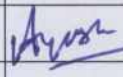
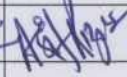
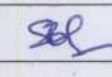




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NTPC Doc No.	9585-001-572-PVM-U-002	Rev. No.	00		Prepared	Checked	Approved
TYPE OF DOC.	TECHNICAL SPECIFICATION			NAME	AJ	AR	SKS
TITLE Technical specification for Fire Protection and Detection System (400KV-Gas Insulated Switchyard Area)							
				DATE	29.11.19	29.11.19	29.11.19
				GROUP	TBEM	W.O. No	87009
CUSTOMER	PATRATU VIDUT UTPADAN NIGAM LTD. (PVUNL)						
CONSULTANT	NTPC LTD.						
PROJECT	3X800 MW PATRATU SUPER THERMAL POWER PROJECTS EXPANSION PHASE-I (3X800MW) - 400 KV GIS						
Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS		



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TECHNICAL PRE QUALIFICATION REQUIREMENT (PQR)

PQR Sr. No	PQR Description	Supporting Document to be attached by Bidder
01	The Bidder should have designed, supplied, erected and commissioned at least one (1) fire protection system of contract value not less than INR 35.0 Million or equivalent in foreign currency (exchange rate applicable as on date of Techno-Commercial bid opening), in industrial installation. The fire protection system should have comprised of: - Fire hydrant system - High Velocity water (HVW) spray or medium velocity water (MVW) spray or sprinkler system. - Fire Water Pumping and pressurising arrangement. The system mentioned above should have been designed to the recommendations of Tariff Advisory Committee of India or Oil Industry Safety Directorate (OISD) or any other International reputed authority (like LPC-U.K. or NFPA, USA) and this system should have been in successful operation for a period of not less than one (1) year prior to the date of techno commercial bid opening (03.03.2017).	Bidder should submit copy of one no. Purchase order and work order from Buyer/end customer each value of equal to more than INR 3.5 crore. Bidder should submit copy of the performance certificate against 1 year successful operation from end customer for the same project of which PO/WO is being submitted. Performance certificate must have information about the type of system designed, installed and erected and date of work completion wherefrom 1 year successful operation could be established. Also it must be mentioned that system have been designed as per TAC/OISD or NFPA.
02	In addition, the analogue addressable type fire alarm system proposed to be supplied shall be sourced from a firm who has supplied at least one (1) similar system which has been approved or listed by UL-USA/ FM-USA/ LPC-UK/ similar agency and should have been in operation for at least one (1) year prior to the date of techno commercial bid opening (03.03.2017).	Bidder should arrange copy of one no. Purchase order and work order in the name of FDA's Original equipment manufacturer or it's Indian distributor. Bidder should submit copy of the performance certificate of FDA's OEM against 1 year successful operation from end customer for the same project of which PO/WO is being submitted. Performance certificate must have information about the FDA equipment installed & erected including make and date of work completion wherefrom 1 year successful operation could be established.



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SECTION 1

INTENT, SYSTEM REQUIREMENT, DESIGN CRITERIA AND SCOPE

INTENT OF SPECIFICATION

1.0.0 This specification is intended to cover following activities and services in respect of all the equipment of the **Fire detection and protection System to be provided for PATRATU SUPER THERMAL POWER PROJECTS EXPANSION PHASE-I (3X800MW) - 400 KV GIS.**

- i) Detailed design of all the equipment and equipment system(s).
- ii) Complete manufacturing including shop testing.
- iii) Providing engineering data, drawings, and O & M manuals as per specified format etc. for owners/purchaser's review, approval and records.
- iv) Packing and transportation from the manufacturer's works to the site including customs clearance/port clearance, if required.
- v) Receipt, storage, preservation and conservation of equipment at site.
- vi) Fabrication, pre-assembly, if any, erection testing and putting into satisfactory operation all the equipment including successful completion of trial operation.
- vii) Performance and Guarantee tests after successful completion of trial operation.
- viii) The system shall be designed, erected & commissioned in accordance with TAC/ NFPA guidelines.

1.0.1 The requirements specified under SECTION 2, SECTION 3, SECTION 4 & SECTION 5 of the specification shall be considered as part of this section. In the event of any conflict between the various sections/sub-sections of this specification, SECTION 1 shall prevail. ***NTPC contract specification attached with SEC 2 shall be referred strictly for equipment specification.***

1.0.2 It is not the intent to specify herein all the details of design and manufacture. However, the equipment and the system shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to Purchaser/ Owner, who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgment is not in full accordance herewith.

1.0.3 **Contract shall be on lumpsum basis for the scope defined in the specification. Variations in quantities during contract stage without any change in input from BHEL side shall not have any commercial implications. The Bidder shall be responsible for providing all material, equipment and services, specified or otherwise which are required to fulfill the intent of ensuring operability,**

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maintainability and the reliability of the complete work covered under this specification.

- 1.0.4 The Bidder shall deem to have understood completely all the tender drawings and documents and quoted accordingly.
- 1.0.5 **Deviation:** There shall preferably be no deviation on technical specification. The bidder shall sign and stamp the “Certificate for No Deviation” enclosed in Schedule-1, Section-5 towards confirmation. Except for these deviations/variations covered under Deviation Schedules which are accepted by the Purchaser before the award of the Contract, it will be the responsibility of the Bidder to fully meet the intent and the requirements of the specification within the quoted price. *Deviations in any other form including clarifications / assumptions / etc will not be considered and it will be construed that the bid conforms strictly to the specification.*
- 1.0.6 The Bidder to note carefully that the parameters, estimated capacities of equipment indicated and the tender drawings in the specification are only for the guidance of the Bidder. The system shall be designed as per relevant standards/ codes and exact capacities and quantities are to be estimated by the Bidder. All such estimations and design calculations shall be submitted for Purchaser's approval.
- 1.0.7 It is the responsibility of the successful Bidder to obtain necessary approval/ clearance from statutory organizations wherever applicable for the equipment/ systems under the scope specified.
- 1.0.8 The term ‘Owner’ appearing in this specification shall refer to **PATRATU VIDUT UTPADAN NIGAM LTD. (PVUNL)**, the term ‘Consultant’ shall refer to **National Thermal Power Corporation (NTPC)**, the term ‘Purchaser’ shall refer to **BHEL** and the term ‘Contractor’ shall refer to the **successful Bidder**.
- 1.0.9 **PROVENESS - The Bidder is required to meet the provenness criteria and/ or qualification requirement for Fire detection and protection system as per criteria stipulated in Sec-1. The term “Bidder/ sub-vendor” in this criteria pertains to successful bidder.**



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SYSTEM REQUIREMENT, DESIGN CRITERIA AND SCOPE FOR FIRE DETECTION CUM PROTECTION ARRANGEMENT

1.0 Function

This system shall be designed to provide fire detection and protection services for 400kV Switchyard area and its control Building and GIS Hall building. Design criterion shall be based on **"Ordinary Hazard Occupancies"** classification as described in Tariff Advisory Committee's (TAC) guidelines. The complete Fire detection and protection system shall be as per the guidelines/ codes/ standards / rules of TAC/ NFPA / IS: 3034 / OISD etc. and all the systems, equipments and installation shall have to be approved from TAC India or TAC accredited agency.

2.0 Scope & Design requirements

The makes/models and technical features offered for various components/ equipment shall comply with the standards of TAC/ BIS/ UL/ VDs and FM / NFPA/ LPCB as applicable. The key elements of fire protection cum detection scheme and the related areas are presented as under:

System	Areas Protected
Hydrant System	i. Switchyard Control Room Building ii. 400KV GIS hall Building iii. Outdoor 400 kV Switchyard
HVW Spray System	125 MVA, 3-phase, 400kV Bus Reactor (2 nos.)
MVW Spray System	Cable Vault at ground floor of Control Room building
Addressable Fire Detection & Alarm System	i. Switchyard Control Room Building areas ii. GIS Hall building areas
Mobile and Portable Fire Extinguishers	i. Switchyard Control Building areas ii. 400kV GIS Hall Building areas

3.0 Design Features

3.1 Detection System

- The Fire Detection and Alarm System will comprise of a network of Addressable intelligent multisensor Detectors (fire/smoke), Microprocessor based Fire Alarm Control Panel, Manual Call Points, Modules, Notification Appliances, Cables and other accessories required to form a complete addressable network (Terminal Boxes and Junction Boxes if required shall also be included in the scope).

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- b. All detection and sensing devices forming an integral part of the microprocessor based, addressable, intelligent fire detection and alarm system shall be approved by UL/FOC/ Any other internationally recognized body acceptable to the owner. The Fire Protection, detection and Alarm System shall comply with NFPA -72/72E and IS: 2189 standards.
- c. Automatic Fire Detection and Alarm System detect fire / over-heating by means of the attendant phenomena of fire, such as smoke or heat. It initiates alarm in fire alarm control panel and actuates pre-programmed control actions. Detection of fire at an early stage permits rapid intervention by fire fighting forces. Thus the automatic fire detection and alarm system reduces damage to property and risk to human lives.
- d. In case of fire the detector or device envisaged in respective area will pick up appropriate signal and conveys to fire alarm panel located in respective areas. These signals triggers visual and audio alarms. The system initiates operation of extinguishing systems such as deluge system, sprinklers and transmits alarm and fault signals to predetermined points. The system must ensure that more number of detectors / devices can be connected in a loop and there will be a facility for additional loop modules for future expansion.
- e. The fire detectors are inherently addressable, which provide continuous surveillance in an area. The dedicated Microprocessor based Fire Alarm Control Panel will process the input signals from detectors at various locations of the switchyard and actuate the respective protection system.
- f. The system will have following self-diagnostic features:
 - Detector cabling will be completely supervised for open circuit and short circuit.
 - Unauthorized removal of a detector head from its base will be supervised to give a fault alarm on the connected control panel.
 - Annunciation will be provided for battery low voltage, battery earth fault, fuse blown and loss of main AC supply.
 - Alarm verification features.
- g. Manual call points shall be located as per cl. no. 6.3.8 of IS 2189. The call points will normally be provided for every 30m distance in indoor areas.
- h. The number of Detectors and their location will be so selected such that the internal area of the building is completely covered by the detectors. The zones of individual Detectors will overlap and no blind zone will be left. **The design coverage area for detectors shall not exceed 25 sq. m for each detector.**
- i. Detector shall not be mounted within 500 mm of obstruction. However, in case of minor obstruction, like light fittings etc. the distance may be reduced to 250 mm. wherever beam depth exceeds 450 mm and center to center of beam exceeds 2500 mm, separate detector shall be provided for each pocket.
- j. For Detectors mounted above false ceiling, a separate Response Indicator shall be mounted directly below the detector (on the false roof). When the detector is mounted below the false floor or in inaccessible position, response indicator for each of the detector shall be mounted on a separate box which shall be suitable for mounting on the wall.

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- k. Addressable multi-sensor type smoke detectors shall be provided below false ceiling areas of control building except for the Battery rooms & Pantry where Addressable corrosion proof rate of rise of heat detector with fixed temperature element shall be provided.
- l. ***In view of very large height of GIS Hall building Beam smoke detectors shall be provided there because regular spot type smoke detectors will not be effective in detecting the smoke to the required sensitivity levels. It shall also be integrated with fire alarm panel for switchyard area. Necessary interface module (CRM and MM) shall be provided for this purpose by contractor.***
- m. ***Suitable nos. of beam detectors assy. for GIS hall shall be finalized during detailed engineering as per the guidelines/standards.***
- n. Two loop Fire Alarm Panel (1 working + 1 spare loop) of analogue addressable type shall be dedicated to Switchyard control room building and other areas where FDA system gets installed within switchyard area which shall further evaluate the signals received from the detectors, transmit the fire or trouble alarms (audio-visual) to prearranged points, supervise and monitor the complete fire detection circuits.
- o. Fire alarm control panel shall have filters to ignore false alarm and increase sensitivity to real fire from sensors and provision for automatic re-calibration of sensitivity levels of over/ under sensitive detectors. The sensitivity of each detector should be automatically raised if detectors are gradually polluted due to dust and dirt entering inside the detector. If detectors are more polluted the control panel shall give a warning. The trouble report shall indicate the location of device requiring service.
- p. All devices shall be individually identifiable for its type, its zone location, and alarm set value, alarm and trouble indication by a unique alpha numerical label. The detectors shall be self-compensating for ambient temperature and humidity. The detectors shall display a steady LED when in the alarm state. The LED shall flash when in standby or normal mode.
- q. One set of 24 V DC power supply system for fire alarm panel consisting of the following:
- 2x100% Battery Chargers
 - 1x100% batteries with battery backup of 24 hours (standby) and 30 minutes (in alarm conditions)
- r. Battery set shall be of adequate capacity to supply fire detection and alarm system and as well actuating devices such as solenoid valves etc. for a period of 24 hours and 30 min from the instant of charger/ AC failure (in alarm conditions). At least 25% of the devices shall be considered to be active in alarm conditions. Each of the redundant chargers shall be sized to meet connected load requirements and keep the connected batteries full charged (Float Mode). Furthermore, the charger shall be sized to enable the boost charge of a fully discharged battery in 10 hours while feeding the load.
- s. Necessary redundant transformers shall be provided by the contractor to derive the power supply from 415V, 3 phase, 3 wire incomers for above.
- t. The detector cable and other control cable shall be armoured, screened and twisted, PVC Cu. FRLS cables type “S” in external areas and for inside building. Type “S” cable shall satisfy requirements of Article 760 NFPA 70.

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- u. The wiring shall be of style 7 as per NFPA - 72 with loop/ short circuit isolators.
- v. Fire alarm panel of the switchyard will be in ring topology with FAP of the main plant. All the panels will be in a ring, when there will be fire anywhere, all the panels will get signal.
- w. Adequate no. of Back-lit maintained type emergency exit signs as per TAC shall be provided in all staircases of the building.
- x. **Sounder cum flashers shall be required at the exit gates along with the hooters/ sounders along with Manual call points. With each Manual Call Point, hooter/Sounder flashers shall be considered. The distance between consecutive MCP and Hooter shall be in such fashion that a person should not travel more than 30 mtr distance from the nearest one.**
- y. It shall be possible to replace any type of detector head by a different type detector without requiring change in cabling/panel wiring and condition of the zone, originally covered by the detector.

Notes: Fire alarm panel of the switchyard will be in ring topology with nearest FAP of the main plant through optical Fiber Cable. All the FAP of plants shall be in a ring and whenever there will be fire anywhere in plant, all the panels will get signal. Contractor shall make all necessary arrangement including supply of additional card for two-way communication in switchyard FAP under ring topology. The make of FDA equipment for switchyard area shall be same as that of main plant FDA (SCHRACK SECONET/Autronica/Edward/Esser or Honeywell).

Note: Make of FDA shall be finalized during detailed engineering with customer. Customer has already clarified to have FDA equipments for complete plant including switchyard of same make. Hence make finalized by customer shall be binding to contractor and there shall not be any price implication on account of FDA make considered by bidder at tender stage and during detailed engineering. Hence bidder may prepare their estimate and quote accordingly to full fill above requirement.

Contractor shall supply and lay this optical Fiber Cable for wiring of switchyard FAP with termination end of main plant fire alarm panels (placed in unit-2 control equipment room and unit-3 control equipment room) for making it work under ring topology. Please refer schematic diagram of fire detection and alarm system for main plant (9585-001-151-PVI-L-001) attached to this specification for better understanding. Optical fiber cable shall be used to wire switchyard FAP with nearest FAP's under ring. Bidder may consider 2500 meter FO cable for estimation purpose alongwith FO convertor in switchyard FAP and nearest two nos. FAP's, however actual length of the FO cable required to be worked out after detailed engineering and same shall be supplied and erected by contractor.

Panels shall be networked integrated through Dual Redundant Optical Fiber Data Highway connected in dual ring topology. Hence bidder shall ensure supply of two-way communication card/suitable convertor/hardware in the switchyard FAP as well as in the other FAP's to enable it to accommodate under ring and get all the communication done. Network interface items necessary to interface switchyard FAP with nearest FAP's shall be provided by contractor.



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In the event of detection of fire, auxiliary systems like ventilation, air-conditioning may require shutdown. For this purpose, 10 nos. potential free contacts (Control relay module) from the output of the fire protection system shall be made available in the local / main fire panel and terminated in the terminal block for further use in Respective plant PLC The closure of fire dampers, automatic tripping of AHU fans and fresh air fans shall be interlocked with fire Detection System PLC.

- z. Microprocessor based Intelligent/ analogue addressable type fire detection and alarm system working on microprocessor based system shall have dual redundant fiber optic data highway.

3.2 Protection System

3.2.1 Hydrant System

- a. Hydrant systems for the switchyard area shall be tapped off from main hydrant header for main plant. Dual feed will be provided to the switchyard hydrant ring mains from the tap-off points. Dual Tap-off coordinates (near switchyard fence) for switchyard hydrant system have been indicated in the GA of switchyard. ***These tap-off points (GV-41 & 42) of size 200NB for switchyard hydrant system has been indicated on Layout Plan of 400KV Switchyard (Drg No: 9585-001-572-PVE-F-0013) provided under enclosures in section-5 of this technical specification.***
- b. Three nos. Hydrant Pumps each of capacity 410cum. (TDH-120m) shall be provided in main plant pump house and is excluded from contractor scope. Tentative Pressure available at Tap-off Points for Switchyard area for hydrant system is 8-10 Kg/cm².
- c. **Hydrant system is designed for Ordinary Hazard Classification.**
- d. Hydrant system shall consist of Hydrant pumps, pressurization arrangement, water mains network, hydrant valves, landing valve, water monitors, hoses, branch pipes, nozzle, hose boxes, central hose houses etc. in switchyard area.
- e. **Hydrant piping network in switchyard shall consist of hydrants valves & water monitors and will be provided only on the periphery of the switchyard area as per hazard condition and relevant TAC guidelines.**
- f. Suitable tapping shall be done from main network around periphery of switchyard to cover control buildings and GIS hall as well as per relevant standard.
- g. Isolation valve shall be provided at suitable places so that a portion of the loop can be taken out for maintenance without any loss of system in the balance part.
- h. System shall be designed in a way so that minimum terminal pressure of 3.5 kg/ cm² can be maintained at the farthest/ remotest hydrant point of the switchyard.
- i. All the outdoor hydrants shall be provided with a front glass type hose box carrying 2 nos. 15 mtrs. hose along with branch pipe coupling and nozzle.

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- j. 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 15 m of the building. When height of the structure, tower exceeds 15 mtr, the concerned hydrant shall be replaced by water monitor.
- k. **The hydrant pipe lines shall be overground. It shall be laid either on pedestals, trestles etc. However, if the layout does not permit laying of overground pipe in that case it shall be laid underground with the approval of Engineer.**
- l. Any hydrant pipe lines if routed underground, shall be equipped with suitable coating and wrapping. Road, Rail or pipe trench crossing shall be through RCC Hume pipes duly covered with coating and wrapping as per specification. Hume pipe for road crossing shall be NP3 class and that for rail crossing shall be NP4.

Specific Data

- a. All hydrant valves shall be of 63 NB dia. Single headed, oblique type having Stainless steel construction (MOC: Body/bonnet/stop valve/valve seat/trim: SS304/SS316) conforming to IS: 5290 or Equivalent.
- b. **Water monitor** As per IS:8442 Type-I, Size: 75mm, Nozzle dia: 38mm. MOC: Water barrel/reducer/elbow: CS (seamless) /SS & Nozzle: Copper alloy / SS confirm in to IS:3444
- c. Hoses shall be of RRL type as per IS: 636 (Type-A) or Equivalent.
- d. Branch pipes shall be constructed of stainless steel SS-316 at both ends. One end of the branch pipe will receive the quick coupling while the nozzles will be fixed to the other end as per IS: 903 / IS: 2871. MOC: Branch pipe: SS316 (Gr 4 of IS: 3444) (both ends) & Nozzle: SS316 (Gr 4 of IS: 3444), Size: min 16mm & max 25mm.
- e. Hose cabinets shall have a 6 mm thick glass panel in front door with the word 'FIRE' painted on it with 150 mm (6") red letters. Hose cabinets shall be made of 16 gauge or thicker M.S. Sheets shall have rubber bushings to prevent ingress of water and dust.

3.2.2 HVW Spray System

- **HVW Spray System is envisaged for the following equipments in the switchyard:**

Bus Reactor 125 MVA (2 nos.)

General

- a. Two nos. spray pump of capacity 410cum. (TDH-120m) shall be provided in main plant pump house and is excluded from contractor scope. Tentative Pressure available at Tap-off Points for Switchyard area for spray system is 10-12 Kg/cm².
- b. System shall be pressurized continuously to normal working pressure up to the Deluge valves.
- c. It shall consist of spray main tapped from the main spray header of power plant, Deluge valve, flow switches, Isolation valves with limit switches, Y-type strainer, spray nozzles/ projectors, spray nozzles piping network, detection system, instrumentation, junction boxes, cables etc.
- d. Tap-off coordinate (near switchyard fence) for switchyard HVWS system has been indicated in the GA

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of switchyard. ***Tap-off point of size 200NB for switchyard spray system has been indicated on Layout Plan of 400KV Switchyard (Drg No: 9585-001-572-PVE-F-0013) provided under enclosures in section-5 of this technical specification.***

e. Spray system shall mainly comprise of the following: -

Automatic deluge valve (DV) assembly suitable size and trims
Isolation (butterfly) valve at the upstream & downstream of each DV
Y-strainer of suitable size at upstream of each DV
S.S Spray nozzles
QB Detectors
Solenoids valve for each DV
One (01) no. pressure switch each in detection line & spray discharge
One (01) no. limit switch for each isolation valve\Butterfly valve
Local control Panel with relays and interface units for each DV
GI piping for spray network at downstream of DV
25NB M.S. Black wet detection piping network.

f. All pylons required for bus reactors shall be anchored to soak pit base slab of individual reactor, paved area outside soak pit, etc. using anchor fasteners of adequate capacity. Subsequent to fixing the pylons, lower part of pylon which would be within filled up gravel portion shall be encased with concrete by Contractor for corrosion protection.

Design Criteria

- The system shall consist of water supply system, suitable number of spray nozzles, deluge valve, strainers, pipes and necessary valves.
- Minimum running water pressure at any projector/spray nozzle shall be not less than 3.5 kg/cm² and not greater than 5.0 kg/ cm² for HVW spray system
- Design discharge density for HVW Spray system shall be 10.2 lpm/ sqm as per the rules of water spray system of Tariff Advisory Committee (TAC).
- An isolation valve shall be provided at upstream of each of the deluge valve. The size shall be same as that of the deluge valve.
- Fast acting butterfly valves will be provided on the downstream of deluge valve, so that this valve can be kept closed and can be operated manually, if there is any malfunction of deluge valves (mechanical or electrical operations).
- Limit switches shall also be provided with isolation and butterfly valve to have monitoring of its position at remote end. Accordingly, suitable arrangement shall be made available.



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- g. Automatic deluge valve assembly shall consist of accessories such as water motor gong, alarm test valves, drain valves, strainers, hydraulic releasing system, solenoid valves, etc.
- h. A strainer ('Y' type) shall be provided at upstream of deluge valve. Strainer wire shall be SS (AISI 316), 30 SWG and 30 mesh. Strainer area shall be at least 4 times the pipe cross section at the pipe inlet. Pressure drop across strainer in clean condition shall not exceed 1.5 kg/cm² at design flow of deluge valve.
- i. Pressure gauges and pressure switches at upstream and downstream of deluge valves shall be provided.
- j. The alarm valve assembly shall consist of accessories like water motor gong, alarm test valves, alarm valves, strainer ahead of these valves etc. the test valves shall be provided to facilitate the periodical testing of alarm valve.
- k. The design features and make of all the projectors/ spray nozzles shall be UL/ FM or equivalent approved / listed.
- l. Pressure switches shall be provided in spray and detector piping to exhibit "FIRE" and "SPRAY ON" annunciations and interlock for tripping of respective equipment wherever applicable.
- m. Wet type detector network with venting arrangement shall be provided for spray system using quartzoid bulb detectors. For wet type detection employed for equipment located above 20 meters elevation from deluge valve, additional pressure switch shall be provided to actuate the deluge valve.
- n. Remote manual operation of the deluge valves shall be possible from the respective fire alarm cum control panel (contractor to make all the provisions accordingly). Apart from the automatic operation of the deluge valve, the system shall have provision for manual operation of the deluge valve by means of hand operated lever close to the deluge valve assembly. There shall also be a provision to operate deluge valve electrically from a nearby Deluge Valve Local control panel.
- o. Each outdoor deluge valve housing shall be provided with brick wall housing on three sides and RCC roof. The fourth side of the enclosure shall be in a direction away from protected equipment. Indoor deluge valve(s) which are within 6 meters of the protected equipment shall also be separated from the latter by a brick wall enclosure.
- p. The spray pipe lines shall be overground. It shall be laid either on pedestals, trestles etc. However, if the layout does not permit laying of overground pipe in that case it shall be laid underground with the approval of Engineer.
- q. Any spray pipe lines if routed underground, shall be equipped with suitable coating and wrapping. Road, Rail or pipe trench crossing shall be through RCC Hume pipes duly covered with coating and wrapping as per specification. Hume pipe for road crossing shall be NP3 class and that for rail crossing shall be NP4.

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3.2.3 MVW Spray System

MVW Spray System is envisaged for Cable vault in switchyard control building. This spray system shall be tapped off from the nearby hydrant header of switchyard area.

General

- System shall be pressurized continuously to normal working pressure up to the Deluge valves.
- For switchyard control room building cable vault area (12.5 m x 12.73 m) approx., suitable zones of MVW spray system operation shall be adopted and same shall be finalized during detailed engineering.
- It shall consist of piping from tap-off, Deluge valve, Isolation valves, Y-type strainer, spray nozzles/projectors, spray nozzles piping network, detection system (LHS), instrumentation, junction boxes, cables etc.

d. Spray system shall mainly comprise of the following:-

Automatic deluge valve (DV) assembly suitable size and trims
Isolation (butterfly) valve at the upstream & downstream of each DV
Y-strainer of suitable size at upstream of each DV
S.S Spray nozzles
Solenoids valve for each DV
One (01) no. pressure switch each in detection line & spray discharge
One (01) no. limit switch for each isolation valve\ Butterfly valve
Local control Panel with relays and interface units for each DV
GI piping for spray network at downstream of DV
25NB M.S. Black wet detection piping network.

Design Criteria

- The system shall consist of water supply system, suitable number of spray nozzles, deluge valve, LHS cable, strainers, pipes and necessary valves.
- For MVW spray system, minimum running water pressure at any projector/spray nozzles shall not be less than 2.8 bars for cable galleries.
- Design discharge density for MVW Spray system shall be 12.2 lpm/sqm as per the rules of water spray system of Tariff Advisory Committee (TAC).
- No. of nozzles for any particular risk shall be selected considering the characteristic of nozzles provided by the bidder and also the density of water needed to protect completely the risk as per sl. no. (b) to (d) above/NFPA/TAC.
- Cable vaults/cable spreader rooms shall be suitably zoned.
- In cable galleries the water spray shall cover all the exposed area of all the trays and racks suitably as

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per recommended guidelines.

- g. An isolation valve shall be provided at upstream & downstream of each of the deluge valve. The size shall be same as that of the deluge valve.
- h. Fast acting butterfly valves will be provided on the bypass line of deluge valve, so that this valve can be kept closed and can be operated manually, if there is any malfunction of deluge valves.
- i. Limit switches shall also be provided with isolation and butterfly valve to have monitoring of its position at remote end. Accordingly suitable arrangement shall be made available.
- j. Water motor gong shall form part of accessories to be provided with deluge valve.
- k. A strainer ('Y' type) shall be provided at upstream of deluge valve.
- l. Pressure gauges at both upstream and downstream of deluge valves, and in the detector pipe network shall be provided.
- m. Pressure switches shall be provided in spray and detector piping to exhibit "FIRE" and "SPRAY ON" annunciations and as well as for interlock.
- n. Local control panel shall be provided for each deluge valve.
- o. LHS cable is used for detection in MVW spray system in the cable vault. This shall be laid on alternate cable trays in zig-zag fashion. The complete area shall be covered by cross zoning method. FAP shall process the signal upon detection of fire either by smoke detectors or LHSC detector of the cable vault & actuates the DV automatically in case of any fire. The LHSC detector shall be provided with suitable interface unit, which shall generate/ make the signal compatible with fire alarm panel.
- p. Linear heat sensing cable detector shall run in a zigzag fashion (with an included angle of 90 deg) on each top cable tray, bottom tray and every alternate intermediate trays of each section of cable tray without undue sagging and interfering the normal operations. All supporting materials for mounting of LHSC shall be provided by the bidder. Cable Vault shall be divided into a smaller risk zones.
- q. The detection zone/loop divisions of LHSC system shall match with the MVW spray system.
- r. MVW system consists of a network of sprayers fitted with a special deflector to give required angle of discharge for the water around the area to be protected. The sprayers discharge a cone of water spray consisting of medium size of droplets of water. The droplet size shall be designed so as to achieve efficient cooling of the flame zone by evaporation and also sufficiently large to penetrate the flame so as to reach and cool surfaces heated by the fire.
- s. Water sprayer of MVW spray system shall be placed in such a way so that the "spray cone" overlaps each other.
- t. The cable galleries shall have number of rows of cable trays and each row shall have number of tiers of cable trays. Each of the cable tray rows shall be provided with a network of water distribution piping and nozzles. The distribution network shall be as per TAC.
- u. All Spray pipe on road, Rail or pipe trench crossing shall be through RCC Hume pipes duly covered with coating and wrapping as per specification. Hume pipe for road crossing shall be NP3 class and that for rail crossing shall be NP4. Underground pipe shall be provided with coating and wrapping as per specification and IS: 10221 /TAC norms.
- v. Push button station/local control panel for deluge valve is required for DV local operation manually in

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case it fails to operate automatically. ***Suitable interfacing by providing sufficient CRM (Control Relay Module) and MM (Monitor Module) for taking feedback of “DV operated” to FAP under this situation should be taken care of by contractor during detailed engineering.***

- w. The cable vault shall be equipped with solenoid type Deluge Valve (SDV) to be operated automatically through fire detection system. Each SDV shall be provided with limit switch contacts to indicate actual operation of the solenoid operated valve in the local panel as well as FAP by using addressable CRM/MM. Since these connecting cables are to be run with other cables, the signal interference shall be avoided. ***All necessary cable and its accessories supply (for equipments to DVLCP and necessary annunciation in the switchyard FAP) shall be under contractor scope.***
- x. Provision (terminal blocks with all electrical connection) in the DVLCP shall be available for remote actuation of deluge valves.
- y. **All painting shall be epoxy based only.**
- z. The spray pipe lines shall be overground. It shall be laid either on pedestals, trestles etc. However, if the layout does not permit laying of overground pipe in that case it shall be laid underground with the approval of Engineer. Any spray pipe lines if routed underground, shall be equipped with suitable coating and wrapping. Road, Rail or pipe trench crossing shall be through RCC Hume pipes duly covered with coating and wrapping as per specification. Hume pipe for road crossing shall be NP3 class and that for rail crossing shall be NP4.

3.2.4 Piping and Valves

General Data for Pipes etc.

- i) Mild steel as per IS: 1239 (Part-I) medium grade (upto 150 NB) & as per IS: 3589 Gr 410 (above 200 NB) or Equivalent for pipes normally filled with water.
- ii) Mild steel as per IS: 1239 (Part-I) medium grade (upto 150 NB) & as per IS: 3589 Gr.410 (above 200 NB) or Equivalent and galvanised as per IS: 4736 for pipes normally empty and periodically charged with water and foam system application.
- iii) Pipe protection shall be as follows:
 To prevent soil corrosion buried pipes / pipes in trench shall be properly lagged with corrosion protective tapes of coal tar type as per IS: 15337 or AWWA C 203. The total thickness of protective tapes to be applied on buried pipes / pipes in trench shall be 4.0 mm. This can be achieved by using 4.0 mm thick tape in single layer or 2.0 mm thick tape in double layer.
- iv) Pipe thickness:
 - a) For Pipe sizes upto 150 NB and above: As per IS: 1239 Part-I medium grade.
 - b) For Pipe sizes 200 NB and above refer Annexure-I.
- v) All valves shall be as per applicable IS/BS codes & approved by TAC for specific fire protection system and shall be provided with locking arrangement (with locks) in open or close condition. Further, all gate/butterfly valves of size 200 mm & above shall be provided with spur gear reduction unit.



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vi) All the flanges and counter flanges shall conform to ANSI B 16.5 CI 150.

vii) Strainer Body as per IS: 2062 (tested).

viii) Pipe Fittings

1) The material shall conform to ASTM A 234 Gr WPB or ASTM A 105 or equivalent and dimensional standard conforming to ANSI B 16.11(socket & threaded type), ANSI B 16.9 (for butt welded fittings) and ANSI B 16.5 (for flanges and flanged fittings) as the case may be. Further, galvanised malleable cast iron fittings as per IS: 1879 in Cast iron fitting as per BS-1641 are also acceptable.

2) **Grooved couplings:** Vendor may also use mechanical grooved couplings type fittings in GI pipe lines for HVW / MVW spray system. All materials and products shall be either Underwriters Laboratories (UL) Listed or Factory Mutual (FM) Approved and installed in accordance with NFPA Standard 13 / equivalent Standard.

3) The fittings shall be galvanised as per IS: 4736 for galvanised pipe application. In case of branching connections from GI mains for spray piping network, socket may be welded for more than two pipe reduction instead of standard tees.

4) Fabricated fittings shall not acceptable up to pipe size to 300 NB. For sizes 350 NB and above, fittings may be fabricated as per BS: 2633/BS: 534.

ix) Welding of galvanised iron pipes/fittings would be permitted provided the same is carried out by means of special electrodes suitable for the above application and the same shall be approved by Employer. After, welding, welded portions shall be applied with three coats of zinc silicate treatment / rich paint over one coat of suitable primer. Further, the Contractor shall provide proper zinc paint at the point of welding.

x) **PIPING THICKNESS:**

Pipes for sizes 200 NB & above shall confirm to IS: 3589 Grade 410. The final thickness shall not be less than that specified as per IS: 3589 as indicated below.

Nominal pipe Size (mm)	Outside Diameter (mm)	Wall Thickness (mm)
200	219.1	6.3
250	273	6.3
300	323.9	7.1

xi) For MS pipeline, welded construction should be adopted unless specified otherwise.

xii) All piping system shall be capable of withstanding the maximum pressure (1.5 times of the maximum working pressure) arising from any condition of operation and testing including water hammer effects.



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- xiii) **Water line Gate / Sluice Valve** - Design Code: a) IS:14846 or BS:5150 (for valves coming inside fire water pump house) b) BS:5150 (for valves at other locations)- Pressure rating: PN1.6 (as per IS:14846) / PN16 (as per BS:5150) -Working Pr. :12Kg/cm² & MOC: Body/bonnet/Yoke/Wedge: CI to IS:210 FG-200 Spindle: SS to ASTM-A-276 type 410.
- xiv) **Check Valve Below 50NB size-** Design Code; IS: 778 MOC: Body/cover/flap: Lead tin bronze to IS: 318 Gr. LTB-2.
For 50NB & above- Design Code; IS: 5312 / BS: 5153 & MOC: CI to IS: 210 FG-200
- xv) **Butterfly Valve** Design Code: Double flanged or lugged wafer type of low leakage rate confirming to BS: EN: 593/API-609/AWWA C-504 Pressure class: PN 16 & MOC: Body & Disc: Cast Iron, Shaft: SS 410 / SS 420 Seat Rings: EPDM

3.2.5 Fire Extinguishers

- Fire extinguishers shall be installed in all the buildings within switchyard boundary as per TAC requirement
- Portable type:**
 - Pressurized water type of 9 liter. Capacity (IS:15683 operated by CO₂ cartridge type)
 - Carbon dioxide of 4.5 kg capacity portable fire extinguisher conforming to IS 15683.
 - Dry chemical powder type 6 kg capacity portable fire extinguishers conforming to IS 15683.
 - Foam type 9 Liter capacity portable fire extinguishers conforming to IS: 15683.
- Mobile type:**
 - Foam type (50 lit. cap. IS: 13386)
 - CO₂ type (22.5 kg. Cap. IS: 2878)
 - Dry Chemical powder (50 kg. Cap. IS: 10658)
- Selection of type and location of installation of fire extinguishers for the various rooms of the switchyard control building, GIS Hall Building etc. shall be done in accordance with TAC guidelines.**

3.3 Mandatory Spares

1.0	FIRE HOSES WITH COUPLINGS	Qty.
1	7.5m long fire hoses (internal) with end connectors	10% of population
2	15 m long fire hoses (internal) with end connectors	10% of population
3	15 m long fire hoses (external) with end connectors	10% of population
2.0	BRANCH PIPES WITH NOZZLES	



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1	Nozzles with branch pipes quick coupling ends (internal)	10% of population
2	Nozzles with branch pipes quick coupling ends (external)	10% of population
3.0	DELUGE VALVE ASSEMBLIES	
1	Complete deluge valve assembly alongwith internals and accessories	10% of population each type
2	Clapper assembly complete (consisting of clapper seat rubber, screws, etc.)	10% of population
3	Solenoid coils	10% of population each type
4.0	VALVES (GATE/GLOBE/BUTTERFLY/NRV)	
1	Complete valves	5% of population of each type and size
2	Reduction gear operator (gate/globe/butterfly)	10% -do-
3	Flap/Door with pin (NRV)	10% -do-
4	Disc (butterfly/globe)	5% -do-
5	Gate (gate valve)	5% -do-
6	Stem (all types)	5% -do-
7	Seal rings (all types)	10% -do-
8	Flap rings (NRV)	10% -do-
9	Gaskets	10% -do-
10	Bearing (butterfly valve)	10% -do-
5.0	Y-TYPE STRAINERS	
1	Strainers elements with O-rings and stiffeners.	20% of population of each type and size
6.0	MVW SPRAY SYSTEM	
1	Spray nozzles	5% of population
2	QB Detectors	5% of population
7.0	HVW SPRAY SYSTEM	
1	Spray nozzles	5% of population
2	QB Detectors	5% of population
8.0	SPRINKLER SYSTEM	
1	Quartz bulb sprinkler	5% of population
9.0	HYDRANT VALVE	
1	Hydrant valve complete (internal) single headed with instantaneous female coupling	20% of population
2	Hydrant valve complete (external) single headed with instantaneous female coupling	20% -do-
3	Water monitor sets with nozzle branch pipe etc.	5% -do-
4	Spindle with nuts of Hydrant valve	10% -do-



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5	Bonnet, gland nut, rubber assembly of hydrant valve	10% -do-
6	Seat, check nut, washer assembly of hydrant valve	10% -do-
7	Rubber washer for female coupling	10% -do-
8	Instantaneous female coupling assembly complete for hydrant valve	10% -do-
9	Lock pin assy. for hydrant valve	10% -do-
10.0	FIRE DETECTORS	
1	Photo-electric type detector(Addressable)	5% of population
2	Multisensor detectors (Addressable)	5% -do-
3	Indicators assembly for smoke detectors provided in false ceiling (Response indicator)	5% -do-
4	LHS cable for cable galleries	5% -do-
5	Manual pull stations	10% of each type
11.0	PORTABLE EXTINGUISHERS	
1	Portable extinguishers	10% of each type
a)	Water Type	
b)	Foam Type	
c)	CO ₂ Type	
d)	Dry Chemical Type	
12.0	MOBILE EXTINGUISHERS	10% of each type
a)	Foam Type	
b)	CO ₂ Type	
c)	Dry Chemical Type	
13.0	FIRE ALARM PANEL	
1	Fuses	100% of population
2	Indicating lamps	100% of population
3	Push Button	10 Nos. of each type and rating
4	Power supply modules	10% or 1 No. of each type & rating whichever is more
5	Control modules, loop cards modules, isolator cards	10% or 1 No. of each type, whichever is more.
6	LCD display of each type unit of panel	1 No.



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7	Interface unit / modules for non-addressable devices, auxiliary / output relay modules, control modules, supervisory control modules and any other electronic modules	10% or 1 No. of each type whichever is more.
8	LED's of each type	100% of population.
9	Power supervision relay	4 Nos. of each type.
10	Fire screen / alarm buzzer	1 No. of each type
14.0	ELECTRICAL	
1	Electrical Actuator	10% or 1 No. of each type, model and rating whichever is more.
15.0	MEASURING INSTRUMENTS	
1	Pressure Switch	2 Nos. of each type and model
2	Pressure Gauge	2 Nos. of each type and model
3	Limit switches for isolation valves	2 Nos. of each type

***Note:** Items under mandatory spares shall be supplied only if applicable under the Fire Protection System for switchyard area, the same shall be decided during detailed engineering.

3.4 Painting

- All the Equipments shall be protected against external corrosion by providing suitable painting.
- The surfaces of stainless steel, Gunmetal, brass, bronze and non-metallic components shall not be applied with any painting.
- All Steel Surfaces (external) exposed to atmosphere (outdoor installation)**
 - (i) **Surface Preparation:** The steel surfaces to be applied with painting shall be thoroughly cleaned before painting by wire brushing, air blowing, etc.
 - (ii) **Painting:** One (1) Coat of red oxide primer of thickness 30 to 35 microns followed up with three (3) coats synthetic enamel paint, with 25 microns as thickness of each coat. For plant at coastal area, epoxy resin based zinc phosphate primer followed by epoxy resin based paint pigmented with titanium di-oxide shall be used in place of enamel paints.
- All Steel Surfaces (external) inside the building (indoor installation)**
 - (i) **Surface Preparation:** The steel surfaces to be applied with painting shall be thoroughly cleaned before painting by wire brushing, air blowing, etc.
 - (ii) **Painting:** One (1) Coat of red oxide primer of thickness 30 to 35 microns followed up with two (2) coats synthetic enamel paint, with 25 microns as thickness of each coat. For plant at coastal area, epoxy resin based zinc phosphate primer followed by epoxy resin based paint pigmented with titanium di-oxide shall be used in place of enamel paints.
- Deluge Valves, Alarm Valves, Water monitors, etc.**

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Painting of all equipments /components of FDPS package shall be as per manufacturer's standard practice or as detailed below whichever is superior in quality.

Environment	Paint scheme	Total DFT
Normal / Mild Corrosive Environment	Primer- zinc filled epoxy Finish – Aliphatic Polyurethane (shade RAL3000)(P.O Red)	Min 125 microns
Corrosive Environment (as in coastal areas)	Primer- zinc filled epoxy Intermediate – Epoxy MIO Finish – Aliphatic Polyurethane (shade RAL3000)(P.O Red)	Min 200 microns

• Other requirements

- Paint manufacturer's instructions shall be followed in method of application, handling, drying time etc.
- The color of the finish paint shall be as per approved color-coding.
- If finish paint was applied in shop, one coat of finish paint shall be applied at site.
- The dry film thickness of paint shall not be less than 0.15 mm.

• Color code for identification

The pipes shall be color painted/banded for identification as per the approved color-coding scheme and shall be generally as per IS-9404.

Enclosure:

- LAYOUT PLAN OF 400 KV SWITCHYARD (Drg. No. 9585-001-572-PVE-F-0013)**
- CONTROL BUILDING LAYOUT FOR OF 400 KV SWITCHYARD (Drg. No. 9585-001-572-PVC-F-0047)**
- 400KV GIS Hall Building (Drg. No. 9585-001-572-PVC-C-0249)**

4.0 SCOPE OF SUPPLY & SERVICES

- Exact requirements shall be worked out during detailed engineering after award of contract. The scope of the work under the contract shall be deemed to include all such items, which although not specifically mentioned in the bid documents and/or in the bidder's proposal, but are required to make the equipment/system complete for its safe, efficient, reliable and trouble free operation, unless the same is specifically excluded from the Bidder's scope of work under clause 5.0 of this section.
- Bidders shall consider makes for various equipments as per Annexure B which shall be subjected to Owner's approval during design engineering stage. Price implication to BHEL later on account of non-acceptance of proposed vendors by Owner shall not be considered.
- Bidder shall also consider the following while quoting for the system:**
 - Power & Control cables for fire protection system (except, cables for detection and alarm system & FO cable) will be supplied on free issue basis to contractor. Contractor shall have to choose their cables from the available sizes only and necessary modifications in their equipment for termination of these cables shall be made by contractor.

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- ii) Since laying & termination of all power & control cables is in contractor's scope, supply of cable accessories such as lugs, glands, cable tags & markers etc. shall be included by the bidders in their offers alongwith supply of cable (power and control of suitable size, FRLS, twisted pair, armored Cu cable) for fire detection and alarm system.
- iii) Necessary cable trays will be supplied on free issue basis to the contractor, however necessary hardware for fixing the same on walls or elsewhere shall be included by the bidders in their offers.
- iv) Earthing material viz. GS flat & wire will also be supplied on free issue basis to contractor; however, requirement shall be given by the bidders in their respective bids.
- v) Bidder shall ensure that sufficient quantities of commissioning spares are made available for timely completion of commissioning of the system. The bidder shall furnish a list of Commissioning spares that will be brought by him. The unused commissioning spares shall be returnable to the bidder.
- vi) The contractor shall lay the aboveground piping required for hydrant and spray system in the switchyard also shall construct RCC pedestals supports for these above ground pipes of adequate size. The size of pedestal shall be decided during detailed engineering with customer. Sufficient margin should be provided on both the side of pedestals and minimum distance should be considered between two pipes if laid over common RCC pedestals, wherever required.
- vii) Pipe size for pylon, size of Anchor fasteners etc. shall be adequate for the support to provide sufficient rigidity against vibration & load during operation. The whole arrangement shall be in bidder's scope. The contractor shall justify adequacy of design during engineering.
- viii) Conducting performance guarantee tests as per approved procedure to the satisfaction of Owner / Purchaser and handing over an operational system to the owner. Procedure for performance guarantee test shall be submitted by contractor for customer review and approval.
- ix) Contractor shall submit valid Type test report for approval by owner. Fresh type test of equipment is not envisaged. It is presumed that equipment offered is duly type tested.

Type Test Certificate for degree of protection shall be submitted for all the electrical panels shall be as per customer specification.

In case the type test reports are found un-satisfactory, tests shall be carried out afresh by contractor without any additional cost implication to BHEL.

4.4. Scope of services

A. Erection, Testing & Commissioning (ETC) requirements

- i) The scope of ETC shall include receipt of material at site, unloading, safe storage of material, handling of equipment / material at site, erection of equipment /material at site

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including fabrication, equipment and system testing, commissioning of the entire system, conducting performance guarantee tests to the satisfaction of Owner / Purchaser and final handing over to the owner of the entire system.

- ii) Furnishing technical calculations in support of equipment selection or sizing as and when required.

B. Electrical System

- i) Preparations of cable interconnection diagram for equipment supplied under this contract and accordingly offer guidance to the purchaser for laying necessary cables. Termination details shall also be furnished in the said interconnection table.
- ii) Laying & Termination of Power/ Control cables/ FO Cables for the equipment under the scope of this specification. Bidders shall include all cable accessories like lugs, glands, cable tags, markers etc in their respective bids.
- iii) Earthing of all installations (to the nearest earth mat/ earthing pad) supplied under the scope of this specification.

C. All machinery tools & tackles and consumables required for erection/testing / commissioning of the system shall be arranged by the Bidder.

D. Minor modifications, alterations in system installation as per customer's specific requirements shall be done without any extra cost to purchaser.

E. Bidders to ensure that sufficient quantity of spares are made available for timely completion of commissioning of the system. The bidder shall furnish a list of commissioning spares that will be brought by him. The unused commissioning spares shall be returnable to the bidder.

F. Obtaining approval from TAC/ TAC accredited agency on documents & installations.

- i) Obtaining, "As Built" certification from purchaser or owner on applicable drawings. Completing documentation as per specification requirement.
- ii) Obtaining customer's written acceptance of satisfactory completion of job. (Acceptance of PG + handing over of system and mandatory spares (if any)).
- iii) Any other service not explicitly illustrated herein but which may be required to complete the system with its desired functionality or in the spirit of contract shall also deemed to be under the scope of bidder.

G. Civil Works

The Bidder shall however supply foundation bolts & hardware and undertake minor civil works such as grouting, filling up of crevices/ cut outs etc. Any damage caused to civil works during ETC work of the equipment/system shall have to be made good to the original finish by the Contractor at no extra cost to the Purchaser.

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In addition, the following shall be in the scope of Contractor:

- i) Hydrant pipes/spray pipes that will be laid underground shall be duly covered with coating and wrapping as per specification, if required on paved area etc. Road, Rail or pipe trench crossing shall be through RCC Hume pipes duly covered with coating and wrapping as per specification. Hume pipe for road crossing shall be NP3 class and that for rail crossing shall be NP4. Laying of aboveground piping on RCC pedestals to support the hydrant/spray pipes wherever required.
- ii) Each of the outdoor deluge valves kit and it's local control panel shall be provided with deluge valve housing of sufficient size to avoid any hurdle during maintenance. Construction of deluge valve housing with RCC roof and its painting (inside & outside) shall be done by contractor.
- iii) *Pipe structure for pylon support around reactor shall be fixed to the bottom of sump with the help of Anchor fasteners. The structure will be in two pieces with a flanged joint at around Zero level above chequered plate. Pipe size for pylon, size of Anchor fasteners etc. shall be adequate for the support to provide sufficient rigidity against vibration & load during operation. Also pylon support pipe casing on the bottom side shall be done as per standard to avoid any rusting. The whole arrangement shall be in bidder's scope. The contractor shall justify adequacy of design during engineering.*
- iv) Civil pedestals for above ground yard piping is under contractor scope. Contractor shall also supply all fixing hardware like plate, angle, U bolts etc. for laying aboveground yard pipes over pedestals.
- v) Underground pipes, if any, shall be suitably covered with wrapping and coating material and is to be supplied and laid by contractor.

5.0 Exclusions

- a) **Supply of power & control cables except for detection cable & FO cable. However, laying and termination of these cables shall be in contractor's scope. The bidder shall furnish quantity and type of cables required complete system in their respective bids. Laying & termination is in contractor scope.**
- b) **Supply of necessary cable trays for laying power and control cables. However, hardware for fixing the same on wall trenches or elsewhere shall be included by the bidder in his bid.**
- c) **Supply of GI flat for earthing of equipments.**

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6.0 Utilities Available

Construction water and electricity shall be available at one point each. Contractor shall be required to make own arrangement for taking supplies from there.

7.0 Engineering Drawings/ Documents

Engineering shall start immediately after the award of the contract.

Submission & approval of all drg. / data sheet – as per tender requirement.

7.1 Operation & Maintenance (O&M) Manual

Operation and Maintenance manuals shall be specifically compiled for the project by the bidders. The draft O&M manual shall be submitted along with the supply of the items. The O&M manual shall contain the following information:

- Description of the system and equipment with design particulars.
- Instruction for erection.
- Instruction for operation, maintenance and repair.
- Recommended inspection practices and inspection schedule.
- Ordering information for all replaceable parts.
- Recommendation for type of lubricants and frequency of lubrication.

8.0 Handing & Taking Over

It is the responsibility of the contractor to maintain the firefighting system for switchyard till PG test conducted successfully and it is handed over to customer. Any defect noted during the period shall be rectified by the contractor without any price implication to BHEL. Also suitable PG tests shall be conducted by the contractor to show the achievement of guaranteed parameters in line with the requirements of specification/ standards/ codes and to the satisfaction of Purchaser/ Owner.

9.0 Various Heads to be quoted for

9.1.1 Based on the above input it is recommended that the bidders shall submit their LUMPSUM offers in the prescribed format only

Sl. No.	Item Description	Unit	Qty.	Ex-works Rate	Total Ex-works	ETC rate	Total ETC price
1.0	Firefighting system for switchyard area as per technical specification	Lot	1				
2.0	Supply of Spares as per technical specification	Lot	1			NA	
Total Lumpsum price for complete package							

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- 9.1.2 It may be noted that BOQ furnished by the bidder against main heads as per Table-I in Cl. 9.1.1 shall not be considered as limits to scope of supply and ETC. Being a lumpsum offer, any other item, which is not specifically mentioned in this specification 'OR' any item not considered by the bidder in his BOQ 'OR' additional quantity of any given item in Bidder's BOQ, which is required for satisfactory operation of the system shall be supplied and erected without any additional cost implication to BHEL.

10.0 Inspection & Testing

All the equipments shall be inspected prior to dispatch in line with relevant IS, approved GTP/ drawing and technical specification, BHEL/ customer approved QAP.



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ANNEXURE-‘A’

Cable Sizes being procured by BHEL for Sub-Station

Sl. No.	Item Description	Length (Mtrs)	Remark
A	XLPE Auxiliary Power Cables		Bidder to furnish the quantity required against the applicable cable size.
1	1C X 630 sq mm XLPE/Aluminium, FRLS, Armoured Auxiliary Power Cable		
2	3.5C X 300 sq mm XLPE/Aluminium, FRLS, Armoured Auxiliary Power Cable		
3	3.5C X 150 sq mm XLPE/Aluminium, FRLS, Armoured Auxiliary Power Cable		
4	1C X 150 sq mm XLPE/Aluminium, FRLS, Armoured Auxiliary Power Cable		
B	PVC Auxiliary Power Cables		
5	3.5 C X 70 sq mm PVC/Aluminium, FRLS, Armoured Auxiliary Power Cable		
6	3.5 C X 35 sq mm PVC/Aluminium, FRLS, Armoured Auxiliary Power Cable		
7	4 C X 16 sq mm PVC/Aluminium, FRLS, Armoured Auxiliary Power Cable		
8	4 C X 6 sq mm PVC/Aluminium, FRLS, Armoured Auxiliary Power Cable		
9	2 C X 6 sq mm PVC/Aluminium, FRLS, Armoured Auxiliary Power Cable		
C	PVC Control Cables		
10	19 C X 2.5 sq mm PVC/Copper, FRLS, Armoured Control Cables		
11	14 C X 2.5 sq mm PVC/Copper, FRLS, Armoured Control Cables		
12	10 C X 2.5 sq mm PVC/Copper, FRLS, Armoured Control Cables		
13	5 C X 2.5 sq mm PVC/Copper, FRLS, Armoured Control Cables		
14	2 C X 2.5 sq mm PVC/Copper, FRLS, Armoured Control Cables		
15	4 C X 10 sq mm PVC/Copper, FRLS, Armoured Control Cables		



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ANNEXURE- B

Sub-Vendor List

Bidder shall choose make of materials from list enclosed in Annexure-B to this section only. However final applicable make is subject to ultimate customer approval. Bidder can provide any other make that is not included in the list only if it is acceptable to ultimate customer without any cost implication to BHEL.

SUB-VENDOR LIST FOR FIRE FIGHTING SYSTEM

S.N.	ITEMS	APPROVED SUB-VENDOR	PLACE	REMARK
1	HYDRANT VALVES & BRANCH PIPE, NOZZLES & COUPLINGS	SHAH BHOGILAL KALPANA NEWAGE H SARKAR VENUS	AHMEDABAD AHMEDABAD SURENDRA NAGAR KOLKATA	ISI MARKED ISI MARKED ISI MARKED ISI MARKED
2	STRAINERS (Y-TYPE & BASKET TYPE)	SAROJNI ENTERPRISES JAYPEE INDUSTRIES	NEW DELHI MUMBAI	ISI MARKED
3	FITTINGS & FLANGES	M S FITTINGS METAL LLOYDS BHARAT FORGE TUBE PRODUCTS NITIN PROFILE	KOLKATA MUMBAI PUNE BARODA BARODA	
4	MS/ GI ERW PIPES	JINDAL SURYA ROSHINI GOOD LUCK TUBES TATA	GHAZIABAD BAHADUR GARH SIKANDRABAD JAMDESHPUR	ISI MARKED
5	FIRE HOSES	NEWAGE CHATTARIA RUBBER	SURENDRA NAGAR BARUCH	ISI MARKED ISI MARKED
6	DELUGE VALVES	HD FIRE	THANE	UL/FM
7	HV SPRAY NOZZLE	HD FIRE KIDDE (I) LTD. TYCO	THANE MUMBAI USA	UL/FM / LPCB/VDS APPROVED
9	QUARTZOID BULB SPRINKLERS	TYCO/ HD FIRE NEWAGE INDUSTRIES	USA MUMBAI	UL/FM/ LPCB/ VDS



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10	SOLENOID VALVE	ROTEX AVCON	BARODA MUMBAI	
11	MICROPROCESSOR BASED FIRE ALARM PANEL, DETECTORS & OTHER ALARM DEVICES	SCHRACK SECONET ESSER HONEYWELL AUTRONICA EST (EDWARD SIGNATURE SERIES)	AUSTRIA GERMANY NORWAY USA	UL/FM/ VDS APPROVED
12	COATING & WRAPPING MATERIAL/TAPE	MP TAR PRODUCTS RUSTECH IWL	BHILAI MUMBAI	
13	CAST IRON GATE VALVE & AIR RELEASE VALVE	SHAH BHOGILAL KALPANA NEWAGE H SARKAR VENUS	KOLKATA JALLANDAR KOLKATA	ISI MARKED
14	PRESSURE GAUGE	AN INSTRUMENTS H GURU	KOLKATA KOLKATA	
15	PRESSURE SWITCH	INDFOS SWITZER SOR INC. DRESSER INDUSTRIES INC.	GHAZIABAD CHENNAI USA USA	
16	PAINT	SHALIMAR ASIAN PAINTS BERGER		
17	POWER & CONTROL CABLE	TORRENT POLYCAB DELTON, PARAMOUNT		ISI MARKED
18	OPTICAL FIBER CABLE	FINOLEX POLYCAB		ISI MARKED ISI MARKED
19.	FIRE EXTINGUISHER	KANEX SAFEX		ISI MARKED ISI MARKED



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SECTION - 2
CUSTOMER SPECIFICATION

Refer Annexure C



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SECTION- 3

PROJECT DETAILS AND GENERAL SPECIFICATIONS

3.0 GENERAL

This section stipulates the General Technical Requirements under the Contract and will form an integral part of the Technical Specification.

The provisions under this section are intended to supplement general requirements for the materials, equipment and services covered under other sections of tender documents and are not exclusive. However in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall prevail.

3.1 PROJECT DETAILS

	Particular	Details															
a)	Customer	Patratu Vidyut Utpadan Nigam Ltd (PVUNL) – A Subsidiary of NTPC in Joint Venture with JBVNL.															
b)	Engineer/Consultant/Inspector	NTPC Ltd.															
c)	Project Title	Patratu Super Thermal Power Project Expansion Phase – I (3X 800MW) – 400kV GIS Switchyard at Patratu STPP															
d)	Project Location	Place: Patratu District: Ramgarh State: Jharkhand															
e)	Latitude & Longitude	Latitudes and Longitudes of the site are as follows: <table><tr><th>Corner name</th><th>Latitude</th><th>Longitude</th></tr><tr><td>Top Corner</td><td>23° 38 ' 60 '' N</td><td>85° 17' 51.5" E</td></tr><tr><td>Bottom Corner</td><td>23° 38 ' 12.5 '' N</td><td>85° 17' 27" E</td></tr><tr><td>Left Corner</td><td>23° 38 ' 22.5 '' N</td><td>85° 17' 10.6 '' E</td></tr><tr><td>Right Corner</td><td>23° 38 ' 40 '' N</td><td>85° 17' 57 '' E</td></tr></table>	Corner name	Latitude	Longitude	Top Corner	23° 38 ' 60 '' N	85° 17' 51.5" E	Bottom Corner	23° 38 ' 12.5 '' N	85° 17' 27" E	Left Corner	23° 38 ' 22.5 '' N	85° 17' 10.6 '' E	Right Corner	23° 38 ' 40 '' N	85° 17' 57 '' E
Corner name	Latitude	Longitude															
Top Corner	23° 38 ' 60 '' N	85° 17' 51.5" E															
Bottom Corner	23° 38 ' 12.5 '' N	85° 17' 27" E															
Left Corner	23° 38 ' 22.5 '' N	85° 17' 10.6 '' E															
Right Corner	23° 38 ' 40 '' N	85° 17' 57 '' E															
f)	Nearest Railway Station	Patratu – At a distance of about 4 km on Barkakhana-Barwadih Railway Line.															
g)	Distance of project location from the Railway station	4 km (approx.)															
h)	Nearest Major Town	Ranchi															
i)	Distance of the town from the project site	45 km															
j)	Nearest commercial airport	Birsa Munda Airport, Ranchi.															
k)	Distance of airport from the project site	45 km															



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SITE CONDITIONS (for design purposes)		
a)	Design ambient temperature	50°C
b)	Maximum Relative humidity	95 %
c)	Height above mean sea level	Less than 1000 meters
d)	Pollution Severity	Heavily polluted
e)	Criteria for Wind Resistant design of structures and equipment	Standard Applicable - IS 875 (Part 3)
f)	Basic Wind speed “Vb” at ten meters above the mean ground level.	39 m/ sec
g)	Category of terrain	Cat –2
h)	Risk Coefficient “K1”	1.06

3.1.1 SYSTEM PARAMETERS:

Sl.No.	Parameters	400 kV
1	Highest system voltage	420 kV rms
2	Lightning Impulse voltage	±1425kVp
3	Switching impulse voltage	±1050kVp
4	Power frequency withstand for 1 min (rms)	650 kV(rms)
5	Max. fault level (1 sec.)	63 kA
6	Minimum creepage distance	10500 mm

3.1.2 AUXILIARY POWER:

Sl.No.	Nominal Connection Voltage	Variations in Voltage	Frequency	Phase	Neutral
1	415V	±10%	50 (+3% -5%)	3Phase , 4 Wire	Solidly Earthed
2	240V	±10%	50 (+3% -5%)	1 phase	Solidly Earthed

Combined variation of voltage and frequency shall be + 10%. Design fault level of 415V system shall be restricted to 50kA rms for 1 second.

The operational limits for variation of DC voltage are (+) 10% to (-) 15%.

3.1.3 The various minimum heights of the AIS switchyard shall be as given below from plinth level:

Voltage	Equipment /1st Level	Line Take Off Gantry Height	Peak
400kV	8000mm	23000mm	8500mm

The minimum vertical distance from the bottom of the lowest porcelain part of the bushing, porcelain enclosures or support insulators to the bottom of the equipment structure, where it rests on the foundation pad shall be 2550mm.

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The minimum height of intermediate gantry tower for 400kV wherever required shall be 25 m and the peak (s) shall be of 8.5 m. The gantry width for 400kV AIS shall be minimum 27m or as required to meet the specified clearances.

3.1.4 The minimum clearances for 400kV switchyards shall be as given below:

	400kV
Phase to earth clearance	3500 mm
Phase to phase clearance	4000 mm
Section clearance	6500 mm

4.0 INSTRUCTION TO BIDDERS:

The bidders shall furnish catalogues, engineering data, technical information, design documents, drawings etc fully in conformity with the technical specification.

The supplier should be approved by Employer. If not, it is the responsibility of the vendor to be assessed and approved Employer, before placement of order by BHEL. Any cost involved in vendor assessment/approval must be borne by the vendor himself.

The Bidder's proposal shall be based upon the use of equipment and material complying fully with the requirements specified herein. It is recognized that the Bidder may have standardized on the use of certain components, materials, processes or procedures different than those specified herein. Alternate proposals offering similar equipment based on the manufacturer's standard practice will also be considered, provided the base offer is in line with technical specifications and such proposals meet the specified design standards and performance requirement and are acceptable to the Purchaser. Sufficient amount of information for justifying such proposals shall be furnished to Purchaser alongwith the bid to enable the Purchaser to determine the acceptability of these proposals.

Wherever a material or article is specified or defined by the name of a particular brand, Manufacturer or Vendor, the specific name mentioned shall be understood to be indicative of the function and quality desired and not restrictive. Other manufacturer's products may be considered provided sufficient information is furnished to enable the Employer to determine that the products proposed are equivalent to those named.

Equipment furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/ or needed for erection, completion and safe operation of the equipment as required by applicable codes, though they may not have been specifically detailed in the Technical Specifications unless included in the list of exclusions. Materials and components not specifically stated in the specification but which are necessary for commissioning and satisfactory operation of the switchyard unless specifically excluded shall be deemed to be included in the scope of the specification and shall be supplied without any extra cost. All similar standard components/parts of similar standard equipment under supply shall be inter-changeable with one another.

The bidder shall supply type tested (including special tests as per tech. specification) equipment and materials. The test reports shall be furnished by the bidder along with equipment/ material drawings. In the event of any discrepancy in the test reports, (i.e., if any test report is not

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acceptable due to any design/ manufacturing changes or due to non-compliance with the Technical Specification and/ or applicable standard), the tests shall be carried out without any additional cost implication to the BHEL. BHEL reserves the right to get any or all type/tests conducted/repeated.

4.3 CODES AND STANDARDS

In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India as well as of the locality where they will be installed, including the following :

- a) Indian Electricity Act
- b) Indian Electricity Rules
- c) Indian Explosives Act
- d) Indian Factories Act and State Factories Act
- e) Indian Boiler Regulations (IBR)
- f) Regulations of the Central Pollution Control Board, India
- g) Regulations of the Ministry of Environment & Forest (MoEF), Government of India
- h) Pollution Control Regulations of Department of Environment, Government of India
- i) State Pollution Control Board.
- (j.) Rules for Electrical installation by Tariff Advisory Committee (TAC).
- (k.) Building and other construction workers (Regulation of Employment and Conditions of services) Act, 1996
- (l.) Building and other construction workers (Regulation of Employment and Conditions of services) Central Rules, 1998
- (m.) Explosive Rules, 1983
- (n.) Petroleum Act, 1984
- (o.) Petroleum Rules, 1976,
- (p.) Gas Cylinder Rules, 1981
- (q.) Static and Mobile Pressure Vessels (Unified) Rules, 1981
- (r.) Workmen's Compensation Act, 1923

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(s.) Workmen's Compensation Rules, 1924

(t.) NTPC Safety Rules for Construction and Erection

(u.) NTPC Safety Policy

(v.) Any other statutory codes / standards / regulations, as may be applicable.

Unless covered otherwise in the specifications, the latest editions (as applicable as on date of bid opening: 03-March-2017), of the codes and standards given below shall also apply:

- a) Bureau of Indian standards (BIS)
- b) Japanese Industrial Standards (JIS)
- c) American National Standards Institute (ANSI)
- d) American Society of Testing and Materials (ASTM)
- e) American Society of Mechanical Engineers (ASME)
- f) American Petroleum Institute (API)
- g) Standards of the Hydraulic Institute, U.S.A.
- h) International Organization for Standardization (ISO)
- i) Tubular Exchanger Manufacturer's Association (TEMA)
- j) American Welding Society (AWS)
- k) National Electrical Manufacturers Association (NEMA)
- l) National Fire Protection Association (NFPA)
- m) International Electro-Technical Commission (IEC)
- n) Expansion Joint Manufacturers Association (EJMA)
- o) Heat Exchange Institute (HEI)
- p) IEEE standard
- q) JEC standard

Other International/ National standards such as DIN, VDI, BS, GOST etc. shall also be accepted for only material codes and manufacturing standards, subject to the Employer's approval, for which the Bidder shall furnish, adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and deviations from the standards mentioned elsewhere in the

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specification together with the complete word to word translation of the standard that is normally not published in English.

As regards highly standardized equipment such as Steam Turbine and Generator, National /International standards such as JIS, DIN, VDI, ISO, SEL, SEW, VDE, IEC & VGB shall also be considered as far as applicable for Design, Manufacturing and Testing of the respective equipment. However, for those of the above equipment not covered by these National / International standards, established and proven standards of manufacturers shall also be considered.

In the event of any conflict between the codes and standards referred to in the above clauses and the requirement of this specification, the requirement of Technical Specification shall govern.

In case of any change in codes, standards & regulations between 03-March-2017 and the date when vendors proceed with fabrication, the Employer shall have the option to incorporate the changed requirements or to retain the original standard. It shall be the responsibility of the Contractor to bring to the notice of the Employer such changes and advise Employer of the resulting effect.

4.4 ENGINEERING DATA

2.4.1 Drawings

All drawings submitted by the supplier including those submitted at the time of bid shall be in sufficient detail to indicate the type, size, arrangement, material description, Bill of Materials, weight of each component, break-up for packing and shipment, the external connections, fixing arrangement required. The dimensions required for installation and interconnections with other equipment and materials, clearances and spaces required for installation and interconnections between various portions of equipment and any other information specifically requested in the specifications.

Each drawing submitted by the bidder (including those of sub-vendors) shall bear a title block at the right hand bottom corner with clear mention of the name of the Employer, the system designation, the specifications title, the specification number, the name of the Project, drawing number and revisions. If standard catalogue pages are submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.

After the approval of the drawings, further work by the bidder shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the Purchaser, if so required.

The review of these document/data/drawings by the purchaser will cover only general conformance of the document/data/drawings to the specification and contract, interfaces with the equipment provided under specification, external connections and of the dimensions which might affect plan layout. This review by the purchaser may not indicate a thorough review of the dimensions, quantities and details of the equipment, material, any devices or items indicated or the accuracy of the information submitted. The review and/or approval by the purchaser shall not be considered by the bidder, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and documents.

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All manufacturing, fabrication and execution of work in connection with the equipment/system prior to the approval of the drawings shall be at the bidder's risk. The bidder is expected not to make any changes in the design of the equipment /system, once they are approved by the Purchaser. However, if some changes are necessitated in the design of the equipment/system at a later date, the bidder may do so, but such changes shall promptly be brought to the notice of the Purchaser indicating the reasons for the change and get the revised drawing approved again in strict conformance to the provisions of the Technical Specification. Approval of bidder's drawing or work by the Purchaser shall not relieve the bidder of any of his responsibilities and liabilities under the Contract.

All engineering data submitted by the contractor after final process including review and approval by the purchaser shall form part of the contract document and the entire work performed under these specifications shall be performed in strict conformity with technical specification, unless otherwise expressly requested by the purchaser in writing.

2.4.2 Bidder's Drawing Submission and Approval Procedure

The following procedure for submission and review/approval of the drawings, data reports, information, etc. shall be followed by the bidder:

- All data/information furnished by Vendor in the form of drawings, documents, Catalogues or in any other form for Employer's information/interface and/or review and approval are referred by the general term "drawings".
- The 'Master drawings list' indicating titles, Drawing Number, Date of submission and approval etc. shall be furnished by the bidder. This list shall be updated if required at suitable interval during detailed engineering.
- All drawings (including those of sub-vendor) shall bear at the right hand bottom corner the 'title plate' with all relevant information duly filled in. The bidder shall furnish this format to his sub-vendor along with his purchase order for sub-vendor's compliance.
- Contractor shall submit all the drawings in five (5) copies for review of Employer. Employer shall forward their comments within four (4) weeks of receipt of drawings.
- Upon review of each drawings, depending on the correctness and completeness of the drawings, the same will be categorised and approval accorded in one of the following categories:

CATEGORY I	Approved
CATEGORY II	Approved, subject to incorporation of comments/modification as noted. Resubmit revised drawing incorporating the comments
CATEGORY III	Not approved. Resubmit revised drawings for Approval after incorporating comments/modifications as noted
CATEGORY IV	For information and records

- Bidder shall resubmit the drawings approved under Category II, III within one (1) week of receipt of comments on the drawings, incorporating all comments. Every revision of the drawing shall bear a revision index wherein such revisions shall be highlighted in the form of

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description or marked up in the drawing identifying the same with relevant revision number enclosed in a triangle (e.g 1.2.3. etc.).

- g. In case Bidder does not agree with any specific comment, he shall furnish the explanation for the same to Employer for consideration. In all such cases Bidder shall necessarily enclose explanations along with the revised drawing (taking care of balance comments) to avoid any delay and/or duplication in review work.
- h. It is the responsibility of the Bidder to get all the drawings approved in the Category I or IV (as the case may be) and complete engineering activities within the agreed schedule. Any delay arising out of submission and modification of drawings shall not alter the contract completion schedule.
- i. Bidder shall not make any changes in the portions of the drawing other than those commented. If changes are required to be made in the portions already approved, the Bidder shall resubmit the drawings identifying the changes (along with reasons for changes) for Employer's review and approval. **Drawings resubmitted shall show clearly the portions where the same are revised marking the relevant revision numbers and Employer shall review only such revised portion of documents.**
- j. As Built Drawings

After final acceptance of individual equipment / system by the Employer, the Bidder will update all original drawings and documents for the equipment / system to "as built" conditions and submit no. of copies as per clause 3.5.5.

- k. **Final Submission of drawings and documents:**

The Bidder shall furnish the following after approval of all drawings /documents and test reports:

List of drawings bearing the Employer's and Contractor's drawing number.

Six (6) bound sets along-with two (2) sets of CD-ROMs/ DVD/Portable hard disk of all final drawings/documents.

Bidder shall also furnish six (6) bound sets of all as-built drawings including the list of all as-built drawings bearing drawing numbers. The Contractor shall also furnish two (2) sets of CD-ROMs/ DVD/Portable hard disk of all as-built drawings as decided by the Employer.

The Bidder shall also furnish four (4) copies and two (2) sets of CD-ROMs/ DVD/Portable hard disk of instruction/ operations & maintenance manuals (after approval) for all the equipments



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SECTION 4 LIST OF DOCUMENTS

1.0 LIST OF TECHNICAL DATASHEETS

In this section Technical Datasheets (TDS) of various equipment/items and system drawings that are required to be generated is furnished herewith. List of datasheets/drawings and numbers to be accorded is also given below.

The list furnished here is tentative and additional documents may be required during detailed engineering.

List of Data Sheets		
Sl. No.	Item Description	NTPC Doc. No.
01.	D.S. For Water based Fire Protection System	Shall be provided during detailed engineering
02.	D.S. For Portable extinguisher	
03.	D.S. For Fire Detection items	
04.	BOQ - FPS switchyard	
05.	D.S. For Solenoid Valve	
06.	D.S. of Fiber Optic Cable for Fire Detection system	
07.	D.S. of Cable	
08.	D.S. of Instruments	
List of Drawings		
09.	Schematic Diagram for Fire Protection system of Switchyard	Shall be provided during detailed engineering
10.	Fire Water Piping Layout for Switchyard	
11.	HWV Spray system of 125MVar Reactor- Side View, Isometric View (with Hydraulic Calc)	
12.	Distribution of Extinguisher inside Switchyard control room	
13.	MVW Spray system of Cable Vault- (with Hydraulic Calc)	
14.	Schematic of Fire detection system for Switchyard Control building	
15.	Fire Alarm & Detection system inside Switchyard control room building	
17.	Fire Alarm & Detection system inside GIS building	
18.	LCPDV Drawing	



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SECTION- 5

ENCLOSURES TO SPECIFICATION

SCHEDULES TO BE FILLED UP BY THE BIDDER

- | | |
|------------|---|
| Schedule 1 | Schedule of makes of Equipments |
| Schedule 2 | Schedules of Deviations |
| Schedule 3 | Details of contact persons (technical & commercial) |
| Schedule 4 | Enclosures to Specification |



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SCHEDULE-1

MAKES OF IMPORTANT ITEMS / COMPONENTS OF EQUIPMENTS AND THEIR DETAILS

ITEM NAME	NAME OF MANUFACTURER	PLACE OF MANUFACTURE OF ITEM	PLACE OF TESTING AND INSPECTION	COMPLIANCE WITH ISO 9001 (YES/NO)

Place

Signature of the authorized representative of Bidder

Name -----

Date

Designation-----

Company seal-----



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SCHEDULE-2

SCHEDULE OF TECHNICAL DEVIATION

The following are the deviations / variations / exceptions from the specification:

Section	Clause No. / Page No.	Statement of deviation/ Variations/Exceptions
---------	--------------------------	--

- 1) In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract are deemed to be in compliance with the specification.
- 2) If there is NIL deviation, even then the format to be filled as **NIL DEVIATION**
- 3) Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

Place

Signature of the authorized representative of Bidder

Name -----

Date

Designation-----

Company seal-----



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SCHEDULE-3

DETAILS OF CONTACT PERSON BOTH TECHNICAL AND COMMERCIAL

Name

Address for correspondence

Phone No.

Fax No.

Email

Place

Signature of the authorized representative of Bidder

Date

Name-----

Designation-----

Company seal -----

Note: Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.



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SCHEDULE –4

ENCLOSURES TO SPECIFICATION

DRAWINGS

1. LAYOUT PLAN OF 400 KV SWITCHYARD
DRG. NO. 9585-001-572-PVE-F-0013 REV.01
2. CONTROL BUILDING LAYOUT FOR OF 400 KV SWITCHYARD
DRG. NO. 9585-001-572-PVC-F-0047 REV.02
3. GA & Architectural Plan, Elevation & Section for 400 kV GIS Building
DRG. NO. 9585-001-572-PVC-C-0249 REV.01
4. OGA OF 125 MVAR REACTOR.
DRG. NO. 34690002045 REV.01
5. CABLE TRENCH LAYOUT FOR 400 KV SWITCHYARD.
DRG. NO. 9585-001-572-PVE-F-0301 REV.01
6. Cable Raceway & Earthing Layout
DRG. NO. 9585-001-572-PVE-F-0050 REV.00
7. *Schematic Diagram for Fire Detection and Alarm System for Main Plant*
DRG. NO. 9585-001-151-PVI-L-001 REV.01

ANNEXURE-C

SUB – SECTION – A-18

FIRE PROTECTION AND DETECTION SYSTEM

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	FIRE PROTECTION AND DETECTION SYSTEM			
1.00.00	GENERAL DESCRIPTION			
1.01.00	A comprehensive Fire Detection and Protection System covering all the areas of the power plant including Employer's facilities/ system /buildings, service building , Administrative building, Auditorium building, Canteen, IT building, permanent stores, Township, is included in the scope of the Contract.			
1.02.00	The complete Fire Detection and Protection Systems shall be as per the guidelines/ codes/ standards / rules of TAC/ NFPA / IS: 3034 / OISD etc. and all the systems, equipments and installation shall be got approved from TAC accredited professional(s)-India.			
1.03.00	Fire Water Source Water for the Fire Protection system shall be drawn from fire water storage tanks to be provided by the Bidder. Water for filling up the fire water storage tanks shall be drawn from the following two sources: a) From Circulating System blow down b) From raw water header as second source. Fill in line from above two sources shall be in the scope of fire fighting vendor. Bidder shall interconnect the same to each of the fire water tank through individual motorised isolation valve. Raw water make-up line to tanks shall be provided with Basket strainer & an isolation valve of suitable size.			
1.04.00	Pressurisation System This system consists of two (2) nos. electric motor driven jockey pumps (1 no. working + 1 no. stand-by).			
2.00.00	HYDRANT SYSTEM Hydrant system shall consist of Hydrant pumps, pressurization arrangement, water mains network, hydrant valves, landing valve, water monitors, hoses, branch pipes, nozzle, hose boxes, central hose houses etc.			
2.01.00	Areas to be Covered Complete main plant, & off site areas including CHP, PT & DM plant, Ash handling plant including its conveying system, FGD, Ash silo area and Air compressor house, CPU regeneration area, ACW, ESP building & chimney area,, FGD area, CHP area, Fuel oil unloading & pumping area, switchyard (GIS Building), water treatment area, and other auxiliary & miscellaneous buildings / areas including township under the scope of the Bidder.			
3.00.00	HVW AND MVW SPRAY SYSTEM			
3.01.00	General It shall consist of: Spray pumps, pressurization arrangements, water mains network, deluge valves, alarm valves, flow switches, isolation valves, Y-type strainers, spray nozzles/projectors, spray nozzles piping network, detection system, instrumentation, local control panels, cables etc.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2	SUB SECTION-A-18 Fire Detection & Protection System	Page 1 of 27

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
3.02.00	Spray system shall mainly comprise of the following:- - Automatic deluge valve (DV) assembly suitable size and trims - Isolation (butterfly) valve at the upstream & downstream of each DV - Y-strainer of suitable size at upstream of each dv - S.S Spray nozzles - QB Detectors - Solenoids valve for each DV - One (01) no. pressure switch each in detection line & spray discharge - One (01) no. limit switch for each isolation valve - Local control Panel with relays and interface units for each DV - GI piping for spray network at downstream of DV 25NB M.S. Black wet detection piping network.			
3.03.00	Areas to be covered by HVW Spray System i) All transformers located in transformer yard of main plant. ii) All other transformers having oil capacity above 2000Ltrs & located with-in plant boundary. iii) Steam Turbine Lube oil storage tanks, oil coolers and purifier units. iv) Central Lube oil tanks (Both Clean oil & dirty oil units) and purifier units. v) Boiler Feed Pumps lube oil tanks, coolers, purifier, consoles, etc. vi) Generator seal oil system tanks, cooler assembly, etc. vii) Turbine Oil canal pipelines in main plant. viii) Boiler burner fronts including fuel oil racks at boiler. ix) Apart from above any other equipments/systems having requirements of HWV spray protection.			
3.04.00	Areas to be covered under MVW Spray System i) All cable galleries/ cable vault/ cable spreader room in main plant including ESP control room building, FGD control building and switchyard control room, etc. ii) Employer’s facilities viz.- Feeder transfer point, Coal conveyors, ash conveying system, transfer points, crusher house, etc. iii) All the un-insulated liquid fuel oil tanks (including HFO & LDO tanks) storing fuels of flash point less than 65 deg. C.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2	SUB SECTION-A-18 Fire Detection & Protection System	Page 2 of 27

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
	iv) All the Fuel oil pumping (unloading & pressurizing) stations and DG set oil tanks. v) For Stacker-Reclaimer machines, MVW spray system shall cover both boom conveyor & intermediate &/or tripper conveyors and associated structure. Water for spray system shall be tapped from hydrant header running along the stock-yard. For this, combination of butterfly valves & quick cam couplings (SS-304construction) with one end flanged shall be provided at every 20M interval in the hydrant header running along the stock yard. Whenever, Stacker-reclaimer is in stationary condition, a flexible hose (SS-304 construction) with suitable end coupling shall be connected to quick cam coupling installed on hydrant header. The other end of flexible hose shall be permanently connected to Deluge valve. vi) Apart from above any other equipments/systems having requirements of MVW spray protection. Note: Criteria for taking two (2) spray pumps in service:- While designing the HVW/MVW spray system for crusher house, HFO & LDO tanks, etc. where flow of one spray pump of 410m3/hr may not be adequate, operation of two (2) spray pumps shall be considered. In such a situation, suitable arrangement shall be done to start the second spray pump automatically from PLC/Fire alarm panel on receipt of fire signal from respective areas.		
3.05.00	BLADDER TYPE FOAM PROTECTION SYSTEM		
3.05.01	GENERAL		
	The fixed foam system of bladder tank foam proportioning type consist of skid mounted foam bladder tank assembly, foam makers, discharge outlets, interconnection piping, valves, fittings and instrumentation. Semi-fixed system consisting of a separate foam solution ring main around the tank with foam hydrant valves at regular intervals shall also be provided in addition to the water hydrants. The operation of the fixed foam system shall be automatic with the aid of dedicated fire detection system provided in the tank. The semi-fixed system shall be operated through the foam hydrants/ monitors, portable type foam water monitors (wheeled type with in-built foam maker), hoses and nozzles for extinguishing spill fire in and around the tank area.		
4.00.00	FIRE EXTINGUISHERS, FIRE TENDER AND FIRE STATION EQUIPMENTS		
4.01.00	Fire Extinguishers		
	As indicated in Bidder's Scope (Refer Relevant Sub-section, Part A, Section VI).		
4.02.00	Fire Tender & Fire Station Equipments		
	As indicated in Bidder's Scope (Refer relevant sub-section, Part A of scope, Section VI).		
5.00.00	FIRE DETECTION, ALARM AND CONTROL SYSTEM		
5.01.00	Codes and Standards		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2	SUB SECTION-A-18 Fire Detection & Protection System
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
5.02.00	a. The design, manufacture, testing, performance, etc. of the various components of the analog addressable Fire Detection and Alarm System shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. Nothing in this specification shall be construed to relieve the contractor of this responsibility. b. Unless otherwise specified, the Fire Detection and Alarm System and the components shall conform to the latest applicable Indian or IEC Standards. Equipment complying with any other authoritative National Standards such as British, USA, VDE, etc. will also be considered, provided the parameters specified are equivalent or better than the corresponding IS. c. The Contractor shall be solely responsible for obtaining the required approval and clearance for the different components and systems of the Fire Detection and Alarm System from the following authorities, as applicable: d. Department of Atomic Energy (Certification of safety from Radioactivity). e. Central Building Research Institute, Roorkee. f. Central Mining Research Station, Dhanbad. g. Local Fire Authorities. h. The equipment and the system shall be of types approved by any of the following bodies, as applicable: i. Loss Prevention Council, (LPC), U.K. j. National Fire Protection Association, (NFPA), USA k. Under-writers laboratories, (UL), USA i. Factory mutual(FM)			
	Areas to be covered under Fire detection and alarm System			
	a) Multisensor type detection system (Above and below the false ceiling or below the false flooring as the case may be)			
	i) All switchgear / MCC/battery rooms of main plant, ESP, FGD, Switchyard (GIS control room building), various auxiliary buildings like ash handling system, condensate polishing plant, water treatment plant, pump houses, service building, administrative & auditorium building, Canteen, Township, etc.			
	ii) Cable galleries of main plant, ESP, FGD & switchyard (GIS control room building) protected by MVW spray system. Further, multisensory detectors shall also be provided inside all cubicles/panels of control room, control equipment room and UPS / Battery charger areas.			
	iii) Above and Below false ceiling areas of all air-conditioned rooms of main plant building, ESP building, FGD control building, service building, administrative & auditorium building, canteen, Township, various control rooms of auxiliaries as defined in Sl. No. (i) above and return air ducts of inert gas protected areas.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2	SUB SECTION-A-18 Fire Detection & Protection System	Page 4 of 27

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
	b) Linear heat sensing cable detection system Coal conveyors, Boom & Tripper/ Intermediate conveyor of stacker-reclaimer machines and various Cable Galleries covered under MVW Spray System. Further, Gypsum and ash conveying system shall also be provided with LHS cable. c) Quartzoid bulb heat detection system Equipments protected by HVW spray system, coal conveyors, HFO/LDO/DAY tanks and fuel oil unloading & pressurizing pump houses protected by MVW spray system. d) Probe type heat detectors for HFO & LDO tanks. e) For buildings / enclosures with High height like Auditorium, etc. Beam Detectors shall be provided for fire detection system. f) Minimum twelve (14) nos. Infrared Detectors (IRDs) shall be provided at strategic location of various coal conveyors and other conveyor. Location of IRDs shall be finalized during detailed engineering. 5.03.00 General requirements for all types of Detectors 5.03.01 Detectors shall be housed or mounted in suitable enclosure in such a way that their performance is in no way affected. Special maintenance procedures if any required for the satisfactory operation of the detectors shall be clearly stated in the bid. 5.03.02 Necessary mounting accessories shall be provided for all the detectors. 5.03.03 In case the detectors are offered with their output (on sensing a fire) in the form of an electrical contact, it shall be noted that the contact shall be 'NC' type such that under fire conditions, this contact will open to initiate the fire alarm system. 5.03.04 Detectors shall preferably be designed as plug-in units, which fit into various bases according to place and type of mounting. This would also enable interchangeability. 5.03.05 Detectors shall be provided with the necessary compression type cable terminating glands for the incoming cables of flameproof type or PVC/metallic flexible/rigid conduits. 5.03.06 Depending upon the environmental conditions in which detectors are installed, chlorinated rubber based or epoxy or equivalent paint shall be used for finishing the surface of the enclosure. 5.03.07 The coverage or the zone of protection afforded by the detector and recommended height of mounting shall be furnished by the Bidder. The bidder shall furnish the test certificate in support of this. 5.03.08 Any metal parts used for detector construction shall be inherently resistant to corrosion or shall be plated or otherwise suitably treated to afford protection against corrosion. The plating or treatment shall in no way affect the detector performance.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2	SUB SECTION-A-18 Fire Detection & Protection System	Page 5 of 27	

CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC	
5.03.09	Any plastic material or any sealing compound used in the detector shall be such as it will not deform or fail under the maximum temperature to be expected.			
5.03.10	No detector shall contain any moving parts subject to wear and tear and must be able to operate afresh after each alarm release, without its exchange or adjustment.			
5.03.11	The detector shall be located where the largest combustion gas concentration can be expected.			
5.03.12	Adequate compensation and considerations shall be made for effects for wind velocities such as air-conditioning system and exhaust fans where dilution of particles of combustion is greater.			
5.03.13	The exact location of detectors shall be coordinated with other services like air-conditioning grills, light fittings, cable trays etc. to provide aesthetically pleasing appearance. The return air paths of air-conditioning shall be avoided for detector location.			
5.03.14	The detectors shall not be affected by temperature, humidity; air flow or by drift failures and shall not give any false alarm due to above.			
5.03.15	The detectors shall not be sensitive to vibrations. Any special mounting arrangements required to counteract vibration shall be included in the contractor scope.			
5.03.16	The quantity of multi- sensor detectors in each zone shall be based on the coverage factor of 25-sq. meter per detector. However the actual quantity of detectors required, taking into consideration obstructions due to floor beams, ventilation, doors, windows etc., shall be worked out and supplied (based on the actual layout) and installed by the contractor.			
5.03.17	The detectors shall not give false alarm due to high humidity, temperature, and velocity of air in the surroundings and static electricity conditions.			
5.03.18	Process actuated switch devices such as pressure switches, flow switches, level switches, etc. shall be provided with suitable individual addressable interface (local or remote) units or modules so that these devices are addressable from the panel.			
5.04.00	Infra-red Detectors			
	Application	Detection of Moving Fire on Coal Conveyor as well as hot spot beneath the surface		
	Sensor type	Infrared		
	Working voltage(detection)	24 V DC		
	Working voltage(purging)	230 V AC		
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CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC
5.05.00	Purging type	Air purging	
	Location	Head of the conveyor	
	Features	1. Ability to detect both black body and diffusion flame radiation.	
		2. Reject electric arc, heaters, artificial light sources and sunlight etc	
		3. Ability to function in heavily coal-dust prone atmosphere without regular maintenance	
		4. Insensitive to vibrations	
	Annunciations	Trouble in purging, Fault Alarm, Trip LED, Power supply ON	
	Output Controls	Two nos. Change over contacts for Alarm & Trip	
	Accessories	Air purge unit including blowers, starter for blowers, hose pipe etc	
	Linear Heat Sensor Cables		
	Application	Detection of Stationary fire	
	Type	Digital	
	Operating voltage	24 V DC	
	Approval	FM/UL	
	Conductor material	Steel	
	Insulation	Heat sensitive polymer	
	Outer Sheath	Black or colored PVC or flouropolymer suitable for the application environment	
	Installation features for LHSC/IR detectors		
	1. Mounting arrangement have been indicated in tender drawing.		
	2. The detection zone/loop divisions of LHSC system shall match with MVW spray zones. Conveyors where LHSC shall be installed shall be divided into no. of various zones whereas conveyor for which IR detector is installed shall be considered as one zone.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
5.06.00	3. Linear heat sensing cable detector shall run in a zigzag fashion (with an included angle of 90 deg) on each top cable tray, bottom tray and every alternate intermediate trays of each section of cable tray without undue sagging and interfering the normal operations. All supporting materials for mounting of LHSC shall be provided by the bidder.			
	Addressable Analog Intelligent Detectors In addition to the features specified under the item General requirements for all types of Detectors, the Addressable Analog Intelligent Detectors shall be provided with the following features: a) Detectors not specifically listed for sensitivity testing from the control panel are not acceptable due to the expense involved with manual testing as required by NFPA 72E. b) The detector shall be suitable for two-wire operation and two-way communication on the intelligent analog signaling circuit. c) The detector shall display a steady LED when in the Alarm State. The LED shall flash when in stand by or normal mode. d) Each detector in a loop shall have short circuit isolator suitable for style-7 wiring as per NFPA-72. e) Address and sensitivity assignments shall be set preferably electronically. However, dip switches / rotary switches for the same are acceptable. The detectors shall be assigned a sensitivity level based on environment, time of day or any programmable function as required by the system user, and shall respond at that level whether in the "on line" or "default" mode. f) The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. g) The detectors furnished shall be listed for use in environments as covered by Factory Mutual and UL and shall be installed according to the requirements of NFPA 72E for open area coverage.			
	Multi sensor Detectors			
5.07.01	Multi sensor detectors shall incorporate a heat detection element and a photoelectric detection element. Both the elements shall be incorporated in a single unit. Both the elements shall be operative at all times and the fire signal shall be available from any or both elements combined together.			
5.07.02	The detectors shall be sensitive to very low smoke densities of the order of say 0.05 g/m³. Also it shall be possible to adjust this sensitivity on a step less basis over a range so that the optimum sensitivity could be selected at site to suit the conditions of installations. The coverage area of the smoke detection under standard NFPA test conditions shall not be less than 80-90m².			
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5.07.03	The detectors shall be complete with a mounting base that includes a terminal box into which the detector can be plugged in. Terminals for looping of the cables shall be provided.			
5.07.04	All detectors shall be provided with built-in response and indicating lamps which shall give local visual indication, when it has operated in dense smoke conditions. The failure of lamp shall not prevent the function of detector.			
5.07.05	In areas such as false ceiling where detectors themselves are not easily accessible, the remote response indicators outside the enclosed areas shall be provided to indicate the fire condition.			
5.07.06	It shall be possible to replace any type of detector head by a different type detector without requiring change in cabling/panel wiring and condition of the zone, originally covered by the detector.			
5.08.00	System Configuration			
5.08.01	Each of the Addressable Fire Alarm panel shall be able to communicate with one another as well as with repeater annunciation panel and PLC based control panels located at different places. The detectors or other devices of any other unit/area shall be addressable only from the respective Addressable Fire Alarm Panel, so that each of the Addressable Fire Alarm Panel is under the control of designated operating personnel at that location. Facility to operate pumps of booster pump house and fire water pump house shall be provided from PC based monitoring station.			
5.08.02	At least one spare loop shall be provided in each of the addressable type fire alarm panel located in control equipment room and in CHP control room with complete loop card and all other accessories so that Employer can expand the system in future. Further, at least 10% of loop capacity be left free in each of the connected loop in all the panels, so that, additional devices may be connected to the system in any of the loop by Employer in future.			
5.08.03	Fire system (as a whole including PLC control systems) shall be provided with necessary interface hardware and software for dual fibre optic connectivity & interconnection with station wide LAN for two –way transfer of signals for information sharing. The information shall be made available through Ethernet link following TCP/IP standard. The system shall be OPC compliant. All required plant data shall be transferred ensuring complete security. The exact number of points shall be finalized during detailed engineering.			
5.09.00	Analog Addressable Fire Detection and Alarm System			
5.09.01	General Requirements			
5.09.02	This specification in general covers the functional requirements, and general design aspects of Microprocessor based, Analog Addressable Fire Detection Alarm / Annunciation and Control System.			
5.09.03	The following description intends to describe only the brief hardware and functional requirements, scope of hardware requirements etc. but the actual configuration of			
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	the system shall be in line with the prevalent normal practices in the industry and shall conform to latest product range of selected manufacturer. The fire detection and control system offered shall be complete in all respects for the safe and reliable operation of the entire system. Any additional hardware/software than those mentioned herein required to make the system complete shall be included in the scope of the Bidder.			
5.09.04	All the system and its equipment specifically detectors, interface modules, panels, power supply, battery chargers etc. shall be furnished from a single source and the same shall be new and latest state of the art products of manufacturer engaged in the manufacture of Integrated Microprocessor based Analog Addressable Fire Detection and Alarm System.			
5.09.05	All equipments such as detectors, panels etc shall be approved and listed by UL/FM/LPCB/VDS.			
5.09.06	All types of smoke detectors shall be of analogue addressable type. Conventional detectors with interface modules are not acceptable. Each zone of LHSC detector and each IR detector shall be provided with interface module.			
5.09.07	All the fire detection systems, process actuated switch devices such as pressure/flow/temperature switches and relays of control functions shall be hooked up with the analogue addressable fire detection and alarm system. Required addressable interface units shall be provided for various switch devices by the bidder to make them addressable.			
5.09.08	The wiring shall be of class-A as per NFPA-72.			
5.09.09	Bidder shall provide isolators at the start & end of the loop.			
5.09.10	The complete system shall include, but not be limited to the following: a) Master system CPU. b) Analog Addressable Fire Detection and Alarm System panels including alarm modules, system supervisory control modules, auxiliary output control modules etc. c) PC based monitoring station with colour graphic display terminal with programming and historical archiving facility along with laser printer. d) Power supplies, batteries and battery chargers. e) Analog addressable type smoke detectors. f) Non addressable type conventional detectors (Linear heat sensing cable detector/ infra red type heat detector) and switching devices each with its own addressable interface modules. g) Software and hardware as required for complete operation of the system.			
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	h) Complete Wiring/cabling including its conduits/trays/fixtures etc. i) The fire alarm control panel shall function as a communication interface between central processing unit and sensors. This panel shall have facility to process the input signal and to control all the input data received from initiating and indicating devices. j) Fire alarm control panel shall have filters to ignore false alarm and increase sensitivity to real fire from sensors. The sensitivity of each detector should be automatically raised if detectors are gradually polluted due to dust and dirt entering inside the detector. If detectors are more polluted the control panel shall give a warning. The trouble report shall indicate the location of device requiring service. k) Fire alarm control panel shall have printer to print out the alarm/ trouble occurrences. l) The CPU shall serve as the systems central processor. Software shall be designed especially for fire alarm annunciation system applications and shall monitor status of processing alarms according to priorities, controlling/processing communications and synchronizing all system activities. n) The system shall be able to recognize and indicate an alarm condition in a degrade mode of operation, in the event of processor failure or the loss of system communications to the circuit interface panels. o) All devices shall be individually identifiable for its type, its zone location, alarm set value, alarm and trouble indication by an unique alpha numerical label. p) The software logic modules and system database shall be programmable using a MS - Windows compatible program (latest version) on PC at site and required hardware shall be included in scope of supply. The system software programme shall be password protected and shall include full upload and download capability and during program upload or download through the PC, the capability of alarm reporting shall be retained. The software shall be downloaded to a PC for editing. The software shall enable Employer to add the spare loop provided in the fire alarm panels or addition of additional devices/detectors in any of the fire alarm panel. q) The system shall support the use of Color Graphic display terminal for the display of information in an appropriate format. r) The system shall include software for system data base, historical event log, logic, and operating system. The system shall require no manual input to initialise in the event of a complete power down condition. It shall return to an on line state as an operating system performing all programmed functions upon power restoration. s) Activation of any fire alarm initiating device shall display (LCD alpha numeric display) message in describing the device originating the alarm condition at			
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	the Central monitoring station, at alarm panel, simultaneously at the repeater annunciation panel and shall initiate the associated protection systems & other related control functions. Similarly activation of any supervisory circuit, (supervised valve closure, air pressure abnormal, fire pump trouble, water pressure low, etc.) or receipt of trouble report (primary power loss, open or grounded initiating or signaling circuit wiring, battery disconnect etc) shall display at the fire alarm control panel the origin of supervisory condition or origin of trouble condition as the case may be. It shall also record the occurrence of the event, the time of occurrence and the device initiating the same.			
	t) System configuration shall be menu driven and capable of being operated by, a person with no previous computer programming experience.			
5.10.00	System Functional Requirements			
5.10.01	The fire alarm panel shall evaluate the signals received from the detectors and shall handle the following functions: 1. System self monitoring and fault signaling. 2. Transmission of alarm and fault signals to the respective fire alarm panels and as well as in the repeater panel in fire station. Further, the panel shall activate a hooter/sounds in each of the area locally provided with fire/smoke detection system. Further, the system shall enable operation of spray system from the panel through monitoring station when the system operation is selected under remote, manual mode. 3. Initiate control functions like stoppage of conveyor, closure of fire doors, shutdown of draft fans, air-conditioning and ventilation plant/ equipment, opening smoke extraction vents, switching on smoke extraction equipment, emergency lighting etc. 4. Triggering stationary extinguishing systems such as clean agent system. 5. Supervising of unauthorised removal of a detector head from its base and giving a fault alarm on the control panel. 6. Supervising and monitoring the detection cabling, to indicate fault conditions in case of open/short circuit in the wiring. 7. Supervising by a separate annunciation window, changeover from mains supply to battery supply. "Mains On" indication shall be continuously on, as long as the main supply is available. 8. Facilitating simulation of fire conditions to enable the testing of circuits (without creating actual fire) under the test mode from the fire Alarm panel. 9. The control unit shall contain all the systems main switches lamps and fuses. Switches and lamps shall be easily identified even in closed casings. 10. All the circuits from the detectors to the panels and the circuits from panels to the actuating/operating devices of the respective extinguishing system shall be of closed loop type and shall be supervised for open-circuiting and			
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5.10.02	short-circuiting of cables. The cable fault shall be audio-visually annunciated on the panels. Separate hooters with different tones shall be provided for 'fault' alarms and 'fire' alarms. 11. Actuate solenoid valve in spray system in case of fire from respective fire alarm panel. For achieving this if any additional hardware is required like relays, power supply and cables, the same may be provided.			
	Analog Addressable Fire Detection and Alarm System shall also meet the following functional requirements: i. Each of the system shall support analog addressable detectors of all types, non-addressable type detectors/devices along with its addressable interface units/modules, Video display units etc. ii. Each of the devices and/or detectors shall be individually, uniquely and continuously addressable by the panel to which it is connected. iii. Detectors shall be interrogated for sensitivity settings from the control panel, logged for sensitivity changes indicating the requirement for cleaning and tested by a single technician using the field test routine. Sensitivity of each of the detectors made available in the panel shall be adjustable from the panel. iv. The system shall be capable of self-adjustment to compensate for the accumulation of contaminants that would change the detector sensitivity in either a more or less sensitive direction to prevent false indications or failure to alarm in the actual fire conditions. The system shall annunciate a trouble condition when any analog addressable smoke detector reaches 80% of its alarm threshold due to gradual contamination, signaling the need for service and eliminating unwanted alarm. v. Continuous supervision/monitoring of all the circuits and its components shall be made available from the panel for open, short circuits and grounding. vi. The system shall be able to recognize and indicate and alarm condition in a degraded mode of operation, in the event of processor failure or the loss of system communications to the circuit interface panels. vii. The system shall be programmable at site and required hardware shall be included in the scope of supply. The system software Programs shall be password protected and shall include full upload and download capability. During program upload or download the system shall retain the capability for alarm reporting. The system shall download to a PC for program editing. The software shall eligible employer to add the spare loop provided in the fire alarm panel or addition of additional devices/detectors in and of loop in any of the fire alarm panel. viii. The system shall support the use of color interactive History Reporting			
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5.11.00	video display terminal for the display of information in an appropriate format. ix. The system shall include software for system database, historical event log, logic and operating system. The system shall require no manual input to initialize in the event of a complete power down condition. It shall return to an on line state performing all programmed functions upon power restoration. x. Software logic modules and system database shall be programmable using a windows compatible program on PC. It shall be possible to program or edit the system database off site after down loading from the panel. xi. All detectors shall incorporate internal automatic temperature compensation to overcome the effects of either high or low ambient temperatures in the installed environment on the detector sensitivity. The detectors shall be tested at a specified frequency by raising the detector sensitivity level to the alarm threshold, to check the operation of the detector without system alarming automatically by the control panel. xii. In an alarm or trouble condition the following shall occur on the monitoring station: 1. Sound an audible. 2. Write details of the actuation to a system log file on the PC. 3. Print the details of the actuation to the system printer. 4. Activate the color graphic display system controls, providing functions such as zooming, scrolling of Alarms, troubles, etc. xiii. System configuration shall be menu driven and capable of being operated by a person with no previous computer programming experience.			
	Panel Display Requirements. System display shall consist of minimum 80 character back lighted alphanumeric LCD display readable at any angle. Thirty-two character customer defined custom messages shall describe the location of the active device. In addition to the above, the following features shall be available. a. The system shall be capable of programming to allow troubles occurred and restored in the system to be automatically removed from the display queue, eliminating the necessity for individual acknowledging of these events. This feature shall not affect the historical logging of events as programmed. b. As a minimum an LED display for “Alarm”, “Audible Silenced”, “Supervisory”, “Trouble”, “Security”, “Power On”, And “Partial System Disabled”. c. Touch activated membrane switches for “Alarm Acknowledge”, “Audible Silence”, “Supervisory Acknowledge”, “Security Acknowledge”, “Reset”,			
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5.12.00	“Display Hold”, And “Display Next”. d. All membrane switches shall be tactile with audible feedback when pressed.			
	System Software Requirements i) The software shall control the operation, function and display of the graphic system and provide for automatic boot up and run from the hard disk drive of the computer. ii) All project specifics actuating device programming shall be capable of being carried out on site via password access. iii) The system shall monitor all alarm, supervisory; trouble and security conditions detected by the fire alarm control panel and provide separate disk based files, for each condition. These logs may be enabled, disabled, or cleared with password access. This log information is not to be lost upon power failure or fire alarm control panel reset. A utility file shall be provided to sort the log data by date or by device and display this information either on the screen or the system printer. iv) Selective memory storage up to 800 events, shall be stored in flash memory and displayed, printed or downloaded by classification for selective event reports. a. Software shall allow selection of events to be logged, including; inputs as alarms, troubles, supervisors, securities, status changes and device verification; out puts, as audible control and output activation; action, as reset, set sensitivity, arm/disarm, override, password, set time and acknowledge. b. Audible and visual indications shall be generated when memory is 80% and 90% full to allow downloading of data. The system shall be programmable circular logging, assuring that at least the last 400 events will always be stored in non-volatile memory. v) Software has driven logic for adjusting the alarm threshold windows on detectors to compensate for accumulating contamination and keep detector response sensitivity constant. The software shall compensate for either over-sensitized or desensitized units, raising a system flag when a detector approaches the allowable limits of adjustment, indicating a requirement for cleaning. a. Values shall be stored in non-volatile memory allowing activation of all tracking functions within 90 sec of system initiation from a "cold boot". During the boot sequence, alarms from detectors programmed with the feature shall be suppressed. When the full data history is active all devices shall be checked and any active alarms displayed.			
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	b. The control panel shall place each detector in the system in an alarm condition, transparent to the system user, every twenty-four hours as a dynamic check of the accuracy of the alarm threshold setting. Upon reception of the alarm report, the system detector shall be restored to its pretest state. c. The system shall be capable of monitoring the stage of detectors and displaying a message when a detector is approaching the limits of adjustment as a result of contaminates. A second message shall be displayed when the detector reaches the limits of adjustment due to these contaminate. d. The system shall be capable of recognizing that a detector has been cleaned, initiating a series of tests to determine if the cleaning was successful and display a detector cleaned message, readjusting that detectors normal sensitivity setting reference. vi) When an alarm or trouble is registered at the fire alarm control panel the graphics system shall display the first screen image for the first actuated device. The system shall be capable of zooming in for further information if required. At all times when in the alarm or trouble mode the fire control panel status i.e. number of current alarms and or troubles is to be displayed on the graphics screen.		
5.13.00	Power Supply for Fire Alarm Panels & Repeater Alarm Panel		
5.13.01	One set of 24V DC redundant power supply system comprising of 2 x 100% chargers and 1 x 100% batteries shall be provided for each fire alarm panel and repeater alarm panel. The batteries for fire alarm system shall be sealed maintenance free lead acid type. The battery backup for each fire alarm panel and repeater alarm panel shall be 24 hours and 30 minutes (in alarm conditions). At least 25% of the devices shall be considered to be active in alarm conditions. Each of the redundant chargers shall be sized to meet connected load requirements and keep the connected batteries full charged (Float Mode). Furthermore, the charger shall be sized to enable the boost charge of a fully discharged battery in 10 hours while feeding the load.		
5.13.02	The batteries shall be sized as per relevant IEEE standard. For battery sizing calculation, an aging factor of 0.8, a temperature correction factor (based on temperature of 4 deg. C), voltage drop of 2V in cables. Capacity factor, Float Correction Factor, as per Battery Supplier Standard, shall be taken into consideration, if applicable and ambient temperature shall be considered as the electrolytic temperature. The sizing of the battery shall be as approved by Employer during detailed engineering.		
5.13.03	The battery chargers and batteries shall be placed at a suitable location inside the fire alarm panel with partitions.		
5.13.04	The detailed specification related to power supply system of fire detection & protection system shall be as specified in other sections of the technical specification.		
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5.14.00	Control & Instrumentation requirements																			
5.14.01	The specification for PLC control system for fire protection system shall be as specified in other sections of the technical specification.																			
5.14.02	The specification for PC, printer and other HMI items shall be as specified in other sections of the technical specification.																			
5.14.03	The specification related to Basic design criteria, Measuring Instruments, Process connection & piping, Control panels, Type test requirements etc shall be as specified in other sections of the technical specification.																			
5.15.00	Cabling for fire alarm system																			
	All instrumentation cables twisted & shielded, FRLS PVC insulated and sheathed data highway / fibre optical cables, short term fire proof cables including prefabricated cables (with plug-in connectors) etc shall be provided by Contractor.																			
	The contractor shall follow the cable philosophy as below:																			
	<table><tr><th colspan="2">Application</th><th rowspan="2">Type of cable</th></tr><tr><th>From</th><th>To</th></tr><tr><td>PLC cabinets</td><td>PC, Printers etc.</td><td>As Mfr.'s Standard. However, connection between PLC and the remote I/Os shall be through fibre optic cable by Bidder if length is>300 M & coaxial cable if length<300 M</td></tr><tr><td>Detectors (including detectors mounted inside panels) /Any loop device</td><td>Detector (including detectors mounted inside panels) / Isolator/ Interface unit</td><td>Shielded, Twisted, PVC Cu. FRLS cables type "S" Refer Note 2 below.</td></tr><tr><td>Detectors (including detectors mounted inside panels) / Isolator / Interface Unit</td><td>JB</td><td>Shielded, Twisted, PVC Cu. FRLS cables Type "S" Refer Note 2 below.</td></tr><tr><td>JB</td><td>Fire alarm Panel</td><td>Shielded, Twisted, PVC Cu. FRLS cables Type "S" Refer Note 2 below.</td></tr></table>			Application		Type of cable	From	To	PLC cabinets	PC, Printers etc.	As Mfr.'s Standard. However, connection between PLC and the remote I/Os shall be through fibre optic cable by Bidder if length is>300 M & coaxial cable if length<300 M	Detectors (including detectors mounted inside panels) /Any loop device	Detector (including detectors mounted inside panels) / Isolator/ Interface unit	Shielded, Twisted, PVC Cu. FRLS cables type "S" Refer Note 2 below.	Detectors (including detectors mounted inside panels) / Isolator / Interface Unit	JB	Shielded, Twisted, PVC Cu. FRLS cables Type "S" Refer Note 2 below.	JB	Fire alarm Panel	Shielded, Twisted, PVC Cu. FRLS cables Type "S" Refer Note 2 below.
Application		Type of cable																		
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PLC cabinets	PC, Printers etc.	As Mfr.'s Standard. However, connection between PLC and the remote I/Os shall be through fibre optic cable by Bidder if length is>300 M & coaxial cable if length<300 M																		
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Detectors (including detectors mounted inside panels) / Isolator / Interface Unit	JB	Shielded, Twisted, PVC Cu. FRLS cables Type "S" Refer Note 2 below.																		
JB	Fire alarm Panel	Shielded, Twisted, PVC Cu. FRLS cables Type "S" Refer Note 2 below.																		
	Notes:																			
	1. 10% spare pair shall be provided for all cables having more than four pairs.																			
	2 Type "S" cable shall satisfy requirements of Article 760 NFPA 70.																			
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5.16.00	3. Over and above, contractor may note that short term fire proof cables shall be provided for coal handling plant and inert gas protected areas. Short term fire proof cables shall be Mineral insulated copper conductor and copper sheathed type satisfying requirements of Fire resistance, safety in the industrial application areas mentioned in the specification and also, shall be approved by UL standards and certified by LPCB. The contractor shall provide all the cables so as to complete the system 4. The detailed specification of cables shall be as specified in other sections of the technical specification. Detection System for Coal Conveyors i) Linear Heat Sensor Cables: a) The LHS cable detector for each conveyor to be provided for both forward and return conveyors and shall be mounted as per the standard practice of the manufacturer/ supplier. Suspension of LHSC through flexible chains is a preferred arrangement. Further, LHS cable shall also be provided for return side of conveyors inside the bunker house. b) The detection zone/loop divisions of LHSC system shall match with the MVW spray system. c) Upon detection of fire either by QB detector or LHSC detector, the spray system shall be initiated. It shall also initiate spray system for the two adjacent zones after a time delay settable at site. d) The LHSC detector shall be provided with suitable interface unit, which shall generate/ make the signal compatible with fire alarm panel. (e.) Type: Digital, Operating Voltage: 24V DC, Conductor Material: Steel, Approval: FM/UL ii) Infra Red Detector: (a.) The infra red type (IR) detectors shall be suitable for detecting moving fires in coal conveyors. The IR detector shall stop the conveyor upon detection of fire and give audio-visual annunciation locally and in fire alarm panel. (b.) Each of the IR detector shall be provided with its own purging arrangement using blowers, hoses, etc and required power supply shall be derived from the fire alarm panel. Alternatively, bidder may offer separate blowers (2x100%) for purge air supply for all the detectors and the complete air piping from the blowers to each of the IR detector shall be provided by the bidder.			
	5.17.00	Detection System of Cable Galleries i) In cable galleries, MVW spray system shall be actuated either by detection of fire by Linear Heat sensing cable detectors or by fire signal from Multisensor detection system. Apart from the automatic operation of spray system in the detected zone, the adjacent two zones shall also be sprayed with water automatically after a set time delay simultaneously.		
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5.18.00	ii) LHSC detector shall run in a zig-zag fashion (with an included angle of minimum 90⁰ atleast) in each of the top tray, bottom tray and in every alternate trays. The mounting arrangement of LHSC detector shall be as per manufacturer's standard practice. iii) The detection zone/ loop divisions shall match with MVW spray zones. Multisensor Detection System i) Upon detection of fire, multisensor detector shall be annunciated in the respective panels and shall activate a local hooter/sounder in the areas where fire is activated and this fire signal shall be employed to initiate the fire extinguishing system of that area such as automatic MVW spray system of cable galleries, fire extinguishing system of Control rooms/Control Equipment Rooms. ii) Cross zoning of the signal from two adjacent multisensor detectors shall be employed to initiate the fire extinguishing system of inert gas protected areas and MVW spray system of cable galleries. iii) Multisensor detector shall be provided for return air ducts of main plant, which shall consist of intake probe, detector housing, and exhaust pipe etc. The detector shall be mounted outside the duct. iv) The design coverage area for detectors (to be considered) shall not exceed 25 Sq.M. for each detector.			
6.00.00	AUTOMATIC TOTAL FLOODING INERT GAS EXTINGUISHING SYSTEM			
6.01.00	General a) Fire protection system for the Central control room and other areas as defined below shall be by means of INERT gas extinguishing system. The INERT gas system shall employ any of the proven inert gas system specified under NFPA-2001. System shall be automatic and shall be activated by a dedicated detection system to be provided for each hazard area. b) System shall consist of inert gas (as per NFPA-2001) gas cylinders filled with the agent gas, cylinder mounting accessories, cylinder manifold, automatic discharge valves, discharge piping, nozzles, automatic operating devices, manual actuation devices/abort switches, associated fire detection/alarm system audio-visual safety warning devices, instrumentation associated control systems, panels etc.			
6.02.00	Areas to be covered under Automatic total flooding Inert Gas Extinguishing System a) Central control rooms, control equipment rooms, UPS/Battery charger rooms, PC room, programmer room, PADO room, panel room, etc. of main plant building. b) IT building as per NFPA-2001including associated programmer/server rooms, PC rooms, panel room, UPS/Battery charger rooms for IT building c) Training Simulator as per NFPA-2001 including simulator training room, programmer/server rooms, UPS rooms etc. for training simulator.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2	SUB SECTION-A-18 Fire Detection & Protection System	Page 19 of 27

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
7.00.01	CLEAN AGENT DIRECT / INDIRECT LOW PRESSURE AUTOMATIC FIRE DETECTION & SUPPRESSION SYSTEM WITH LINEAR PNEUMATIC HEAT DETECTION TUBE			
7.01.00	Regulatory Requirement			
	(a) The clean agent automatic direct / indirect low pressure fire suppression system shall be approved by UL/FM/VDS/LPCB.			
	(b) Clean agent used should be NOVEC-1230			
7.02.00	System Description			
	(a) The clean agent automatic direct / indirect system consists of the following major components:			
	- Clean agent (NOVEC-1230) cylinder & valve assembly along with cylinder mounting arrangement.			
	- Linear heat detection/discharge tube along with necessary fittings.			
	- Discharge Network (applicable for indirect system) composed of copper tubing / stainless steel tubing / braided hose, necessary fittings and appropriate nozzles.			
	- Pressure switch, End of line adapters, Audio-visual indication unit.			
	(b) Each clean agent extinguishing unit shall be equipped with its own automatic (non electric) detection/discharge tubing system, which when actuated, automatically releases the suppression agent into the electrical panel.			
	(c) Clean agent cylinder / container shall be a part of UL/FM/VDS/LPCB listed/approved system. Further, cylinders shall have approval by Chief Controller of Explosives (CCOE) – India (if applicable).Each container shall be equipped with a valve, a pressure gauge to monitor container pressure, etc.			
	(d) Detection/discharge tubing shall be installed within the limitations stated in the manufacturer’s manual.			
	(e) A pressure switch shall be connected at the other end of detector/discharge tubing or on main valve to monitor system pressure and/or signal of system actuation, etc.			
7.03.00	Design Requirement:			
	(a) Design concentration of clean agent used shall be as per NFPA-2001 / manufacturer’s recommendation.			
	(b) All documents/drawings related to design of the system shall be vetted by the system manufacturer before submission to NTPC for approval.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2	SUB SECTION-A-18 Fire Detection & Protection System	Page 20 of 27

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
8.00.00	FIRE WATER STORAGE, PUMPS & PUMP HOUSE			
	i)	Horizontal type centrifugal pumps shall be provided for hydrant, spray and jockey pumps. Maximum speed of the pumps shall be 1500 rpm. However, for jockey pumps the speed upto 3000 rpm is acceptable. The motor driven pump and the corresponding diesel engine driven pump shall completely interchangeable in respect of speed, impeller diameter, etc.		
	ii)	Capacity, discharge pressure & quantity of pumps for the hydrant water system and spray water system shall be individually designed as per Tariff Advisory committee (TAC) guidelines. However for minimum design requirement please refer Annexure- II		
	iii)	Atleast one hydrant pump of identical capacity be provided as standby pump so that in case any of the working hydrant pump is not available, the total requirement can be met by the standby pump.		
	iv)	Atleast one spray pump of identical capacity be provided as standby pump apart from the working spray pumps.		
	v)	The standby hydrant and spray system pumps shall be of diesel engine driven.		
	vi)	The headers of spray and hydrant system shall be interconnected with an isolation and a non-return valve so that hydrant pumps can feed to spray system not vice-versa.		
	vii)	The diesel engine drive of the pump shall conform to the requirements of TAC. Each of the diesel engine shall be provided with batteries (2x100%) and battery chargers (2x100%).		
	viii)	Battery of the diesel engine shall be lead acid type as per IS and shall be large enough to crank the engine twelve times successively, each for a duration of 10 sec. without any charging in between.		
	ix)	Each engine shall be provided with fuel oil tank having adequate capacity to hold sufficient fuel oil for a minimum of twelve (12) hours of full load run. The fuel oil tank shall preferably be mounted on the engine. No fuel oil tank will be provided by the Employer.		
	x)	Continuous drive motor rating (at 50 ⁰ C ambient) shall be at least 10% (ten percent) above the maximum load demand of the pump in the entire operating range of the pump.		
	xi)	The feeding line of the spray system from the header shall be provided with 2x100% capacity basket type filters to avoid any particles in the spray system.		
	xii)	The system shall be complete with required instrumentation, control recirculation pipe line with valves for each of the pumps, NRV in discharge outlet etc.		
	xiii)	Pumps shall be designed for continuous operation at its best efficiency point to meet the specific requirements of the system for which it is to be employed. Pumps of each category shall be suitable for parallel operation.		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2	SUB SECTION-A-18 Fire Detection & Protection System	Page 21 of 27

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	xiv) Fire Water Storage Tanks: Two numbers each of 50% capacity vertical cylindrical column supported fixed cone roof type fire water storage tanks shall be provided by the bidder. To avoid vacuum creation inside the tank, two (2) nos. vents each of size 300 NB shall be provided on the roof of the tanks. Bidder shall ensure that the total capacity of fire water storage shall be as per the recommendation of TAC. xv) Fire water booster pump house: Two sets of Hydrant & Spray booster pumps (one motor driven & one diesel driven pump) alongwith associated equipment shall be installed in fire water booster pump house. Tapping shall be taken from nearest hydrant and spray header. xvi) Fire water storage tank: Two numbers each of 50% capacity vertical cylindrical column supported fixed cone roof type fire water storage tanks shall be provided by the bidder. To avoid vacuum creation inside the tank, two (2) nos. vents each of size 300 NB shall be provided on the roof of the tanks. Bidder shall ensure that the total capacity of fire water storage tank shall be as per the recommendation of TAC with a minimum capacity of each tank equal to 2300 m³.			
9.00.00	PIPING AND VALVES			
9.01.00	General Data for Pipes etc.			
	i) Mild steel as per IS:1239 (Part-I) medium grade (upto 150 NB) & as per IS:3589 Gr 410 (above 200 NB) or Equivalent for pipes normally filled with water. ii) Mild steel as per IS:1239 (Part-I) medium grade (upto 150 NB) & as per IS:3589 Gr.410 (above 200 NB) or Equivalent and galvanised as per IS:4736 for pipes normally empty and periodically charged with water and foam system application. iii) Pipe protection shall be as follows : To prevent soil corrosion buried pipes / pipes in trench shall be properly lagged with corrosion protective tapes of coal tar type as per IS:15337 or AWWA C 203. The total thickness of protective tapes to be applied on buried pipes / pipes in trench shall be 4.0mm. This can be achieved by using 4.0mm thick tape in single layer or 2.0mm thick tape in double layer. iv) Pipe thickness: a) For Pipe sizes upto 150 NB and above: As per IS:1239 Part-I medium grade. b) For Pipe sizes 200 NB and above refer Annexure-I. v) All valves shall be as per applicable IS/BS codes & approved by TAC for specific fire protection system and shall be provided with locking arrangement (with locks) in open or close condition. Further, all gate/butterfly valves of size 200 mm & above shall be provided with spur gear reduction unit. vi) All the flanges and counter flanges shall conform to ANSI B 16.5 CI 150. vii) Strainer Body as per IS: 2062 (tested).			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2	SUB SECTION-A-18 Fire Detection & Protection System	Page 22 of 27

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	viii) Pipe Fittings 1) The material shall conform to ASTM A 234 Gr WPB or ASTM A 105 or equivalent and dimensional standard conforming to ANSI B 16.11 (socket & threaded type), ANSI B 16.9 (for butt welded fittings) and ANSI B 16.5 (for flanges and flanged fittings) as the case may be. Further, galvanised malleable cast iron fittings as per IS:1879 in Cast iron fitting as per BS-1641 are also acceptable. 2) Grooved couplings: Vendor may also use mechanical grooved couplings type fittings in GI pipe lines for HVW / MVW spray system. All materials and products shall be either Underwriters Laboratories (UL) Listed or Factory Mutual (FM) Approved and installed in accordance with NFPA Standard 13 / equivalent Standard. 3) The fittings shall be galvanised as per IS: 4736 for galvanised pipe application. In case of branching connections from GI mains for spray piping network, socket may be welded for more than two pipe reduction instead of standard tees. 4) Fabricated fittings shall not acceptable up to pipe size to 300 NB. For sizes 350 NB and above, fittings may be fabricated as per BS: 2633/BS: 534. ix) Welding of galvanised iron pipes/fittings would be permitted provided the same is carried out by means of special electrodes suitable for the above application and the same shall be approved by Employer. After, welding, welded portions shall be applied with three coats of zinc silicate treatment/rich paint over one coat of suitable primer. Further, the Contractor shall provide proper zinc paint at the point of welding.			
10.00.00	PAINTING			
10.01.00	All the Equipments shall be protected against external corrosion by providing suitable painting.			
10.02.00	The surfaces of stainless steel, Gunmetal, brass, bronze and non-metallic components shall not be applied with any painting.			
10.03.00	Fire Water Storage Tanks: i) The Contractor shall clean the tank plates and structure steel before erection by wire brushing and air blowing. After erection of tank and hydro testing, tanks are subjected to surface preparation and painting as per procedure detailed below: ii) Surface Preparation: Outside/inside surface preparation shall be carried out by shot blasting as per SA2 ½. iii) Inside surface painting: One coat of epoxy zinc phosphate primer of min. DFT of 30-35 micron followed by three (3) coats of epoxy resin based finish paint with 25 micron as thickness of each coat.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2	SUB SECTION-A-18 Fire Detection & Protection System	Page 23 of 27

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC									
10.04.00	iv)	Outside surface painting: One coat of epoxy zinc phosphate primer of min. DFT of 30-35 micron followed by three (3) coats of epoxy resin based finish paint with 25 micron as thickness of each coat.											
	v)	Outside bottom surface painting: One coat of epoxy zinc phosphate primer of min. DFT of 30-35 micron followed by three (3) coats of coal tar epoxy paint with 25 micron as thickness of each coat.											
10.05.00	All Steel Surfaces (external) exposed to atmosphere (outdoor installation)												
	(i)	Surface Preparation: The steel surfaces to be applied with painting shall be thoroughly cleaned before painting by wire brushing, air blowing, etc.											
10.06.00	(ii)	Painting: One (1) Coat of red oxide primer of thickness 30 to 35 microns followed up with three (3) coats synthetic enamel paint, with 25 microns as thickness of each coat. For plant at coastal area, epoxy resin based zinc phosphate primer followed by epoxy resin based paint pigmented with titanium di-oxide shall be used in place of enamel paints.											
	All Steel Surfaces (external) inside the building (indoor installation)												
	(i)	Surface Preparation: The steel surfaces to be applied with painting shall be thoroughly cleaned before painting by wire brushing, air blowing, etc.											
	(ii)	Painting: One (1) Coat of red oxide primer of thickness 30 to 35 microns followed up with two (2) coats synthetic enamel paint, with 25 microns as thickness of each coat. For plant at coastal area, epoxy resin based zinc phosphate primer followed by epoxy resin based paint pigmented with titanium di-oxide shall be used in place of enamel paints.											
10.06.00	Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam Proportioning equipments, Foam makers, etc.												
	Painting of all equipments /components of FDPS package shall be as per manufacturer's standard practice or as detailed below whichever is superior in quality.												
	<table><tr><th>Environment</th><th>Paint scheme</th><th>Total DFT</th></tr><tr><td>Normal / Mild Corrosive Environment</td><td>Primer- zinc filled epoxy Finish – Aliphatic Polyurethane (shade RAL3000)(P.O Red)</td><td>Min 125 microns</td></tr><tr><td>Corrosive Environment (as in coastal areas)</td><td>Primer- zinc filled epoxy Intermediate – Epoxy MIO Finish – Aliphatic Polyurethane (shade RAL3000)(P.O Red)</td><td>Min 200 microns</td></tr></table>	Environment	Paint scheme	Total DFT	Normal / Mild Corrosive Environment	Primer- zinc filled epoxy Finish – Aliphatic Polyurethane (shade RAL3000)(P.O Red)	Min 125 microns	Corrosive Environment (as in coastal areas)	Primer- zinc filled epoxy Intermediate – Epoxy MIO Finish – Aliphatic Polyurethane (shade RAL3000)(P.O Red)	Min 200 microns			
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EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2	SUB SECTION-A-18 Fire Detection & Protection System	Page 24 of 27									

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11.00.00	The hydrant and spray lines shall be overground. It shall be laid either on pedestals, trestles etc. However, if the layout does not permit laying of overground pipe in that case it shall be laid underground with the approval of Engineer.			
12.00.00	MULTIPURPOSE NOZZLE The multipurpose nozzle should be such that water under pressure is applied on fire in the form of a jet, spray or fog. Material of construction for multipurpose nozzle shall be as per manufacturer's standard.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO.: CS-9585-001-2	SUB SECTION-A-18 Fire Detection & Protection System	Page 25 of 27

ANNEXURE-I

PIPING THICKNESS:

Pipes for sizes 200 NB & above shall confirm to IS: 3589 Grade 410. The final thickness shall not be less than that specified as per IS: 3589 as indicated below.

Nominal pipe Size (mm)	Outside Diameter (mm)	Wall Thickness (mm)
200 NB	219.1	6.3
250 NB	273	6.3
300 NB	323.9	7.1
350 NB	355.6	8.0
400 NB	406.4	8.0
450 NB	457	8.0
500 NB	508	8.0
600 NB	610	8.0

CLAUSE NO.	TECHNICAL REQUIREMENTS						एनटीपीसी NTPC																																																																																																						
	Annexure-II Technical Data: <table><tr><td>1. Fire water pumps</td><td>Hydrant</td><td>Spray</td><td>Booster Hydrant</td><td>Booster Spray</td><td>Jockey</td></tr><tr><td>Number of pumps</td><td>4(3 motor driven & 1 diesel engine driven)</td><td>3 (2 motor driven & 1 diesel engine driven)</td><td>2 (1 motor driven & 1 diesel engine driven)</td><td>2 (1 motor driven & 1 diesel engine driven)</td><td>2 (both motor driven)</td></tr><tr><td>Design Capacity</td><td>410 m³/hr</td><td>410 m³/hr</td><td>171 m³/hr</td><td>410 m³/hr</td><td>75 m³/hr</td></tr><tr><td>TDH of pump (MWC)</td><td>120 (min) or as per system reqt.</td><td>120 (min) or as per system reqt.</td><td>45 (min) or as per system reqt.</td><td>45 (min) or as per system reqt.</td><td>120 (min) or as per system reqt.</td></tr><tr><td>MOC</td><td colspan="5">Casing:IS:210 Gr. FG 260 (2.5% Ni), Impeller: Bronze IS:318 Gr.II, Impeller shaft, coupling :SS316</td></tr><tr><td rowspan="2">2. Hydrant Valve</td><td colspan="5">Oblique female type as per IS:5290</td></tr><tr><td colspan="5">MOC: Body/bonnet/stop valve/valve seat/trim : SS304/SS316</td></tr><tr><td rowspan="2">3. Water monitor</td><td colspan="5">As per IS:8442 Type-I, Size: 75mm, Nozzle dia: 38mm</td></tr><tr><td colspan="5">MOC: Water barrel/reducer/elbow: CS (seamless)/SS Nozzle: Copper alloy / SS confirm in to IS:3444</td></tr><tr><td rowspan="2">4. Water branch pipe & nozzle</td><td colspan="5">As per IS:903 / IS:2871</td></tr><tr><td colspan="5">MOC: Branch pipe: SS316 (Gr 4 of IS:3444) (both ends) Nozzle : SS316 (Gr 4 of IS:3444), Size: min 16mm & max 25mm</td></tr><tr><td rowspan="3">5. Water line Gate / Sluice Valve</td><td colspan="5">- Design Code: a) IS:14846 or BS:5150 (for valves coming inside fire water pump house) b) BS:5150 (for valves at other locations) - Pressure rating: PN1.6 (as per IS:14846) / PN16 (as per BS:5150) -Working Pr. :12Kg/cm2</td></tr><tr><td colspan="5">MOC: Body/bonnet/Yoke/Wedge : CI to IS:210 FG-200 Spindle: SS to ASTM-A-276 type 410</td></tr><tr><td colspan="2">6. Check Valve</td><td colspan="3">Below 50NB size</td><td>50NB & above</td></tr><tr><td></td><td colspan="2"></td><td colspan="2">Design Code; IS:778 (below 50NB)</td><td>IS:5312 / BS:5153</td></tr><tr><td></td><td colspan="2"></td><td colspan="2">MOC: Body/cover/flap: Lead tin bronze to IS:318 Gr. LTB-2</td><td>CI to IS:210 FG-200</td></tr><tr><td rowspan="2">7. Butterfly Valve</td><td colspan="5">Design Code: Double flanged or lugged wafer type of low leakage rate confirming to BS:EN:593/API-609/AWWA C-504 Pressure class: PN 16</td></tr><tr><td colspan="5">MOC: Body & Disc : Cast Iron, Shaft : SS 410 / SS 420 Seat Rings : EPDM</td></tr></table>						1. Fire water pumps	Hydrant	Spray	Booster Hydrant	Booster Spray	Jockey	Number of pumps	4(3 motor driven & 1 diesel engine driven)	3 (2 motor driven & 1 diesel engine driven)	2 (1 motor driven & 1 diesel engine driven)	2 (1 motor driven & 1 diesel engine driven)	2 (both motor driven)	Design Capacity	410 m³/hr	410 m³/hr	171 m³/hr	410 m³/hr	75 m³/hr	TDH of pump (MWC)	120 (min) or as per system reqt.	120 (min) or as per system reqt.	45 (min) or as per system reqt.	45 (min) or as per system reqt.	120 (min) or as per system reqt.	MOC	Casing:IS:210 Gr. FG 260 (2.5% Ni), Impeller: Bronze IS:318 Gr.II, Impeller shaft, coupling :SS316					2. Hydrant Valve	Oblique female type as per IS:5290					MOC: Body/bonnet/stop valve/valve seat/trim : SS304/SS316					3. Water monitor	As per IS:8442 Type-I, Size: 75mm, Nozzle dia: 38mm					MOC: Water barrel/reducer/elbow: CS (seamless)/SS Nozzle: Copper alloy / SS confirm in to IS:3444					4. Water branch pipe & nozzle	As per IS:903 / IS:2871					MOC: Branch pipe: SS316 (Gr 4 of IS:3444) (both ends) Nozzle : SS316 (Gr 4 of IS:3444), Size: min 16mm & max 25mm					5. Water line Gate / Sluice Valve	- Design Code: a) IS:14846 or BS:5150 (for valves coming inside fire water pump house) b) BS:5150 (for valves at other locations) - Pressure rating: PN1.6 (as per IS:14846) / PN16 (as per BS:5150) -Working Pr. :12Kg/cm2					MOC: Body/bonnet/Yoke/Wedge : CI to IS:210 FG-200 Spindle: SS to ASTM-A-276 type 410					6. Check Valve		Below 50NB size			50NB & above				Design Code; IS:778 (below 50NB)		IS:5312 / BS:5153				MOC: Body/cover/flap: Lead tin bronze to IS:318 Gr. LTB-2		CI to IS:210 FG-200	7. Butterfly Valve	Design Code: Double flanged or lugged wafer type of low leakage rate confirming to BS:EN:593/API-609/AWWA C-504 Pressure class: PN 16					MOC: Body & Disc : Cast Iron, Shaft : SS 410 / SS 420 Seat Rings : EPDM				
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