



BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS ENGINEERING MANAGEMENT
TRANSMISSION BUSINESS GROUP
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SECTION 1

INTENT, SYSTEM REQUIREMENT, DESIGN CRITERIA AND SCOPE

1.0 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 Gas Insulated Switchyard (GIS) and GIS Control Building of 2X660MW UDANGUDI STPP (STAGE-1)**.
- Detailed design of all the equipment and equipment system(s).
 - Complete manufacturing including shop testing.
 - Providing engineering data, drawings, and O & M manuals as per specified format etc. for owner's/purchaser's review, approval and records.
 - Packing and transportation from the manufacturer's works to site including customs clearance/port clearance, if required.
 - Receipt, storage, preservation and conservation of equipment at site.
 - Fabrication, pre-assembly, if any, erection testing and putting into satisfactory operation all the equipment including successful completion of trial operation.
 - Performance and Guarantee tests after successful completion of trial operation.
 - 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. *TANGEDCO Technical specification is attached with SECTION 2 & shall be referred strictly. Requirements of the same regarding system specification shall be provided by the contractor without any deviation.*
- 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 The Contract shall be on unit rate basis for the quantities furnished by BHEL. The quantities furnished in Price bid (BOQ) are as per preliminary design only. BHEL reserves the right for quantity variation (upward/ downward) due to any reason upto $\pm 30\%$ of total contract value at same unit rate and terms & conditions during execution of contract.
- 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-2, 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.*



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- 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 **Tamil Nadu Generation & Distribution Corporation (TANGEDCO)**, the term '**Purchaser**' shall refer to **BHEL** and the term '**Contractor**' shall refer to the **successful Bidder**.

2.0 FIRE FIGHTING REQUIREMENTS FOR VARIOUS AREAS

This system shall be designed to provide fire detection and protection services for Switchyard and its Control Building Fire protection cum detection system of switchyard portion is an extension of Fire protection cum detection system of the main plant area.

Design criterion shall be based on "Ordinary Hazard Occupancies" classification as described in Tariff Advisory Committee's (TAC) guidelines. All equipment or systems in the designed fire detection cum protection arrangement shall be completely in compliance with the regulations of Tariff Advisory Committee (TAC) of India/ Loss Prevention Association (LPA) / National Fire Protection Association (NFPA)/LPCB/ VDs.

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	Switchyard Control Building, GIS Hall Building with ventilation room and 125MVAR Bus Reactors
HVW Spray System	125MVAR Bus Reactors-2 Nos.
MVW Spray System	Switchyard Control Building (Cable Vault)
Addressable Fire Detection & Alarm System	i. Switchyard Control Building ii. GIS Hall Building and it's ventilation room
Portable Fire Extinguisher	i. Switchyard Control Building ii. GIS Hall Building and it's ventilation room

3.0 DESIGN FEATURES

3.1 DETECTION SYSTEM

The system shall consist of addressable manual call points (indoor & outdoor), addressable intelligent automatic detectors of various types, digital LHS cable, addressable interface units, microprocessor



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based fire alarm panel as required for the complete system with associated cabling (**Power & control cable for FDA of switchyard area and FO cable for interconnection of switchyard FAP with nearest FAP's under ring topology**) and cabling accessories, fire sirens, etc. Detector & devices shall be loop powered to avoid additional cabling for the same from panel. However, the hooters shall require power to work and shall have separate power cable loop as well.

Type of detectors/devices in various rooms is as below:

Sl. No.	Building/Equipment	Type of Detectors
a.	Switchyard Control Building	Multi-sensor Detectors, Heat Detectors & Manual Call Point
b.	Switchyard Control Building (Cable Vault)	MSD, LHS cable & MCP
c.	GIS Hall Building	Beam Detector & MCP
d.	Ventilation room	MSD & MCP
e.	125MVAR Bus Reactors-2 Nos.	QBD & Outdoor MCP

- All detection and sensing devices forming an integral part of the microprocessor based, addressable, intelligent fire detection and alarm system shall be approved by Tariff Advisory Committee (TAC) of Insurance Companies of India/LPA India/NFPA USA/ UL/FOC/ Any other internationally recognized body acceptable to the owner.
- All the detectors shall be UL/FM approved and coverage of heat detectors and multi criteria smoke detectors shall be as per TAC. Spacing of detectors shall be as per cl. No. 6 of IS 2189. Factors like beam depth and area separation criterion, air changes, type of combustible material/type of environment/type of risk/ ceiling height/air movement factor/ type of ceiling construction etc. shall also be implemented in deciding coverage of each of the detectors.
- The detectors shall be of Multisensor type with a combination of photo electric and heat sensing elements. The multicriteria smoke detector provides photo electric sensing and heat sensing combined in a single sensor/base assembly. The multisensor base provides two sequentially addressable points, automatically assigned with one address selection.
- Microprocessor based addressable analog type multi criteria smoke detectors connected as per NFPA/FOC recommendation and in two wire circuitry shall be provided in all areas of switchyard Control Building & ventilation room for GIS Hall building except for the Battery rooms, Pantry.
- Heat detection system (microprocessor based analogue addressable corrosion resistant heat detector) shall be provided in the battery rooms and pantry in order to avoid spurious operation of the smoke detectors due to fumes, smoke & dust which are present in these areas.
- Multisensor detectors shall be as per IS2189 i.e. multisensor detectors shall be able to work as photo alone or Heat alone or combined.
- The multi criteria smoke detectors shall be capable of sensing the fire in the incipient or smoldering stage itself, long before the fire matures to a visible flame. For achieving this requirement, the detector shall be capable of sensing visible combustion gases (in the form of smoke) or invisible combustion gases, which are the only clues for a long time in smoldering fires.
- The detectors shall be self-compensating for ambient temperature and humidity & shall display a steady LED when in the alarm state. The LED shall flash when in standby or normal mode.



- In air conditioned areas of switchyard control building where false ceiling is present, multisensory detectors shall be installed below true ceiling and below false ceiling. For above false ceiling detectors a response indicator shall be provided below false ceiling for the purpose of detector's alarm status indication.
- ***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.***
- ***Suitable nos. of beam detectors assy. shall be finalized during detailed engineering as per the guidelines for GIS Hall.***
- Linear Heat sensing cable (LHSC) shall be digital type.
- All the detectors in the switchyard control building and GIS hall building shall be looped into a Fire Alarm Panel situated in the switchyard control room.
- ***Adequate nos. of Back Lit maintained type emergency "self-illuminating exit light" shall be provided in control room, equipment rooms, switchgear room, battery & battery charger rooms, escape stair case and other strategic location of switchyard control building as per TAC. These shall be switched on upon detection of fire through FAP & relay modules.***
- ***Fire Alarm Panel (micro-processor based) of analogue addressable type shall be located in the switchyard control building which shall 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. Fire alarm panel in switchyard control building shall be provided with one no. standby loop.***
- ***Each & every Fire alarm panel shall be provided with 100% hot standby redundant processor/controller.***
- Complete automatic fire detection and alarm system shall be designed with electronics having built-in redundancy to ensure availability at all times.
- The fire alarm panel shall be designed to include all the standard features and shall also accommodate programmed activation of various interlocks with fire protection system and other associated systems and programmed activation of sequence of events to be carried out in case of fire in any particular protective area. Fire detection & alarm system will have following interfaces -
 - i) Interface with air conditioning system (Package AC) of switchyard control building to shut down the AC equipment in case of fire.
 - ii) Interface with Air Handling Units for Dry Ventilation system for GIS Hall to shut down the equipment in case of fire.
 - iii) Provision should be kept for automatic closing of fire dampers in ventilation ducts or tripping of related ventilation fans as required on detection of fire.
- All the circuits from the detectors to the panels and the circuits from the panels to the actuating devices shall be closed loop type and shall be supervised for open and short circuiting. Incipient fires sensed by these detectors shall trigger an alarm at the FAP.
- 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



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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. Facilities shall be provided on the fire alarm panel for simulating fire conditions, sensitivity adjustment, isolation of detectors etc. from the panel.

- 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.
- Indoor Manual call points shall be provided in switchyard control building & GIS hall building and outdoor manual call points with self-standing supports in other switchyard area inline with TAC guidelines.
- Each of the switchyard control building & GIS hall building shall be provided with adequate number of hooters associated with the MCP located suitably.
- Two (2) sets (1 working & 1 standby, 100% capacity) of 24 Volt (2x12V) sealed type maintenance free lead-acid battery with charger for Repeater Fire Detection and Alarm panels in switchyard control room shall be provided as standby power source which will cut-in automatically in the event of AC power failure. Battery back-up time shall be as per IS 2189. The Battery of the panels shall be located in the bottom portion of the same panel. Minimum ampere hour capacity of the Battery shall be selected accordingly. Float cum-boost charger of adequate capacity shall be provided to trickle charge the battery from AC supply during normal operation. The standby battery backup is provided for 24 hrs normal operation and 30 min. of alarm condition.
- **A 240V single phase, 50Hz power supply shall be provided by BHEL for switchyard FAP at nearest point in control room.**
- Control cables used for looping the devices shall be 1PX1.5MM2, CU, PVC/FRLS PVC Loop Cable, Armored, Twisted, overall shielded.
- Power cables used for looping the devices shall be 2CX2.5 Copper Conductor XLPE Insulated PVC Inner sheath, FRLS, PVC Outersheath, Armored cable.
- All detectors, junction boxes, manual call points and cable marshalling boxes shall be earthed with 8 SWG GI wire in case the operating voltage of the system is greater than 24 V.
- 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, thereby making it possible for a smoke detector to be replaced by either heat or flame type or vice versa. The detectors shall not be effected by temperature, humidity, air flows.
- The Fire Detection and Alarm System will comprise of a network of Addressable Detectors (fire/smoke), Microprocessor based Fire Alarm Control Panel, Manual Call Points, Digital Linear Heat Sensing cable (LHS), Modules, Notification Appliances, Cables and other accessories required to form a network (i.e. Terminal Boxes and Junction Boxes as applicable).
- The fire detectors will be wired on a common connecting line called loop that shall be of class A wiring. Each loop consists of about 100 to 250 detectors / devices based on OEM standard. The number of loops and location of detectors to be installed in the various areas of switchyard control building and GIS hall building will be finalized during detailed engineering stage based on standards mentioned above.
- **All fire detection and alarm panels and repeater panel of complete plant shall be integrated through dual redundant optical fiber data highway connected in ring main topology.** Hence fire detection & alarm panel of switchyard area shall also be accommodated under ring topology and it shall be accordingly interfaced with Main fire alarm panel in the central control room and repeater fire alarm panel in fire station of power plant to repeat switchyard fire signals.



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- **Microprocessor based addressable analog type multi criteria smoke detectors connected in cross-zoning principle as per NFPA/FOC recommendation shall be provided in the Control Rooms, Control equipment room, UPS room etc. in switchyard control room building.**
- All the areas to be covered for Heat detection system as per Technical Specification/Contract.
- **All detectors shall be located and spaced as per NFPA-72E and shall be UL/FM approved. On receipt of impulse from the detectors, in the event of fire, suitable annunciations signal shall be exhibited in the respective Repeater fire panels as well as Main Fire Panels. The areas including electrical control rooms, switchgear rooms, cable vault, etc shall be suitably sectionalized as far as the fire detection is concerned and as such the affected Zone can also be spotted.**
- ***Detectors shall be connected as per Class A wiring.***
- Quantities of Fire detectors shall be finalized depending on coverage area capacity of individual detector. Type of Smoke & Fire detectors are multi sensor detector. Quantities of Manual call points shall be finalized depending upon entry & exit points. MCP shall be provided at each entry & exit point. Quantities of Response indicators shall be finalized based on locations.
- ***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.***
- ***Optical fiber cable shall be used to wire switchyard FAP with nearest FAP's under ring. Bidder may consider FO cable alongwith FO convertor in switchyard FAP and nearest two nos. FAP's, actual length of the FO cable required to be worked out after detailed engineering and same shall be supplied and erected by contractor. Network interface items necessary to interface switchyard FAP with nearest FAP's shall be provided by contractor.***
- ***Microprocessor based Intelligent/ analogue addressable type fire detection and alarm system working on microprocessor based system shall have dual redundant fiber optic data highway.***
- ***External circuit supervision shall not require additional wires other than the pair used for detection or alarm. These two wires shall provide both supervision and alarm signals.***
- ***In addition to the requirements stated elsewhere in the specification following requirements shall be met with. Multi criteria smoke/heat detectors shall be intelligent analogue addressable type and shall have bi directional communication capability with the control panel. The accessory for the programming of the detector's address shall be provided. Further it shall be possible to change the detector sensitivity, calibration and identification from the control panel.***
- ***Upon activation of any detection device installed in the circuit, the system shall automatically report the status and initiate the sequence of operations.***
 - a) Sound an alarm on audible devices.
 - b) Notify automatically central fire station.
 - c) Light an indicating lamp on device initiating the alarm.
 - d) Display "zone" and / or device no. on the panel with defined message.
 - e) Activate the output relays for shutdown of ventilation/air- conditioning system, coal conveyor etc. as per requirement.
 - f) Actuate in fire protection devices & deluge valves of MVWS & HVWS etc.
- ***Hardwired signals between Fire alarm panels and respective PLC for system like Air conditioning, Ventilation system etc. shall be included for interlock & protection.***



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- **Alarm shall have priority over trouble. All trouble conditions shall be reported to include the zone / device no., location etc.**

Note: The make of FDA equipment for switchyard area shall be same as that of main plant FDA. 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/purchaser 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. No deviation from bidder shall be acceptable on this point.

Interfacing Requirement

Provision of sufficient potential free contacts in FAP to repeat all the fire-fighting system alarms in **SAS (Substation automation system)/ SCADA**. All the necessary inputs for SAS/SCADA shall be in the form of potential free contacts only. *No MODBUS/BACKNET support is available in the SAS/SCADA to take any signal from FAP to SAS/SCADA.*

Since we have microprocessor type FDA system under present scope, contractor need to consider sufficient control relay module to repeat the fire annunciation in a particular zone as may be defined during detailed engineering. All necessary programming shall be done by contractor accordingly. Also make of the microprocessor based FDA system shall be finalized during detailing engineering with customer and the same shall be binding on the contractor without any commercial implication.

In the event of detection of fire, auxiliary systems like ventilation, air-conditioning may require shutdown. For this purpose, potential free contacts from the output of the fire protection system shall be made available in the fire panel and terminated in the terminal block.

3.2 PROTECTION SYSTEM

3.2.1 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

- a. System shall be pressurized continuously to normal working pressure up to the Deluge valves.
- b. For switchyard cable vault area, suitable zones of MVW spray system operation shall be adopted and same shall be finalized during detailed engineering.
- c. It shall consist of spray main tapped from the main hydrant header of power plant, Deluge valve, Isolation valves, Y-type strainer, spray nozzles/ projectors, spray nozzles piping network, detection system, instrumentation, junction boxes, cables etc.

Design Criteria

- a. The system shall consist of water supply system, suitable number of spray nozzles, deluge valve, LHS cable, addressable multisensory detectors, strainers, pipes and necessary valves.
- b. For MVW spray system, minimum running water pressure at any projector/spray nozzles shall not be less than 2.8 bars for cable galleries.



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- c. 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).
- d. In cable galleries the water spray shall cover the exposed area of all the trays and racks.
- e. 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.
- f. Water motor gong shall form part of accessories to be provided with deluge valve.
- g. Isolation gate valve and Y type strainer shall be provided at upstream and downstream side of deluge valve.
- h. Pressure gauges at both upstream and downstream of deluge valves, and in the detector pipe network shall be provided.
- i. A pressure switch will be provided at the down streamside of the deluge valve for remote annunciation of "Deluge Valve Open" alarm in the main Fire Alarm panel in central Control Room. Another pressure switch will be provided in the detection line of the system for remote annunciation of "Detection circuit operated" alarm in the main Fire Alarm panel in central Control Room.
- j. Local control panel shall be provided for each deluge valve.
- k. Digital 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. Zones of protection & detection shall match in cable vault where MVWS system is used. FAP shall process the signal from smoke detectors & LHS cable of the cable vault & actuates the DV in case of any fire. This process signal is given only if both smoke detector & LHS activated.
- l. **LHS cable in cable vault shall be on alternate trays in Zig- Zag fashion also Cable Vault shall be divided into a smaller risk zones.** Each zone shall have separate water supply network controlled by a deluge valve. A fire detection system provided for the MVWS protected area shall sense fire and shall actuate the deluge valve. In the event of fire in one zone, the deluge valve of corresponding zone and those of adjacent zones on either side shall be opened.
- m. 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.
- n. Water sprayer of MVW spray system shall be placed in such a way so that the "spray cone" overlaps each other.
- o. 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.
- p. 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 NP2 class and that for



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rail crossing shall be NP3. All buried pipes shall be double coated and wrapped as per IS: 10221 and/or IS: 15337.

- q. Push button station/local control panel for deluge valve is required for DV local operation manually in 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.***
- r. 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 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 it's accessories supply (for equipments to DVLCP and necessary annunciation in the switchyard FAP) shall be under contactor scope.***
- s. Provision (terminal blocks with all electrical connection) in the DVLCP for remote actuation of deluge valves, through a push-button shall be made available.
- t. Each of the outdoor deluge valves and its accessories will be housed in a deluge valve housing (As per TAC).
- u. All painting shall be epoxy based only.

3.2.2. HVWS System for Reactors

- a. HVW Spray System is envisaged for two Nos. 125MVAR reactors in switchyard area. ***This spray system shall be tapped off from the main spray header of main plant. A feed of size 150NB will be provided for switchyard HVWS network from the tap-off point. Location of this tap-off point has been shown as per drawing PY-LP-0-M109-8315-01 Composite Layout for Hydrant and Spray System.***
- This system shall automatically detect, control and extinguish any out-break of fire and simultaneously give audible alarm. Water line forms a ring around the equipment to be protected with projected outlets at various selected points fitted with the specially designed nozzles. The water supply to the HVW spray system is controlled by deluge valve which shall be operated hydraulically. This valve is normally closed by water pressure in the water piping. The same water pipe forms a ring around the equipment to be protected and quartzoid bulb type detectors are mounted on this water line at selected places. When the surrounding temperature rises more than the rated temperature of the detector, detector quartzoid bulb collapses releasing water and consequently pressure in water line will fall sharply. This fall of pressure opens the deluge valve and water starts projecting out from the projectors. Local audible alarm shall be produced by water motor alarm gong. The operation of the Deluge Valve shall be annunciated in the Local Zonal Fire Alarm Panel as well as in the Central Fire Detection and Alarm Panel.
 - The system shall also have a manual over riding facility along with regular testing facility.

General

- a. System shall be pressurized continuously to normal working pressure up to the Deluge valves.



- b. It shall consist of spray main tapped from the main spray header of power plant, Deluge valve, Isolation valves, Y-type strainer, spray nozzles/ projectors, spray nozzles piping network, detection system, instrumentation, junction boxes, cables etc.

Design Criteria:

The system shall consist of water supply system, suitable number of spray nozzles, deluge valve, Q.B. detectors, strainers, pipes and necessary valves.

For HVW spray system, minimum running water pressure at any projector/spray nozzles shall not be less than 3.5 bars for reactors.

Design discharge density for HVW Spray system of reactors shall be 10.2 lpm/sqm as per the rules of water spray system of Tariff Advisory Committee (TAC).

Quartzoid bulb detectors shall be used in all reactors.

Spray nozzles shall be arranged in the form of ring to all transformers and nos. of such rings/tiers shall be decided considering maximum gaps between two (2) consecutive tier of rings as 2.5 M. The distance of the deluge valves from the transformers shall be approx. 10 metres.

Placing of spray nozzles shall be such that their spray cones overlap each other.

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 mentioned above/NFPA.

An isolation valve and Y type strainer shall be provided at upstream & downstream 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 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.

Water motor gong shall form part of accessories to be provided with deluge valve.

A pressure switch shall be provided at the down streamside of the deluge valve for remote annunciation of "Deluge Valve Open" alarm in the main Fire Alarm panel in central Control Room. Another pressure switch shall be provided in the detection line of the system for remote annunciation of "Detection circuit operated" alarm in the main Fire Alarm panel in central Control Room.

Local control panel shall be provided for each deluge valve.

HVWS Spray pipe lines 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. RCC hume pipes shall be as per IS:458 NP class II for road crossings and NP class III for rail crossings. All buried pipes shall be double coated and wrapped as per IS: 10221 and/or IS: 15337.

Push button station/local control panel for deluge valve is required for DV local operation manually in 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.

Facility for remote actuation of deluge valves, through a push-button shall be made available. Suitable terminal blocks with necessary electrical wiring should be made available in the DVLCP for remote actuation of deluge valves from control building. For each deluge valve of HVWS system, module shall be provided in the circuit in similar to Fire Detection System with the audio-visual alarm for (a) Detector circuit water pressure low, (b) Fire Water pressure high (c) Deluge valve operated (i.e. FIRE) etc.

All necessary cable and it's accessories supply (for equipments to DVLCP and necessary annunciation in the switchyard FAP) shall be under contactor scope.

Each of the outdoor deluge valves and its accessories will be housed in a deluge valve housing (As per TAC).

3.2.3. Hydrant System

- a. **Hydrant systems for the switchyard area shall be tapped off from main hydrant header for main plant. Dual feed each of size 200NB will be provided to the GIS hydrant network from the tap-off point. Locations of two nos. tap-off points for switchyard hydrant system have been shown as per drawing PY-LP-0-M109-8315-01 Composite Layout for Hydrant and Spray System.**
- b. As per TAC Cl. No. 7.6.11, spacing between hydrant points in the hydrant network shall be 45 meters for Ordinary hazard occupancy.
- c. The Hydrant System of Fire Protection shall consist of generally above ground pipe that will feed water to a number of hydrants valves in GIS area.
- d. 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.
- e. When height of structure, tower exceeds 15M, the concerned hydrants shall be replaced by water monitors.
- f. Based on total nos. of hydrants (outdoor), nos. of branch pipes, tripple purpose nozzles & hoses shall be determined as per guideline of TAC.
- g. Based on total nos. of indoor hydrants (landing valves), nos. of hoses branch pipe, tripple purpose nozzles & hose boxes shall be determined as per guideline of TAC.
- h. All the outdoor hydrants shall be provided with a front glass type hose box carrying 2 nos. 15 mtrs hose for hydrant along with branch pipe coupling and nozzle.
- i. Pipes for hydrant system in the switchyard shall be normally laid over ground on RCC pedestals.
- j. Hydrant 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. RCC hume pipes shall be as per IS:458 NP class II for road crossings and NP class III for rail crossings. All buried pipes shall be double coated and wrapped as per IS: 10221 and/or IS: 15337.
- k. One hydrant ring shall be provided for switchyard area (covering GIS building, control building and reactor) with dual feed from the two locations of tap-off. Suitable number of isolation valves (Gate Valve) shall be provided to isolate the loop for maintenance.
- l. Air release valves, if required shall be provided at the highest point in each wet riser.



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m. All painting shall be epoxy based only.

Design Criteria

- i) Provision of "double headed hydrants" as per the configuration of "risk area" shall be acceptable.
- ii) Spacing of hydrant (outdoor) shall be 45 M in general and for internal hydrant/landing valves spacing shall be 30 M (max.).
- iii) Hydrants shall not be located less than 2M from building. No building shall be deemed to be protected by a hydrant unless such hydrant is within 15M of the building.
- iv) All outdoor piping shall be buried such that the top of the pipe is atleast 1.0 M below the finished ground level.
- v) Pressure at each hydrant point (both outdoor & indoor) shall be 3.5 Kg/Sq. cm (g).
- vi) Pressure break-down orifice shall be provided as necessary to restrict pressure of all hydrant point upto 3.5 Kg/cm².
- vii) The entire pipe network shall be hydraulically designed in such a way that the velocity of water in any section does not exceed 5.0 m/s at any segment of pipe network.

3.2.4. Specific Data

A. PIPING

Specific features of buried/ aboveground piping for Fire Protection System shall be as follows: -

1. M. S. ERW pipes as per IS-1239, Part – 1, Heavy grade for pipes of sizes 150 mm NB and below and IS-3589 Gr.410 ERW for sizes 150 mm NB and above; galvanized as per IS 4736 for pipes normally empty and periodically charged with water and foam system application.
2. C-Factor 100 is for CS pipe for fire water pipes
3. Pipe thickness for size above 150 NB shall be 6.35 mm.
4. All buried pipes shall be double coated and wrapped as per IS: 10221 and/or IS: 15337.
5. Over-ground pipes normally empty but periodically charged with water shall be galvanized as per IS: 4736. These pipes shall be provided with one coat of primer and three coats of chlorinated rubber paint.

B. FITTINGS

Unless otherwise specified all elbows/ bends shall be long radius type.

All the fittings the material shall be mild steel shall be IS 1239 Part-II up to 150 mm dia and above shall fabricated from parent pipe in addition to following,

- Unless otherwise specified all elbows/ bends will be long radius type.

1. For Pipes normally filled:

- a) Pipe to pipe joint: Butt welded for size 65 mm NB & higher as per ANSI B16.9 and socket welded for sizes upto 50 mm NB as per ANSI B16.11
- b) Pipe to valve joint: Flanged and drilled to ANSI 150# B16.5 with neoprene gaskets between flanges for sizes 50NB & above. Screwed for sizes below 50NB.
- c) Pipe Fittings: IS 1239 (Part II) Heavy grade MS for sizes upto 150NB, Fabricated from parent material for sizes above 150NB, Butt welded as per ANSI B 16.25 for sizes 65 NB and above and socket welded as per ANSI-B-16.11 for sizes upto 50 NB.



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2. For Pipes normally empty:

- d) Pipe to pipe joint: Screwed flange as required for sizes 65 mm NB & above and screwed socket for sizes 50 mm NB and below.
Welding on GI Pipes shall not be carried out. All GI Pipe joint connections shall be threaded type only with sealant Teflon.
- e) Pipe to valve joint: Flanged for sizes 50NB & above, screwed for sizes below 50NB.
- f) Pipe Fittings: IS 1239 (Part II) Heavy grade galvanized MS Screwed flanged for sizes 65mm NB & above and screwed socketed as per ANSI B 16.11 or IS 1239, Part II for sizes 50 mm NB and below.
All fittings and flanges for galvanized pipes shall be galvanized.

3. Bolts, nuts & washers: Hot dip galvanized MS.

4. Working and test pressure of piping & fittings shall be as per IS or relevant international standards.

C. VALVES

Gate Valve

Gate valves shall be outside screw rising spindle type.

1. Basic Design Code

- a) Gate Valve: i) IS-14846 for sizes 50 mm NB to 600 mm NB

2. Construction: Cast Body and bonnet/cover

3. Material of Construction: Body and bonnet Material for Gate and Globe valve cover IS-210 Gr. FG 260.

Note: Gate, globe and check valve of size 50 mm NB & below shall be of forged CS body as per API 602 (Gate valve). These valves shall have socket welded ends. Valves will be provided with locking arrangements.

Deluge Valve

Deluge valves shall be used for automatic HVW spray system and MVW spray system. In automatic HVW Spray System, deluge valve in spray water line shall be kept closed normally by water pressure. Same water line will form the water circuit of fire detector. When the detector quartzoid bulb collapses in the event of fire, the water pressure in the deluge valve will fall resulting in the opening of deluge valve. But the deluge valves, which will be used in the MVW spray system shall be of solenoid-operated type, will remain normally closed but in the event of fire, the solenoid will be energized to open the valve.

1. Type: Differential pressure type with diaphragm & clapper assemblies.

2. Material of construction

- a) Body: CI conforming to IS-210 Gr. FG-260

Hydrant valve [Outdoor/ landing valve (Internal hydrant valve)]

The general design of hydrant valve shall conform to IS: 5290 type A and shall be suitable for outdoor operation and for further details data sheet shall be referred to. The general arrangement of outdoor stand post assembly, consisting of a column pipe and a hydrant valve with a quick coupling end shall be as approved by the Regional Committee of the Tariff Advisory Committee/NFPA.

The general design of hydrant valve shall conform to IS: 5290 Type- A and shall be suitable for indoor operation. It shall be identical with hydrant valves (outdoor) as outlined above to facilitate interchangeability.

1. Type: Female oblique type



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2. Code/Standard: IS-5290
3. End Connection
 - a) Inlet: Flanged and drilled to ANSI 150# B 16.5
 - b) Outlet: Female instantaneous coupling with spring lock type coupling with blank cap & chain.
4. Size: 63 mm
5. Material of Construction
 - a) Body, Female Outlet, Stop valve, Blank cap, Bonnet, Gland: SS-304
 - b) Hand Wheel: CI IS 210 Gr. 260
 - c) Spring: Phosphor bronze to IS:7608
6. All SS 304 material shall be as per IS:3444, Gr.1

D. Branch pipe and nozzles

1. Manufacturer: As per approved make
2. Size: 63 NB with 20 NB Nozzle
3. Nozzle Type: Hexagonal, Detachable
4. Code/Standard: IS-903-1995.
5. Material of construction
 - a) Branch pipe / nozzle: SS 304
 - b) Spanner: Steel of grade C-40 to IS:1570 (Part 5) chromium or zinc plated.
6. Testing: As per IS 903
7. Approval: ISI marked/ TAC Approved

E. Hose Coupling

1. Type: Instantaneous Male & Female
2. Size: 63 NB
3. Code/ Standard: IS 903
4. Material of Construction:
 - a) Female Half Coupling, Male Half Coupling, Seal washer, Outdoor disc, Self-locking nut, Locking latch, Guide disc, Knob: SS 604
 - b) Spring: Phosphor Bronze
5. Testing: As per IS 903
6. Approval: ISI marked/ TAC Approved

F. Fire Hose for Hydrants

1. Type: Reinforced Rubber lined
2. Size: 63 mm
3. Code/Standard: IS-636 Type A
4. Length: 15 m for external hydrant, 7.5 m for internal
5. End Fittings: Instantaneous spring lock type coupling at both ends.
6. Wt. (gm/m): As per IS 636

G. Hose Box / cabinet

1. Manufacturer: As per approved make.
2. Type: Fabricated out of 16 G MS sheet.
3. Size: Approx. 750 x 600 x 250
4. Mounting: Wall / column mounted for internal hydrant, pedestal mounted for external hydrant.



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5. Special requirement:

- (i) Each cabinet shall accommodate 2 nos. of 15 m long hoses and 1 no. branch pipe & nozzle.
- (ii) Cabinet to have double door having toughened glass panel (3 mm) with rubber lining and marked 'Fire' on it in 80 mm size letters.
- (iii) Approved lock with duplicate keys kept wired in a break glass key cabinet in the hose box itself.
- (iv) A spanner and a set of spare rubber rings packed in fresh chalk to be kept inside the hose box.
- (v) Clamp for holding branch pipe to be provided.

6. Accessories:

- Fastening nuts, bolts and hardware
- Hammer for breaking the glass to take out the keys

H. Spray Nozzles

1. HVWS System:

- a) Type: Open type, solid cone
- b) Working pressure: 3.5 bar
- c) K factor/Orifice size (mm): 17.5 / 7 & 33/10
- d) End connector: Screwed, 3/4" BSP

2. MVWS System:

- a) Type: Open type
- b) Working pressure: 1.4-2.8 bar
- c) K factor/Orifice size (mm): 21.05/6.6 mm
- d) Spray Angle: 120°
- e) End connector: Screwed, 1/2" BSP screwed

3. Material: SS304

4. Approval: TAC Approved

5. Marking: K – factor to be marked on hexagonal face.

I. Quartzoid Bulb Type Detector

a) In quartzoid bulb type detectors a small amount of gas along with heat sensitive liquid (coloured) is entrapped and hermetically sealed. This detector shall generally be mounted on the pressurized water line which forms a ring around the equipment to be protected. When the surrounding temperature rises more than the rated temperature of the detector, the gas inside the detector shall expand and as a result the quartzoid bulb shall collapse releasing water and consequently pressure in the water line shall fall sharply. This fall in pressure will give signal/annunciation in the Panel.

b) Type and make of frangible bulb shall be of Owner's choice /approval.

c) Material: Bronze with Nickel Chrome plated

d) Sensitive Element: Heat Sensitive Bulb

e) Set Temperature: 79°C

f) Response Time: Less than 20 seconds

g) End Connector: 1/2" BSP, Screwed

J. Strainers

Y-type Inline Strainer: Body shall be constructed of mild steel as per IS: 2062 (tested quality). Strainer wires shall be of stainless steel AISI: 316, 18 BWG, 30 mesh. Blowing arrangement shall be provided



with removable plug at the outlet. Screen open area shall be at least 4 times pipe cross-sectional area at inlet.

3.2.5. Portable Fire Extinguishers

General:

The portable fire extinguishers shall be selected according to the type of fire that may be encountered. In this system, the following classes of fire are envisaged:

Class-A: Fire in ordinary combustibles such as wood, coal dust, vegetable, fibre, paper and the like.

Class-B: Fires in flammable liquids, paints, grease, solvents and the like.

Class-E: Fires in Electrical Equipment: To encounter the above classes of fires, extinguishers of Stored Pressure type, Carbon dioxide type and Dry chemical powder type shall be provided by the Bidder inside all other main/auxiliary buildings where the above mentioned classes of fires are envisaged.

The selection of number of extinguishers for each type shall basically follow the guidelines laid down in Cl. No. 4.0 of the latest edition of the Fire Protection Manual Published by TAC, Part-I.

- a. Stored Pressure type (ABC Fire) 5 Kg capacity fire extinguisher conforming to IS 15683:2006 or latest
- b. Carbon dioxide of 9 Kg capacity portable fire extinguisher conforming to IS 15683:2006 or latest.
- c. Dry chemical powder type 10 Kg capacity portable fire extinguishers conforming to IS 15683:2006 or latest.
- d. Carbon dioxide of 22.5 Kg capacity trolley wheel mounted fire extinguisher conforming to IS 15683:2006 or latest.
 - For switchgear rooms a combination of adequate number of DCP and CO2 extinguishers shall be provided.
 - Selection of type and location of installation of fire extinguishers for the various rooms of the switchyard control building shall be done in accordance with TAC guidelines.

(Separate document shall be submitted for Portable & Mobile Fire extinguishers titled as “Fire Extinguisher Distribution Schedule”).

DESIGN, CONSTRUCTION AND SPECIFIC REQUIREMENTS

Design and manufacture of the extinguishers shall conform to the latest editions of Indian and other equivalent International Standards and shall be suitable for respective design pressure, temperature and service conditions.

All the extinguishers along with accessories shall be guaranteed for satisfactory and trouble-free operation.

Portable extinguishers shall be complete with brackets/fittings suitable for mounting on wall and a carrying handle of ample strength.

Spanner and other accessories as required shall be supplied with each fire extinguisher.

Each extinguisher shall be designed, constructed, tested and painted in accordance with respective Indian/International Standard and marked with BIS Certification.

First charge of chemicals in each extinguisher shall be provided. All chemical charges shall be refilled after testing at site.



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As required by Tariff Advisory Committee, 20% spare charge of the total no. of extinguishers installed, with a minimum of six recharges, shall be supplied for each type of extinguishers.

Fire extinguishers shall be fitted with pressure gauges as applicable to indicate whether the extinguisher is charged or in need of a recharge.

The discharge horn of the Carbon-Dioxide Extinguishers shall be made of a material non-conducting to electricity.

All extinguishers shall be mounted at strategic locations in bunches and/or individually to TAC approval.

- ❖ **Firefighting system shall be designed as per the latest drawing during the detailed engineering stage.**
- ❖ **Specification/ data sheets of various items of this package shall be submitted to customer/ consultant for approval during the detailed engineering stage.**

3.3.0 Mandatory Spares

Following mandatory spares items shall be provided:

FIRE PROTECTION SYSTEM		
A. FIRE HOSES WITH COUPLINGS		
SL. NO.	ITEM DESCRIPTION	QUANTITY
1	7.5 M LONG FIRE HOSES WITH AND CONNECTIONS	1 NO. 10% OF POPULATION
2	FIRE HOSE WITH END CONNECTION BUT 15 M LONG	1 NO. 10% OF POPULATION
B. BRANCH PIPES WITH NOZZLES		
1	NOZZLES WITH BRANCH PIPES AND QUICK COUPLING ENDS	1 NO. 10% OF POPULATION
C. DELUGE VALVE ACCESSORIES		
1	CLAPPER ASSEMBLY COMPLETE (CONSISTING OF CLAPPER, SEAT RUBBER AND SCREWS ETC.)	1 NO. 10% OF POPULATION
2	SOLENOID COILS	1 NO. 10% OF POPULATION
D. VALES (GATE / GLOBE / BUTTERFLY / NRV) ACCESSORIES		
1	REDUCTION GEAR OPERATOR (GATE / GLOBE / BUTTERFLY)	1 NO. 10% OF POPULATION OF EACH TYPE & SIZE
2	FLAP / DOOR WITH PIN (NRV)	1 NO. 10% OF POPULATION OF EACH TYPE & SIZE
3	DISC (BUTTERFLY / GLOBE)	1 NO. 10% OF POPULATION OF EACH TYPE & SIZE
4	SEAL RINGS (ALL TYPES)	1 NO. 10% OF POPULATION OF EACH TYPE & SIZE
5	FLAP RING (NRV)	1 NO. 10% OF POPULATION OF EACH TYPE & SIZE
6	GASKETS	1 NO. 10% OF POPULATION OF EACH TYPE & SIZE
7	BEARING (BUTTERFLY VALVE)	1 NO. 10% OF POPULATION OF EACH TYPE & SIZE
8	COMPLETE VALVE ASSEMBLY	1 NO. FOR EACH TYPE & SIZE
E. Y-TYPE STRAINER		
1	STRAINER ELEMENTS WITH O-RINGS	1 NO. 20% POPULATION OF EACH TYPE & SIZE



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	AND STIFFENERS	
F. MVW SPRAY SYSTEM		
1	SPRAY NOZZLES	1 NO. 20% POPULATION OF EACH TYPE & SIZE
G. HVW SPRAY SYSTEM		
1	SPRAY NOZZLES	1 NO. 10% POPULATION OF EACH TYPE & SIZE
2	QB DETECTORS	1 NO. 20% POPULATION OF EACH TYPE & SIZE
H. SMOKE / HEAT DETECTORS		
1	PHOTO ELECTRIC HEAT DETECTORS	1 NO. 10% POPULATION OF EACH TYPE & SIZE
2	HEAT DETECTORS	1 NO. 10% POPULATION OF EACH TYPE & SIZE
3	INDICATOR ASSEMBLY FOR SMOKE DETECTORS PROVIDED IN FALSE ROOF	1 NO. 5% POPULATION OF EACH TYPE & SIZE
4	LHS CABLES	10% POPULATION OF EACH TYPE & SIZE
5	SPOT HEAT DETECTORS (GENERATOR SEAL OF UNIT)	1 NO. 10% POPULATION OF EACH TYPE & SIZE
6	CONNECTORS OR TERMINAL BOXES FOR INTERCONNECTION OF LHS CABLES	1 NO. 10% POPULATION OF EACH TYPE & SIZE
7	MULTI SENSOR DETECTORS	1 NO. 10% POPULATION OF EACH TYPE & SIZE

Note: Please note that the final quantity of above mandatory spares shall be min. one no. or (5/10/20) % of total population whichever is higher of each type and size.

3.3.1 Special Tools & Tackles

Following Special Tools and Tackles shall be provided along with the main equipment as per equipment manufacturer's recommendations:

S.No.	DESCRIPTION	UNIT	QUANTITY
1	SPANNER DOUBLE END FIX TYPE CONFORMING TO IS:2028 (SIZE 1/8" - 3/16" TO 5/8"-3/4")	NOS.	1
2	SPANNER RING TYPE (SIZE 1/8" TO 5/8" X 3/4")	NOS.	1
3	SCREW DRIVER WITH TRANSPARENT GREEN HANDLE CONFORMING TO IS:844 INSULATED		
3.1	SIZE : 150 MM LONG X 8 MM BLADE DIA	NOS.	1
3.2	SIZE : 250 MM LONG X 8 MM BLADE DIA	NOS.	1
3.3	SIZE : 300 MM LONG X 8 MM BLADE DIA	NOS.	1
4	M.S CHISSEL 1/4" X 3" LONG	NOS.	1
5	MACHINIST FILE FLAT SMOOTH (300 MM)	NOS.	1
6	MACHINIST FILE HAND BASTARD (300 MM)	NOS.	1
7	COMBINATION PLIER INSULATED WITH THICK C.A. SLEEVE CONFORMING TO IS:3650 (HAVING LENGTH OF 205 MM)	NOS.	1
8	TOMMY BAR HEXAGONAL	NOS.	1
9	HAMMER WITH HANDLE CONFORMING TO IS:8481 (BALL PEIN & CROSS PEIN) (500 GMS)	NOS.	1
10	HACKSAW STEEL FRAME WITH 6 NOS. HSS BLADE of 12" LENGTH	SET	1
11	SPIRIT LEVEL GAUGE	NOS.	1

4.0 SCOPE OF SUPPLY & SERVICES

- 4.1. 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



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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.

- 4.2. 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.

4.3. Bidder shall also consider the following while quoting for the system:

- i) Power & Control cables for fire protection system (except for cable for detection and alarm system & FO cable) will be supplied on free issue basis to contractor. BHEL shall procure various sizes of cables (as per Annexure 'A' of this section) for the complete requirement of sub-station. 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.
- 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 cable of suitable size, FRLS, twisted pair, armoured 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. RCC pedestals shall be provided by BHEL. However, pylon supports to be provided by contractor for HVWS.
- 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 including fabrication, equipment



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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 plant 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 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.

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 NP2 class and that for rail crossing shall be NP3. However, hume pipe shall be supplied and laid by BHEL. Sizes of hume pipes procured by BHEL is 250NB, 300NB, 450NB and contractor shall choose out of the same only. Contractors shall provide such requirement of hume pipes in the piping layout drawing.



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CONSULTANT- TATA CONSULTING ENGINEERS LTD, BANGALORE

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- ii) *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.*
- iii) *Laying of aboveground piping in contractor scope however provision of RCC pedestals in BHEL scope. **Contractor shall also supply all fixing hardware like plate, angle, U bolts etc. for laying aboveground yard pipes over pedestals.***
- iv) *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 for complete system in their respective bids.***
- 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.*
- d) *Provision of RCC pedestals for piping.*
- e) *Provision of deluge valve housing.*
- f) *Supply and laying of hume pipe for road and rail crossing.*

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:

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



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8.0 Handing & Taking Over

It is the responsibility of the contractor to maintain the plant till it is handed over. 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 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.

10.0 Various Heads to be quoted for

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

SI No.	Item Description	Qty	Unit	SUPPLY		ETC		Remarks
				Unit Rate	Total Ex-Works	Unit Rate	Total ETC	
1	MS Pipe 200NB (Fe410 Grade)	600	Meter					As per IS-3589 Gr.410 ERW, minimum thickness 6.35mm, including pipe fittings and accessories
2	MS ERW PIPE 150NB (HEAVY GRADE)	10	Meter					As per IS-1239, Part – 1, Heavy grade, including pipe fittings and accessories
3	MS ERW PIPE 100NB (HEAVY GRADE)	150	Meter					As per IS-1239, Part – 1, Heavy grade, including pipe fittings and accessories
4	MS ERW PIPE 80NB (HEAVY GRADE)	120	Meter					As per IS-1239, Part – 1, Heavy grade, including pipe fittings and accessories
5	WRAPING & COATING MATERIAL	10	SqMtr					
6	GI PIPE 100NB (HEAVY GRADE)	96	Meters					Galvanized as per IS 4736, including pipe fittings and accessories
7	GI PIPE 65NB (HEAVY GRADE)	106	Meters					Galvanized as per IS 4736, including pipe fittings and accessories
8	GI PIPE 50NB (HEAVY GRADE)	266	Meters					Galvanized as per IS 4736, including pipe fittings and accessories
9	GI PIPE 25NB (HEAVY GRADE)	272	Meters					Galvanized as per IS 4736, including pipe fittings and accessories
10	PYLON PIPE 80NB (LIGHT	188	Meters					Including pipe fittings



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	GRADE)							and accessories
11	GATE VALVE 200NB	4	Nos.					
12	GATE VALVE 100NB	8	Nos.					
13	GATE VALVE 80NB	2	Nos.					
14	BUTTERFLY VALVE - 100NB	3	Nos.					
15	DELUGE VALVE - 100NB	3	Nos.					Deluge Valve with complete trim connection and pressure gauge
16	Y-TYPE STRAINER - 100NB	3	Nos.					
17	Q.B DETECTOR	104	Nos.					
18	HVW SPRAY NOZZLE	146	Nos.					
19	MVW SPRAY NOZZLE	85	Nos.					
20	LOCAL CONTROL PANEL FOR DELUGE VALVE	3	Nos.					
21	PRESSURE SWITCH	6	Nos.					
22	SOLENOID VALVE	3	Nos.					
23	SINGLE HEADED HYDRANT VALVE- EXTERNAL	12	Nos.					
24	SINGLE HEADED HYDRANT VALVE- INTERNAL	1	Nos.					
25	HOSE BOX-EXTERNAL	12	Nos.					
26	HOSE BOX-INTERNAL	1	Nos.					
27	HOSE PIPE - 15M LONG	24	Nos.					Hose pipe with coupling
28	HOSE PIPE - 7.5M LONG	2	Nos.					Hose pipe with coupling
29	BRANCH PIPE WITH NOZZLE	13	Nos.					
30	WATER MONITOR	3	Nos.					
31	AIR RELEASE VALVE	1	Nos.					
32	ADDRESSABLE FIRE ALARM PANEL	1	Nos					
33	MULTI SENSOR DETECTOR	82	Nos.					Addressable type
34	HEAT DETECTOR	10	Nos.					Addressable type
35	LHS CABLE	360	Meter					Digital LHS Cable
36	BEAM DETECTOR SET	4	Nos.					
37	MANUAL CALL POINT	12	Nos.					
38	HOOTER	8	Nos					
39	RESPONSE INDICATOR	36	Nos					
40	LOOP CABLE	2000	Meter					
41	FO CABLE	800	Meter					
42	MONITOR MODULE	10	Nos.					
43	CONTROL MODULE	25	Nos.					



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44	EXIT SIGN	12	Nos.					
45	PRESSURIZED WATER TYPE FIRE EXTINGUISHER - 5KG	5	Nos.					
46	CO2 TYPE EXTINGUISHER - 9 KG	6	Nos.					
47	CO2 TYPE EXTINGUISHER - 22.5 KG	2	Nos.					
48	PORTABLE DRY CHEMICAL POWDER CYLINDRICAL SHAPE FIRE EXTINGUISHER 10 KG CAPACITY	26	Nos.					
49	MECHANICAL FOAM TYPE FIRE EXTINGUISHER PORTABLE 9L CAPACITY	2	Nos.					
50	Mandatory Spares							
i.	HOSE PIPE - 15M LONG	3	Nos.					Hose Pipe with coupling
ii.	HOSE PIPE - 7.5M LONG	1	Nos.					Hose Pipe with coupling
iii.	BRANCH PIPE WITH NOZZLE	2	Nos.					
iv.	CLAPPER ASSEMBLY FOR DELUGE VALVE 100NB	1	Nos.					Consisting of clapper, seat rubber and screws etc.
v.	SOLENOID COIL FOR DELUGE VALVE 100NB	1	Nos.					
vi.	REDUCTION GEAR OPERATOR FOR GATE VALVE 200NB	1	Nos.					
vii.	REDUCTION GEAR OPERATOR FOR GATE VALVE 100NB	1	Nos.					
viii.	REDUCTION GEAR OPERATOR FOR GATE VALVE 80NB	1	Nos.					
ix.	REDUCTION GEAR OPERATOR FOR BUTTERFLY VALVE 100NB	1	Nos.					
x.	DISC FOR BUTTERFLY VALVE 100NB	1	Nos.					
xi.	SEAL RING FOR GATE VALVE 200NB	1	Nos.					
xii.	SEAL RING FOR GATE VALVE 100NB	1	Nos.					
xiii.	SEAL RING FOR GATE VALVE 80NB	1	Nos.					
xiv.	SEAL RING FOR BUTTERFLY VALVE 100NB	1	Nos.					
xv.	GASKETS FOR GATE VALVE 200NB	1	Nos.					
xvi.	GASKETS FOR GATE VALVE 100NB	1	Nos.					
xvii.	GASKETS FOR GATE VALVE 80NB	1	Nos.					

NA

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xviii.	GASKETS FOR BUTTERFLY VALVE 100NB	1	Nos.				
xix.	BEARING FOR BUTTERFLY VALVE 100NB	1	Nos.				
xx.	GATE VALVE 200NB	1	Nos.				
xxi.	GATE VALVE 100NB	1	Nos.				
xxii.	GATE VALVE 80NB	1	Nos.				
xxiii.	BUTTERFLY VALVE 100NB	1	Nos.				
xxiv.	STRAINER ELEMENT WITH O-RINGS & STIFFENER 100NB	1	Nos.				
xxv.	MVW SPRAY NOZZLES	17	Nos.				
xxvi.	HVW SPRAY NOZZLES	15	Nos.				
xxvii.	QB DETECTORS	21	Nos.				
xxviii.	HEAT DETECTORS	1	Nos.				Addressable type
xxix.	RESPONSE INDICATOR	2	Nos.				
xxx.	LHS CABLE	36	Nos.				Digital LHS Cable
xxxi.	CONNECTORS OR TERMINAL BOXES FOR INTERCONNECTION OF LHS CABLES	1	Set				1 no. or 10% of each type & size
xxxii.	MULTI SENSOR DETECTORS	9	Nos.				Addressable type
51	SPECIAL TOOLS AND TACKLES	1	Set				As per clause 3.3.1 of Section-1 of Technical Specification
52	ALL CABLING AND TERMINATION BETWEEN PANELS	2000	Meter	NA			ETC scope only

NOTE:

- Price of items like pipe fittings, hardware items etc. shall be considered along with price of the respective pipes/ items in the price schedule.
- The equipments and services to be furnished under this contract are detailed here under Cl. No. 10.0 of this section is for reference. Bidders shall work out the actual requirement based on the building & switchyard layout enclosed with this specification during detailed engineering stage.
- The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, General and Special Conditions of Contract, Technical Specifications, and Drawings.
- The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Purchaser and valued at the rates and prices bid in the priced Bill of Quantities.
- A rate or price shall be entered against each item in the priced Bill of Quantities. The cost of Items against which the Contractor has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.



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- f) The whole cost of complying with the provisions of the Contract shall be included in the Items provided in the priced Bill of Quantities, and where no Items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related Items of Work.
- g) General directions and descriptions of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the Contract documentation shall be made before entering prices against each item in the priced Bill of Quantities.
- h) Miscellaneous items like hardware, fixtures, fittings etc. shall be deemed to be included under the relevant BOQ items and bidders shall consider the same while quoting for BOQ items.
- i) Exact requirements shall be worked out during detailed engineering after award of contract.
- j) 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.



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ANNEXURE-‘A’

Cable Sizes being procured by BHEL for Sub-Station

2C x 2.5 sq mm PVC/Copper, Armoured Control Cable
5C x 4 sq mm PVC/Copper, Armoured Control Cable
5C x 2.5 sq mm PVC/Copper, Armoured Control Cable
7C x 2.5 sq mm PVC/Copper, Armoured Control Cable
10C x 2.5sqmm PVC/Copper, Armoured Control Cable
14C x 2.5 sq mm PVC/Copper, Armoured Control Cable
19C x 2.5 sq mm PVC/Copper, Armoured Control Cable
2C x 6 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
4C x 16 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
4C x 6 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
3.5C x 70 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
3.5C x 150 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
3.5C x 300 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
1C x 630 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable

Annexure-B
Sub-Vendor List

Tamil Nadu Generation and Distribution Company Limited.
(Udangudi Project)

From

To

Er. U.S.PONGIANNAN,B.E.,
Chief Engineer /Projects-II ,
TANGEDCO,
1st Floor,New EB Quarters
144,Anna salai
Chennai-600 002.
Email- secutpp@tnebnnet.org

BHEL, PS-PEM,
Power Projects Engineering Institute (PPEI
Building),
HRDI & ESI Complex, Plot No. 25, Sector-16A,
Noida-201301 (U.P.)
Email: permindersingh@bhel.in
pedm@bhel.in

Lr. No. CE/PROJ/SE/C/UP/EE/M/ AEE/M/Engineering/ D.599/2018,dt.17.12.2018.

Sir,

Sub.: TANGEDCO-Udangudi 2x660 MW Super Critical Thermal
Power Project Stage-I-Vendor Approval for BHEL_PESD-New
vendor approval for Fire Protection system-Regarding.

Ref.: Your letter ref. No. PESD/CM/UDANGUDI/CM LTR-01,
dt.09.11.2018.

<<<O>>>

With reference to your letter cited above, the following new vendor approval is
accorded for Fire Protection System.

Sl No	Items Description	Name of Vendor	Remarks on Vendor Approval
1	HYDRANT VALVE	ASHOKA ENGINEERING COMPANY	Approved
		SHAH BHOGILAL JETHALAL & BROTHERS	Approved
		NEWAGE FIRE FIGHTING CO. LTD.	Approved
		SUKAN EQUIPMENTS	Approved
2	WATER MONITOR	FIRETECH EQUIPMENT & SYSTEMS	Approved
		HD FIRE PROTECT PVT. LTD.	Approved
		NEWAGE FIRE FIGHTING CO. LTD.	Approved
		SHAH BHOGILAL JETHALAL & BROTHERS	Approved
3	HOSE BOX	ASHOKA ENGINEERING COMPANY	Approved
		ASHOKA ENGINEERING COMPANY	Approved
		SHAH BHOGILAL JETHALAL & BROTHERS	Approved
		NEWAGE FIRE FIGHTING CO. LTD.	Approved

Sl No	Items Description	Name of Vendor	Remarks on Vendor Approval
4	FIRE HOSE WITH COUPLING		
		NEWAGE FIRE FIGHTING CO. LTD.	Approved
		SHAH BHOGILAL JETHALAL & BROTHERS	Approved
		CHHATARIYA FIRETECH INDUSTRIES LTD.	Approved
5	HOSE REEL	ASHOKA ENGINEERING COMPANY	Approved
		NEWAGE FIRE FIGHTING CO. LTD.	Approved
6	BRANCH PIPE WITH NOZZLE	ASHOKA ENGINEERING COMPANY	Approved
		SHAH BHOGILAL JETHALAL & BROTHERS	Approved
7	GUN METAL VALVE	A.V.VALVES LIMITED	Approved
		LEADER VALVES LIMITED	Approved
		STEEL STRONG VALVES (I) PVT. LTD.	Approved
		NITON VALVE INDUSTRIES LTD.	Approved
		WEIR BDV VALVES	Approved
		OSWAL INDUSTRIES LTD.	Approved
		L & T VALVES LIMITED	Approved
8	AIR RELEASE VALVE	FOURESS ENGINEERING (I)PVT.LTD.	Approved
		KAMALA VALVES & ENGINEERING PVT. LT	Approved
		A.V.VALVES LIMITED	Approved

Sl No	Items Description	Name of Vendor	Remarks on Vendor Approval
		DURGA VALVES PRIVATE LIMITED	Approved
9	PRESSURE TRANSMITTER	EMERSON PROCESS MGT (I) PVT LTD.	Approved
		ABB INDIA LIMITED, HYD	Approved
		YOKOGAWA INDIA LIMITED	Approved
		ENDRESS + HAUSER (INDIA) PVT. LTD.	Approved
		HONEYWELL AUTOMATION INDIA LIMITED	Approved
10	AIR COMPRESSOR	INGERSOLL RAND (INDIA) LTD.	Approved
		ELGI EQUIPMENTS LIMITED	Approved
		ATLAS COPCO INDIA LTD.	Approved
		KIRLOSKAR PNEUMATIC COMPANY LIMITED	Approved
11	HYDRO-PNEUMATIC TANK		
		THERMOSYSTEMS PRIVATE LIMITED.	Approved
		EXCEL INDUSTRIES,	Approved
		RUKSAN ENGINEERS PVT.LTD.	Approved
		P S A NITROGEN LIMITED.	Approved
		BARODA EQUIPMENT AND VESSELS	Approved
		GRAND PRIX ENGINEERING PVT. LTD	Approved
		FABTECH PROJECTS & ENGINEERS LTD.	Approved
12	LEVEL SWITCH	RAVI INDUSTRIES	Approved
		EMERSON PROCESS MGT (I) PVT LTD	Approved
		ENDRESS + HAUSER (INDIA) PVT. LTD.	Approved
		PUNE TECHTROL PVT LTD	Approved
13	PRESSURE GAUGE		
		VEGA INDIA LEVEL & PRESSURE	Approved
		A.N. INSTRUMENTS PVT. LTD.,	Approved
		GAUGES BOURDON INDIA PVT. LTD.	Approved
		BAUMER TECHNOLOGIES	Approved
		H.GURU INSTRUMENTS(S.I)PVT.LTD	Approved
		PRECISION MASS PRODUCTS PVT LTD	Approved
		GOA INSTRUMENTS INDUSTRIES PVT. LTD.	Approved

Sl No	Items Description	Name of Vendor	Remarks on Vendor Approval
		FORBES MARSHALL (HYD) PVT LIMITED	Approved
14	LEVEL GAUGE	D.K.INSTRUMENTS (P) LTD.	Approved
		LEVCON INSTRUMENTS (P) LTD	Approved
		GAUGES BOURDON INDIA PVT. LTD.	Approved
		PUNE TECHTROL PVT LTD.	Approved
		CHEMTROLS INDUSTRIES PVT LTD.	Approved
		BLISS ANAND PVT. LTD.	Approved
		IGEMA GmbH	Approved
		V AUTOMAT AND INSTRUMENTS PVT LTD.	Approved
15	DELUGE VALVE	DE'S TECHNICO LIMITED	Approved
		DARLING MUESCO (INDIA) PVT. LTD.	Approved
		NAFFCO	Approved
		HD FIRE PROTECT PVT. LTD.	Approved
16	SPRAY NOZZLE	SHAH BHOGILAL JETHALAL & BROTHERS	Approved
		NEWAGE FIRE FIGHTING CO. LTD.	Approved
		HD FIRE PROTECT PVT. LTD.	Approved
		FIRETECH EQUIPMENT & SYSTEMS	Approved
17	QUARTZOID BULB DETECTOR	NEWAGE FIRE FIGHTING CO. LTD.	Approved
		HD FIRE PROTECT PVT. LTD.	Approved
18	PRESSURE SWITCHES	SWITZER PROCESS INSTRUMENTS	Approved
		GAUGES BOURDON INDIA PVT. LTD.	Approved
		BAUMER TECHNOLOGIES	Approved
		TRAFAG CONTROLS INDIA PVT LTD.	Approved
		PRECISION MASS PRODUCTS PVT LTD.	Approved
19	FOAM BRANCH PIPE	ASHOKA ENGINEERING COMPANY	Approved
		SHAH BHOGILAL JETHALAL & BROTHERS	Approved
20	INLINE BALANCE PROPORTIONER	SHAH BHOGILAL JETHALAL & BROTHERS	Approved
		HD FIRE PROTECT PVT. LTD.	Approved
		FIRETECH EQUIPMENT & SYSTEMS	Approved

SI No	Items Description	Name of Vendor	Remarks on Vendor Approval
21	FOAM TANK	HD FIRE PROTECT PVT. LTD.	Approved
		FIRETECH EQUIPMENT & SYSTEMS	Approved
22	FOAM PUMP & AUXILIARIES	DEL PD PUMPS AND GEAR PVT. LTD.	Approved
23	FIRE WATER PUMPS & AUXILIARIES	WPIL LIMITED	Approved
		FLOWMORE LIMITED	Approved
		JYOTI LIMITED	Approved
		WILO MATHER AND PLATT PUMPS	Approved
		KIRLOSKAR BROTHERS LTD.	Approved
25	PORTABLE EXTINGUISHER	TECHNICO (INDIA) PVT. LTD.	Not Approved, since no Experience with vendor
		INTEGRATED FIRE PROTECTION	Not Approved, since no Experience with vendor
		DE S TECHNICO PRIVATE LIMITED	Not Approved, since no Experience with vendor
		AGNICE FIRE PROTECTION PVT. LTD.	Approved
		SAFEX FIRE SERVICES LTD.	Approved
		KANADIA FYR FYTER PVT. LTD.	Approved
		HITEK ENGINEERING SERVICES	Approved
		INTIME FIRE APPLIANCES PVT. LTD.	Approved

Sl No	Items Description	Name of Vendor	Remarks on Vendor Approval
	PORTABLE EXTINGUISHER	SUPREMEX EQUIPMENTS	Not Approved, since no Experience with vendor
		MX SYSTEMS INTERNATIONAL PVT. LTD.	Not Approved, since no Experience with vendor
		NITIN FIRE PROTECTION INDUSTRIES LTD.	Not Approved, since no Experience with vendor
		NEW FIRE ENGRS. PVT. LTD.	Approved
		TYCO FIRE & SECURITY INDIA PVT. LTD.	Approved
		FIREPRO SYSTEMS PVT. LTD.	Not Approved, since no Experience with vendor
		MEHTA & ASSOCIATES FIRE PROTECTION	Approved
		ASHOKA ENGINEERING COMPANY	Approved
		UNITED FIRE EQUIPMENTS PVT LTD.	Not Approved, since no Experience with vendor
		CONSILIUM MIDDLE EAST (FZC)	Not Approved, since no Experience with vendor
		THERMOSYSTEMS PRIVATE LIMITED.	Approved
		GAJANAN TUBES PRIVATE LIMITED	Approved
26	FIRE WATER PIPES		
		APL APOLLO TUBES LIMITED	Approved
		DADU PIPES PVT. LTD.	Approved
		STEEL AUTHORITY OF INDIA LIMITED	Approved
		MAHARASHTRA SEAMLESS LTD.,	Approved
		SURYA ROSHNI LIMITED	Approved
		JINDAL PIPES LIMITED	Approved
27	BUTTERFLY VALVES	INDUS TUBES LIMITED	Approved

Sl No	Items Description	Name of Vendor	Remarks on Vendor Approval
	BUTTERFLY VALVES		
		ADVANCE VALVES PVT.LTD.	Approved
		A.V.VALVES LIMITED	Approved
		STAFFORD CONTROLS LIMITED	Approved
		R & D MULTIPLES (METAL CAST)	Approved
		CRANE PROCESS FLOW TECHNOLOGIES	Approved
		L & T VALVES LIMITED	Approved
		WEIR BDK VALVES	Approved

Sl No	Items Description	Name of Vendor	Remarks on Vendor Approval
	BUTTERFLY VALVES		
28	CAST IRON VALVES- GATE(SLUICE)&C HECK		
		H.SARKER & COMPANY	Approved
		FLUIDLINE VALVES COMPANY PVT.	Approved
		A.V.VALVES LIMITED	Approved
		ATAM VALVES PVT. LTD.	Approved
		LEADER VALVES LIMITED	Approved
		CRESCENT VALVES MFG CO. PVT. LTD.	Approved
		HAWA VALVES (INDIA) PVT. LTD.	Approved
29	FOAM PUMP & AUXILIARIES	MAHESH INDUSTRIES	Approved
		UNIQUE ENGINEERING ENTPS. PVT. LTD.	Approved
30	FITTINGS	TRIOMECH ENGINEERING PVT. LTD.	Approved
		JINDAL FORGING PVT LTD.	Approved
		REAL FORGE	Approved
		SUPER FORGE	Approved
		PRESHZINGER ENGINEERING	Approved
31	SOCKET WELDED / SCREWED WELDED PIPE FITTINGS	JINDAL FORGING PVT LTD.	Approved
		REAL FORGE	Approved
		SUPER FORGE	Approved
		BHARAT FORGE	Approved
		DYNAMIC FORGE	Approved
		FLOWTECH	Approved
		ENGINEERING SERVICE ENTERPRISE	Approved
		N L HAZRA AND SON	Approved
		M.S. FITTINGS MANUFACTURING CO. PVT	Approved
		LEADER VALVES LIMITED	Approved
		NAV DURGA FORGING AND FITTINGS	Approved

Sl No	Items Description	Name of Vendor	Remarks on Vendor Approval
	SOCKET WELDED / SCREWED WELDED PIPE FITTINGS	FITTECH INDUSTRIES PVT. LTD.	Approved
		PRECISION ENGINEERING INDS.	Approved
		SKY FORGE PRIVATE LIMITED	Approved
		K. S. PIPE FITTINGS PVT. LTD.	Approved
		P.K. TUBES & FITTINGS PVT. LTD.	Approved
		TRUE FORGE PVT.LTD.	Approved
		PIPEFIT ENGINEERS PVT. LTD.	Approved
		U I PIPE FITTINGS PVT. LTD.	Approved
		CARLO DYNATECH INDUSTRIES,	Approved
		FLASH FORGE PVT LTD.	Approved
		PRESHZINGER ENGINEERING	Approved
		UNIQUE ENGINEERING ENTPS. PVT. LTD.	Approved
		S.S.PIPE FITTINGS & FORGINGS	Approved
33	BOLTING MATERIAL	HARYANA FASTNERS	Approved
		KWALITY FORGE	Approved

SI No	Items Description	Name of Vendor	Remarks on Vendor Approval
35	CONTROL CABLES	UDEY PYROCABLES PVT. LTD.	Approved
		ADVANCE CABLE TECHNOLOGIES PVT LTD.	Approved
		LAPP INDIA PVT. LTD.	Approved
		T C COMMUNICATION PVT. LTD.	Approved
37	CABLE TRAY	INDUSTRIAL PERFORATION (I) PVT. LTD.	Approved
		RUKMANI ELECTRICAL & COMPONENTS	Approved
		RABI ENGINEERING WORKS PVT. LTD	Approved
		RATAN PROJECTS & ENGG. CO. PVT. LTD.	Approved
		PREMIER POWER PRODUCTS	Approved
		EROS METAL WORKS (P) LTD.	Approved

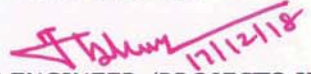
Sl No	Items Description	Name of Vendor	Remarks on Vendor Approval
		PATNY SYSTEMS PVT. LTD	Approved
		KANSAI NEROLAC PAINTS LTD.	Approved
		ASIAN PAINTS INDIA) LTD.	Approved
		SHALIMAR PAINTS LTD.	Approved
		BERGER PAINTS INDIA LTD.,	Approved
		COROMANDEL PAINTS LIMITED	Approved
38	PAINTS AND PRIMER		
		HEMPEL PAINTS (INDIA) PVT. LTD.	Approved
		CARBOLINE (INDIA) PRIVATE LIMITED	Approved
39	ERW PIPES and GI Pipes	GAJANAN TUBES PRIVATE LIMITED	Approved
		JINDAL INDIA	Approved
40	GATE VALVE	A.V.VALVES LIMITED	Approved
		LEADER VALVES LIMITED	Approved
		SHALIMAR VALVES PVT. LTD.	Approved
		NITON VALVE INDUSTRIES LTD.	Approved
41	SOLENOID VALVE	ROTEX MANUFACTURERS & ENGINEERS	Approved
		ASCO PVT. LTD.	Approved
		AVCON CONTROLS PVT LTD.	Approved
42	FLANGES	TESHI ENGINEERS	Approved
		DYNAMIC FORGE & FITTINGS PVT. LTD.	Approved

Sl No	Items Description	Name of Vendor	Remarks on Vendor Approval
		ENGINEERING SERVICE ENTERPRISE	Approved
		JINDAL FORGINGS	Approved

The above approval is accorded to the contractor without prejudice to the terms and conditions of the contract.

The receipt of this letter may be acknowledged.

Yours faithfully,


CHIEF ENGINEER /PROJECTS-II
TANGEDCO

Copy to M/s. DESEIN (By mail)

Tamil Nadu Generation and Distribution Company Limited.
(Udangudi Project)

From

To

Er. U.S.PONGIANNAN,B.E.,
Chief Engineer /Projects-II ,
TANGEDCO,
1st Floor,New EB Quarters
144,Anna salai
Chennai-600 002.
Email- secutpp@tnebnet.org

BHEL, PS-PEM,
Power Projects Engineering Institute (PPEI
Building),
HRDI & ESI Complex, Plot No. 25, Sector-16A,
Noida-201301 (U.P.)
Email: permindersingh@bhel.in
pedm@bhel.in

Lr. No. CE/PROJ/SE/C/UP/EE/M/ AEE/M/Engineering/ D.597/2018,dt.17.12.2018.

Sir,

Sub.: TANGEDCO-Udangudi 2x660 MW Super Critical Thermal
Power Project Stage-I-Vendor Approval for BHEL_PESD-Fire
Protection System-Regarding.

Ref.: Your letter ref. No. PESD/CM/UDANGUDI/CM LTR-01,
dt.09.11.2018.

<<<O>>>

With reference to your letter cited above, the following vendor approval is accorded
for Fire Protection System in line with approved vendors for Ennore SEZ Project.

Sl. No.	Item Description	Name of the Vendor	Remarks on Vendor Approval
1	ERW PIPES AND GI PIPES	UTKARSH INDIA LIMITED	APPROVED
		NEZONE TUBES LIMITED	APPROVED
		APL APOLLO TUBES LIMITED	APPROVED
		DADU PIPES PVT. LTD.	APPROVED
		BHARAT TUBES CORPORATION	APPROVED
		STEEL AUTHORITY OF INDIA LIMITED	APPROVED
		MADRAS STEEL AND TUBES	APPROVED
		BHAWANI INDUSTRIES LTD	APPROVED
		TUBES INDIA	APPROVED
		MOKSHI INDUSTRIES PVT. LTD.	APPROVED
		MAHARASHTRA SEAMLESS LTD.	APPROVED
		SURYA ROSHNI LIMITED	APPROVED
		JINDAL PIPES LIMITED	APPROVED
		SWASTIK PIPE LIMITED	APPROVED
		NAVRATAN PIPE AND PROFILE LIMITED	APPROVED
		INDUS TUBES LIMITED	APPROVED
		FUTNANI STEELS PVT LTD.	APPROVED
2	VALVES	MICON VALVES (I) PVT. LTD.	APPROVED
		NSSL LIMITED	APPROVED
		WEIR BDK VALVES	APPROVED

Sl. No.	Item Description	Name of the Vendor	Remarks on Vendor Approval
	VALVES	B.F.E.SRL BONNEY FORGE	APPROVED
		VALVITALIA S.P.A	APPROVED
		FLOSTEER ENGINEERS PVT. LTD.	APPROVED
		OSWAL INDUSTRIES LTD.	APPROVED
		L & T VALVES LIMITED	APPROVED
		FOURESS ENGINEERING (I)PVT.LTD	APPROVED
3	FITTINGS	ENGINEERING SERVICE ENTERPRISE	APPROVED
		N L HAZRA AND SON	APPROVED
		M.S. FITTINGS MANUFACTURING CO. PVT	APPROVED
		POONAM ENTERPRISE	APPROVED
		NAV DURGA FORGING AND FITTINGS	APPROVED
		TUBE TURN (INDIA) P. LTD.	APPROVED
		UNITECH MACHINES LIMITED	APPROVED
		K. S. PIPE FITTINGS PVT. LTD.	APPROVED
		P.K. TUBES & FITTINGS PVT. LTD.	APPROVED
		TRUE FAB ENGINEER (P) LTD.	APPROVED
		DEE DEVELOPMENT ENGINEERS LTD.	APPROVED
		TRUE FORGE PVT.LTD.,	APPROVED
		PIPEFIT ENGINEERS PVT. LTD.	APPROVED
		PETRO CHEM INDUSTRIES	APPROVED
		SAWAN ENGINEERS PVT. LTD.	APPROVED
		GUJARAT INFRAPIPES PVT.LTD.	APPROVED
		TUBE PRODUCTS INCORPORATE	APPROVED
		WEIFANG HUODA PIPE FITTINGS	APPROVED
		U I PIPE FITTINGS PVT. LTD.	APPROVED
4	FLANGES	KUNJ FORGINGS PVT. LTD.	APPROVED
		C.D.ENGINEERING CO.	APPROVED
		KISAAN STEELS (PVT) LTD.	APPROVED
		CHW FORGE PRIVATE LIMITED	APPROVED
		C.D. INDUSTRIES,	APPROVED
		NAV DURGA FORGING AND FITTINGS	APPROVED
		TRUE FORGE PVT.LTD.	APPROVED
		PIPEFIT ENGINEERS PVT. LTD.	APPROVED
		TUBE PRODUCTS INCORPORATE	APPROVED
		METAL FORGINGS P. LTD.	APPROVED
		THE PUNJAB STEEL WORKS,	APPROVED
		PRESHZINGER ENGINEERING	APPROVED
		KIRLOSKAR BROTHERS LTD	APPROVED
		KSB PUMPS LIMITED,	APPROVED
		SULZER PUMPS INDIA PRIVATE LIMITED.	APPROVED
		WILO MATHER AND PLATT PUMPS	APPROVED
		FLOWMORE LIMITED	APPROVED

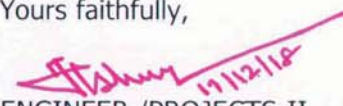
Sl. No.	Item Description	Name of the Vendor	Remarks on Vendor Approval
5	BOLTING MATERIAL (U Bolt, Nuts & Clamps)	SREE PAVITHRA INDUSTRIES,	APPROVED
		UDEHRA FASTENERS LIMITED	APPROVED
		MORNING STAR INDUSTRIES,	APPROVED
		PIONEER NUTS AND BOLTS PVT.LTD	APPROVED
		MEGA ENGINEERING PVT. LTD.	APPROVED
		PRESIDENT ENGINEERING WORKS	APPROVED
		BOLTMASTER (INDIA)PVT.LTD.	APPROVED
		MULTI FASTNERS PVT. LTD.	APPROVED
		ATLAS FASTENERS	APPROVED
6	POWER CABLES	SUNGOV ENGINEERING PVT LTD.	APPROVED
		ASIAN INDUSTRIAL VALVES AND	APPROVED
		NISAN SCIENTIFIC PROCESS	APPROVED
		SKILT FABRICATORS PVT.LTD.	APPROVED
		FILTRATION ENGINEERS INDIA PVT LTD.	APPROVED
		JAY-EESH ENGINEERING COMPANY	APPROVED
		SCIENTIFIC DEVICES (BOMBAY) PVT. LT	APPROVED
		GRAND PRIX ENGINEERING PVT. LTD.	APPROVED
		TRIVENI EQUIPMENTS PVT LTD.	APPROVED
		GUJARAT OTOFILT	APPROVED
		H K ENTERPRISES	APPROVED
		SPIRAX MARSHALL LIMITED	APPROVED
7	CONTROL CABLES	GUPTA POWER INFRASTRUCTURE LTD.	APPROVED
		PAGODA CABLES PVT. LTD.	APPROVED
		ASSOCIATED CABLES PVT LTD.	APPROVED
		RAVIN CABLES LTD	APPROVED
		SBEE CABLES (INDIA) LIMITED	APPROVED
		ELKAY TELELINKS LIMITED	APPROVED
		SUYOG ELECTRICALS LTD.	APPROVED
		POLYCAB WIRES PVT.LTD.	APPROVED
		GEMSCAB INDUSTRIES LTD.	APPROVED
		SRIRAM CABLES PVT. LTD.	APPROVED
		SPECIAL CABLES PVT. LTD.	APPROVED
		PARAMOUNT COMMUNICATIONS LTD.	APPROVED
		DELTON CABLES LIMITED	APPROVED
		KEI INDUSTRIES LIMITED	APPROVED
		CMI LIMITED	APPROVED
		CORDS CABLE INDUSTRIES LTD.	APPROVED
		KEC INTERNATIONAL LIMITED	APPROVED
		THERMO CABLES LIMITED	APPROVED
		UNIVERSAL CABLES LTD.	APPROVED
		NICCO CORPORATION LTD HYD	APPROVED

Sl. No.	Item Description	Name of the Vendor	Remarks on Vendor Approval
8	GASKETS	GOODRICH GASKET PVT. LTD.	APPROVED
		MADRAS INDUSTRIAL PRODUCTS	APPROVED
		I G P ENGINEERS LIMITED	APPROVED
		TEEKAY FLOWFLEX PVT. LTD.	APPROVED
		UNI KLINGER LTD.	APPROVED
		UNIQUE INDUSTRIAL PACKINGS PVT. LTD.	APPROVED
		JAMES WALKER INMARCO INDS PVT LTD.	APPROVED
		STARFLEX SEALING INDIA PVT. LTD.	APPROVED
		JYOTHI INDUSTRIES	APPROVED
9	ELECTRICAL HOIST	MM ENGINEERS PVT. LTD.	APPROVED
		EDDYCRANES ENGINEERS PVT.	APPROVED
		CENTURY CRANE ENGINEERS PVT. LTD.	APPROVED
		ROCK WELL HOISTO CRANES PVT. LTD.	APPROVED
		GRIP ENGINEERS PVT. LTD.	APPROVED
		SOUTHERN PLANTAIDS PVT LIMITED	APPROVED

The above approval is accorded to the contractor without prejudice to the terms and conditions of the contract.

The receipt of this letter may be acknowledged.

Yours faithfully,


CHIEF ENGINEER /PROJECTS-II
TANGEDCO

Copy to M/s. DESEIN (By mail)

	CLIENT – TAMILNADU GENERATION & DISTRIBUTION CORPORATION LTD. CONSULTANT- TATA CONSULTING ENGINEERS LIMITED BENGALURU PROJECT: 2X660MW UDANGUDI STPP (STATE-1) TECHNICAL SPECIFICATION FOR FIRE FIGHTING SYSTEM	TB-400-552-125
		Rev. 00
		Page 1

SECTION-2 CUSTOMER SPECIFICATION

Customer contract document is enclosed as part of this specification. Only equipment specification pertaining to Section-1 shall be referred. Regarding quantities and type of Fire Fighting equipment, Section-1 shall be referred. In case of variance between Section-1 and Section-2, the requirement of Section-1 shall prevail. Customer specification in annexure to section-2 shall be adhered to by the bidder.



VOLUME II
SUB-SECTION - 2.15
FIRE PROTECTION SYSTEM

1.0.0 GENERAL

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

2.0.0 SCOPE OF SUPPLY

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

- ~~Fire water pumping system combined for Hydrant system and MVWS system – The fire hydrant and MVW spray system shall have a dedicated adequate number of electrical motor driven main fire water pumps (minimum 3 Nos.) and 50% standby diesel engine driven pumps (minimum 2 Nos.).~~
- ~~Fire water pumping system for HVW Spray system – The spray system shall be provided with dedicated pumping system comprising of adequate number of electric motor driven pumps and 100% standby diesel engine driven pumps.~~
- ~~The common pressurization unit shall be provided for hydrant and spray water system network. Pressurization unit shall consist of Two (2) nos. of electric motor driven fire water jockey pumps (one working + one standby), One (1) no. hydro-pneumatic tank and Two (2) nos. air compressors (one working + one standby) of adequate rating for pressurization of hydro-pneumatic tank shall be provided.~~
- ~~Fire water booster pumping system - Dedicated fire water booster pumps comprising of adequate number of electric motor driven main pumps and 100% diesel engine driven standby pumps shall be provided for higher elevation of boiler units/transfer towers/bunker floors.~~
- ~~The seawater intake pump house shall be provided with one (1) no of Diesel Engine driven vertical turbine pump of capacity 410 m3/hr for supplying fire water to the coal stockpile area ring main header for fighting large coal stockpile fire. The material of construction for the pumps, piping and isolation gate valves (Duplex stainless steel) shall be rated for seawater duty. The sea water fire water pump outlet shall be connected to the main fire hydrant network near the coal stockpile through a normally closed isolation (Duplex stainless steel) gate valve.~~
- ~~Hydrant system shall be provided for all the buildings, equipments and entire area of inside the power plant boundary including Boiler and ESP Areas, Mill Reject Handling System compressor house, ESP Control Building, Fly ash equipment building, HFO & HSD Pump House Area, HFO & HSD storage tanks and dyke area, Compressor House, Diesel Generator Area, Generator, Station, Unit transformers and all auxiliary Transformers, CW Pump House, Electrochlorination building (CW), Water Pretreatment Plant, Sludge Pump House, Filtered Water Reservoir and Pump House, Sea Water Intake Pump House, DM Plant with acid and alkali bulk storage tanks, Chemical House, Coal Handling Plant and Coal Storage Yards including all transfer points, bunker bay conveyors, sub-stations and control room, office building (Coal handling shall include complete ECHS & ICHS) Crusher House, Coal Handling Control Building, Ash Handling Plant Area including Ash Slurry Pump House, Ash Water Pump House, FA Conveying Blower Room, MCC rooms, All storage areas including O & M Store, Effluent treatment Plant, Open Storage Yard, Transformer Yard, GIS Switchyard & Grid Control Room Building, Service Building, Administrative building, CPU Regeneration building, All gate~~



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

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



3.0.0 DESIGN REQUIREMENTS

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

Fire water reservoir

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

Pump house equipments

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

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

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

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

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

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

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

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

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



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

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

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

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

Hydrant system

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

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

**High velocity water spray system**

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

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

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

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

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

Medium velocity water spray system

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

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



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

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

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

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

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

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

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



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

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

Fixed Foam System

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

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

Automatic Clean Agent Fire Suppression System

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

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

Portable & Mobile Fire Extinguishers

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

Fire Tenders

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

Water tender

~~One (1) number of water type fire tender consist of 4500Lts. capacity water tank with rear mounted multistage high pressure pump, DCP and CO₂ extinguishers including all accessories shall be fabricated as per IS:950.~~

**Foam tender**

~~One (1) number of foam fire tender consist of 3000Lts. capacity water tank, 500 Lts. Capacity foam tank with rear mounted multistage high pressure pump, DCP and CO₂ extinguishers including all accessories shall be fabricated as per IS:951/87 and IS:10460.~~

Electrical

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

Control and operation philosophy**Fire water pumping system**

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

Hydrant and MVWS System

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

- ~~a) In the event of fire when hydrant valves and MVWS system deluge valves are opened, the pressure in the header will drop due to the resulting flow and at a preset low pressure in the header, the electric motor driven pumps shall start automatically by getting an impulse from a pressure transmitters mounted on the header.~~
- ~~b) In case the electric motor driven pump fails to start, the pressure in the mains will drop further and sequentially start the other electric motor driven pumps. There will be a provision to start the pump manually in case of emergency.~~
- ~~c) In case the electric motor driven pump fails to start, the pressure in the mains will drop further and sequentially start the standby diesel engine driven pumps shall come into operation by getting in impulse from a pressure switch provided at a preset low pressure. There will be a provision to start the pump manually in case of emergency.~~
- ~~d) Stopping of all the above pumps shall be manual.~~
- ~~e) Jockey pumps shall not be running when main pumps are in operation.~~

HVW Spray System

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

- ~~a) On detection of fire the deluge valve is opened and water will be released from the projectors. This will cause a drop in pressure in the HVWS mains due to the resulting flow through the deluge valve. At a pre-set low pressure in the header, the motor driven pump shall start automatically by getting in impulse from a pressure transmitters provided on the header. A manual emergency release is also provided for manual local operation. Remote / manual operation will be possible from the deluge valve local control panel.~~
- ~~b) In case the electric motor driven pump fails to start automatically pressure in the mains will drop further and the diesel engine driven pump shall come into operation by getting an impulse from pressure transmitter provided at a preset low pressure.~~
- ~~c) Stopping of all the above pumps shall be manual.~~



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

Pressurization System

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

- a) ~~This system shall keep the hydrant system under pressurised state under all conditions.~~
- b) ~~The pressurisation in the hydro-pneumatic tank is achieved by means of two air compressors. Two (2) nos. jockey pumps will assure that the volume of water inside the hydro-pneumatic tank will be refilled after reaching the minimum level.~~
- c) ~~Small system leakages are met by make up water supply from hydro-pneumatic tank and electric driven jockey pump located in the firewater pump house. When the water level in the hydro-pneumatic tank falls to a predetermined low level the jockey pump starts automatically through an impulse from a level switch and pumps water to the hydro-pneumatic tank. The jockey pump will stop when predetermined high level is reached in the tank through an impulse from a level switch. However compressor shall start only when the water level has reached a high set point and the pressure in the tank falls below the determined set point and stops when the pressure in the tank reaches the determined set point sensed through a pressure switch. While deciding the settings it will be ensured that the jockey pump and compressor do not start simultaneously. The jockey pump and compressors are capable of both start and stop in either auto or manual modes.~~

Booster Fire Water Pumping System

~~The Booster Fire Water Pumping system will operate as follows:~~

- a) ~~In the event of fire when hydrant valves of boiler upper elevations are opened, the pressure in the header will drop due to the resulting flow and at a preset low pressure in the header, the electric motor driven pump will start automatically by getting an impulse from a pressure switch mounted on the header on the down steam / discharge end of booster pumps.~~
- b) ~~In case the electric motor driven pump fails to start, the pressure in the mains will drop further and sequentially start diesel engine driven pump. There will be a provision to start the pump manually in case of emergency.~~
- c) ~~Stopping of all the above pumps will be manual.~~

Fixed foam system

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

Control and instrumentation

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

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



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

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

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

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

Fire Detection and Alarm System

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

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

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

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

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

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

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



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



4.0.0 CONSTRUCTION REQUIREMENTS

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

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

5.0.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED ALONG WITH THE PROPOSAL

- a) Master drawing/document list
- b) Time schedule for design, manufacture, delivery, erection, testing and commissioning.
- c) Duly filled-in technical data, bill of material and prices as per specified schedules.



- d) Technical write-up for the entire fire protection, detection and alarm system.
- e) Schedule for all type of fire protection, detection and alarm system for each type for various buildings, equipment and entire plant area.
- ~~f) Flow diagram for fire water pumping system~~
- ~~g) Flow diagram for fire water booster pumping system~~
- ~~h) Flow diagram for foam pumping system~~
- ~~i) Flow diagram for fire water from sea water make-up pumping system~~
- j) Schematic layout for hydrant system
- k) Schematic layout for spray system
- ~~l) Flow diagram for foam system~~
- ~~m) Schematic diagram for inert gas flooding system~~
- n) Schematic diagram for fire detection and alarm system
- o) Schedule of portable and mobile fire extinguishers
- ~~p) Fire tender equipment details~~
- ~~q) Ambulance equipment details~~
- ~~r) Fire jeep equipment details~~
- s) Preliminary layout drawings for the complete scope of work
- t) Manufacturer's catalogue for Fire, Protection Detection and Alarm system.
- u) List of tests the Bidder proposes to carry out in shop and at site after installation including those pertaining to their sub-contractor.
- v) List of all tools, tackles and accessories required for maintenance of the offered equipment including bought out components.
- w) List of all recommended spare parts for all equipment offered including bought out components of the offered fire protection system.
- x) List of all mandatory spares for all the equipment as per TAC/technical specification
- y) Power consumption list and feeder list.

6.0.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT

- a) Final version of Master Drawing/document submission schedule
- b) Technical write-up for the entire fire protection, detection and alarm system.
- c) Schedule for all type of fire protection, detection and alarm system for each type for various buildings, equipment and entire plant area.



- d) ~~P&ID for fire water pumping system~~
- e) ~~P&ID for fire water booster pumping system~~
- f) ~~P&ID for foam pumping system~~
- g) ~~P&ID for fire water from sea water make-up pumping system~~
- h) ~~P&ID for foam system~~
- i) ~~Piping and equipment layout for fire water pump house~~
- j) ~~Piping and equipment layout for fire water booster pump house~~
- k) ~~Piping and equipment layout for fire water in sea water make pump house~~
- l) ~~Piping and equipment layout for foam system pump house~~
- m) Foundation drawings with dead load as well as operating load and other data as required.
- n) GA drawings of the equipment, dimensional and sectional drawings of all equipment giving details of materials.
- o) Cross sectional drawings indicating the assembly of all the major equipment.
- p) Piping layout drawings and isometric drawings including pipe support drawings for all automatic high velocity / medium velocity spray / ~~foam system.~~
- q) Hydraulic calculations for Hydrant system, high velocity spray system, medium velocity spray system ~~and foam system.~~
- r) Composite layout for hydrant system
- s) Area wise fire water piping layout for hydrant and spray system
- t) ~~Schematic diagram for inert gas flooding system~~
- u) ~~Piping and equipment layout for inert gas flooding system~~
- v) Schematic diagram for fire detection and alarm system
- w) Fire detection and alarm system layout for each area
- x) GA and wiring diagrams for control cum annunciation panel, PLC panel, MFAP, RAP, local control panels etc.
- y) Instrument hook-up diagram for all type of instruments
- z) Protection and interlocking logics for Fire protection, detection & alarm system.
- aa) Portable fire extinguisher layout for the entire plant
- ~~bb) Detailed and final drawing of fire tender equipment~~
- ~~cc) Ambulance equipment details~~
- ~~dd) Fire jeep equipment details~~



- ee) QAP for all manufactured and sub contracted items.
- ff) Comprehensive quality assurance plan.
- gg) Instruction manuals for the operation, maintenance, repair, replacement and spare parts ordering.
- hh) Training manual
- ii) Test procedures and details of test to be conducted.
- jj) Type and Routine Test certificates, material test certificates for major components.
- kk) Technical data sheet, GA drawing for motor
- ll) Power consumption list and feeder list.
- mm) Performance and characteristics curves for motor
- nn) As-built drawings for all equipment/systems supplied under this contract and all buildings / structures / works executed under this contract incorporating all changes/modifications upto the time of commissioning / handing over to the Owner/consultant.
- oo) Drawings/data to be required/submitted to statutory authorities
- pp) List of all tools, tackles and accessories required for maintenance of the offered equipment including bought out components.
- qq) List of all recommended spare parts for all equipment offered including bought out components of the offered fire protection system.
- rr) List of all mandatory spares for all the equipment as per TAC/technical specification



ANNEX 2.15.1

SPECIFIED DESIGN DATA

A. Fire Water Pumps for Hydrant System and Spray System

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

B. Hydro-Pneumatic Tank

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

C. Air compressor for Hydro-Pneumatic Tank

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

**D. Fire Water Booster Pumps**

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

E. Foam Pumps

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



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

F. Pipes and Fittings

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



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

G. Valves and Specialties

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



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



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



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



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



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



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



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



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

**H. PORTABLE AND MOBILE FIRE EXTINGUISHERS**

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



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



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



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



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



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

Project : 400kV Gas Insulated Substation at UDANGUDI TPS Stage-I (2X660MW)

Customer: TANGEDCO

Contractor: Bharat Heavy Electricals Limited.



Section 2

General Technical Parameters

2.1 Environmental Conditions

Altitude	:	About 1 meter above MSL
Design Ambient conditions	:	50 degree Celsius (maxm.)
Mean Wind Velocity	:	20.6 kmph
Seismic acceleration	:	as per IS-1893-Latest
Creepage distance	:	31mm/kV
Maximum Humidity (Monsoon)	:	95% max.

2.2 System Parameters

The following system parameters are considered while preparing the offer

Nominal system voltage	400kV
Highest system voltage	420 kV
Rated short time current	63 kA for 1 sec
Dry and wet impulse withstand voltage positive and negative	1425kVP
Minimum total creepage	31 mm/kV
System Earthing	Effectively earthed

2.3 Auxiliary Power

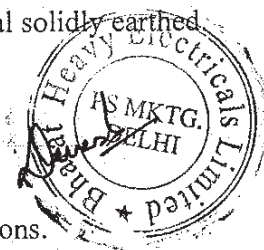
AC Voltage	:	415V/240V, 50Hz, 3 phase 4wire, neutral solidly earthed
DC Voltage	:	220 V, 2 wire ungrounded.

2.4 Units and Symbols

SI Units shall be adopted for all designs, drawings and specifications.

2.5 Standardization

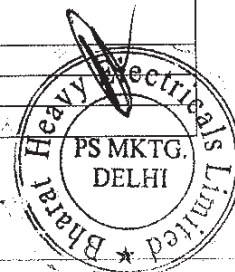
Care will be taken so that material and equipment will be standard catalogued products of manufacturers regularly engaged in manufacture of such products and will be of standard design conforming to system requirements.
The equipment shall conform to relevant Indian Standards.





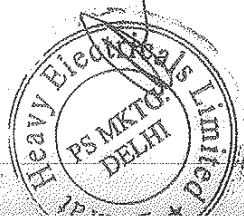
8.0 FIRE PROTECTION SYSTEM

DESCRIPTION	UNIT	DATA
Fire Protection system		
Fire Water Tank ; Volume (minimum effective)	m ³	3600 m3
Fire water Main Pumps (Electrical Driven Pump) – Hydrant System		
(Contractor shall furnish data for each pump)		
Make & Type	-	DDE (During Detail Engineering)
Rated capacity	m ³ /hr.	410 m3/hr
Total head at rated capacity	mwc	105 (Indicative)
Absorbed power consumption	BKW	DDE (During Detail Engg.)
NPSH required at rated capacity	m	DDE
Shutoff head	m	DDE
Characteristic pump curve no.	-	DDE
Material of pump casing, impeller, shaft	-	DDE
Motor rating & Make	kW	220 KW (Approx.) & DDE
Fire water Standby Pumps (Diesel Engine Driven pumps) – Hydrant System		
(Contractor shall furnish data for each pump)		
Pumps		
Make & Type	-	DDE
Rated capacity	m ³ /sec.	410 m3/hr
Total head at rated capacity	m	105 (Indicative)
Absorbed power consumption	BKW	DDE
NPSH required at rated capacity	m	DDE
Shutoff head	m	DDE
Characteristic pump curve no.	-	DDE
Material of pump casing / outer parts	-	DDE
Material of inner parts/shaft, impeller, bearings etc.	-	DDE
Diesel Engine drive		
Make & Type	-	DDE
Rating of diesel engine	kw	220 (Approx.)
Fuel consumption at full load	l/min	DDE
Fuel/LHV	KJ/kg	DDE
Capacity of diesel tank	l	480 Ltr Approx.
Fire water Main Pumps (Electrical Driven Pump) – Spray System		
(Contractor shall furnish data for each pump)		
Make & Type	-	DDE
Rated capacity	m ³ /hr.	410 m3/hr
Total head at rated capacity	mwc	105 (Approx.)
Absorbed power consumption	BKW	DDE
NPSH required at rated capacity	m	DDE
Shutoff head	m	DDE
Characteristic pump curve no.	-	DDE
Material of pump casing, impeller, shaft	-	DDE
Motor rating & Make	kW	220 & DDE
Fire water Standby Pumps (Diesel Engine Driven pumps) – Spray System		
(Contractor shall furnish data for each pump)		
Pumps		
Make & Type	-	DDE



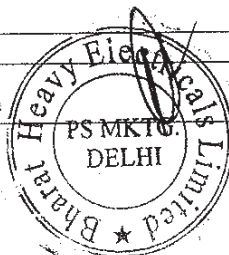


DESCRIPTION	UNIT	DATA
Rated capacity.	m ³ /sec.	410 m ³ /hr
Total head at rated capacity	m	105
Absorbed power consumption	BKW	DDE
NPSH required at rated capacity	m	DDE
Shutoff head	m	DDE
Characteristic pump curve no.	-	DDE
Material of pump casing / outer parts	-	DDE
Material of inner parts/shaft, impeller, bearings etc.	-	DDE
Diesel Engine drive		
Make & Type	-	DDE
Rating of diesel engine	kw	220 (Aprox.)
Fuel consumption at full load	l/min	DDE
Fuel/LHV	KJ/kg	DDE
Capacity of diesel tank	l	DDE
Fire water booster Main Pumps (Electrical Driven Pump)		
(Contractor shall furnish data for each pump)		
Make & Type	-	DDE
Rated capacity	m ³ /hr.	137 m ³ /hr
Total head at rated capacity	mwc	40
Absorbed power consumption	BKW	DDE
NPSH required at rated capacity	m	DDE
Shutoff head	m	DDE
Characteristic pump curve no.	-	DDE
Material of pump casing, impeller, shaft	-	DDE
Motor rating & Make	kW	30 & DDE
Fire water booster Standby Pumps (Diesel Engine Driven pumps)		
(Contractor shall furnish data for each pump)		
Pumps		
Make & Type	-	DDE
Rated capacity	m ³ /sec.	137 m ³ /hr
Total head at rated capacity	m	40
Absorbed power consumption	BKW	DDE
NPSH required at rated capacity	m	DDE
Shutoff head	m	DDE
Characteristic pump curve no.	-	DDE
Material of pump casing / outer parts	-	DDE
Material of inner parts/shaft, impeller, bearings etc.	-	DDE
Diesel Engine drive		
Make & Type	-	DDE
Rating of diesel engine	kw	DDE
Fuel consumption at full load	l/min	DDE
Fuel/LHV	KJ/kg	DDE
Capacity of diesel tank	l	V
Foam System Main Pumps (Electrical Driven Pump)		
(Contractor shall furnish data for each pump)		
Make & Type	-	DDE
Rated capacity	m ³ /hr.	1.2 m ³ / hr



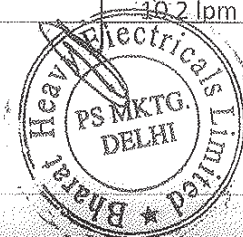


DESCRIPTION	UNIT	DATA
Total head at rated capacity	mwc	110
Absorbed power consumption	BKW	DDE
NPSH required at rated capacity	m	DDE
Shutoff head	m	DDE
Characteristic pump curve no.	-	DDE
Material of pump casing, impeller, shaft	-	DDE
Motor rating & Make	kW	10 & DDE
Foam system Standby Pumps (Diesel Engine Driven pumps)		
(Contractor shall furnish data for each pump)		
Pumps		
Make & Type	-	DDE
Rated capacity	m ³ /sec.	1.2 m3/ hr
Total head at rated capacity	m	100
Absorbed power consumption	BKW	DDE
NPSH required at rated capacity	m	DDE
Shutoff head	m	DDE
Characteristic pump curve no.	-	DDE
Material of pump casing / outer parts	-	DDE
Material of inner parts/shaft, impeller, bearings etc.	-	DDE
Diesel Engine drive		
Make & Type	-	DDE
Rating of diesel engine	kw	DDE
Fuel consumption at full load	l/min	DDE
Fuel/LHV	KJ/kg	DDE
Capacity of diesel tank	l	DDE
Hydrant System		
Pipes and Fittings (Outside the buildings/ ring system) make / type		ERW pipes
Pipes and fittings: make / type		ERW pipes
Valves: make / type		Single headed , Oblique Type
External Hydrants: make / type		Single headed , Oblique Type
Internal Hydrants: make / type		Single headed , Oblique Type
Water monitors: make / type		DDE
Fire hoses make / type		
Weather proof hose boxes (Outside installation) make / type		DDE
Hose boxes make / type		DDE
Spray System		
High-Velocity Water Spray System for Transformer		
Design pressure	bar (a)	12.3 kg/cm2. (MAX.)
Max. water quantity delivered via automatic deluge valve station (s) for the transformers	L/min.	10.2 lpm
High-Velocity Water Spray System for Turbine Lubrication Oil Tank(s)		
Design pressure	bar (a)	DDE
Max. Water quantity delivered via automatic deluge valve station(s) for the lubrication oil tank(s)	L/min.	10.2 lpm
High-Velocity Water Spray System for Turbine oil canal pipe lines in main plant		





DESCRIPTION	UNIT	DATA
Design pressure	bar (a)	DDE
Max. Water quantity delivered via automatic deluge valve station(s) for turbine oil canal pipe lines in main plant	L/min.	10.2 lpm
High-Velocity Water Spray System for Boiler feed pumps lube oil tanks, coolers, consoles etc		
Design pressure	bar (a)	DDE
Max. Water quantity delivered via automatic deluge valve station(s) for the Boiler feed pumps lube oil tanks, coolers, consoles etc	L/min.	10.2 lpm
High-Velocity Water Spray System for Boiler burner front		
Design pressure	bar (a)	DDE
Max. Water quantity delivered via automatic deluge valve station(s) for the Boiler burner front	L/min.	10.2 lpm
High-Velocity Water Spray System for clean and dirty lube oil tanks		
Design pressure	bar (a)	DDE
Max. Water quantity delivered via automatic deluge valve station(s) for the clean and dirty lube oil tanks	L/min.	10.2 lpm
High-Velocity Water Spray System for main lube oil tank		
Design pressure	bar (a)	DDE
Max. Water quantity delivered via automatic deluge valve station(s) for main lube oil tank	L/min.	DDE
High-Velocity Water Spray System for Generator seal oil system tanks and its coolers.		
Design pressure	bar (a)	DDE
Max. Water quantity delivered via automatic deluge valve station(s) for Generator seal oil system tanks and its coolers.	L/min.	10.2 lpm
		DDE
Medium Velocity Water Spray System for the Coal Handling System		
Design pressure	bar (a)	DDE
Max. water quantity delivered via automatic deluge station (s) for the coal conveyor/bunker/pulveriser	L/min	10.2 lpm
Medium Velocity Water Spray System for Cable Spreader (racks) Rooms		
Design pressure	bar (a)	DDE
Max. water quantity delivered via automatic deluge station (s) for the cable spreader rooms	L/min	12.2 lpm
Medium Velocity Water Spray System for Fuel Oil Storage Tanks		
Design pressure	bar (a)	DDE
Max. water quantity delivered via automatic deluge valve station (s) for the HSD tank	L/min	10.2 lpm
Medium Velocity Water Spray System for Fuel Oil Pump house		
Design pressure	bar (a)	DDE
Max. water quantity delivered via automatic	L/min	10.2 lpm





DESCRIPTION	UNIT	DATA
deluge valve station (s) for the Fuel oil pump house		
Medium Velocity Water Spray System for Emergency DG set building		
Design pressure	bar (a)	DDE
Max. water quantity delivered via automatic deluge valve station (s) for the Emergency DG set building	L/min	10.2 lpm
Foam System for HSD Tank		
Type of foam		DDE
Foam application rate	L/min	DDE
Valves		
Gate Valve		
Make & Type		Non Rising Spindle & In Side Screw
Pressure rating		DDE
Material of construction		DDE
Deluge Valve		
Make & Type		Manual, remote solenoid valve and with wet pilot.
Material of construction		DDE
Check Valve		
Make & Type		Non Rising Spindle & In Side Screw
Material of Construction		DDE
Extinguishers		
Mobile Fire-Extinguishing Equipment		
Mobile Extinguishing		
Fire-extinguishing agent CO ₂		
Make & Type		As per IS: 15683 :2006
Capacity / Charger per cylinder	kg	4.5 & 9 Kg
Snow (spray) pipe, incl. nozzle and hose :		MS
Mobile Extinguishing		
Fire-extinguishing agent Dry Chemical Powder		
Make & Type		As per IS: 15683 :2006
Capacity / Charger per cylinder	kg	6 & 9 Kg
Snow (spray) pipe, incl. nozzle and hose :		MS
Mobile Extinguishing		DDE
Fire-extinguishing agent foam type		
Make & Type		As per IS: 15683 :2006
Capacity / Charger per cylinder	kg	9 Litrs
Snow (spray) pipe, incl. nozzle and hose :		MS
Portable Extinguisher		
Fire extinguishing agent Dry Chemical Powder		
Make & Type	-	As per IS: 15683 :2006
Capacity / charge per steel cylinder:		25 Kg
a) Charge of	kg	DDE
b) Charge of	kg	
Fire extinguishing agent CO ₂		
Make & Type		
Capacity / charge per steel cylinder:		
a) Charge of	kg	
b) Charge of	kg	
Fire extinguishing agent Foam type extinguishers		
Make & Type	-	As per IS: 15683 :2006
Capacity / charge per steel cylinder:		DDE
a) Charge of	kg	DDE

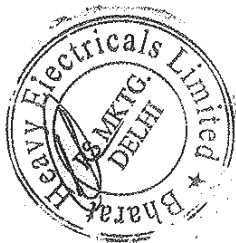




DESCRIPTION	UNIT	DATA
b) Charge of	kg	DDE
Central Fire Station		
Size of fire station (L x b x h)	m x m x m	
No. of fire tender		One no. foam tender
No. of trailer pumps		Not applicable as per Tender Spec.
Capacity of each fire engine		As per Tender Spec.
Capacity of each trailer pump		Not applicable as per Tender Spec.
List of annunciation provided inside the fire station		} DDE
Type of annunciation system provided in the fire station		
List of accessories and equipment provided in the fire station		
Ambulance		2 Nos.
Fire jeep		1 No.

NOTES:

1. Data sheets for each drive motors shall be filled up separately as per the format given in Electrical section.
2. Spares shall be provided strictly in compliance with TAC regulations.
3. Pipes shall be hydro tested at 1.5 times the pump shut-off head or twice the design head, whichever is higher.



**8.0 FIRE PROTECTION SYSTEM**

DESCRIPTION	UNIT	DATA
Fire Protection system		
Fire Water Tank ; Volume (minimum effective)	m³	
Fire water Main Pumps (Electrical Driven Pump) – Hydrant System		
(Contractor shall furnish data for each pump)		
Make & Type	-	
Rated capacity	m³/hr.	
Total head at rated capacity	mwc	
Absorbed power consumption	BKW	
NPSH required at rated capacity	m	
Shutoff head	m	
Characteristic pump curve no.	-	
Material of pump casing, impeller, shaft	-	
Motor rating & Make	kW	
Fire water Standby Pumps (Diesel Engine Driven pumps) – Hydrant System		
(Contractor shall furnish data for each pump)		
Pumps		
Make & Type	-	
Rated capacity	m³/sec.	
Total head at rated capacity	m	
Absorbed power consumption	BKW	
NPSH required at rated capacity	m	
Shutoff head	m	
Characteristic pump curve no.	-	
Material of pump casing / outer parts	-	
Material of inner parts/shaft, impeller, bearings etc.	-	
Diesel Engine drive		
Make & Type	-	
Rating of diesel engine	kw	
Fuel consumption at full load	l/min	
Fuel/LHV	KJ/kg	
Capacity of diesel tank	l	
Fire water Main Pumps (Electrical Driven Pump) – Spray System		
(Contractor shall furnish data for each pump)		
Make & Type	-	
Rated capacity	m³/hr.	
Total head at rated capacity	mwc	
Absorbed power consumption	BKW	
NPSH required at rated capacity	m	
Shutoff head	m	
Characteristic pump curve no.	-	
Material of pump casing, impeller, shaft	-	
Motor rating & Make	kW	
Fire water Standby Pumps (Diesel Engine Driven pumps) – Spray System		
(Contractor shall furnish data for each pump)		
Pumps		
Make & Type	-	



DESCRIPTION	UNIT	DATA
Rated capacity	m³/sec.	
Total head at rated capacity	m	
Absorbed power consumption	BKW	
NPSH required at rated capacity	m	
Shutoff head	m	
Characteristic pump curve no.	-	
Material of pump casing / outer parts	-	
Material of inner parts/shaft, impeller, bearings etc.	-	
Diesel Engine drive		
Make & Type	-	
Rating of diesel engine	kw	
Fuel consumption at full load	l/min	
Fuel/LHV	KJ/kg	
Capacity of diesel tank	l	
Fire water booster Main Pumps (Electrical Driven Pump)		
(Contractor shall furnish data for each pump)		
Make & Type	-	
Rated capacity	m³/hr.	
Total head at rated capacity	mwc	
Absorbed power consumption	BKW	
NPSH required at rated capacity	m	
Shutoff head	m	
Characteristic pump curve no.	-	
Material of pump casing, impeller, shaft	-	
Motor rating & Make	kW	
Fire water booster Standby Pumps (Diesel Engine Driven pumps)		
(Contractor shall furnish data for each pump)		
Pumps		
Make & Type	-	
Rated capacity	m³/sec.	
Total head at rated capacity	m	
Absorbed power consumption	BKW	
NPSH required at rated capacity	m	
Shutoff head	m	
Characteristic pump curve no.	-	
Material of pump casing / outer parts	-	
Material of inner parts/shaft, impeller, bearings etc.	-	
Diesel Engine drive		
Make & Type	-	
Rating of diesel engine	kw	
Fuel consumption at full load	l/min	
Fuel/LHV	KJ/kg	
Capacity of diesel tank	l	
Foam System Main Pumps (Electrical Driven Pump)		
(Contractor shall furnish data for each pump)		
Make & Type	-	
Rated capacity	m³/hr.	



DESCRIPTION	UNIT	DATA
Total head at rated capacity	mwc	
Absorbed power consumption	BKW	
NPSH required at rated capacity	m	
Shutoff head	m	
Characteristic pump curve no.	-	
Material of pump casing, impeller, shaft	-	
Motor rating & Make	kW	
Foam system Standby Pumps (Diesel Engine Driven pumps)		
(Contractor shall furnish data for each pump)		
Pumps		
Make & Type	-	
Rated capacity	m ³ /sec.	
Total head at rated capacity	m	
Absorbed power consumption	BKW	
NPSH required at rated capacity	m	
Shutoff head	m	
Characteristic pump curve no.	-	
Material of pump casing / outer parts	-	
Material of inner parts/shaft, impeller, bearings etc.	-	
Diesel Engine drive		
Make & Type	-	
Rating of diesel engine	kw	
Fuel consumption at full load	l/min	
Fuel/LHV	KJ/kg	
Capacity of diesel tank	l	
Hydrant System		
Pipes and Fittings (Outside the buildings/ ring system) make / type		
Pipes and fittings: make / type		
Valves: make / type		
External Hydrants: make / type		
Internal Hydrants: make / type		
Water monitors: make / type		
Fire hoses make / type		
Weather proof hose boxes (Outside installation) make / type		
Hose boxes make / type		
Spray System		
High-Velocity Water Spray System for Transformer		
Design pressure	bar (a)	
Max. water quantity delivered via automatic deluge valve station (s) for the transformers	L/min.	
High-Velocity Water Spray System for Turbine Lubrication Oil Tank(s)		
Design pressure	bar (a)	
Max. Water quantity delivered via automatic deluge valve station(s) for the lubrication oil tank(s)	L/min.	
High-Velocity Water Spray System for Turbine oil canal pipe lines in main plant		
Design pressure	bar (a)	



DESCRIPTION	UNIT	DATA
Max. Water quantity delivered via automatic deluge valve station(s) for turbine oil canal pipe lines in main plant	L/min.	
High-Velocity Water Spray System for Boiler feed pumps lube oil tanks, coolers, consoles etc		
Design pressure	bar (a)	
Max. Water quantity delivered via automatic deluge valve station(s) for the Boiler feed pumps lube oil tanks, coolers, consoles etc	L/min.	
High-Velocity Water Spray System for Boiler burner front		
Design pressure	bar (a)	
Max. Water quantity delivered via automatic deluge valve station(s) for the Boiler burner front	L/min.	
High-Velocity Water Spray System for clean and dirty lube oil tanks		
Design pressure	bar (a)	
Max. Water quantity delivered via automatic deluge valve station(s) for the clean and dirty lube oil tanks	L/min.	
High-Velocity Water Spray System for main lube oil tank		
Design pressure	bar (a)	
Max. Water quantity delivered via automatic deluge valve station(s) for main lube oil tank	L/min.	
High-Velocity Water Spray System for Generator seal oil system tanks and its coolers.		
Design pressure	bar (a)	
Max. Water quantity delivered via automatic deluge valve station(s) for Generator seal oil system tanks and its coolers.	L/min.	
Medium Velocity Water Spray System for the Coal Handling System		
Design pressure	bar (a)	
Max. water quantity delivered via automatic deluge station (s) for the coal conveyor/bunker/pulveriser	L/min	
Medium Velocity Water Spray System for Cable Spreader (racks) Rooms		
Design pressure	bar (a)	
Max. water quantity delivered via automatic deluge station (s) for the cable spreader rooms	L/min	
Medium Velocity Water Spray System for Fuel Oil Storage Tanks		
Design pressure	bar (a)	
Max. water quantity delivered via automatic deluge valve station (s) for the HSD tank	L/min	
Medium Velocity Water Spray System for Fuel Oil Pump house		
Design pressure	bar (a)	
Max. water quantity delivered via automatic deluge valve station (s) for the Fuel oil pump house	L/min	



DESCRIPTION	UNIT	DATA
Medium Velocity Water Spray System for Emergency DG set building		
Design pressure	bar (a)	
Max. water quantity delivered via automatic deluge valve station (s) for the Emergency DG set building	L/min	
Foam System for HSD Tank		
Type of foam		
Foam application rate	L/min	
Valves		
Gate Valve		
Make & Type		
Pressure rating		
Material of construction		
Deluge Valve		
Make & Type		
Material of construction		
Check Valve		
Make & Type		
Material of Construction		
Extinguishers		
Mobile Fire-Extinguishing Equipment		
Mobile Extinguishing		
Fire-extinguishing agent CO ₂		
Make & Type		
Capacity / Charger per cylinder	kg	
Snow (spray) pipe, incl. nozzle and hose :		
Mobile Extinguishing		
Fire-extinguishing agent Dry Chemical Powder		
Make & Type		
Capacity / Charger per cylinder	kg	
Snow (spray) pipe, incl. nozzle and hose :		
Mobile Extinguishing		
Fire-extinguishing agent foam type		
Make & Type		
Capacity / Charger per cylinder	kg	
Snow (spray) pipe, incl. nozzle and hose :		
Portable Extinguisher		
Fire extinguishing agent Dry Chemical Powder		
Make & Type	-	
Capacity / charge per steel cylinder:		
a) Charge of	kg	
b) Charge of	kg	
Fire extinguishing agent CO ₂		
Make & Type		
Capacity / charge per steel cylinder:		
a) Charge of	kg	
b) Charge of	kg	
Fire extinguishing agent Foam type extinguishers		
Make & Type	-	
Capacity / charge per steel cylinder:		
a) Charge of	kg	
b) Charge of	kg	
Central Fire Station		



DESCRIPTION	UNIT	DATA
Size of fire station (L x b x h)	mxmxm	
No. of fire tender		
No. of trailer pumps		
Capacity of each fire engine		
Capacity of each trailer pump		
List of annunciation provided inside the fire station		
Type of annunciation system provided in the fire station		
List of accessories and equipment provided in the fire station		
Ambulance		
Fire jeep		
NOTES: 1. Data sheets for each drive motors shall be filled up separately as per the format given in Electrical section. 2. Spares shall be provided strictly in compliance with TAC regulations. 3. Pipes shall be hydro tested at 1.5 times the pump shut-off head or twice the design head, whichever is higher.		



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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 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 hold good.

3.1 SITE INFORMATION

SL.NO.	DESCRIPTION	
3.1	PROJECT INFORMATION	
	a) Customer	Tamil Nadu Generation and Distribution Corporation (TANGEDCO)
	b) Project	400kV GIS at 2 x 660 MW Udangudi STPP (Stage-I)
	c) Project location	
	i) Country	India
	ii) State	Tamil Nadu
	iii) Administrative district	Thoothukudi
	iv) Next Big cities to site	Thoothukudi (approx.. 45 kms from site)
	v) Road access	East Coast Road- State high way (176)
	vi) Nearest Railway Station	Thiruchendur (approx.. 12 kms from site)
	vii) Nearest Airport	Vaigai (approx.. 60 kms from site)
	viii) Nearest Harbour	Tuticorin (approx.. 45 kms from site)



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3.2	SITE CONDITIONS	
3.2.1	Ambient Air Temp.	
	a) Maximum dry bulb temp. (max.) °C	41 ⁰ C
	b) Minimum dry bulb temp. (min.) °C	17 ⁰ C
	Design ambient temperature	50 ⁰ C
3.2.2	Relative humidity	
	Mean Maximum humidity (Summer)	84 %
	Mean Minimum humidity (Summer)	62 %
	Maximum humidity (Monsoon)	97%
	Minimum humidity (Monsoon)	45%
3.2.3	Rain fall	
	Annual rainfall (Maximum)	718.2 mm
	Annual rainfall (Minimum)	384.1 mm
	Twenty four (24) Hour max	138.2 mm
3.2.4	High Flood Level	
	High Flood Level for site	RL 2.450 m
3.2.5	Wind	
	Mean Wind Speed (max)	39 m/sec (As per IS: 875)
	Wind direction	North, North east, North west, East
3.3	Seismic intensity	
	Seismic Intensity	As per IS:1893 Latest
	Zone	II

3.2 INSTRUCTION TO BIDDERS

The bidders shall submit the technical requirements, data and information as per the technical data sheets, provided in Section-4.

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

It is recognized that the Manufacturer 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



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practice will also be considered provided such proposals meet the specified designs, standard and performance requirements and are acceptable to the Purchaser. Unless brought out clearly, the Bidder shall be deemed to conform to this specification scrupulously.

3.3 STANDARDS

The works covered by the specification shall be designed, engineered, manufactured, built, tested and commissioned in accordance with the Acts, Rules, Laws and Regulations of India.

The equipment to be furnished under this specification shall conform to latest issue (with all amendments) of specified standards.

In addition to meeting the specific requirement called for in Sections 1 and 2 of the Technical Specification, the equipment shall also conform to the general requirement of the applicable standards, which shall form an integral part of the specification.

The Bidder shall note that standards mentioned in the specification are not mutually exclusive or complete in themselves, but intended to complement each other.

When the specific requirements stipulated in the specifications exceed or differ from those required by the applicable standards, the stipulation of the specification shall take precedence.

Other internationally accepted standards, which ensure equivalent or better performance than that specified in the standards referred, shall also be accepted. The bidder shall submit copies of such standards.

In case governing standard for the equipment is different from IS or IEC, the salient points of difference shall be clearly brought out in the offer along with English language version of standard or relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to Purchaser's / owner's approval.

The bidder shall clearly indicate in his bid the specific standards in accordance with which the works will be carried out.

3.4 SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING FURNISHED

All equipment shall also perform satisfactorily under various other electrical, electro mechanical and meteorological conditions of the site of installation All equipment



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shall be able to withstand all external and internal mechanical, thermal and electro mechanical forces due to various factors like wind load, temperature variation, ice & snow, (wherever applicable) short circuit etc for the equipment.

3.5 ENGINEERING DATA

3.5.1 Drawings

The Supplier shall necessarily submit all the drawings/ documents unless anything is waived. The Supplier shall submit drawings/ design documents/ data/ test reports/manuals as may be required for the approval of the purchaser. All drawings submitted by the Manufacturer 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 Manufacturer shall be clearly marked with the name of the Purchaser, the unit designation, the specifications title, the specification number and the name of the Project. 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.

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

All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at the Manufacturer's risk. The Manufacturer may make any changes in the design which are necessary to make the equipment conform to the provisions and intent of the Contract and such changes will again be subject to



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approval by the Purchaser. Approval of Manufacturer's drawing or work by the Purchaser shall not relieve the manufacturer of any of his responsibilities and liabilities under the Contract.

All engineering data submitted by the Manufacturer after final process including review and approval by the Owner shall form part of the Contract Document and the entire works performed under these specifications shall be performed in strict conformity, unless otherwise expressly requested by the Owner in Writing. The title block of drawings shall contain the following information incorporated in all contract drawings

Title block for project:

1. Customer : Tamil Nadu Generation and Distribution Corporation (TANGEDCO)
2. Consultant : DESEIN PRIVATE LIMITED, DESEIN HOUSE, NEW DELHI
3. Project : 400kV GIS at 2 x 660 MW Udangudi STPP (Stage-I)
4. Contract No./LOA No. : Lr.No.CE/Proj.II/SE/C/UTPP/EE/E/LOI/D.179/2017, dt.07.12.2017
5. Main Contractor : Bharat Heavy Electricals Limited
6. BHEL Order No. & Date :

3.5.2 Documentation

Document Distribution Schedule - After Placement of Order:

S. No.	Stage	No. of copies	
i)	Submission of Data sheets Datasheet, drawings, documents, write-ups, calculation, test reports, Preliminary	13	As per agreed schedule
ii)	Resubmission of above, if required	13	As per agreed schedule
iii)	Final approved documents	13	As per agreed schedule
iv)	Instruction manuals for erection and O&M	6	As per agreed schedule
v)	As built drawings including O &M manual		As per agreed schedule



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	-Hard copy	13	
	-Soft copy in CD/Pendrive	6	

NOTES:

- a) The manufacturer may note that all re-submissions must incorporate all comments given in the prior submission by the Purchaser. Adequate justification for not incorporating the same must be submitted, failing which the submitted documents may be returned.

3.5.3 Format of Documentation

- a) All engineering documents and drawings shall be of international “A” series sizes, that is, A0, A1, A2, A3 and A4.
- b) Two set of CD/ pendrive containing all the drawings in Auto CAD shall also be supplied in addition to hard copies. Soft copy of all documents shall be supplied in a CD/pendrive in PDF format.
- c) Grouped documents shall be provided by size A4, with the inclusion of bigger size drawings which, however, have to be folded as Size A4.

3.5.4 Instruction manuals and operating manuals

The Supplier shall provide Instruction & Maintenance Manuals for each part of the Plant and Equipment included in the Works and Operating Manuals for each Station.

The Instruction Manuals and Operating Manuals shall be arranged in an organized library adequately cross referenced to facilitate issuing clauses of the manuals as required by the work i.e. erection instructions shall be required before operating & maintenance instructions.

All Manuals provided by the Supplier shall be fully detailed and specifically prepared for the Works and equipment provided. General manuals not specifically required for the work shall not be acceptable.

The instruction manuals shall at least contain:

- a) A general description of all components
- b) Storage instructions
- c) Erection instructions
- d) Pre-commissioning Instruction:
- e) Material and part list.
- f) Design clearances and settings
- g) Complete sets of drawings as finally issued



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- h) Operating Instructions:
- i) Routine and Preventive Maintenance instructions with material requirement for each site
- j) Preventive Maintenance Schedule.
- k) Replacement instruction for all equipment

The operation manuals shall at least contain:

- a) Operator oriented functional descriptions of the equipment.
- b) Operator oriented description of the protection and control systems
- c) Description of the equipment auxiliary systems
- d) Fault finding and diagnostic tools
- e) User software interface tools for modification/augmentation etc.

Notes:

The supplier may please note that all resubmissions must incorporate all comments given in the earlier submission by the Owner/Purchaser or adequate justification for not incorporating the same must be submitted failing which the submission of documents is likely to be returned.

If after the commissioning and initial operation of the substation, the instruction manuals require any modifications/ additions/changes, the same shall be incorporated and the updated final instruction manuals shall be submitted by the Supplier to the Owner/Purchaser.

The Supplier shall furnish to the Owner/Purchaser, catalogues of spare parts also.

3.6 QUALITY ASSURANCE PROGRAMME

This section contains general requirements for inspection of material, parts, equipment and workmanship during manufacture, assembling to demonstrate compliance with specification, codes and standards to ensure overall reliability of product operation and performance.

The Owner and/or authorized Representatives shall, at any time, be allowed free and ready access to the Contractor's premises and those of his suppliers as well as to the site installation and the Contractor has to make the items available for the purpose of inspection of the specified equipment components and obtaining information as to the progress of the work. Failure on the part of the Owner, at this or any other time, to discover or reject materials or work which do not meet specified requirements shall not be deemed an acceptance thereof nor a waiver of defects therein.



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The approval of the Owner shall not prejudice the right to reject equipment if it does not give complete satisfaction in service.

To ensure that the equipment and services under the scope of this Contract, whether manufactured or performed within the Manufacturer's Works or at his Sub-manufacturer's premises or at the Purchaser's site or at any other place of Work, are in accordance with the specifications, the Manufacturer shall adopt a suitable quality assurance programme to control such activities at all points, as necessary.

Before manufacture commences and not later than 45 days after award of contract, the Contractor shall submit an outline of his proposed inspection program, which shall include all major stages during manufacturing. The inspection and test program shall include for the various items the designation No., name of equipment, part of equipment, the kind of test, test standard, company which carries out the test, place, date and witnesses by the Contractor, third party or Owner's Representative. The detailed manufacturer's quality assurance plan shall be subject to approval after award of contract.

The Owner will return a copy of the Contractor's proposed inspection program indicating those inspection stages for which notification is required. Notification shall be by Fax or email in a format to be agreed and shall be sent prior to the intended test. If the Owner intends to be represented at the test he will provide at least 24 hours' notice and if his representative does not attend on the notified date, an alternative date has to be informed by the Owner.

A quality assurance programme of the manufacturer shall generally cover the following:

- (a) Manufacturer's organisation structure for the management and implementation of the proposed quality assurance programme;
- (b) Documentation control system;
- (c) Qualification data of bidder's key personnel;
- (d) The procedure for purchases of materials, parts components and selection of sub-Manufacturer's services including vendor analysis, source inspection, incoming raw material inspection, verification of material purchases etc.
- (e) System for shop manufacturing and site erection controls including process controls and fabrication and assembly control;
- (f) Control of non-conforming items and system for corrective actions;
- (g) Inspection and test procedure both for manufacture and field activities;
- (h) Control of calibration and testing of measuring instruments and field activities;
- (i) System for indication and appraisal of inspection status;
- (j) System for quality audits;
- (k) System for authorising release of manufactured product to the Purchaser
- (l) System for maintenance of records;
- (m) System for handling storage and delivery; and



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(n) A quality plan detailing out the specific quality control measures and Procedures adopted for controlling the quality characteristics relevant to each item of equipment furnished and/or services rendered. The Purchaser or his duly authorised representative reserves the right to carry out quality audit and quality surveillance of the system and Procedure of the Manufacturer/his vendors quality management and control activities.

3.7 Quality Assurance Documents

The Manufacturer shall be required to submit all Quality Assurance Documents as stipulated in the quality plan at the time of purchaser's inspection of equipment/material.

3.8 TYPE TESTING, INSPECTION, TESTING & INSPECTION CERTIFICATE

All equipment being supplied shall conform to type tests and shall be subject to routine and acceptance tests in accordance with requirements stipulated under respective sections. Purchaser reserves the right to witness any or all the tests. The Manufacturer shall intimate the Purchaser the detailed programme about the tests at least three (3) weeks in advance in case of domestic supplies & six (6) weeks in advance in case of foreign supplies. The Manufacturer shall also submit type test procedure for approval of the Purchaser.

In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes (including substitution of components) or due to non-compliance with the requirement stipulated in the technical specification or any/all additional type tests not carried out, Such test shall be conducted fresh without any additional cost implication to the Purchaser.

The price of conducting all tests and additional type tests is deemed to be included in Bid price. In case any bidder indicates that he shall not carry out a particular test, his offer shall be considered incomplete and shall be liable to be rejected.

Inspection may be made at any stage of manufacture, dispatch or at site at the option of the Purchaser and the equipment if found unsatisfactory due to bad workmanship or quality, material is liable to be rejected.

The Purchaser or Inspector shall, within fifteen (15) days from the date of inspection as defined herein, give notice in writing to the Manufacturer, of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Manufacturer shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the



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said objections or shall confirm in writing to the Purchaser/ inspector giving reasons therein, that no modifications are necessary to comply with the Contract.

When the factory tests have been completed at the Manufacturer's works, the Purchaser/inspector shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by the Purchaser/inspector, the certificate shall be issued within fifteen (15) days of receipt of the Manufacturer's Test certificate by the Engineer/ Inspector. Failure of the Purchaser/inspector to issue such a certificate shall not prevent the Manufacturer from proceeding with the Works. The completion of these tests or the issue of the certificate shall not bind the Purchaser to accept the equipment should it, on further tests/ after erection, be found not to comply with the Contract. The equipment shall be dispatched to site only after approval of test reports and issuance of MICC by the Purchaser.

In all cases where the Contract provides for tests whether at the premises or at the works of the Manufacturer or of any Sub-Contractor, the Manufacturer except where otherwise specified shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Purchaser /Inspector or his authorised representative to carry out effectively such tests of the equipment in accordance with the Contract and shall give facilities to the Purchaser Inspector or to his authorised representative to accomplish testing.

The inspection by Purchaser and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Manufacturer in respect of the agreed quality assurance programme forming a part of the Contract.

The Purchaser reserves the right for getting any field tests not specified in respective sections of the technical specification conducted on the completely assembled equipment at site. The testing equipment for these tests shall be provided by the Purchaser.

3.9 MATERIALS AND WORKMANSHIP

Equipment materials and components shall be new, of high grade and good quality and be to the latest engineering practice. The material and workmanship throughout shall be in accordance with the purpose for which they are intended. Each component shall be designed to be consistent with its duty.

All the information concerning materials or components to be used in manufacturing, machinery, equipment, materials and components supplied, installed or used shall be submitted for approval. Without such approval the supplier shall run risk of



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subsequent rejection. The cost as well as time delay associated with such rejection shall be borne by the supplier.

3.10 COLOUR SCHEME

The Supplier shall propose a colour scheme for the equipment for the approval of the Employer. The decision of the Employer shall be final. However, the finishing colour shall be RAL 7035 for all Control panels/ MCC/ Switchgear panels. The scheme shall include:

- Finishing colour of Indoor equipment
- Finishing colour of Outdoor equipment
- Finishing colour of various auxiliary system equipment including piping
- Finishing colour of various building items.
- Finishing colour of all cubicles.

All steel structures, plates etc shall be painted with non-corrosive paint on a suitable primer. The galvanised structures in the switchyard shall not be painted. However galvanised structures in other areas may require painting for aesthetic reasons.

3.11 PACKING AND STORAGE

Packing specification shall be submitted for BHEL/customer approval after award of contract.

All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. On request of the purchaser, the manufacturer shall also submit packing details/associated drawing for any equipment/ material at a later date, in case the need arises. While packing all the materials, the limitation from the point of view of availability of Railway wagon sizes in India should be taken into account. The manufacturer shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Any demurrage, wharf age and other such charges claimed by the transporters, railways etc shall be to the account of the manufacturer. Purchaser takes no responsibility of the availability of the wagons.

All coated surfaces shall be protected against abrasions, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device.

Supplier shall ensure that equipment shall be properly packed, blocked, padded, coated and protected so that it is not damaged due to possible mishandling. Storage requirements shall be clearly defined by the supplier. Packing shall be such that if



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required, long time storage (at least 1 year) at site should not deteriorate the performance of the equipment.

3.12 NAME PLATE

Name plates which are to be firmly fixed on all the equipment, buildings and structures shall be provided. For equipment of small size, these are to be fixed on the piping or structure adjacent to the equipment. The contents of nameplate are to include the designation and principal parameters of the equipment.

The nameplate within the field shall be made of a high temperature - resistant metallic sheets, with designation permanently engraved on them. Indoor installed equipments (e.g., panels, cabinets, switchgear, etc.) shall also be labelled by appropriate name plate.

The form, size, base colour and colour of contents of the name plates and prompting plates will be agreed between the Contractor and the Owner. It shall be possible for these to be readily seen by the operator. The designation of warning tags shall be different from that of other tags.

The Equipment identification shall be finalized by vendor in consultation with BHEL/TANGEDCO and should be included in name plates.

3.13 CLAMPS & CONNECTORS

- i) All power clamps and connectors shall conform to IS: 5561, and/or IEC standard and shall be made of materials listed below:

a)	For connecting ACSR conductors	Aluminium alloy casting, conforming to designation A6 of IS: 617 and shall be tested for all tests as per IS:617
b)	For connecting equipment terminals made of copper with ACSR conductors	Bimetallic connectors made from aluminium alloy casting, conforming to designation A6 of IS 617 with 2 mm thick Bimetallic liner and shall be tested as per IS: 617.
c)	For connecting G.I. Shield wire	Galvanised mild steel
d).1	Bolts, nuts & Plain washers.	Electro galvanized for sizes below M12, for others hot dip galvanised
d).2	Spring washers for items 'a' to 'c'	Electro-galvanised mild steel suitable for at least service condition-3 as per IS: 1573



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- ii) Equipment shall be supplied with the necessary terminals and connectors, as required by the ultimate design for the particular installation. The conductor terminations of equipment shall be either expansion, sliding or rigid type. The requirements regarding external corona and RIV as specified for any equipment shall include its terminal fittings and the equipment shall be factory tested with the connectors in position. In case the connector is not available then equivalent connector may be used. If corona rings are required to meet these requirements they shall be considered as part of that equipment and included in the scope of Work.
- iii) Where copper to aluminium connections are required, bi-metallic clamps shall be used, which have been properly designed to ensure that any deterioration of the connection is kept to a minimum and restricted to parts which are not current t shall be furnished to the Employer.
- iv) Low voltage connectors, grounding connectors and accessories for grounding all equipment as specified are also included in the scope of Work.
- v) No current carrying part of any clamp shall be less than 10 mm thick. All ferrous parts shall be hot dip galvanised. Copper alloy liner of minimum 2mm thickness shall be cast integral with aluminium body for Bi-metallic clamps. When copper alloy is not cast integral with aluminium body, a bimetallic washer or strip shall be used to meet the functional requirement.
- vi) All casting shall be free from blow holes, surface blisters, cracks and cavities. All sharp edges and corners shall be blurred and rounded off.
- vii) Flexible connectors, braids or laminated straps made for the terminal clamps for bus posts shall be suitable for both expansion or through (fixed/sliding) type connection of IPS Aluminium tube as required. In both the cases the clamp height (top of the mounting pad to centre line of the tube) should be same.
- viii) Clamp shall be designed to carry the same current as the conductor and the temperature rise shall be equal or less than that of the conductor at the specified ambient temperature. The rated current for which the clamp/connector is designed with respect to the specified reference ambient temperature, shall also be indelibly marked on each component of the clamp/connector, except on the hardware.
- ix) All current carrying parts shall be designed and manufactured to have minimum contact resistance.



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x) TESTS

The following is the list of type tests.

- a) Temperature rise test (maximum temperature rise allowed is 35deg C over 50 deg C ambient)
- b) Short time current test
- c) Dry corona and RIV test as per annexure-A
- d) Resistance test and tensile test

3.14 GALVANIZING

Galvanizing works shall conform in all respect to B.S. 729, B.S. 3083 and B.S.C.P. 2008 and to DIN 50976 whatever requires the higher quality and shall be performed by the hot dip process, unless otherwise specified. It is essential that details of steel members and assemblies which are to be hot-dip galvanized should be designed in accordance with B.S 4479.

Vent-holes and drain-holes should be provided to avoid high internal pressures and air-locks during immersion, which may cause explosions, and to ensure that molten zinc is not retained in pockets during withdrawal.

Careful cleaning of welds is necessary before welded assemblies are dipped. The welds and the surrounding metal should be cleaned separately, preferably by blast-cleaning, because the usual preliminary pickling cannot be relied on to remove the welding slag.

All defects of the steel surface including cracks, surface laminations, laps and folds shall be removed in accordance with B.S. 4360. All drilling, cutting, welding, forming and final fabrication of unit members and assemblies shall be completed, where feasible, before the structures are galvanized. The surface of the steelwork to be galvanized shall be free from paint, oil, grease and similar contaminants in accordance with DIN 55928, part 4 and DIN 50976. The weight of zinc coating per unit area has to be noted in the manufacturing documents in accordance with DIN 50976.

The minimum average coating weight shall be as specified in Table 1 of B.S. 729 or Table 2, DIN 50976, whatever requires higher quality.

Structural steel items shall be initially grit-blasted to B.S. 4232, second quality, (Sa 21/2) or by pickling in a bath and the minimum average coating weight on steel sections 5 mm thick and over shall be 610 g/m² (DFT = 85μ).

On removal from the galvanizing bath, the resultant coating shall be smooth, continuous, free from gross surface imperfections such as bare spots, lumps, blisters and inclusions of flux, ash or dross.



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Galvanized contact surfaces to be joined by high-tensile friction-grip bolts shall be roughened before assembly so that the required slip factor (defined in B.S. 3294, part 1 and B.S. 4604,

part 1) is achieved. Care shall be taken to ensure that the roughening is confined to the area of the mating faces.

Bolts, nuts and washers, including general grade high-tensile friction grip bolts (referred to in B.S. 3139, and B.S.4395 part 1) shall be hot dip galvanized and subsequently centrifuged (according to B.S. 729). Nuts shall be tapped up to 0.4 mm oversize after galvanizing and the threads oiled to permit the nuts to be finger-turned on the bolt for the full depth of the nut. No lubricant, applied to the projecting threads of galvanized high-tensile friction-grip bolt after the bolt has been inserted through the steelwork, must be allowed to come into contact with the mating faces of the steelwork,. A local remelting of the galvanized parts to achieve the nuts to be finger turned on the bolt is possible in accordance with DIN 50976.

Protected slings must be used for offloading and erection. Galvanized work which is to be stored at the works or on site shall be stacked so as to provide adequate ventilation to all surfaces to avoid wet storage staining (white rust).

Small areas of the galvanized coating damaged in any way shall be restored in accordance with DIN 55928, part A and DIN 50976 by:

- Cleaning the area of any weld slag rust and other impurities and by thorough wire brushing to give a metallic clean surface.
- Application of suitable number of coats of zinc-rich paint containing more than 90 % w/w of zinc in dried film. The dry film thickness shall exceed at least 50 % the thickness of the desired galvanization. In case of application of a low melting point zinc alloy repair rod, the rods shall be in accordance with DIN1707, the thickness of the alloy shall be at least as of the desired galvanization.

The restored area is not to exceed 1 % of the galvanized surface. Surface restoration of parts in contact with drinking water is not allowed and the quality of the galvanization is to be in accordance with DIN 2444.

After fixing, bolt heads, washers and nuts shall receive two coats of zinc-rich paint.

Connections between galvanized surfaces and copper, copper alloy or aluminum surfaces shall be protected by suitable preferably hydrophobe tape wrappings to the owner's approval.

3.15 DEGREE OF PROTECTION

The enclosures of the control cabinets, Junction boxes and Marshalling boxes, panels etc. to be installed as detailed here under:



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The minimum requirements for panels are as follows:

- Installed out door: IP- 55
- Installed indoors in air-conditioned area: IP-32
- Installed in covered area: IP-52
- Installed indoors in non air-conditioned area where possibility of entry of water is limited: IP-41.
- For LT Switchgear (AC & DC distribution Boards): IP-52.

The degree of protection shall be in accordance with IS:13947 (Part-I) / IEC-947 (Part-I) / IS 12063 / IEC 529. Type test report for degree of protection test, on each type of the box shall be submitted for approval.



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SECTION-4 LIST OF DRAWINGS & DOCUMENTS

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	BHEL's Doc. No.
01.	Datasheet for fire protection system	TB-400-552-125-01
02.	Data sheet for fire detection system	TB-400-552-125-02
03.	BOQ - FPS	TB-400-552-125-03
List of Drawings		
01.	Fire Water Piping Layout for GIS area	TB-400-552-126-01
02.	Distribution of Extinguisher inside GIS Control Room building	TB-400-552-126-02
03.	Schematic of Fire detection system	TB-400-552-126-03
04.	Fire Alarm & Detection system inside GIS control building	TB-400-552-126-04
05.	Fire Alarm & Detection system inside GIS building	TB-400-552-126-05
06.	MVW Spray System for Cable spreader room - Plan, Elevation & Side View (Sheet 1 of 2)	TB-400-552-126-06
07.	MVW Spray System for Cable spreader room - Isometric View (Sheet 2 of 2) (with hydraulic calc)	TB-400-552-126-07
08.	HVW Spray System for Reactor - Plan, Elevation & Side View (Sheet 1 of 2)	TB-400-552-126-08
09.	HVW Spray System for Reactor - Isometric View (Sheet 2 of 2) (with hydraulic calc)	TB-400-552-126-09
10.	LCPDV Drawing	TB-400-552-126-10
11.	O&M Manual for Fire Fighting System	TB-400-552-126-11



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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 Schedule of past experience and qualifying requirements
- Schedule 4 Schedule of performance certificates
- Schedule 5 Schedule of type test and special tests
- Schedule 6 Details of contact persons (technical & commercial)
- Schedule 7 Enclosures to Specification

ANNEXURE-A Drawings



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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-----

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SCHEDULE – 3

SCHEDULE OF PAST EXPERIENCE AND QUALIFYING REQUIREMENT

Following is the list of earlier orders executed by us for supply of equipment / material of similar nature over the last past five years:

S.No.	Item	Brief rating	Qty	customer	Date Of order	Date of supply	Order value
-------	------	--------------	-----	----------	------------------	-------------------	----------------

Place

Signature of the authorized representative of Bidder

Date

Name-----

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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

SCHEDULE OF PERFORMANCE CERTIFICATE

Bidder shall furnish the performance certificate of the similar equipment having
The following details:

S.No.	Item	Brief rating	Qty	Customer	Date Of supply
-------	------	--------------	-----	----------	-------------------

Place _____ Signature of the authorized representative of Bidder

Date _____ Name-----

Designation-----

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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-5

SCHEDULE OF TYPE TESTS AND SPECIAL TESTS

The following type tests and special tests as called for in the Specification shall be conducted (all type tests / special tests as mentioned in the relevant clauses of the Specification shall be listed here):

Sl no.	Clause no/ page no of Specification	Details of test	Lab in which to be conducted	Whether test to be conducted free or on chargeable basis. Mention 'FREE' or 'CHARGEABLE'	If charges per test have been quoted for in the price bid. YES / NO
		A. Type Tests			
		1.			
		2.			
		B. Routine Tests			DO NOT
		1.			MENTION
		2.			ANY PRICE
		C. Site Tests			IN THIS
		1.			COLUMN
		2.			
		D. Special Tests (specified)			
		1.			
		2.			
		E. Other tests at works / site recommended by the Bidder			
		1.			
		2.			

NOTE:

- 1) Details have to be furnished on cables as well as accessories, each separately.
- 2) **NO PRICE SHALL BE FURNISHED IN THIS FORMAT.**

Place

Signature of the authorized representative of Bidder

Name-----

Date

Designation-----

Company seal-----



CLIENT – TAMILNADU GENERATION & DISTRIBUTION CORPORATION LTD.
CONSULTANT- TATA CONSULTING ENGINEERS LTD, BANGALORE
PROJECT: 2X660MW UDANGUDI STPP – (STAGE-1)
TECHNICAL SPECIFICATION FOR FIRE FIGHTING SYSTEM

TB-400-552-125

R0

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SCHEDULE-6

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.



CLIENT – TAMILNADU GENERATION & DISTRIBUTION CORPORATION LTD.
CONSULTANT- TATA CONSULTING ENGINEERS LTD, BANGALORE
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SCHEDULE –7

ENCLOSURES TO SPECIFICATION

DRAWINGS ENCLOSED

1. COMPOSITE LAYOUT FOR HYDRANT & SPRAY SYSTEM
DRG NO. PY-LP-0-M109-8315-01 REV01
2. PLOT PLAN
DRG. NO. PE-DG-435-100-M001
3. GIS AND POTHEAD PLAN & SECTION LAYOUT
DRG NO. TB-0-400-316-002 REV06
4. ARCHITECTURAL DRAWING CONTROL ROOM BUILDING (PLAN)
DRG NO. TB-1-400-607-620-1 REV01
5. ARCHITECTURAL DRAWING CONTROL ROOM BUILDING (SECTION)
DRG NO. TB-1-400-607-620-3 REV01
6. ARCHITECTURAL DRAWING CONTROL ROOM BUILDING (ELEVATION)
DRG NO. TB-1-400-607-620-2 REV01
7. TRENCH LAYOUT FOR 400KV SWITCHYARD
DRG NO. TB-2-400-316-010 REV01
8. ARCHITECTURAL DRAWING GIS BUILDING (PLAN)
DRG NO. TB-1-400-607-640-1 REV01
9. ARCHITECTURAL DRAWING GIS BUILDING (SECTION)
DRG NO. TB-1-400-607-640-3 REV01
10. ARCHITECTURAL DRAWING GIS BUILDING (ELEVATION)
DRG NO. TB-1-400-607-640-2 REV01
11. ONLINE GENERAL ARRANGEMENT FOR REACTOR
DRG NO. 34690002032 REV02
12. FOUNDATION PLAN FOR REACTOR
DRG NO. 34690002034 REV01