Cable galleries , Coal Conveyors)		A	2 WEEKS								
16	Technical Datasheet of Exit Sign (Self illuminating)		A	2 WEEKS								

	Master Document Schedule	Annexure-F of PY51842
	Project: 2 x 660MW Udangudi STPP	

S. NO	Drawing / Document Name	VENDOR Drg/ Document No	Category (A/I)	Schedule of submission from P.O. Date	First Submission (Rev -00)			Current Revision			Current Status (Approved / commented)	BHEL APPD CATEGORY
					Rev No	Actual Date of Submission	Return Date	Rev No	Actual Date of Submission	Return Date		
17	Technical Datasheet of Siren with Siren Control Panel		A	2 WEEKS								
18	Technical Datasheet of Hooter cum Strobe		A	2 WEEKS								
19	Technical Datasheet of Graphics Software		A	2 WEEKS								
20	Technical Datasheet of Work Station		A	2 WEEKS								
21	Technical Datasheet of Printer		A	2 WEEKS								
22	Technical Datasheet of Laptop		A	2 WEEKS								
23	Technical Datasheet of Mini- UPS		A	2 WEEKS								
24	Technical Datasheet of Furniture		A	2 WEEKS								
25	Technical Datasheet of Optical Fibre Cable		A	2 WEEKS								
26	Technical Datasheet of 24V DC Power Supply Modules with Battery-Back UP		A	2 WEEKS								
27	Technical Datasheet of End of Line Resistance with Terminal Box		A	2 WEEKS								
28	Technical Datasheet of LHS Cable Jointing Box		A	2 WEEKS								
29	Technical Datasheet of Junction box for Terminating MICC Cable of Size 2PX2.5 Sq MM		A	2 WEEKS								

	Master Document Schedule	Annexure-F of PY51842
	Project: 2 x 660MW Udangudi STPP	

S. NO	Drawing / Document Name	VENDOR Drg/ Document No	Category (A/I)	Schedule of submission from P.O. Date	First Submission (Rev -00)			Current Revision			Current Status (Approved / commented)	BHEL APPD CATEGORY
					Rev No	Actual Date of Submission	Return Date	Rev No	Actual Date of Submission	Return Date		
D.	**ERECTION**											
1	Typical Connection ,GA & Wiring Diagram of Fire alarm system		I	3 WEEKS								
2	Installation diagram for Fire alarm componenets		I	3 WEEKS								
3	Fire Alarm networking details (Interconnection between FAP & RP)		I	3 WEEKS								
4	Battery Sizing Calculation		I	3 WEEKS								
5	Electrical Load List		I	3 WEEKS								
6	Installation manual & Erection procedures		I	3 WEEKS								
7	Fire Alarm And Detection Operating Manual		A	3 WEEKS								
8	Billing Break up		A	3 WEEKS								
9	Certificates(Factory tests, calibration reports, statutory approval certificates)		I	3 WEEKS								
10	Packing procedure + Packing list		I	3 WEEKS								
11	Erection drawings		I	3 WEEKS								
12	Field quality plans		I	3 WEEKS								
13	Commissioning procedure		I	3 WEEKS								

ANNEXURE – G

Vendor List

ANNEXURE - G

SUB – VENDOR LIST

Sl. No.	Vendor Name	Remarks
1.		
2.		
3.		
4.	-- NIL --	
5.		
6.		
7.		

NOTE: -

1. Bidder to comply with sub-vendor list as listed above. The sub-vendors for any item that is not appearing in the above list shall be proposed for BHEL's approval.

2. Non-acceptance of any proposed sub-vendor by bidder shall not have any commercial implication. While submitting sub-vendors for approval of BHEL, bidder shall furnish following documents:
   a) UL / FM / Vds / LPCB / CE etc. certificates of Sub-vendors
   b) Proven track record (references for makes and models supplied in the last 3 years along with supporting documents like unpriced PO, customer approved datasheets, proof of supply).

ANNEXURE – H

Quality Requirements

QAP GUIDELINES & FORMAT

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(ANNEXURE -)

The QAP format and guidelines for filling up the format shall be used by vendor for preparation and submission of QAP after order placement.

Note :

1. Typical /Indicative /Standard QAP(s) for equipment /package attached is reference document and to use by successful bidder in future for preparation and submission of QAP for BHEL /CUSTOMER approval.

2. No deviation to reference document is acceptable.

GUIDELINES TO VENDORS FOR PREPARATION OF QUALITY ASSURANCE PLAN

1. QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10.

2. Each page of QAP shall contain the following information.
   a) Vendor's name & address.
   b) Customer: BHEL, Hyderabad.
   c) Project.
   d) BHEL Product Standard Number/revision number as referred in P.O.
   e) BHEL Purchase Order Number & Date.
   f) Product as per P.O. description.
   g) QAP Number (unique and shall not repeat)/revision number/date.
   h) Page number and number of pages

3. QAP shall contain four parts / stages as follows.
   a) Raw materials and bought out items.
   b) In process Control / Inspection.
   c) Final assembly, Inspection & Testing.
   d) Painting, preservation & packing.

4. Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc).

5. Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT,DP etc.), hydrostatic test, calibration check etc.)

6. Under 'Class', indicate minor, major or critical depending on the importance of characteristic.

7. Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.)

8. Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.)

9. Under 'Reference document' and 'Acceptance norms', appropriate National & International standards, BHEL standards, approved drawing references etc. should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practice etc.". If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review & approval by our Engineering dept.

10. Under 'Format of record', indicate appropriately supplier's test certificate, calibration certificate, lab report, inspection report etc.

11. Please refer 'Agency' in QAP format.
    Under P: Perform, W: Witness, V: Verify
    Indicate against each characteristic 1: (BHEL CQS/Nominated inspection agency), OR
    2: (Vendor / Sub vendor)

Note: Performing agency is normally vendor or his sub vendor (Legend 2). Where witness points are indicated in specification, P.O., Drawing etc., for such operations, under Witness (W) column use 1. Under 'Verify' column, use code1.

12. Under ‘D’ please put (□ Tick) against each characteristic where vendor proposes to submit test certificate/report etc. OR as required as per BHEL Specification.

13. Vendor’s signature & stamp should be available on each page of QAP.

14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only inline and relevant to the Specification & Approved Drawings.

15. The following operations/characteristics/check points may be included (AS APPROPRIATE)
   a) Visual check
   b) Dimensional check
   c) Mechanical and Chemical properties.
   d) Surface preparation before painting (by chemical cleaning, sand blasting, shot blasting etc. as the case may be.)
   e) Painting check for shade, Dry Film Thickness (DFT), Adhesion/ peel off test etc.
   f) Check for correctness for all components mounted as per General arrangement Drawing, Bill Of Materials (BOM), etc. for range, rating, make, color, size, location as per GA, quantity, label description including tag nos., annunciator facia, loose components, accessories, spares etc.
   g) Verification of test certificate for protection class for the enclosures.
   h) Mechanical functioning of switches.
   i) Continuity of earthing and provision of earth points.
   j) Colour coding of wiring, size, tightness & dressing of wiring.
   k) Review of test certificates of assembled items, raw materials, internal test reports etc.
   l) Witness of functional checks, which may include mechanical run & electrical run, H.V.test, IR measurement, Electrical and Mechanical tests etc.
   m) PQR, WPS, Welder Qualification Record, welding records (fit up, DP) etc.
   n) Material identification (for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc.)
   o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non Destructive Tests.
   p) Tests on Galvanised items (Visual, Hammer Test, Knife Test, Thickness, Pierce Test (Copper sulphate test), Hydrogen evaluation test, Stripping test (for Mass of Zinc coating)
   q) All tests as per BHEL Product Standard & approved drawings including Type tests and Routine tests on individual items and on System as a whole.
   r) For loose items test certificate or COC is required.
   s) Packing and Preservation.
16. **QAP Format enclosed.**
17. **Typical Manufacturing QAP is attached.**

VENDOR'S NAME & ADDRESS:	**MANUFACTURING QUALITY PLAN**		QP. NO.:	
	CUSTOMER: BHEL, HYDERABAD – 32. PROJECT: PRODUCT:	BHEL P.O.NO.: P.O.DATE: BHEL SPEC: REV:	REV NO:	DATE:
			PAGE 1 OF 1	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
									D	P	W	V	
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
2.0	**INPROCESS INSPECTION**												
3.0	**FINAL INSPECTION & TESTING**												
4.0	**PRESERVATION & PACKING**												

VENDOR TO NOTE: THIS FORMAT IS IN MICROSOFT WORD. HEADER & FOOTER SHALL BE AVAILABLE IN EACH PAGE OF QP. QP SHALL BE IN LANDSCAPE & A4 SIZE ONLY. FONT SIZE SHALL BE MIN 10. VENDOR SHALL SIGN & STAMP IN EACH PAGE OF QP. LOI REF. & DATE ARE NOT ACCEPTABLE. P.O.NO. & DATE SHALL BE INDICATED. QP NO. SHOULD BE UNIQUE AND SHALL NOT REPEAT. ALL THE TESTS / CHECKS INDICATED IN THE BHEL SPEC. SHALL BE INDICATED IN THE QP.

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.	PREPARED BY VENDOR'S SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP

ANNEXURE – I

Checklist

ANNEXURE - I

CHECK LIST FOR OFFER SUBMISSION

SL No	Description	Bidder's Confirmation
1	Technical offer complies with the specifications and its associated annexures, pre-bid clarifications in Toto and there are no technical deviations. Signed and stamped copy of this specification along with annexures enclosed along with technical offer.	
2	Bidder to submit the No Deviation letter w.r.t. BHEL spec: PY51842, Rev-00 along with offer.	
3	Bidder to quote as per BHEL price format only. No other format is acceptable. Bidder to attach un-priced price bid format by indicating "QUOTED" against each item and submit with technical offer duly signed & stamped.	
4	Bidder to submit Pre-Qualification criteria along with necessary docments like: 1) Unpriced Purchase Order copy 2) Commissioning Certificate / Job Completion Certificate / Performance Certificate from End Customer 3) Customer Approved Documents like Datasheets etc.	
5	All items are manufactured conforming to latest version of material grade standard and manufacturing standard mentioned in this specifications	
6	For addition/reduction of quantity, unit rate quoted in the present offer shall be considered during ordering and shall be valid up to execution of the contract to the extent of ± 10% of order Value.	
7	In case of deviation, vendor to confirm that these are technically not feasible deviations and same are submitted in BHEL format. In case technically feasible deviations are proposed by the bidder and subsequently withdrawn, no commercial implications can be claimed by the bidder	
8	It shall be bidder's responsibility to get all his queries and deviations addressed by the purchaser during the pre-bid stage itself. No queries / deviations shall be acccepted by purchaser from the bidder after the closure of pre-bid.	
9	Vendor shall supply all the material to meet the performance, sizing & technical requirement as per specification & its Annexures, scope matrix etc.	
10	Confirm that the quote includes training, commissioning spares, special tool & tackles, erection & mounting hardware/ accessories, terminations, networking components, dongle etc. as required for erection & commissioning activities.	
11	Bidder to confirm that supply of software and hardware as required for complete functioning and maintenance of the system shall be in the scope of the bidder.	
12	All the equipments / items / sensors / detectors etc., supplied by bidder are having valid statutory approval certificates and same will be produced at any stage of contract execution to BHEL. The same were eligible to take local statutory regulatory body approval during commissioning of the system	

BIDDER'S SIGNATURE:
NAME:
DATE:
COMPANY SEAL:

ANNEXURE – J

Deviation Format

ANNEXURE - J

LIST OF DEVIATIONS

Project: FDA SYSTEM FOR 2 x 660 MW UDANGUDI STPP

Sl. No.	Part No./ Volume	Page no.	Clause No.	Subject	Deviation/Clarification	Reason for Deviation
1						
2						
3						
4						
5						
6						

NOTES:

1. Deviations, if any, shall be clearly brought out only in this format. Deviations mentioned / taken elsewhere or in any other format will be ignored.
2. Additional sheets in the same format can be attached by the vendor, if necessary.
3. Nature of Deviations shall only be of Design / Manufacturing constraints and non-availability of items / components / makes in market.
4. No price implications shall be entertained for deviations withdrawn during the technical scrutiny. If any deviations are accepted by BHEL during technical scrutiny then also there will be no price implication. Hence, in no case there will be consideration of Price implications.
5. Reasons for the deviations shall be specified in the Remarks column.
6. If there are no deviations from the specifications, bidder still has to submit the signed copy of this format by writing "NO Deviations" on this format.
7. If the "Deviation Schedule" is not submitted along with the offer, the bidder's offer is likely to be rejected without any further interaction with the bidder. Only the accepted deviations in conjunction with the original tender shall constitute the contract document for the award of job to the bidder.
8. Technical offer of the bidder will be evaluated only on the basis of Deviation Schedule. Deviation Schedule constitutes this sheet (with these Notes) duly signed and stamped.

SIGNATURE OF THE BIDDER_____

NAME_____

DESIGNATION_____

COMPANY SEAL DATE_____

ANNEXURE – K

Specification for Fibre Optic Cable

overall screening along with drain wire and analogue signal carrying cables shall have each pair screening and overall screening along with each pair drain wire and overall drain wire. Colour coding for the identification of pairs shall be as per BS-5308 Part-2.

3.0.0 CONTROL CABLES

Control cables shall be 1100V AC grade, multicore, minimum 1.0 sq.mm cross section, stranded copper conductor having 7 strands, PVC insulated, inner PVC sheathed of type ST-1, galvanized steel wire armoured and outer sheath made of FRLS PVC compound of type ST-1. In situations where accuracy of measurement or voltage drop in control circuit, warrant, higher cross sections as required shall be used. Colour coding for the identification of pairs shall be as per BS-5308 Part-2.

4.0.0 FIBRE OPTIC CABLES

Mono mode type fibre optic cable with following parameters shall be provided.

- Cable Type: Mono-mode with minimum 4 fibres
- Wavelength band optimized : 850nm / 1300nm / 1550nm
- Mode field diameter : 9-10µm $\pm$ 10% of nominal value
- Cladding diameter : 125µm $\pm$ 3
- Non-concentricity core/cladding : not more than 2µm
- Non-circularity of cladding : not more than 3µm
- Cut-off wavelength : 1200nm
- Attenuation : less than 0.3-0.4 dB/km at 1300nm
  less than 0.15-0.25 dB/km at 1550nm

Multi mode type fibre optic cable with following parameters shall be provided.

- Cable Type: Multi-mode with minimum 4 fibres
- Core / cladding diameter: 62.5 / 125 µm
- Jacketing Material: Halogen Free, Flame Retardant, Low Toxicity
- Attenuation @ 850 nm: Length (m) x 0.0035 db/m+2db maximum
- Outside Diameter: 8.10 mm (0.324 in)
- Minimum Bend Radius: 12.5 cm (5 in)
- Minimum Bend Radius (Long term): 7.5 cm (3 in)
- Cable Assembly: Tensile Load for attenuation increase <0.5 db: 300 N (66 lb) maximum
- Tensile Load at Installation: 1776 N (400 lb) max.
- Connector Tensile Load MIC : 133 N (30lb)
- Minimum Crush Resistance: 46 N /cm (250 lb /in)
- Maximum Cable Weight : 46 kg/1 km (31 lb/1000ft)
- Maximum Cable length: 2 km (6560 ft)

HDPE insulation shall be suitable for continuous conductor temperature of 85^{o}C. The insulation material shall be resistant to oil, acid and alkali and shall be tough enough to withstand mechanical stresses during handling.

The cables shall have HDPE primary insulation suitable for FRLS. Inner and outer jacket shall be made of extruded flame retardant HDPE.

The cables shall be armoured. Armour shall be of galvanised steel wire / flat as per IS 3975.

The cables shall be protected against termite and rodent attack. Necessary chemicals shall be added into the compound of the outer sheath.

The material used in the construction of fibre optic cables shall be compatible with the properties of the cables and shall be in accordance with the relevant IS and IEC standards as stated above.

5.0.0 Design requirements

All cables shall be suitable for laying on racks, in ducts, trenches with chances of flooding by water and shall also be suitable for directly buried installation. All the cables shall be FRLS type designed to withstand mechanical, electrical and thermal stresses developed under steady state and transient operating conditions.

The cables shall be capable of operating satisfactorily under the power supply and frequency variations, high ambient, high humid tropical climatic conditions as specified in project information.

The cables are proposed to be laid in multi-tier overhead cable racks, in concrete cable trenches. Derating factors for grouping and ambient temperature shall be furnished by successful bidder along with filled up datasheets during contract engineering stage.

PVC insulation shall be suitable for continuous conductor temperature of 85^{o}C and short circuit conductor temperature of 160 ^{o}C. The insulation material shall be resistant to oil, acid and alkali and shall be tough enough to withstand mechanical stresses during handling.

All the cables shall be protected against termite and rodent attack. Necessary chemicals shall be added into the PVC compound of the outer sheath.

All cables shall have PVC primary insulation as per IS 5831 Type C / IEC 502 suitable for FRLS. Inner and outer jacket shall be made of extruded flame retardant 90^{o}C PVC to IS 5831 Type ST2 / IEC 502. Oxygen Index of PVC shall be over 29% and temperature index shall be over 250^{o}C.

The cable cores shall be laid up with fillers between the cores wherever necessary. All the cables shall have distinct extruded PVC inner sheath.

The cables shall be armoured. Armour over inner jacket shall be of galvanised steel wire / flat as per IS 3975.

All the cores of single pair or multipair shall be twisted and twists shall not be less than 20 per metre.

The outer sheath for analog and digital cables the colour shall be light blue and black respectively.

Running length of cable shall be printed atleast every 5m interval. For multipair cables, pair identification shall be provided with numbers at interval of not more than 250mm or as per vendor's standard.

6.0.0 Construction

The insulation shall be applied directly over the conductor by extrusion method. in such a way that it fits closely on the conductor and it shall be possible to remove it easily without damage to the conductor. Two cores shall be twisted to form a pair and four such pairs shall be twisted together to form a unit.

Every pair shall be twisted with a lay of 40 to 50 mm and to be wrapped with polyester tape. Individual pair screening with edges frees poly aluminium tape with continuous drain wire of minimum overlap of 30%.

ANNEXURE – L

Specification for PC & Printer

S.NO.	FEATURES	QUALIFYING MINIMUM REQUIREMENTS
9.	Mouse	Optical mouse
10.	Form Factor	5 U with option for rack mountable kit
11.	Ethernet	1GB 10 / 100 / 1000 with Ethernet controller
12.	Slots and Bays	2 Full size PCI – Express X 4 / 8, 2 full size 64 bit / 100 Mhz, 1 full size 64 bit 133 Mhz, 1 full size 64 bit 66 Mhz , total 6 PCI slots , 6 Hot swap HDD bays
13.	Operating system	(For data base server) Windows Latest server software or Linux Enterprise edition.(For web server) Windows Latest server, Linux Enterprise edition.
14.	Security	Mechanical side panel key lock (locks hot-swap disks on hot-swap models) / optional U-bolt support via knock out / power on password / boot sequence control / operation without keyboard and mouse
15.	RAID support	RAID 5 Support
16.	Compliances	For OEM: ISO 9001:2000, 14001
17.	Redundant Power supply	Hot swap redundant
18.	Warranty	3 yrs comprehensive on site, backed by manufacturers support, with OEM certified spare parts.
19	Preferable Make	HP/DELL /IBM

For all PC's, general MS Windows latest, MS Office, MS Visual studio, Adobe Acrobat, Antivirus (Professional) software shall be included in all the PC's including the application software to suit the project specific requirement.

4. MONITOR

01.	Type	:	LED Monitor
02.	Sync.	:	Multisync.
03.	Screen diagonal	:	24" flat
04.	Display	:	Super Video Graphic Array
05.	Resolution	:	1600 x 1200
06.	Degree of protection	:	IP-30
07.	Brightness	:	300cd/m^2
08.	Contrast	:	800: 1
09.	External Controls	:	Brightness, contrast, Horizontal / Vertical amplification & shift
10.	Power supply	:	240 V, 50 Hz, 1 phase
11.	Ambient temperature	:	0-50 ^{O} C
12.	Humidity	:	95% non-condensing.
13.	Version	:	To suit industrial application.

5. KEY BOARD

01. Type	:	Flat, spill proof membrane type or positive depression type.
02. Different keys	:	a) Soft and user defined function keys for software/ programming including text correction, scan rate alteration, zooming/ flashing color selection etc. b) Panel select keys for alarm summary, control loop display, overview, trend, graphic, operator guide message etc. c) Standard Alphanumeric keys d) Alarm acknowledge keys e) Cursor keys f) Mode loop mode / loop status switching keys g) Multiple loop setting change keys h) Print-out command keys i) Other keys as required to operate the system j) Multiple loop output change keys k) Soft and user defined function keys for process mimics
03. Key lock	:	Lockable type push button mounted on keyboard
04. Life Expectancy	:	50 million cycles per key
05. Version	:	To suit industrial application

6. PERSONAL COMPUTERS (MIS AND OTHER SYSTEM) PLANT WIDE NETWORK

01. CPU	:	Latest intel 17 processor
02 Type	:	Tower
03 Main Memory	:	4 GB DDR @ 800 MHz expandable to 8GB / higher
04 Drives	:	DVR – RW
05 Hard Disk	:	500 GB SATA or solid drive 256 GB or higher
06 Monitor	:	24” LED type for MIS Stations 21” LED type for LAN
07 Communication port	:	2 serial plus one parallel, 4 USB
08 Expansion slot	:	5
09 Connectivity	:	Ethernet LAN
10 Operating system	:	Latest windows software (64 bit)
11 Softwares	:	Latest version of MS office, (profession) Client’s Software and other softwares as required
12 Features	:	101 keys keyboard and mouse
13 Accessories	:	Furniture’s, Mouse pad
14. Preferable Make	:	HP/DELL /IBM-Lenova

7. LASER PRINTER

01. Type	:	Electro-photographic laser, tabletop / latest
02. Printer Memory	:	256 MB (min.)
03. Speed	:	Monochrome 24 ppm - A4 Color 20 ppm - A4
04. Resolution	:	1200 x 1200 DPI in color
05. No. of color (Basic)	:	4 (four) minimum
06. Duty cycle	:	Monochrome 75000 pages / month
07. Power supply	:	240 V, 50 Hz, 1 phase
08. Ambient temperature	:	0-50° C
09. Humidity	:	95% non-condensing.

10. Size of paper	:	Letter, A4 (25 Reams of paper), Legal, Ledger, A3 (20 Reams of paper)
11. Print media	:	Plain paper, transparencies, thick stock, glossy stock, envelopes
12. Accessories	:	i) Adapters ii) Connector Cable iii) Multiplexer switch (4 point)

8. DOT MATRIX PRINTER (LATEST MODEL)

01. No. of Needles	:	24 Pin
02. Printing speed	:	300 characters per second (approx.)
03. Character dimension	:	9 x 8
04. Buffer	:	80 KB (Min)
05. Local memory	:	RAM with battery backup
06. Interface	:	Serial / parallel / USB for High speed
07. Power supply	:	240 V, 50 Hz, 1 phase
08. Ambient temperature	:	0-50 ^{O} C
09. Humidity	:	95% non-condensing.
10. Size of paper	:	Fanfold, A4, A3
11. Character sets	:	ASCII, IBM (Sets 1 & 2), Italics, user defined
12. Transfer distance	:	200 Mtrs. (minimum)
13. Print features	:	Graphic printout, emphasized, double width, underlined, subscript, superscript, double strike, backspace, margin etc.
14. Reliability	:	MTBF more than 8000 Hrs.
15. Noise level	:	Less than 60 dBA
16. Ribbon life	:	2 million characters
17. Diagnostics	:	Self diagnostic. LED error code display, Audio alarm – paper exhausted
18. No. of copies	:	Minimum Original plus 3 (three)
19. Accessories	:	i) Ribbon ii) Printer stand iii) Table top receiving tray iv) Interface cable v) Paper tear box. vi) 20 Reams of 132 column computer sheets and 10 Reams of 80 column computer sheets

9. DIGITAL NETWORK PRINTER WITH COPIER

01. Type	:	Laser, tabletop / latest
02. Printer Memory	:	256 MB (min.)
03. Speed	:	Monochrome 20 ppm - A4 10 ppm – A3
04. Resolution	:	600 x 600 DPI
05. No. of color (Basic)	:	Monochrome
06. Duty cycle	:	Monochrome more than 75000 pages / month
07. Power supply	:	240 V, 50 Hz, 1 phase
08. Ambient temperature	:	0-50° C
09. Humidity	:	95% non-condensing.
10. Size of paper	:	Paper weight of 45 to 165 g/M^2
11. Networking Capability	:	USB / Ethernet
12. Coping	:	Max Original Size – A3, Continuous Coping (1-999)
12. Accessories	:	i) Adapters ii) Connector Cable iii) Duplex Unit.

ANNEXURE – M

Specification for 24 V DC Power Supply Modules with Battery Back Up

Specification for Power Supply Modules (SMPS with Battery)

1. SCOPE

This technical specification covers the Design, Engineering, Manufacturing, Assembly, testing at vendor works, inspection by purchaser, packing and transportation to site with necessary documentation like data sheets, statutory approvals, O&M manuals etc., as required for Power supply modules.

2. SCOPE of SUPPLY – As per enquiry

3. INSTRUCTIONS TO BIDDERS

3.1 Bidders are advised to contact BHEL for essential technical queries in writing within one week of issue of Enquiry. Offers with incomplete information will not be considered for evaluation, and are likely to be rejected outright without any further interaction with the Bidder.

3.2 Any technical features [over & above BHEL enquiry specification requirements] proposed by Bidder will not be given preference for the purpose of evaluation.

3.3 In the event of any conflict between these specifications, data sheets, related standards, codes etc. the vendor shall refer the matter to the purchaser for clarifications and only after obtaining the same shall proceed with the manufacture of the items in question.

4. TECHNICAL SPECIFICATIONs

4.1 SMPS with batteries shall be shall be supplied in fully wired condition. BHEL terminal point shall be at 230VAC incomer [cable size: 3Cx2.5mm2] and 24V DC outgoing feeder [Cable size:3Cx2.5sq.mm].

4.2 All our cables (indicated in S.no. (4.2) above) are armoured cables. Hence, bidder shall include suitable cable glands & lugs to meet the IP-class in scope of supply for all incoming / & outgoing cables of SMPS.

4.3 Bidder shall supply all the erection material required for installation of SMPS.

4.4 The Power Module shall be provided with AC to DC conversion circuits and the battery charger circuits. The SMPS panels having requirement of equal to and less than 16 Amp., A.C. power supply shall be suitable to receive, 240 Volt ±10%, single phase, 50 Hz ±5%, phase and neutral, through MCB.

4.5 The Power Supply Module shall provide 24V DC outputs with a current capacity of 6A. Two nos. of 24V DC outputs shall be provided in each Power Supply Module. The application of Power Supply module shall be such that only one output of 6A current capacity or two outputs with a total current capacity of 6A shall be used.

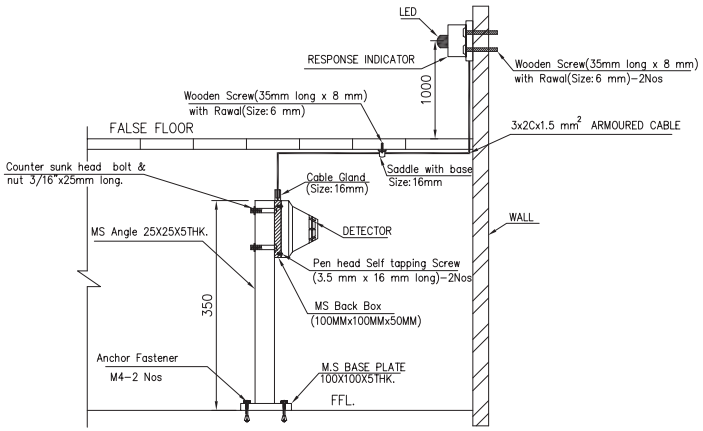
4.6 The panel shall have in-built stabilized power supply unit for its electronic circuitry which rectifies A.C. power supply to D.C. for system operation. Power supply to the detectors, manual call points, external hooters, solenoid valves etc. shall be provided in the panel.

4.7 The automatic with manual over-ride change over inclusive of all metering, control, indication and interlock system shall be provided.

4.8 Parallel redundant (2 x 100% rating) Regulated power supply modules shall be used for operation of various components / cards. LED indications for system ON and blow fuses shall be provided on the Facia of Power Module.

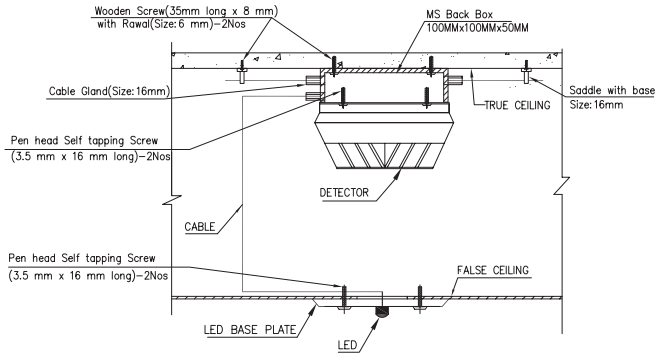
ANNEXURE – N

Typical Erection/Mounting Drawings of FDA components



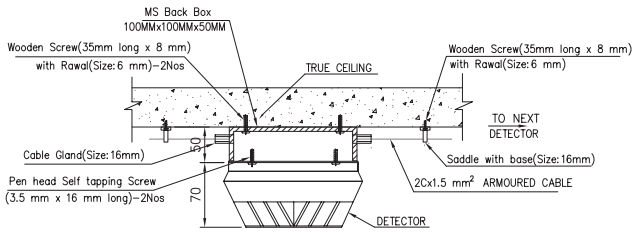
INSTALLATION DETAIL FOR DETECTORS BELOW FALSE FLOOR

DETECTOR WITH RESPONSE INDICATOR BELOW FALSE FLOOR			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	MS ANGLE(SIZE: 25 X 25 X 5 MM,350 LONG)	Nos	1
2	MS Back Box(Size:100 x 100 x 50 mm)	Nos	1
3	MS Base Plate(Size:100 x 100 x 5 mm)	Nos	1
4	Anchor Fastener (Size: M–4)	Nos	2
5	Saddle with base(Size:16mm)	Nos	9
6	Counter sunk head bolt & nut 3/16"x25mm long.	Nos	2
7	Wooden Screw(35mm long x 8 mm) with Rawal(Size:6 mm)	Nos	2
8	Cable Gland(Size:16mm)	Nos	3
9	Cable Lug(Size:1.5Sqmm)	Nos	6
10	Pen head Self tapping Screw(3.5 mm x 16 mm long)	Nos	2



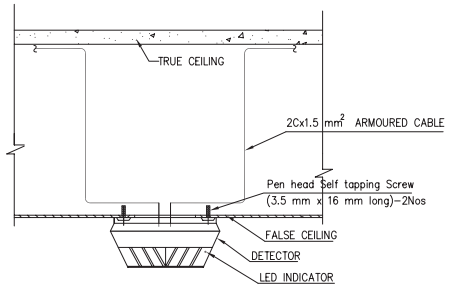
MOUNTING ARRANGEMENT OF RESPONSE INDICATOR ON FALSE CEILING

DETECTOR ABOVE FALSE CEILING WITH RESPONSE INDICATOR ON FALSE CEILING			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	MS Back Box–(100 x 100 x 50 mm)	Nos	1
2	Saddle with base(Size:16mm)	Nos	2
3	Pen head Self tapping Screw(3.5 mm x 16 mm long)	Nos	4
4	Cable Gland(Size:16mm)	Nos	3
5	Cable Lug(Size:1.5Sqmm)	Nos	6
6	Wooden Screw(35mm long x 8 mm) with Rawal(Size:6 mm)	Nos	4



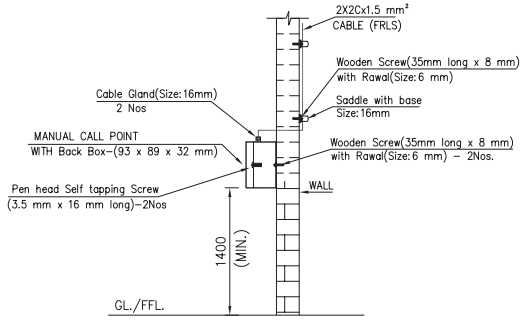
MOUNTING ARRANGEMENT OF DETRCTOR ON TRUE CEILING

DETECTOR ON TRUE CEILING			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	MS Back Box–(100 x 100 x 50 mm)	Nos	1
2	Wooden Screw(35 mm x 8 mm) with Rawal(Size:6 mm)	Nos	2
3	Cable Gland(Size:16mm)	Nos	2
4	Cable Lug(Size:1.5Sqmm)	Nos	4
5	Saddle with base(Size:16mm)	Nos	2
6	Pen head Self tapping Screw(3.5 mm x 16 mm long)	Nos	2



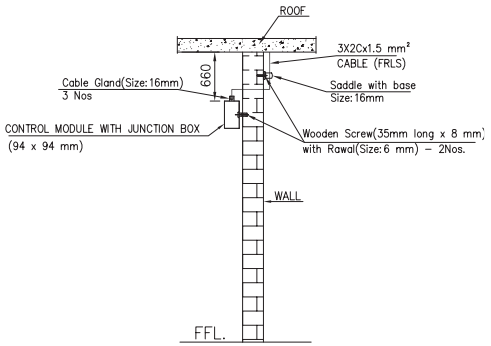
MOUNTING ARRANGEMENT OF DETECTOR ON FALSE CEILING

DETECTOR ON FALSE CEILING			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	Pen head Self tapping Screw(3.5 mm x 16 mm long)	Nos	2
2	Cable Lug(Size:1.5Sqmm)	Nos	4
2	Cable Gland(Size:16mm)	Nos	2



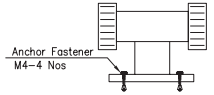
TYPICAL MOUNTING ARRANGEMENT OF MANUAL CALL POINT

MANUAL CALL POINT			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	MANUAL CALL POINT -(93 x 89 x 32 mm)	Nos	1
2	Wooden Screw(35 mm x 8 mm) with Rawal(Size:6 mm)	Nos	4
3	Cable Gland(Size:16mm)	Nos	2
4	Cable Lug(Size:1.5Sqmm)	Nos	4
5	Saddle with base(Size:16mm)	Nos	2
6	Pen head Self tapping Screw(3.5 mm x 16 mm long)	Nos	2

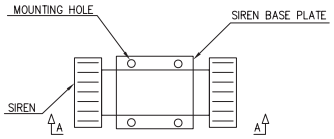


TYPICAL MOUNTING ARRANGEMENT OF CONTROL MODULES

MANUAL CALL POINT			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	CONTROL MODULE WITH JUNCTION BOX (94 x 94 mm)	Nos	1
2	Wooden Screw(35 mm x 8 mm) with Rawal(Size:6 mm)	Nos	3
3	Cable Gland(Size:16mm)	Nos	3
4	Cable Lug(Size:1.5Sqmm)	Nos	6
5	Saddle with base(Size:16mm)	Nos	1

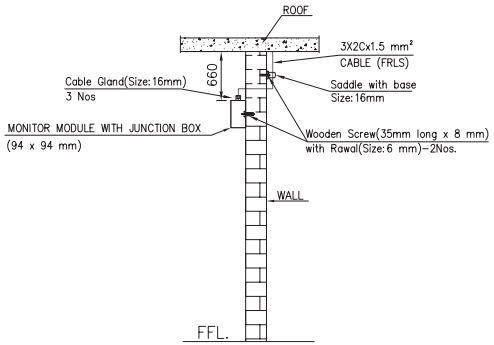


VIEW A-A



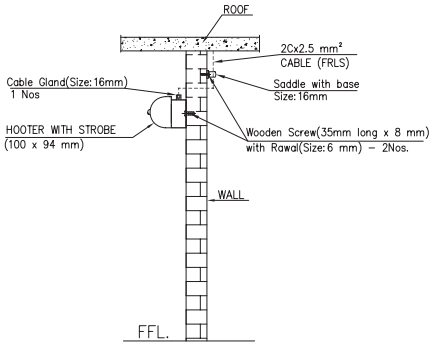
TYPICAL MOUNTING ARRANGEMENT OF SIREN

SIREN			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	Anchor Fastener (Size: 6ø)	Nos	4
2	Cable Gland(Size:16mm)	No	1
3	Cable Lug(Size:2.5Sqmm)	Nos	3



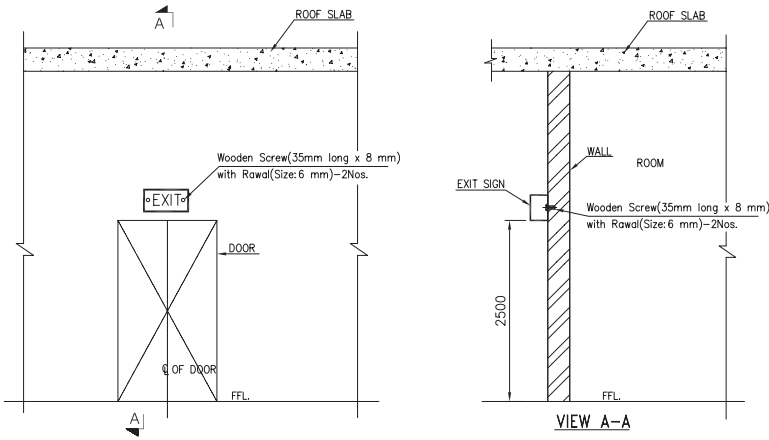
TYPICAL MOUNTING ARRANGEMENT OF MONITOR MODULES

MANUAL CALL POINT			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	MONITOR MODULE WITH JUNCTION BOX (94 x 94 mm)	Nos	1
2	Wooden Screw(35 mm x 8 mm) with Rawal(Size:6 mm)	Nos	3
3	Cable Gland(Size:16mm)	Nos	3
4	Cable Lug(Size:1.5Sqmm)	Nos	6
5	Saddle with base(Size:16mm)	Nos	1



TYPICAL MOUNTING ARRANGEMENT OF HOOTER WITH STROBE

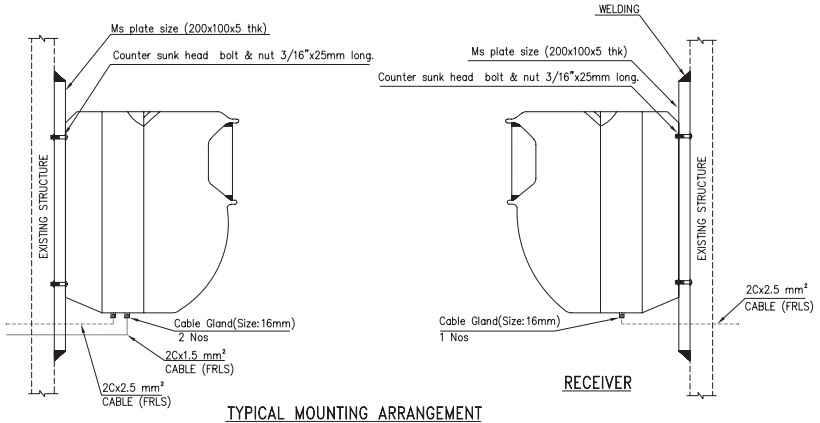
HOOTER WITH STROBE			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	HOOTER WITH STROBE (100 x 94 mm)	Nos	1
2	Wooden Screw(35 mm x 8 mm) with Rawal(Size:6 mm)	Nos	3
3	Cable Gland(Size:16mm)	Nos	1
4	Cable Lug(Size:2.5Sqmm)	Nos	2
5	Saddle with base(Size:16mm)	Nos	1



VIEW A-A

TYPICAL MOUNTING ARRANGEMENT
WALL MOUNTED TYPE EXIT SIGN

WALL MOUNTED TYPE EXIT SIGN			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	EXIT SIGN (200X200)	Nos	1
2	Wooden Screw(35 mm x 8 mm) with Rawal(Size:6 mm)	Nos	2

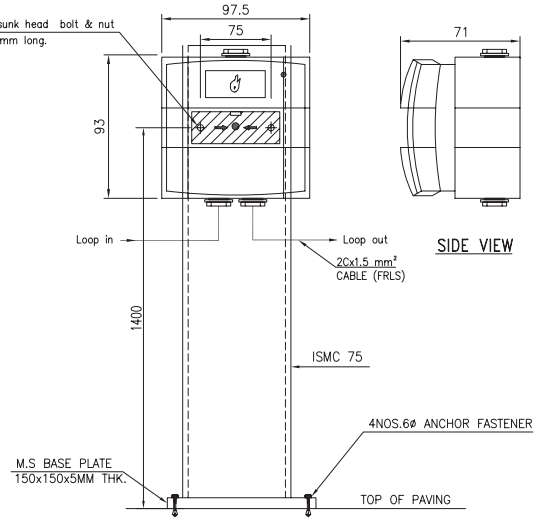


EMITTER

RECEIVER

TYPICAL MOUNTING ARRANGEMENT
BEAM DETECTOR

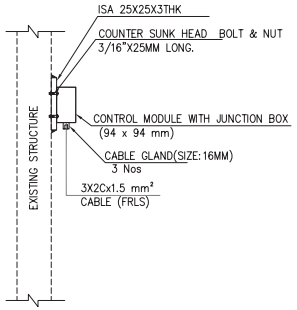
BEAM DETECTOR			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	Counter sunk head bolt & nut 3/16"x25mm long.	Nos	4
2	MS PLATE SIZE (200X100X5 THK)	Nos	2
3	Cable Gland(Size:16mm)	Nos	3
4	Cable Lug(Size:1.5Sqmm)	Nos	2
5	Cable Lug(Size:2.5Sqmm)	Nos	4



SIDE VIEW

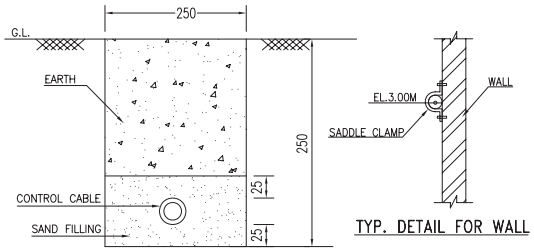
MOUNTING ARRANGEMENT OF OUTDOOR
MANUAL CALL POINT

OUTDOOR MANUAL CALL POINT			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	MS Base Plate(Size:150 x 150 x 5 mm)	Nos	1
2	Anchor Fastener (Size: 6ø)	Nos	4
3	Counter sunk head bolt & nut 3/16"x25mm long.	Nos	2
4	Cable Gland(Size:16mm)	Nos	2
5	Cable Lug(Size:1.5Sqmm)	Nos	4
5	Ismc 75 (Length 1500mm)	Nos	1



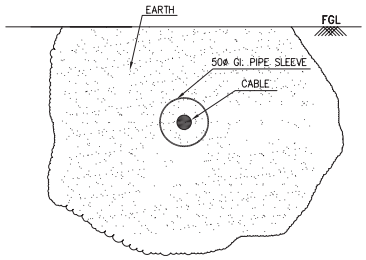
TYPICAL MOUNTING ARRANGEMENT OF
INPUT OUTPUT MODULE FOR COAL CONVEYOR

INPUT OUTPUT MODULE FOR COAL CONVEYOR			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	Control module with junction box (94 x 94 mm)	Nos	1
2	Counter sunk head bolt & nut 3/16"x25mm long.	Nos	2
3	Cable Gland(Size:16mm)	Nos	3
4	Cable Lug(Size:1.5Sqmm)	Nos	6
5	MS ANGLE(SIZE:25 X 25 X 5 MM,100MM LONG)	Nos	1

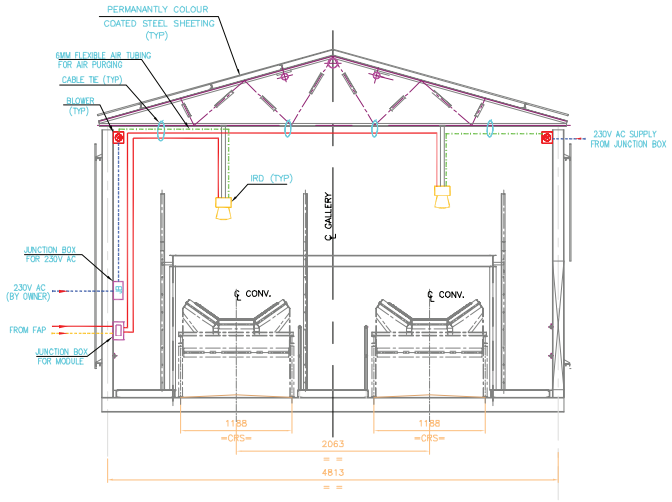


TYP. DETAIL FOR WALL

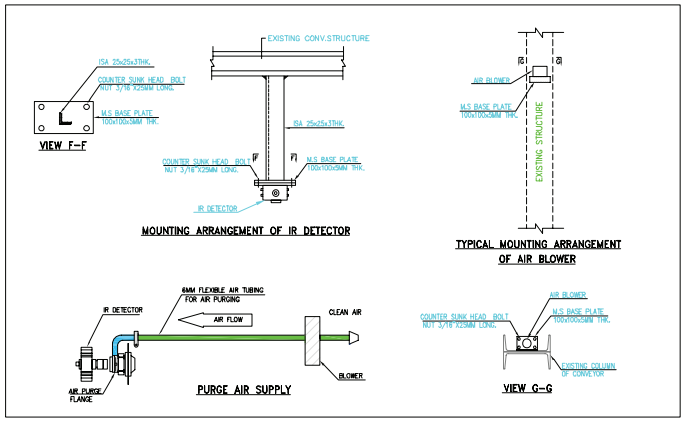
TYP. DETAIL FOR LAYING
OF BURIED CABLE



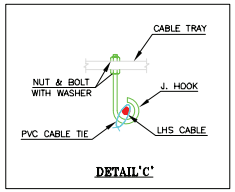
TYP. DETAIL FOR ROAD CROSSING
CABLE LAYING DETAIL



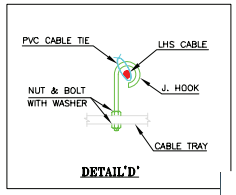
TYPICAL MOUNTING ARRANGEMENT FOR IRD FOR COAL CONVEYOR



INFRA RED DETECTOR & BLOWER			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/1TEM
1	MS Base Plate(Size:100 x 100 x 5 mm)	Nos	4
2	Counter sunk head bolt & nut 3/16"x25mm long.	Nos	8
3	MS ANGLE(SIZE:25 X 25 X 5 MM,500MM LONG)	Nos	2
4	JUNCTION BOX FOR 230V AC SUPPLY	No.	1

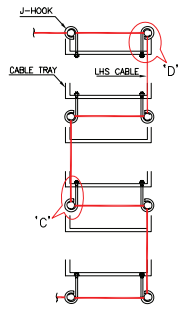


DETAIL'C'

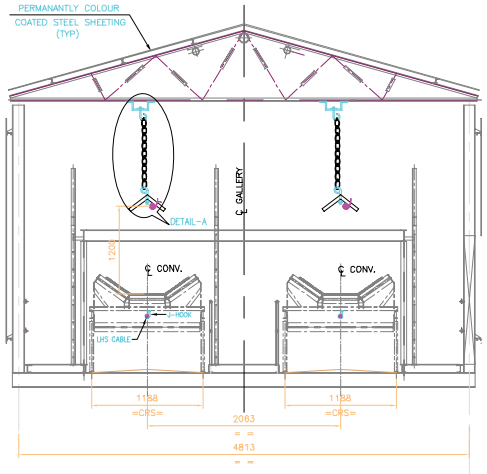


DETAIL'D'

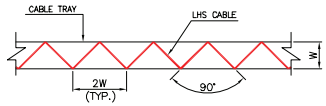
200mm long J- Hook for every 1 metre



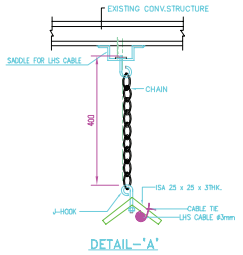
LHS MOUNTING DETAIL FOR CABLE TRAY



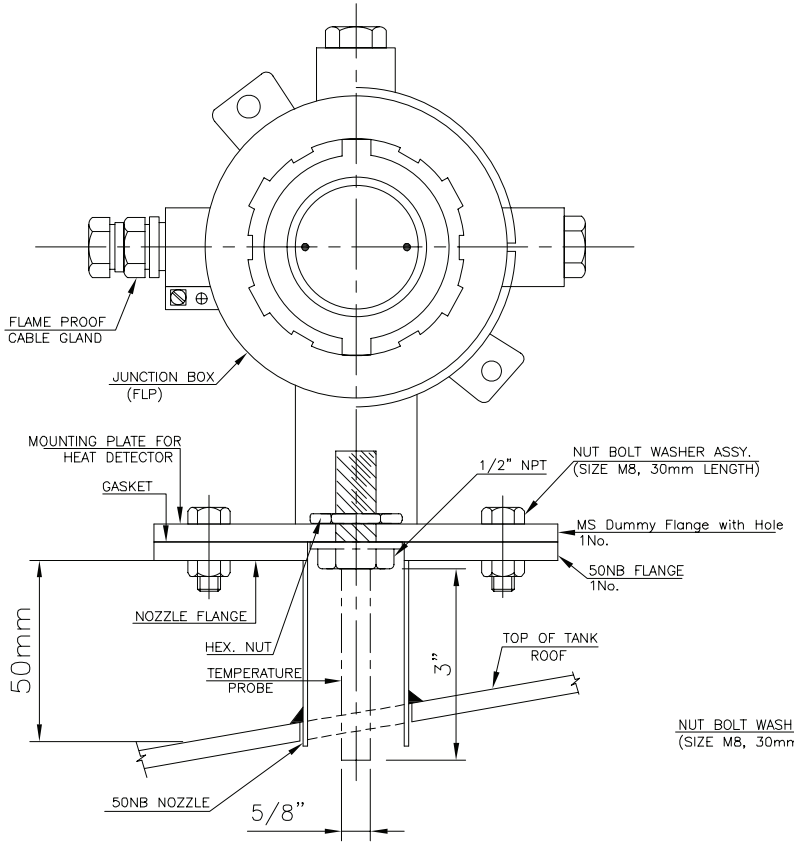
TYPICAL MOUNTING ARRANGEMENT FOR LHS CABLE FOR COAL CONVEYOR



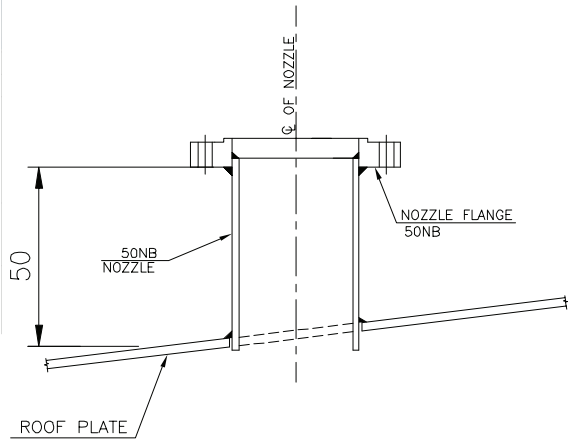
TYPICAL LHS ZIG-ZAG ARRANGEMENT (FOR CABLE GALLERY)



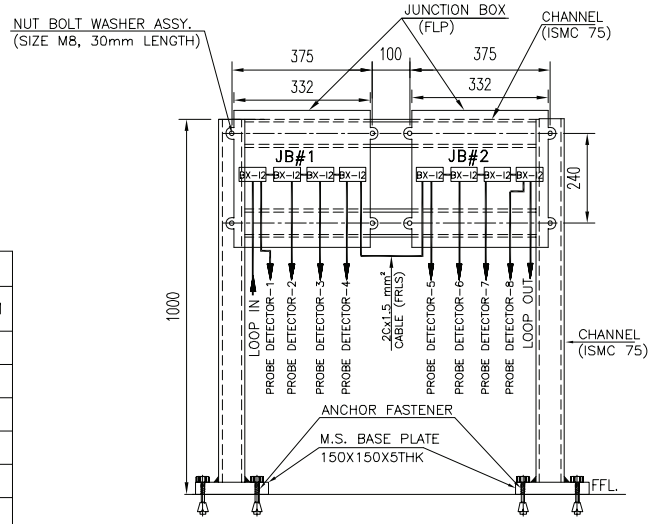
DETAIL-'A'



TYPICAL MOUNTING ARRANGEMENT
OF PROBE TYPE DETECTOR



NOZZLE ARRANGEMENT
TANK ROOF FOR PROBE TYPE DETECTOR



TYPICAL MOUNTING DETAIL
OF JUNCTION BOX

PROBE DETECTOR & JUNCTION BOXES			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	MS BASE PLATE(SIZE:150 X 150 X 5 MM)	Nos	2
2	ANCHOR FASTENER (SIZE: 6ø)	Nos	8
3	NUT BOLT WASHER ASSY. (SIZE M8, 30MM LENGTH)	Nos	12
4	CABLE GLAND(SIZE:16MM)	Nos	20
5	CABLE LUG(SIZE:1.5SQMM)	Nos	40
6	ISMC 75 (LENGTH 1000MM)	Nos	2
7	ISMC 75 (LENGTH 850MM)	Nos	2
8	MS DUMMY FLANGE WITH HOLE	Nos	8
9	JUNCTION BOX FOR PROBE DETECTOR	Nos	8
10	JUNCTION BOX FOR MODULES	Nos	2