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NTPC DWG. NO. : 9962-001-ES-151-PVM-W-001

REV.04

PROJECT	1 x 660 MW PANKI THERMAL POWER EXTENSION PROJECT
OWNER 	UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LTD.
REVIEW CONSULTANT 	NTPC LIMITED (A GOVT. OF INDIA ENTERPRISE)
CONSULTANT 	DEVELOPMENT CONSULTANTS PVT. LTD. KOLKATA
EPC CONTRACTOR: 	BHARAT HEAVY ELECTRICALS INDIA LTD.

BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGG & SYSTEMS DIVISION HYDERABAD	DEPT CODE		NAME	SIGN	DATE
		DRN			
		DESN	HARISH/DVP	-SD-	10.05.19
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TITLE : DESIGN BASIS REPORT (DBR) - FIRE PROTECTION AND DETECTION SYSTEM

						DEPT.	SCALE	DOC. NO. :		
						SIGN		PYSZ4M101831501		
								SHEET	1 OF 25	REV. 04



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1. SCOPE

The scope of this design basis report covers the type of fire protection and detection systems to be provided for all buildings, equipment, fuel tanks, transformers, etc., as per contract, that are in the scope of BHEL within power plant boundary of proposed **1 x 660 MW, Panki Thermal Power Station for UPRVUNL, Uttar Pradesh State.**

Fire Protection & Detection System of switchyard is excluded from the scope of this document as the same is covered by BHEL-TBG in their document "Design Philosophy for Fire Fighting System"; Doc No. 9962-001-TB-572-PVM-U-002.

Refer Annexure-2 (Area-wise fire protection and detection system) for the type of fire protection and detection system provided for different facilities and areas within the plant.

2. CODES & STANDARDS

The design and installation of complete fire protection system will comply with the regulations of:-

a) Tariff Advisory Committee (TAC)

- FP Manual
- Rules for Water Spray Systems
- Rules for Fire Alarm System

b) National Fire Protection Association (NFPA)

- NFPA-11 (Standard for Low-, Medium-, and High-Expansion Foam)
- NFPA-2001 (Standard on Clean Agent Fire Extinguishing Systems)

c) Indian Standards (IS)

- IS 5120 (Technical requirements for rotodynamic special purpose pumps)
- IS 1239 (Steel Tubes, Tubulars and Other Wrought Steel Fittings - Specification - Part 1 : Steel Tubes)
- IS 3589 Gr 410 (Steel Pipes for Water and Sewage (168.3 to 2 540 mm Outside Diameter)
- IS 4736 (Specification for Hot-dip Zinc Coatings on Mild Steel Tubes)
- IS 15337 (Coal Tar Based Anticorrosion Tape for Protection of Underground Mild Steel Pipelines)
- IS 14846 (Sluice Valve for Water Works Purposes, 50 to 1200 mm Size)
- IS 210 (Grey Iron Castings)
- IS 5290 Type A (Specification for landing valves)
- IS 8442 (Stand Post Type Water and Foam Monitor for Fire Fighting)



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- IS 636 (Non-percolating flexible firefighting delivery hose)
- IS 884 (Specification for first-aid hose reel for firefighting)
- IS 2871 (Specification for branch pipe, universal for firefighting purposes)
- IS 2189 (Selection, Installation and Maintenance of Automatic Fire Detection and Alarm System - Code of Practice)
- IS 15683 (Portable Fire Extinguishers - Performance and Construction)
- IS 3034 (Fire Safety Of Industrial Buildings: Electrical Generating And Distributing Stations)
- IS 325 (Three-phase induction motors)

d) American Society for Testing and Materials (ASTM)

- A 105 (Standard Specification for Carbon Steel Forgings for Piping Applications)
- A 234 (Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service)
- A 182 (Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service)

e) British Standards (BS)

- BS 2633 (Specification for Class I arc welding of ferritic steel pipework for carrying fluids)
- BS EN 13789 (Industrial valves. Cast iron globe valves)
- BS 1868 (Specification for steel check valves (flanged and butt-welding ends) for the petroleum, petrochemical and allied industries)
- BS 1873 (Specification for steel globe and globe stop and check valves (flanged and butt-welding ends) for the petroleum, petrochemical and allied industries)

f) American Petroleum Institute (API)

- API 602 (Steel Gate, Globe And Check Valves For Sizes Dn 100 And Smaller For The Petroleum And Natural Gas Industries)

3. SYSTEM DESCRIPTION & DESIGN CRITERIA

3.1 Fire Water Pump House

- a) A common pump house has been envisaged for both Fire and Clarified Water Pumps.
- b) Water for the fire protection system shall be drawn from the common Clarified Water cum Fire Water reservoir.



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- a) A reserve storage of water 3000 m³ shall be provided for fire protection system in line Clause No. 24.1 of Volume –III (Mechanical Works) of Bid Document.

3.2 Fire Water Pumps and other equipment:

- b) Fire water pumps consist of two sets of pumps, namely, fire hydrant pumps and spray water pumps. Please refer Table-01 for configuration of pumps and other equipment in line with Clause No. 24.4.6 of Volume –III (Mechanical Works) of Bid Document.
- c) The fire pumps shall be designed for continuous operation at its best efficiency up to 150% of rated flow to meet the specific requirements of the system.
- d) The pump head shall be so designed that when the aggregate pumping capacity is being discharged at the farthest or hydraulically remotest hydrant point a minimum running pressure of 3.5 Kg/sq.cm is available at that point.
- e) Test line for each pump with gate valve shall be provided. Test line discharge shall be routed fire water tank. This is to check and maintain the operability of the pumps.
- f) The Water for Spray and Hydrant System shall feed through separated headers. 1 No. isolation Valve with a non-return valve shall be employed in between Hydrant Pumps and Spray pumps so that the water from hydrant pumping system shall feed to spray header in case of emergency.

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- g) Pressure transmitters shall be provided at discharge line after NRV of each hydrant pump, spray pump and jockey pump within the Fire water pump house for control and monitoring of fire & jockey pumps. In addition to this, Pressure transmitters shall be provided at Hydrant and spray headers.

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- h) The water pressure in hydrant header and spray water header shall be maintained at 12 Kg/cm² (g) always. To maintain this parameter, a Jockey Pump has been envisaged.

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- i) Two jockey pumps (1W+1S) have been provided to supply water, in case of fall in water pressure in the main header.

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- j) Gate valves shall be provided on suction and discharge side of pumps.
- k) There shall be a common header for High Velocity Spray service and Medium Velocity Spray service. Capacity of fire pump shall not be less than 150% of rated capacity at a head of 65% of the rated head and shut off head shall not exceed 140% of rated head.

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Table – 01

List of pumps & other major equipments

EQUIPMENT NAME	NOS	DETAILS
Main Hydrant Pump (electric motor driven)	2(W)	Type: Vertical Centrifugal Pump set
		Capacity: 410 M3/Hr
		Head: 120 MWC
		Drive -Electric Motor
Diesel engine driven Hydrant Pump	2(S)	Type: Vertical Centrifugal Pump Set
		Capacity: 410 M3/Hr
		D Head: 120 MWC
		Drive - Diesel Engine
Main Spray water Pump (electric motor driven)	1(W)	Type: Vertical Centrifugal Pump Set
		Capacity: 410 M3/Hr
		Head: 120 MWC
		Drive -Electric Motor
Diesel engine driven Spray water Pump	1(S)	Type: Vertical Centrifugal Pump Set
		Capacity: 410 M3/Hr
		Head: 120 MWC
		Drive - Diesel Engine
Jockey Pumps	2 (1W+1S)	Type: Vertical Centrifugal
		Capacity: 40 M3/Hr
		Head: 120 MWC
		Drive -Electric Motor
Hydrant Booster Pump	2 (1W+1S)	Type: Horizontal Centrifugal
		Capacity: 137 m3/hr
		Head: 50 MWC
		Drive - Electric Motor & Diesel Engine
Control Panel	1 No.	PLC panel located in Fire Water pump house
Control Panel	1 No.	Remote IO panel located in Booster pump house
Control Panel	1 No.	Remote IO panel located in Foam Pump House

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3.3 Fire Water Pressurization System

- a) The pressurization of both hydrant system and water spray system shall be maintained through Jockey pumps.
- b) In case of small system leakages, there will be a pressure drop in the Delivery Header.
- c) A pressurised hydrant /spray main shall be maintained through the jockey pumps. Small system leakages will be met up by make-up water supply from jockey pump. Jockey pump shall cut-out automatically when the pressure reaches the higher limit or when Hydrant/Spray pump starts.

3.4 Control System

- a) PLC based control system along with remote IO panels shall be provided which will include the interlocks and/or monitoring functions for the fire pumps, jockey pumps, Booster Pumps and foam pump. [This is in-line with S.No. 9 of Volume V- Instrumentation & Control Works; Part B/Ch 14: Annexure-A; Control System for BOP/Offsite Packages; Sheet | 5 of 11 & Cl. 24.4.7.1 of Volume III - Mechanical Works; Ch 24 : Fire Detection, Alarm & Protection System; Sheet | 21 of 68]
- b) This FPS PLC shall be provided with one number OWS & one number OEWS with A4 sized B/W LJP.
- c) FPS PLC shall be connected to DDCIMS in Main Control room through fiber optic cables via redundant OPC link.
- d) FPS PLC shall be connected with master clock for time synchronization.
- e) 24V DC power supply system for PLC based control system (for Offsite packages) shall comprise of two sets, each set shall consist of 1 x 100% Chargers, 1 x 100% Nickel – Cadmium batteries for one (1) hour duty, 1 X 100% DC distribution board, 1x100% Battery Health Monitoring System (BHMS)–common for both the sets. [This is in-line with cl. 14.11.01 (A); Volume V - Instrumentation & Control Works; PART B/Ch 14: PLANT AUXILIARY SYSTEMS; Sheet | 12 of 22 & Sub Section, Vol.-V, Part B, chapter 7, Cl. No. 7.01.03 (A) of Specification].
- f) Tripping of fire pump(s) at low level is not allowed. Stopping of all the above pumps will be manual.
- g) Jockey pumps will not be running when main pumps are in operation.

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3.5 Hydrant Network

a) Design Guidelines

- As per cl. No. 7.2.2 of TAC (Tariff Advisory Committee), Thermal power plants are classified under ordinary hazard.
- As per TAC cl. No. 7.6.11, spacing between hydrant points in the hydrant network shall be 45 meters. These hydrant points shall not be located less than 2 meters or more than 15 meters from buildings & structures.
- As per TAC Cl. 7.6.14, an internal hydrant system shall be provided so that no portion of the floor is more than 45 m from an external hydrant or 30 m from an internal hydrant.
- Velocity in Fire water Pipes shall be as per TAC recommendation. The velocity in the hydrant/Spray header shall not exceed 3 m/sec.
- Friction drop shall be calculated based on Hazen Williams equation considering "C" as 100.

b) System Description

- The Hydrant System of Fire Protection essentially consists of a large network of pipe, both underground and over ground around areas to be protected which feeds water to a number of hydrants valves (External /Internal) and to a number of outdoor type fixed water monitors. Limit Switches shall be provided in all isolation Valves.
- External hydrant posts will be located all around the periphery of buildings. All the required accessories (hose pipe fitted with quick coupling ends, branch pipes, nozzles, spanner etc.) shall be provided in a hose box, which shall be located near point of use. Internal Hydrant (Landing valves) will be provided at the landing floor of staircases through wet risers along with isolation valves. A hose box with required accessories (hose pipe fitted with quick coupling ends, branch pipes, nozzles, spanner etc.) shall be provided with each landing valve.
- Water monitors shall be provided for tall buildings, Coal stockpiles, ESP area apart from ground hydrant and Landing Valve.
- Hydrant piping in the main plant area (i.e. paved area) will be laid underground in RCC trench with pre-cast slabs covers and protected by means of wrapping and coating as per IS:10221/IS:15537. Outside the main plant area, the fire water pipes shall be running aboveground on the pedestals. Where ever road crossing, pipe shall be laid in RCC Hume pipe of NP-3 class. In case of fire water pipe crossing rails, it shall be laid in RCC Hume pipe of NP-4 class.

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- All operating floors of boiler staircases, turbine buildings and other multi-storied structures, coal handling plant transfer point etc., shall be provided with hydrant landing valves. For ESP areas / Tall buildings (having height greater than 15 m) /coal stock piles, fixed water monitors will be provided apart from ground hydrant and landing valves.
- Water in the pipe network is kept pressurized by jockey pump arrangement as explained in Cl.3.3 above.
- Hosepipes of suitable lengths, as mentioned below, fitted with branch pipes & nozzles are kept in "Hose Boxes" (for outdoor & indoor hydrants):

	Hosepipe of 15M Length	Hosepipe of 7.5M Length
Outdoor Hydrants	2 Nos.	--
Indoor Hydrants	2 Nos.	--

- At the most three hydrant ring mains shall be provided, one ring for the main plant area (from transformer yard to chimney) & other rings for remaining plant area.
- Each loop shall be interconnected for better reliability of the system. Suitable number of isolation valves (Gate Valve) shall be provided to isolate the loop for maintenance.
- Air release valves shall be provided at the highest point in each wet riser.
- Separate header shall be provided for Hydrant system and spray system from the outlet of the pump house.

c) Operation of Hydrant System

- The hydrant system will be a pressurized system provided with automatic starting of pumps. The mode of operation of hydrant system will be as follows:
- In the event of fire when hydrant 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 motor driven pump will start automatically by getting a signal from pressure transmitter mounted on the header.
- In case, the motor driven pump fails to start, the pressure in the mains will drop further and sequentially start the 2nd motor driven pump. There will be a provision to start the pump manually in case of emergency.
- Stopping of all the above pumps will be manual.

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- Interlock shall be provided between main hydrant pumps, Jockey pumps such that, jockey pumps will shut down when main hydrant pumps are in operation.
- A flow switch is provided in the hydrant line near boiler area. In case of fire, when there is water flow in this line, the flow switch gives a signal to start the main booster pump. The stand-by diesel engine driven booster pump will come into operation automatically with low pressure on main booster pump discharge. The main booster pump shall also take start from header pressure low transmitter.

3.6 Water Spray System

Fire Water Spray System includes fixed water spray arrangement, strategically installed in specified areas of plant (mentioned elsewhere) for protection against fire damage.

This application requires forceful directional water discharged achieved by specially designed nozzles according to the risk and environment. The discharged is broken into droplets of water traveling at high velocity which provides the necessary mechanical agitation and cooling at the surface of the burning liquid.

a) Automatic High Velocity Water Spray System (HVWS)

Design Guidelines

- The density of spray will be 10.2 lpm/m² of the surface area for the HVWS system as per cl. No. 3.2.3.6.1 of TAC manual for Spray System.
- The minimum running water pressure at any spray nozzles will not be less than 3.5 kg/cm² (g) and not greater than 5.0 kg/cm² (g). The velocity in feed pipes shall not be more than 10m/s as per cl. No. 3.2.3.6.2.7 of TAC manual for Spray System.

System Description

- Refer Annexure-2 (Area-wise fire protection and detection system) for the type of fire protection and detection system provided for different facilities and areas within the plant.
- The spray system has been provided in accordance with Cl. No. 8.8.1 of IS 3034 (Fire Safety of Industrial Buildings - Electrical Generating and Distributing Stations) - which specifies that no fixed fire protection equipment (such as high velocity water spray) is required for transformers below 10 MVA or in the case of oil filled transformers with oil capacity of 2000 liters and below.



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- For all other transformers of higher rating for which the above clause is not applicable shall be provided with high velocity water spray system.
- The detection in HVWS system is through heat sensing detectors of fusible type (Quartzoid Bulb). In the event of fire, the surrounding temperature increases. As the surrounding temperature reaches the rated temperature of QB detector, the detector bulb bursts and allows water in detection line to flow out. This creates a pressure drop in the detection line. The pressure drop in detection line will open the deluge valve and water starts projecting out from the spray nozzles.
- The water supply to HVWS system will be controlled by wet pilot type deluge valve which will be operated hydraulically and is normally closed by water pressure. Water for deluge valves shall be supplied from spray header. Gate valves with limit switch shall be provided for each deluge valve on upstream and downstream. Fast acting butterfly valve with limit switch is provided in the bypass line of deluge valve. Y- Strainer shall be provided at upstream of each deluge valve.
- Remote manual operation of the deluge valves shall be possible from the respective fire alarm cum control panel through the keyboard operation of Operating Work-station when the system is selected in remote manual mode. The remote manual selection for the operation of spray system on any equipment or any zone shall also be through the monitoring station of the respective panel. Apart from the automatic operation of the deluge valve, the system shall have provision for manual operation of the deluge valve by means of hand operated lever close to the deluge valve assembly. There shall also be a provision to operate deluge valve electrically from a nearby local panel.
- A provision is also made to operate the HVWS system manually through local push button station and remotely from fire alarm panel. The system will automatically detect, control and extinguish any outbreak of fire and simultaneously give audible alarm.

Operation of HVWS System

The mode of operation of HVWS system will be as follows:

- As explained above, when the deluge valve opens there is a pressure drop in the spray header. This pressure drop is sensed by a pressure transmitter (provided in the spray header) and gives a signal to start the main spray water pumps.
- In case the motor driven pumps fails to start, the pressure in the spray header will drop further and sequentially start the diesel engine driven pump. There will be a provision to start the pump manually in case of emergency.
- Stopping of all the above pumps will be manual.

b) Medium Velocity Water Spray System (MVWS)
Design Guidelines

- In case of MVW spray system minimum and maximum pressure shall be 1.4 kg/cm² and 3.5 kg/cm² respectively as per Cl. 4.5.2.5 of TAC spray Manual. However for cable vaults/ cable spreader rooms and cable galleries, a minimum running pressure of 2.8 kg/cm² (g) shall be achieved at the hydraulically remotest nozzle/sprayer as per Cl. 4.8.3 of TAC spray Manual.
- The density of spray and pressure required at the hydraulically remotest point for various equipment covered in MVWS system are indicated in the following table:

S. No.	Equipment to be protected	Density of Spray	Min. Press. Required
1.	Cable vault/Cable Gallery/cable spreader room in Power House, CHP control room, ESP control room building.	12.2 lpm/m ²	2.8 bar
2.	Coal Conveyors, all transfer points, take-up pulleys, and crusher house of CHP	10.2 lpm/m ²	1.4 bar
3.	LDO tanks	10.2 lpm/m ²	1.4 bar
4.	Emergency DG Set Diesel Tank	10.2 lpm/m ²	1.4 bar
5.	Fuel Oil Unloading and Pressurizing Pump House	10.2 lpm/m ²	1.4 bar

- The velocity in feed pipes shall not be more than 10 m/s as per clause no 4.8.5.3 and 4.9.5.3 of TAC manual for spray system.

System Description

- Refer Annexure-2 (Area-wise fire protection and detection system) for the type of fire protection and detection system provided for different facilities and areas within the plant.
- The detection in MVWS system is through Linear Heat Sensing (LHS) cable. In the event of fire, the surrounding temperature increases. As the surrounding temperature reaches the set point temperature, the LHS cable gives a signal to main fire alarm panel. With the receipt of fire signal from LHS cable, the main fire alarm panel opens the solenoid valve placed in the detection line of deluge valve. As the solenoid valve opens, the water in detection line to flow out. This creates a pressure drop in the detection line. The pressure drop in detection line will open the deluge valve and water starts projecting out from the spray nozzles.



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- In order to avoid total flooding of the area, the area will be divided into number of zones. Each zone will have separate water supply network controlled by a deluge valve. Gate valves with limit switch shall be provided for each deluge valve on upstream and downstream. Fast acting butterfly valve with limit switch is provided in the bypass line of deluge valve. Y- Strainer shall be provided at upstream of each deluge valve.

- The MVWS system for fuel oil pump house will be provided similar to that of the system provided for cable galleries except that there will not be any zoning in this area. The fire in the fuel oil pump house will be detected by a detection system (water filled quartzoid bulb detectors), which will actuate the deluge valve.

Operation of MVWS System

- On detection of fire the deluge valve is opened and water will be released from the spray nozzles. This will cause a pressure drop in the spray header from which water supply is taken for MVWS system. This pressure drop in the system will start the pumps as explained in HVWS system.

3.7 Fire Detection & Alarm System

a) Scope of fire detection & alarm system

Fire alarm detection and protection system shall consist of the following major devices:-

- One (01) Main fire alarm panel located in Central Control Room (CCR).
- One (01) Local fire alarm panel located in CHP control room.
- One (01) Satellite fire alarm panel located in DM Plant Control Room.
- One (01) Satellite fire alarm panel located in ESP Control Room.
- One (01) Satellite fire alarm panel located in FO Handling Plant Control Room.
- One (01) Satellite fire alarm panel located in AHP Control Room.
- One (01) Repeater Panel located in Fire Station.
- One (01) lot of Detectors.
- One (01) lot of Digital Linear Heat Sensing (LHS) cable.
- One (01) lot of manual call points.
- One (01) lot of notification appliances (hooter & beacons).
- One (01) lot of interface modules.
- One (01) lot of cables.

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Miscellaneous Items:-

- Self Illuminating EXIT signs shall be provided in control room, control equipment rooms, switchgear and MCC rooms, battery charger rooms, escape stair case in power house and other buildings in the plant.
- One (1) no. of siren – This siren will be operated by main fire alarm panel in case fire in any part of the plant.
- Fire Detection and Alarm Panel in the Central Control Room shall be provided with Operating work station and printer.
- Fire Detection and Alarm Panel in the Central Control Room shall be provided with hardwired contacts for Group Alarms for the fire Protection, detection & Alarm system and to be connected to the DDCMIS.
- Repeater fire alarm panel shall be provided with an operating work station and printer
- Isolator modules shall be provided as per IS 2189.
- All consumables like lubricants, markers, printer papers etc. as per requirement.

All equipment such as fire detectors, panels, notification appliances shall be approved or listed by UL/FM/LPCB/VDs/TAC.

b) General Description Of The System

- This system is provided for all the buildings and closed spaces within the scope of BHEL. Please refer to Annexure-2 for details.
- The Fire Detection and Alarm System will comprise of a network of Addressable Detectors (fire/smoke), Microprocessor based Fire Alarm Control Panels, Repeater Panels, , Manual Call Points, Linear Heat Sensing cable (LHS), Modules, Notification Appliances, Cables and other accessories required to form a network (i.e. Terminal Boxes and Junction Boxes).
- Automatic Fire Detection and Alarm System detect fire / over-heating by means of the attendant phenomena of fire, such as smoke or heat. It initiates alarm in fire alarm control panel and actuates pre-programmed control actions. Based fire affected area – spray system (HVWS or MVWS) or inert gas fire extinguishing system or foam system will be actuated. Detection of fire at an early stage permits rapid intervention by fire fighting forces. Thus the automatic fire detection and alarm system reduces damage to property and risk to human lives.
- The fire detectors will be wired on a common connecting line called loop. 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 will be finalized during detailed engineering stage based on standards mentioned above.



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- Refer Annexure-2 (Area-wise fire protection and detection system) for the type of fire protection and detection system provided for different facilities and areas within the plant.
 - In case of fire, the detector or device envisaged in respective area will pick up appropriate signal and conveys it to fire alarm panel to which it is connected. These signals triggers two types of actions, (1) visual and audio alarms in CCR and affected area, and (2) actuates firefighting process and gives signals (if applicable) to MCC to stop/close/shutdown the equipment in affected area. It initiates tripping of AHU for AC system, air washer fans in ventilation system, package air-conditioners, fire dampers, conveyor motors, etc. related to the affected area. The system initiates operation of extinguishing systems such as deluge system, inert gas extinguishing system and transmits alarm and fault signals to predetermined points.
 - All detectors & devices shall be connected to the Fire Alarm Panel. All the signals received by fire alarm panel shall be repeated in the repeater panel located in the fire station and shall be available in all the fire alarm panels.
 - The fire detectors are inherently addressable, which provide continuous surveillance in an area. The Microprocessor based Fire Alarm Control Panel will process the input signals from detectors at various locations of the plant and actuate the respective protection system.
 - The system will have following self-diagnostic features:
 - Detector cabling will be completely supervised for open circuit and short circuit.
 - Unauthorized removal of a detector head from its base will be supervised to give a fault alarm on the connected control panel.
 - Annunciation will be provided for battery low voltage, battery earth fault, fuse blown and loss of main AC supply.
 - Alarm verification features.
 - Facility to transmit annunciation to Repeater Panel.
- c) Layout and Coverage of detectors/devices in buildings/ plant areas shall be as mentioned below:-
- Spacing of detectors shall be as per cl. No. 6 of IS 2189.
 - Digital LHS cable shall be laid in zig-zag fashion in cable galleries.
 - In coal conveyors, Digital LHS cable shall be laid in straight fashion.
 - In coal conveyors, two (2) nos. of infra-red detectors (with inbuilt air purging unit) shall be provided for each conveyor. Each conveyor shall have 1 detector each at a distance of 1 m from tail end and head end.
 - Siren – 3 km range diametric.



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- Manual call points shall be located as per cl. no. 6.3.8 of IS 2189. The call points will normally be provided for every 30m distance in indoor areas and for every 45 m in outdoor areas.
- Hooters shall be located as per cl. no. 4.3 of IS 2189.
- Isolator modules shall be provided as per manufacturer standards.
- Detectors will be installed at the highest point of the ceiling (as per IS 2189) and minimum coverage indicated by supplier will also be considered.
- The number of Detectors and their location will be so selected such that the internal area of the building is completely covered by the detectors. The zones of individual Detectors will overlap and no blind zone will be left.
- For Detectors mounted above false ceiling, a separate Response Indicator shall be mounted directly below the detector (on the false roof). When the detector is mounted below the false floor or in inaccessible position, response indicator for each of the detector shall be mounted on a separate box which shall be suitable for mounting on the wall.

d) Fire Alarm Panels

- The microprocessor based Fire Alarm Control Panel comprise of hot redundant processor.
- All the fire alarm circuits will be of modular design using electronic printed card circuits to facilitate easy replacement of faulty circuits with spare cards. All the electronic components and cards will be compatible to non-air-conditioned environment for working satisfactorily.
- The Microprocessor based Fire Alarm Control Panel will incorporate the following features:
 - Continuous supervision of the detector connecting lines, individual detector performance / operation and disconnection / removal of Detectors. The system will automatically reset on clearance of a fault.
 - Discrimination between a real fire and false fire conditions by incorporating signal verification and other features.
 - Pre-alarm in case of any detector(s) requiring maintenance.
 - Logging of alarm, time and action text on printers.
 - Programmed activation of various interlocks with fire protection system and other associated system such as ventilation and air conditioning, etc.
 - The Fire Alarm Control Panel will have adequate number of loops so as to cover all the areas to be protected. Provision shall also be made in Fire Alarm Control Panel to add additional detector loop modules for further expansion.

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- Fire Alarm Control Panel shall have provision for repeating annunciation of fire, water spray on, deluge valve signals for each area to be protected by interfacing with pressure switch/test switch or auxiliary contacts from fire protection panels.

Note: The features indicated above are indicative only and shall depend on the actual make of the Fire Alarm Panel.

e) Repeater Fire Alarm Panels

- All Repeater Panels will be Microprocessor based which will repeat all the annunciations from Fire Alarm Panels.

f) Power supply system for fire alarm detection system equipment:

- The system shall be provided with main power supply and a standby power supply as per TAC norms. The standby power supply shall takeover automatically in case failure of main power supply.
- Main/Sub fire alarm panels normally operates on 230 V AC UPS power supply.
- Satellite Fire Alarm panels and Repeater panels shall operate on 240V, 1-Ph, non-UPS power supply.
- In addition to above, fire alarm panels shall be provided with two sets of (1 working & 1 standby, 100% capacity each) of 24 v sealed maintenance free lead acid battery with battery charger as standby power source for 48 hours of normal operation which will cut-in automatically in the event of AC power failure and 30 min of alarm condition.
- Control and power cables used for FDA system in CHP area shall be Fire Survival MICA type with EPR insulation and Type-SE3 outer sheath.
- For other areas, control and power cables shall be FRLS Type-A and FRLS Type-C respectively.
- 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.

3.8 Foam Protection System

- a) Automatic foam protection system will be provided for LDO oil storage tanks located in fuel oil dyke area. The system will be designed as per NFPA – 11 and TAC.



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The system will consist of two foam concentrate tank (MS with 2 mm FRP lining) with foam concentrate, foam ejectors with discharge outlets, associated piping, valves, fittings, instrumentation etc. It will be discharged to the foam inductors through 2 x 100% capacity foam pumps (Motor driven) through balancing line, with control valves, flow controllers etc. The foam will be Aqueous Film Forming Foam (AFFF) type.

- b) All the foam protection system equipment are located in foam pump house.
- c) Foam pumps shall be controlled from a RIO based local control panel. This panel is located in foam pump house. This panel is hard-wired with main fire alarm panel through potential free contacts.
- d) Foam pumps are powered by 415 V AC, 50 Hz and RIO based panel is powered by 230 V. The RIO based panel shall have a redundant UPS power supply.
- e) Apart from primary protection, supplementary protection shall be provided with 3 Nos. of Mobile foam unit (self contained unit) each of min. capacity of 189 LPM.

Operation of Foam System

- a) In case of a fire inside the tank, the detection system shall detect the fire and will cause following sequence of events through RIO based foam system panel:
 - Start the Foam pump
 - Open the Deluge valve of respective tank
 - Open the foam supply valve (Solenoid valve) to the respective foam proportioner.
- b) Further, following annunciations will appear in RIO based foam system panel:
 - Fire annunciation of respective tank
 - Pump running annunciation
 - "DV Open" annunciation for the respective deluge valve through the pressure transmitter at downstream of DV.
- c) Water from deluge valve flows through the proportioner where foam concentrate is injected and mixed with the flowing water in definite proportion. The foam water mixture flows to the foam chamber mounted at top of the protected tank where foam is generated and discharged in to the tank.

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- d) The foam will cover the entire burning oil surface thereby cutting off oxygen, cooling the oil surface and finally extinguishing the fire. The system can be operated locally by manual operation through DV local control panel in foam pump house.

Design Guidelines

- a) Foam concentrate tank will be sized based on the simultaneous operation of foam injection to one LDO tank and operation of two foam hydrants for 60 minutes considering foam-water spray application rate for the fuel tanks as 6.1 lpm / Sqm (Cl. No. 24.4.4.4 (I) of Vol-III, Chapter 24 of Bidding Doc. No. 14A14-SPC-G-0001) and foam water density of foam hydrants as 225 lpm (Clause 5.9.2.3 of NFPA-11; minimum recommended application rate of 189 lpm). The minimum foam application rate of 3% foam solution.

- b) Foam concentrate will be 100% AFFF type.

3.9 Inert Gas Extinguishing System

- a) Refer Annexure-2 (Area-wise fire protection and detection system) for the type of fire protection and detection system provided for different facilities and areas within the plant. However, following areas of TG building shall be protected with inert gas system:

- Control equipment room
- Common control room
- Computer room
- UPS/Battery charger room

- b) The inert gas system shall employ any of the proven inert gas specified as in NFPA-2001.

- c) The gas release panel of the cylinder bank shall be connected to the main fire alarm panel located in control room.

- d) The System consists of gas release panel, cylinders, nozzles, directional valves, check valves, manifolds etc.

- e) The gas release panel shall be power by 230 V. Standby power supply shall be catered by 24 V DC Ni-Cd batteries.

- f) Common cylinder bank with directional valve systems are provided for each protected area. Main cylinders will be calculated based on the single largest risk in

each protected area and these cylinders will be located in the cylinder storage room near the protected area.

Operation

- a) Fire detectors used in these areas (areas where inert gas is provided) are cross zoned. Upon receipt of signal from any detector in the protected enclosure & pre-discharge signal shall be sent to the main fire alarm panel. Upon receipt of signal from second detector from the protected enclosure & discharge signal shall be sent to the gas release panel of respective control room/ system, which activates the solenoid valve in the master control head of the inert system cylinder. Manual mechanical actuation of the inert cylinder is also possible using the Manual mechanical actuator in the master control head.
- b) Every zone does have one master cylinder (which can operate slave cylinders) which has release unit consist of solenoid actuator, manual actuator and contact gauge, mounted on the cylinder valve. When the solenoid valve opens, propellant from the gauge port on the cylinder valve trips the internal actuating device opening the cylinder valve. The cylinder valve will remain open until internal cylinder pressure reaches approx. 1 bar. A high-pressure pilot hose(s) inter-connect the cylinder valves. The interconnected cylinder valves opens simultaneously as the internal actuators are pressurized at the same time. Thus releases inert gas to the protected room area through a restrictor, Selector Valve, the distribution pipe work and the discharge nozzles.
- c) In Automatic operation, the detectors will send the fire signal to the main fire alarm panel. Then the signal is sent to the Pre-discharge Audio/Video Signal Unit to allow personnel evacuation prior to discharge. This alarm is for Personnel evacuation prior to system discharge takes place normally after a specified time delay (0-3 minutes adjustable, set time to be decided by client based on time required for personnel evacuation, supplier recommends for set time of 60 sec). Simultaneously the solenoid valve on the manifold gets energized through a signal from panel. This in turn will open the directional valve and the gas is released from the cylinder to the area under fire.

3.10 Portable Fire extinguishers

- a) Portable fire extinguishers are provided for the areas as per Annexure-2. In general, portable fire extinguishers are provided for all indoor and outdoor areas.
- b) Following type of fire extinguishers shall be provided.
 - Portable Carbon Dioxide type.
 - Portable Dry Chemical Powder type.
 - Portable Foam type.
 - Mobile Carbon dioxide type
 - Mobile Dry Chemical Powder type.

- c) Distribution of these extinguishers in various locations shall be as per the guidelines of TAC. (Separate document shall be submitted for Portable & Mobile Fire extinguishers titled as “Allocation Chart of Portable Fire Extinguishers, Doc. No: 9962-001-ES-151-PVM-H-002”).

4. MATERIAL OF CONSTRUCTION (MOC) OF MAJOR EQUIPMENTS

The major items of FPS system and their MOC is listed in the table below:-

SL. NO.	ITEM	MOC
1.	Fire water Pumps (Electric Motor Driven, Diesel Engine Driven)	• Casing : CI, IS 210 Gr Fg 260 • Casing liner : CI, IS 210 Gr Fg 260 • Impeller : SS 304 • Wearing rings : CF8 • Pump shaft : SS 410 • Base plate : MS:IS-2062 Gr-B • Wetted Fasteners : SS-316 • Mechanical Seal : As per Manufacturer's Standard
2.	Fire Water Booster Pumps	• Casing: Cast steel • Diffuser: Fabricated CS as per IS 2062 • Impeller: AISI-410 • Wearing Rings: AISI-410 • Shaft: AISI-410 • Shaft Sleeve: AISI-410 (Hardened) • Base Plate: MS to IS:2062 • Shaft Sealing: Mechanical Seal • Shaft Coupler: Forged/Cast Steel • Wetted Fasteners: SS 316
3.	Fire Water Jockey Pumps	• Casing: 2.5% Ni CI: IS 210 Gr.FG.260 • Casing Liner: 2.5% Ni CI: IS 210 Gr.FG.260 • Diffuser: Fabricated CS as per IS 2062 • Impeller: AISI-410 • Wearing Rings: AISI-410 • Shaft: AISI-410 • Shaft Sleeve: AISI-410 (Hardened) • Base Plate: MS to IS:2062 • Shaft Sealing: Mechanical Seal • Shaft Coupler: Forged/Cast Steel • Wetted Fasteners: SS 316

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4.	Fire Water Pipes (150 NB and below)	M. S. ERW pipes as per IS-1239, Part – 1 heavy grade
5.	Fire Water Pipes (200 NB and above)	M. S. ERW pipes as per IS-3589 Gr.410
6.	Fire Water Pipes (Over ground pipes normally empty but periodically charge with water & foam system applications)	Galvanized as per IS 4736
7.	Gate Valve (65 NB and above)	C.I. as per IS 14846. (Gate valves shall be outside screw rising spindle type for above ground Piping and Non Rising Spindle type for underground Piping.)
8.	Butterfly Valve	C.I. as per IS 13095
9.	Valves below 50 NB	As per IS 778
10.	HVWS Nozzle	SS
11.	MVWS Nozzle	SS
12.	Hydrant Valve	SS to IS: 3444
13.	Basket/Y Strainer	Body is MS fabricated as per IS 2062 and internal is S.S (AISI 316), 30 mesh
14.	Branch Pipe	SS to IS: 3444
15.	Air Release Valve	Gun Metal as per IS 318
16.	Deluge Valve	Cast Iron conforming to IS:210 Gr-260
17.	Flanges	ASTM A 105
18.	Fittings	Upto 1 ½ "ASTM A 105 and above 1 ½ "ASTM A 234 Gr. WPB. <u>Note:</u> All fittings and flanges for galvanized pipes shall be galvanized as per IS 4736.
19.	Hose Pipe	Reinforced Rubber Lined Fire Hose as per IS 636, Type – A
20.	Bolts, Screws and Nuts	As per IS 1363 (Part I and II)

LIST OF ANNEXURES

Sl no	Drawings/Documents	Drg/Doc no
i.	Supporting Sheet For Finalizing The Fire Water Pump Capacity And Head	Annexure-1
ii	Area-wise Fire Protection and Detection system	Annexure-2



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ANNEXURE-1**SUPPORTING SHEET FOR FINALIZING THE FIRE WATER PUMP CAPACITY AND HEAD -****Hydrant system –****a) Flow of The Hydrant Pump -**

Total Nos of Hydrant and water monitors (approx.)

Hydrants (Including Landing Valves) - 223 Nos – (i)

Water Monitors – 26 Nos

Each water monitor is equivalent to 4 nos of hydrant valves, so

Effective hydrant valves in place of water monitor is – 4 x 26 nos – 104 Nos. – (ii)

Hence, total nos of hydrant valves (i+ii) – 327 Nos

The capacity for hydrant service shall be determined by the clause no 7.4.1.4.1 of TAC, Table -02, which states for 1st 100 hydrants, 273 m3/hr Pump capacity is required and Extra 273 m3/hr pump capacity is required for every additional 125 hydrants or part thereof.

Hence, for 327 nos of hydrants, Pump capacity in line with above TAC guidelines shall be

S.No	Nos of Hydrants	Pump capacity	Remarks
01	0-100 hydrants	273 m3/hr	
02	100-225	273 m3/hr	
03	226-327	273 m3/hr	Part thereof
	Total	819 m3/hr	

So, Total Pumping capacity required is 819 m3/hr. Hence, 410 m3/hr. Pump capacity is selected for single Hydrant pump, and to meet the pumping capacity, 02 nos of hydrants pumps with 410m3/hr. pumping capacity is selected. Hence total working capacity is 820 m3/hr.

b) Header of The Hydrant Pump -TAC states that, minimum pressure at the remotest Hydrant should be 3.5 Kg/cm².

Head of the hydrant pump is calculated to meet the pressure requirement of remotest Hydrant, as this is the worst case.

It can be ensured that, Head of hydrant pump that is sufficient for the remotest hydrant (worst case), will be surely sufficient for other hydrants also.

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In line with above mentioned philosophy, Highest landing valve of Boiler is considered as the remotest nozzle.

Hence, –

Pressure requirement at the Top of landing valve (78.5 meters height)	3.5 Kg/cm ² .
Pressure loss due to static height (78.5 meters)	7.85 Kg/cm ² .
Pressure loss due to Pipe and fittings (maximum)	1.5 Kg/cm ²
Net Pressure required at the Pump Outlet	12.85 Kg/cm²

Pressure required at the Pump outlet is **12.85 Kg/cm²**. Selected head of Pump is 12.0 Kg/cm². Since, selected hydrant Pump Head is not sufficient to meet the Pressure requirement at top of landing valve; Hydrant booster pump shall be utilized to generate additional pressure.

Spray system -

a) Flow of The Spray Pump -

Flow of the spray pump is calculated for meeting the maximum possible water demand of the Spray system of equipment/Area/ building etc.

For this project, Maximum water demand is for the MVWS System of LDO Tanks is approx. 9000 LPM or 540 m³/hr.

Since the Spray Pump being selected for this project is having the approx. rated flow of 410 m³/hr @ 120 MWC, the requirement of spray water of 540m³/hr @ 75 MWC can be met with the same pump. Based on the above, the spray system pumping configuration for this project shall be 2 Nos. (1 Motor Driven-working + 1 Diesel Engine Driven)

b) Head of The Spray Pump –

Spray pumps cater to both HVW and MVW spray system. It may be noted that, all HVW spray system are low rise structures. However, MVW spray system includes many high rise structures like (Transfer Points and conveyors), which becomes the hydraulically remotest structures (Worst case)

TAC clause no 6.2.4.1.8 that all spray nozzles of the medium velocity spray system should be in the range of 1.4 to 3.5 Kg/cm².

Head of the Spray pump is calculated to meet the pressure requirement of remotest



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Nozzles of MVWS system, as this is the worst case.

Hence, it can be ensured that, Head of spray pump that is sufficient for the remotest Structure of the MVW spray system (worst case), will be surely sufficient for other HVW spray system also.

In line with above mentioned philosophy, spray nozzles in the MVWS of transfer point near Boiler Bunker area, is considered as the remotest nozzle.

Hence,

Pressure requirement at the remotest nozzle of Transfer point near boiler bunker	1.4 Kg/cm ² .
Pressure loss due to static height (71 meters)	7.1 Kg/cm ² .
Pressure loss due to Pipe and fittings (maximum)	1.5 Kg/cm ²
Net Pressure required at the Pump Outlet	10.0 Kg/cm²

Pressure required at the Pump outlet is 10.0 Kg/cm². Selected head of Pump is 12.0 Kg/cm² which is sufficient to meet the design requirements.

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Annexure-2: Area-Wise Fire Protection and Detection System, 1 X 660 MW UPRVUNL PANKI

Sr. No.	Buildings/ Facilities	TYPE OF PROTECTION								TYPE OF DETECTION						MCP	Remarks
		Hydrant / Water Monitor			Water Spray		IGES	Portable / Mobile fire Extinguisher	Foam Injection	Multisensor detector	Infrared Detector	LHS Cable	Q.B. detector	Heat detector	Beam detector		
		Water Monitor	External Hydrant	Landing Valve/Fire Escape Hydrant	HVWS	MVWS											
1	Power House Building		√	√				√								√	
1.1	Ground floor (EL +0.0 m)							√								√	
1.2	Boiler feed pump lube oil tanks, coolers, purifiers, consoles etc. (2 Nos.)				√							√					
1.3	Generator seal oil systems tanks, cooler assembly etc. (1 No.)				√							√					
1.4	Central lube oil tanks (Both clean and dirty oil units) and purifier units - (1 No.)				√				√			√					
1.5	Cable Spreader Room (+0.0m)					√			√		√					√	
1.6	SWAS Room at (+0.0m)								√							√	
1.7	AC Plant at (+0.0m)								√								
1.8	Inert Gas Room at (+0.0m)								√								
1.9	HT switchgear room (+3.5 m)							√	√							√	
1.10	Mezzanine floor (EL +8.5)			√				√									
1.11	Cable Spreader Room El (+8.5 m)					√			√		√						
1.12	Steam turbine lube oil storage tanks, oil coolers and purifier units (+8.5) (1 No.)				√							√					
1.13	220V Battery room (+8.5 m)												√				
1.14	UPS Battery Room (+8.5m),						√						√				
1.15	AHU Room (+8.5m),								√								
1.16	LT switchgear room (+12.0 m)							√	√							√	
1.17	Cable Spreader Room (+13.5)					√		√	√		√					√	
1.18	Operating floor (EL +17.0 m)			√				√									
1.19	Turbine Oil Canal (1 No.) (+17.0 m)				√							√					
1.20	Central Control room (+17.0 m)						√		√								
1.21	Control equipment room (+17.0 m)						√		√								
1.22	Computer room (+17.0 m)						√		√								
1.23	Cable Spreader Room (+24.0 m)			√		√		√	√		√					√	
1.24	AHU Room (+24.0 m)								√								
1.25	Air Washer Room (+24.0 m)								√								
1.26	Boiler MCC room (+28.0m)							√	√								
2	Boiler Area	√	√					√								√	
2.1	Air preheater area	By BHEL Piping Centre Chennai															
2.2	Boiler Mill	By BHEL Piping Centre Chennai															
2.3	Boiler Platforms			√												√	
2.4	Boiler burner fronts including fuel oil racks				√							√					
3	ESP Area	√	√													√	
3.1	Common ESP & FGD control room		√	√				√									
3.1.1	Cable Vault					√			√		√					√	
3.1.2	MCC/Switchgear room								√							√	
3.1.3	Control room								√								
4	Auxiliary Boiler		√					√								√	

Annexure-2: Area-Wise Fire Protection and Detection System, 1 X 660 MW UPRVUNL PANKI

Sr. No.	Buildings/ Facilities	TYPE OF PROTECTION							TYPE OF DETECTION						MCP	Remarks	
		Hydrant / Water Monitor			Water Spray		IGES	Portable / Mobile fire Extinguisher	Foam Injection	Multisensor detector	Infrared Detector	LHS Cable	Q.B. detector	Heat detector			Beam detector
		Water Monitor	External Hydrant	Landing Valve/Fire Escape Hydrant	HVWS	MVWS											
4.1	Aux boiler platform															√	
4.2	Aux. Boiler Burner Front				√								√				
5	Transformer Yard Area		√					√								√	
5.1	Generator Transformer (3 Nos.) + 1 No. spare GT Transformer -275 MVA				√								√				
5.2	Unit Transformer (2 Nos.) - 45 MVA				√								√				
5.3	Unit Auxiliary Transformers (2 Nos.) - 16 MVA				√								√				
5.4	Station Transformer (2 Nos.) - 110 MVA				√								√				
6	Switchyard Area	By BHEL TBG, Refer “Design Philosophy for Fire Fighting System”; Doc No. 9962-001-TB-572-PVM-U-002															
7	Emergency Diesel Generators (1750 KVA)- 2 Nos		√					√								√	
7.1	Oil tanks					√							√				
8	Fuel Oil Area							√								√	
8.1	LDO Storage Tanks		√ (Foam hydrant)			√		√					√	√			
8.2	Pressuring & Heating Unit		√			√							√				
8.3	Electrical Annexe								√							√	
8.4	LDO Unloading Pump House		√			√										√	
8.4.1	Electrical MCC & Switchgear Room								√							√	
9	Air Compressor House		√					√								√	
9.1	Air compressor Room								√							√	
9.2	MCC Room								√								
9.3	Air Washer Room								√								
10	PT Plant, DM Plant, CPU, CW & ACW System		√													√	
10.1	CW Fore Bay and CW & ACW Pump House		√					√	√								
10.1.1	Electrical Annexe								√							√	
10.1.2	Control room								√							√	
10.1.3	CW Treatment Plant								√								
10.2	CW Chlorination Plant		√					√									
10.2.1	MCC room								√							√	
10.2.2	Control room								√								
10.2.3	Battery room								√								
10.2.4	Side Stream Filtration Unit																
10.3	Chemical House		√					√	√							√	
10.3.1	MCC room								√							√	
10.3.2	Control room								√								
10.3.3	Battery room												√				
10.3.4	RW Chlorination								√								

Annexure-2: Area-Wise Fire Protection and Detection System, 1 X 660 MW UPRVUNL PANKI

Sr. No.	Buildings/ Facilities	TYPE OF PROTECTION							TYPE OF DETECTION						MCP	Remarks	
		Hydrant / Water Monitor			Water Spray		IGES	Portable / Mobile fire Extinguisher	Foam Injection	Multisensor detector	Infrared Detector	LHS Cable	Q.B. detector	Heat detector			Beam detector
		Water Monitor	External Hydrant	Landing Valve/Fire Escape Hydrant	HVWS	MVWS											
10.3.5	DM Storage Tanks									√							
10.4	DM Plant		√						√								
10.4.1	MCC room									√						√	
10.4.2	Control room									√							
10.4.3	Battery room													√			
10.4.4	Chemical Lab								√	√						√	
10.4.4.1	Coal Analysis Lab									√							
10.4.4.2	Store									√							
10.4.4.3	Water Analysis Lab									√							
10.4.4.4	Environmental & Metro									√							
10.4.4.5	Instrumentation Room									√							
10.4.4.6	Chemist Room									√							
10.4.4.7	Oil Anaylsis Lab									√							
10.4.4.8	Office Room									√							
10.5	CPU Regeneration Building		√						√							√	
10.5.1	MCC room									√							
10.5.2	Control room									√							
10.5.3	Battery room													√			
11	AHP SYSTEM		√						√								
11.1	Ash Slurry Pump House		√							√						√	
11.2	AHP Vacuum Cum Compressor House		√						√								
11.2.1	Cable Vault					√				√		√				√	
11.2.2	MCC room									√						√	
11.2.3	Control room									√							
11.3	Ash Water Pump Cum Chemical House		√						√	√						√	
11.4	Silo Utility Building Cum HCSD Pump House		√						√							√	
11.5	Ash Silo		√						√							√	
12	CHP AREA		√														
12.1	Wagon Tippler Complex		√	√					√	√						√	
12.1.1	Control room									√							
12.2	Junction Towers	√	√	√		√			√							√	Water Monitor above 15 m elevation
12.3	Coal Conveyors	√	√			√					√	√	√				Water Monitor above 15 m elevation
12.4	Crushed Coal Stock Piles	√	√													√	
12.5	Stacker reclaimr	√	√						√							√	
12.6	Crusher house	√	√	√		√			√				√			√	
12.7	ERHC		√						√							√	
12.8	CHP MCC-1		√						√	√						√	
12.8.1	Cable Vault					√				√		√					
12.8.2	MCC room									√							
12.8.3	Control room									√							
12.8.4	Battery room													√			

Annexure-2: Area-Wise Fire Protection and Detection System, 1 X 660 MW UPRVUNL PANKI

Sr. No.	Buildings/ Facilities	TYPE OF PROTECTION								TYPE OF DETECTION						MCP	Remarks
		Hydrant / Water Monitor			Water Spray		IGES	Portable / Mobile fire Extinguisher	Foam Injection	Multisensor detector	Infrared Detector	LHS Cable	Q.B. detector	Heat detector	Beam detector		
		Water Monitor	External Hydrant	Landing Valve/Fire Escape Hydrant	HVWS	MVWS											
12.9	CHP MCC-2		√					√		√						√	
12.9.1	Cable Vault					√				√		√					
12.9.2	MCC room									√							
12.9.3	Control room									√							
12.9.4	Battery room													√			
12.10	CHP MCC-3		√					√		√						√	
12.10.1	Cable Vault					√				√		√					
12.10.2	MCC room									√							
12.10.3	Control room									√							
12.10.4	Battery room													√			
12.11	CHP MCC-4		√					√		√						√	
12.11.1	Cable Vault					√				√		√				√	
12.11.2	MCC room									√							
12.11.3	Control room									√							
12.11.4	Battery room													√			
12.12	CHP MCC Transformers of 7.5 MVA (2 nos.)				√			√					√				
13	FGD AREA		√														
13.1	Gypsum Dewatering Building		√					√		√						√	
13.2	Limestone Crusher House		√					√								√	
13.3	Limestone Storage Shed		√					√								√	
13.4	Limestone Transfer Tower		√					√								√	
13.5	Gypsum Storage Shed		√					√								√	
13.6	Ball Mill Building		√					√								√	
13.7	FGD Aux Transformer (2 No.) - 7.5 MVA				√			√					√				
14	Chimney Area		√					√								√	
15	Cooling Tower		√					√								√	
16	Condensate Transfer Pump House		√					√								√	
17	Hydrogen Generation Plant		√					√		√						√	
18	ETP		√					√								√	
18.1	MCC room									√							
18.2	Control room									√							
18.3	Battery room													√			
19	Raw Water Intake Pump House (Canal Intake)		√					√								√	
19.1	MCC room									√							
19.2	Control room									√							
19.3	Battery room									√				√			

Annexure-2: Area-Wise Fire Protection and Detection System, 1 X 660 MW UPRVUNL PANKI

Sr. No.	Buildings/ Facilities	TYPE OF PROTECTION							TYPE OF DETECTION						MCP	Remarks	
		Hydrant / Water Monitor			Water Spray		IGES	Portable / Mobile fire Extinguisher	Foam Injection	Multisensor detector	Infrared Detector	LHS Cable	Q.B. detector	Heat detector			Beam detector
		Water Monitor	External Hydrant	Landing Valve/Fire Escape Hydrant	HVWS	MVWS											
20	Raw Water Discharge Pump House		√					√								√	
20.1	MCC room									√							
20.2	Control room									√							
20.3	Battery room													√			
21	Ammonia Unloading & Storage Area for SCR System		√					√								√	
22	Gate Complex/Gates		√					√		√						√	
23	Security Complex & Time Office		√					√		√						√	
24	Dozer Shed		√					√								√	
25	STP		√					√								√	
26	Dispensary		√					√		√						√	
27	Recovery Water Pump House		√					√		√						√	
28	Canteen		√					√								√	
28.1	Kitchen Area									√							
28.2	Dining Area									√							
28.3	Manager Room									√							
28.4	Staff Room									√							
28.5	Refrigerator Room									√							
28.6	Store Room									√							
28.7	Pantry													√			
29	Administration Building		√	√				√								√	
29.1	Ground Floor (+0.0 M)							√									
29.1.1	AC plant room									√							
29.1.2	MCC room									√							
29.1.3	AC Control Room									√							
29.1.4	Battery room													√			
29.1.5	Store									√							
29.1.6	EPBAX Room									√							
29.1.7	Bank									√							
29.1.8	Medical Room									√							
29.1.9	IT Switch Panel Room									√							
29.1.10	Meeting Room									√							
29.1.11	Waiting Lounge									√							
29.1.12	Exhibition Room									√							
29.1.13	AHU									√							
29.1.14	Lift Lobby									√							

Annexure-2: Area-Wise Fire Protection and Detection System, 1 X 660 MW UPRVUNL PANKI

Sr. No.	Buildings/ Facilities	TYPE OF PROTECTION							TYPE OF DETECTION						MCP	Remarks	
		Hydrant / Water Monitor			Water Spray		IGES	Portable / Mobile fire Extinguisher	Foam Injection	Multisensor detector	Infrared Detector	LHS Cable	Q.B. detector	Heat detector			Beam detector
		Water Monitor	External Hydrant	Landing Valve/Fire Escape Hydrant	HVWS	MVWS											
29.1.15	Canteen									√							
29.2	First Floor (+4.5 M)			√				√									
29.2.1	Workstations, Cabins									√							
29.2.2	Meeting room									√							
29.2.3	Conference Room									√							
29.2.4	IT Switch Panel Room									√							
29.2.5	Lift Lobby									√							
29.2.6	Model Room									√							
29.2.7	AHU									√							
29.3	Second Floor (+9.0 M)			√				√									
29.3.1	Workstations, Cabins									√							
29.3.2	Meeting room									√							
29.3.3	Video Conference Room									√							
29.3.4	IT Switch Panel Room									√							
29.3.5	AHU									√							
29.3.6	Archive room									√							
29.3.7	Library									√							
29.3.8	Lift Lobby									√							
30	Service building		√	√				√								√	
30.1	Ground Floor (+0.0 M)							√									
30.1.1	Battery Room													√			
30.1.2	EPBAX Room									√							
30.1.3	VIP Lounge									√							
30.1.4	Visitor Waiting Room									√							
30.1.5	Safety & Welfare Cell									√							
30.1.6	AC Control Room									√							
30.1.7	MCC Room									√							
30.1.8	Model Room									√							
30.1.9	AC Plant Room									√							
30.1.10	Store									√							
30.1.11	Lift Lobby									√							
30.1.12	AHU Room									√							
30.1.13	Electrical Room									√							
30.1.14	Pantry													√			
30.1.15	Conference room									√							
30.1.16	First Aid Room & Doctor's Cabin									√							
30.2	First Floor (+4.25 M)			√				√									
30.2.1	Workstations, Cabins									√							
30.2.2	Meeting Room									√							
30.2.3	Conference Room & Mini Conference Room									√							
30.2.4	AHU Room									√							
30.2.5	Lift Lobby									√							
30.2.6	Pantry													√			

Annexure-2: Area-Wise Fire Protection and Detection System, 1 X 660 MW UPRVUNL PANKI

Sr. No.	Buildings/ Facilities	TYPE OF PROTECTION								TYPE OF DETECTION						MCP	Remarks
		Hydrant / Water Monitor			Water Spray		IGES	Portable / Mobile fire Extinguisher	Foam Injection	Multisensor detector	Infrared Detector	LHS Cable	Q.B. detector	Heat detector	Beam detector		
		Water Monitor	External Hydrant	Landing Valve/Fire Escape Hydrant	HVWS	MVWS											
30.2.7	Store									√							
30.2.8	IT Switch Panel Room									√							
30.2.9	Server Room									√							
30.2.10	C&I Lab									√							
30.2.11	Electrical Room									√							
30.2.12	Record Room									√							
30.3	Second Floor (+8.50 M)			√				√									
30.3.1	Workstations, Cabins									√							
30.3.2	Record Room									√							
30.3.3	Mini Conference Room									√							
30.3.4	IT Switch Panel									√							
30.3.5	AHU Room									√							
30.3.6	Lift Lobby									√							
30.3.7	Pantry													√			
30.3.8	Store									√							
30.3.9	Electrical Room									√							
30.3.10	Electrical Lab													√			
30.3.11	Documentation Room									√							
30.4	Third Floor (+12.75 M)			√				√									
30.4.1	Workstations, Cabins									√							
30.4.2	Mini Conference room									√							
30.4.3	Store									√							
30.4.4	Pantry													√			
30.4.5	IT Switch Panel									√							
30.4.6	Lift Lobby									√							
30.4.7	AHU Room									√							
30.4.8	Electrical Room									√							
30.4.9	Relay Testing Lab									√							
30.5	Fourth Floor (+17.00 M)			√				√									
30.5.1	Workstations, Cabins									√							
30.5.2	Mini Conference room									√							
30.5.3	AHU Room									√							
30.5.4	Transmitter Lab									√							
30.5.5	IT Switch Panel									√							
30.5.6	Lift Lobby									√							
30.5.7	Electrical Room									√							
30.6	Terrace Floor (+21.25 M)							√									
30.6.1	Machine Room									√							
30.6.2	O&M Store & Locker Room									√							
31	Workshop		√					√		√						√	
31.1	Workshop Area									√							
31.2	MCC Room									√							
31.3	Store Room/Tool Room									√							

Annexure-2: Area-Wise Fire Protection and Detection System, 1 X 660 MW UPRVUNL PANKI																	
Sr. No.	Buildings/ Facilities	TYPE OF PROTECTION							TYPE OF DETECTION						MCP	Remarks	
		Hydrant / Water Monitor			Water Spray		IGES	Portable / Mobile fire Extinguisher	Foam Injection	Multisensor detector	Infrared Detector	LHS Cable	Q.B. detector	Heat detector			Beam detector
		Water Monitor	External Hydrant	Landing Valve/Fire Escape Hydrant	HVWS	MVWS											
31.4	Workshop Staff Office									√							
31.5	Gents Change Locker Room									√							
31.6	Ladies Change Locker Room									√							
32	O&M Permanent Stores/Storage Area		√						√						√		
32.1	Store Office		√						√								
32.1.1	Hot Store									√							
32.1.2	Cold Store (AC area)									√							
32.1.3	C&I Store (AC area)									√							
32.1.4	Receipt room									√							
32.1.5	Inspection Area									√							
32.1.6	Pantry									√							
32.1.7	Office (AC area)									√							
32.1.8	Conference Room (AC area)									√							
32.1.9	PA Room (AC Area)									√							
32.1.10	Superintendent Office (AC Area)									√							
33	Fire Fighting Systems																
33.1	Fire Station		√						√						√		
33.2	Fire Water Booster Pump House		√						√						√		
33.3	Clarified/Fire Water Storage Pump House		√						√						√		
33.3.1	Control Room								√								
33.3.2	Electrical Annexe								√								
33.4	Foam Pump House		√						√						√		
Notes:																	
1)	Number and type of portable fire extinguishers shall be specified during detail engineering. Actual placement/installation shall be as per TAC and shall be finalized in "Schedule of Fire extinguishers"																