

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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WATER SPRAY SYSTEM COMPRISING OF HVWS & MVWS: –

Systems shall comprise network of pipelines with distribution control units, open spray nozzles (capable of spraying water with medium velocity for cable premises and high velocity for oil premises and transformers), automatic fire detection cum alarm facility, deluge valves, on line strainers, instrumentation (pressure switches, limit switches, pressure gauges) gate valve & deluge valve housing / room etc. Bypass gate valves shall also be provided for each deluge valve.

A common pump house (Fire water pump house) shall be planned which shall house pumps for hydrant and water spray system. However headers for both systems shall be separate with interconnectivity with non-return valve and gate valves. The construction of Fire Water Reservoir, Fire Water Pump House (FWPH) and erection of all related equipments therein, shall be under the scope of the Bidder.

The water spray system shall be designed as per TAC and NFPA guidelines.

MAIN COMPONENTS OF THE SYSTEM

The HVWS/MVWS System shall be provided with the following major components:

- a/ Water Supply at high Pressure
- b/ Arrangement of Spray Nozzles
- c/ Arrangement of Quartzoid Bulb Detectors (for HVWS & MVWS)
- d/ Deluge Valve
- e/ Y-type Strainers just before deluge valve
- f/ Pipes, fittings and fixtures
- g/ Basket strainers in HVWS / MVWS system header
- i/ Pressure gauges, pressure switches and solenoid valves
- j/ Fire detectors
- k/ De-watering pumps

OPERATION OF THE SYSTEM

Initially, delivery line should be pressurised upto deluge valve with the help of electrically driven Main Pump/Jockey pump and the water line pressure upto deluge valve should be maintained at around 10 Kg/cm². The Q.B. detector line should be pressurised with help of water which should be tapped from the header itself. Deluge valve clack is kept in horizontal position in normal condition due to balanced hydraulic pressure on two sides of the clack.

In case of transformer fire, temperature will rise all around the transformer. On reaching a predetermined temperature quartzoid bulb detectors, which are installed on pressurised water line (water for which is tapped from the main header itself), will shatter. As the bulb shatters, water in the detector line gets released through the detector openings and water pressure in detection line

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drops rapidly. This results in creation of pressure differential in the deluge valve and leads to latter's actuation. During this operation pressure in the water delivery line falls rapidly resulting in start up of main electrical driven pump. In case of power failure, pressure in the header shall go on decreasing causing start up of diesel engine driven pump.

In case of cable galleries / oil premises the actuation of deluge valves are effected by signal from intelligent addressable fire detection and alarm system provided in the premises. Cable galleries shall be provided with linear heat sensing cables and fixed temperature cum rate of rise heat detector (intelligent type) shall be provided for the oil premises. These have been described in detail in FDA specification. In the event of fire in the premises, the detection system shall give signal to Main Fire Alarm Panel (MFAP) which in turn shall actuate the solenoid of the deluge valve concerned. Each deluge valve shall be provided with local control panel with its normal power supply as well as battery backup with charging facility for 48 hours duration. Interface units in adequate numbers shall also be provided to transmit the signal/ control between each deluge valve and main fire alarm panel. All cabling, electrics complete in all respect shall be included in the bidders scope. There shall be provision for manual operation of the system also by operating quick opening valves of each deluge valve.

Following signals shall be obtained on the local deluge valve panel and main fire alarm panel for each deluge valve.

1. DV has operated
2. DV/Solenoid valve failed to open
3. Low detection pressure
4. Fire signal

Design Criteria for High Velocity Water Spray Systems (HVWS)

The High Velocity Water Spray System shall be designed as per the stipulation of TAC rules on the subject as well as NFPA's guidelines. Following salient parameters shall be followed by Bidder for the design of the system.

- Water application rate – 10.2 lpm / m² of the surface area of the entire transformer including bottom surface, radiators etc.
- Water application rate – 10.2 lpm / m² of the surface area of the oil tanks and other oil facilities etc.
- The system shall be so hydraulically designed that the pressure at the hydraulically most remote projector in the network shall not be less than 3.5 bars.
- Max. permissible pressure in any projector = 5.0 bars.

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- Velocity in the main header pipe shall not exceed 3m/sec & in the feed pipe after deluge valve shall not exceed 5 m/sec
- There shall be common header for (HVWS & MVWS) headers shall be inter-connected with a non-return valve in between so that hydrant system can be a back-up for the spray system.
- Q.B. detectors shall be installed in two rings one at top and another at bottom around the protected area of the transformers. Maximum spacing between detectors shall not exceed 2.5 m.
- Projectors shall be installed in rings encircling the protected area. One ring shall be provided at the top and subsequently rings for every 3 m from top to bottom shall be provided.

Design criteria for medium velocity spray system (MVWS)

The medium velocity water spray shall be designed as per the stipulation of TAC rules on the subject as well as NFPA's guidelines.

Following salient parameters shall be followed for the design of the system.

- Water application rate for conveyors – 10.2 lpm / m² of the exposed surface area of the belt.
- Water application rate for cable racks – 12.2 lpm / m² of the exposed surface area of the cable racks.
- The system shall be so hydraulically designed that the pressure at the hydraulically remotest sprayer shall satisfy the following conditions:

For Conveyors:

Pressure at remotest sprayer – not less than 1.4 bars

Pressure at most favourable sprayer – not more than 3.5 bars

For Cable Galleries/ cable tunnel

Pressure at remotest sprayer – not less than 2.8 bars

- There shall be common header for HVWS and MVWS systems which shall be fed water from the pump dedicated for the spray system. The hydrant header and spray system (HVWS & MVWS) headers shall be inter-connected with a non-return valve in between so that hydrant system can be back-up for the spray system.
- The protected area shall be divided into several zones, each of which shall be fed by individual deluge valve. In event of fire water shall be sprayed on the zone concerned (i.e. zone under fire) along with preceding and succeeding zones.
- Distribution of sprayers:

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Sprayers shall be providing to spray water on both the top side and bottom side of the conveyor belts. Spacing between sprayers shall not be more than 4m.

The sprayers shall be installed in rows at the central aisle between the cable trays and spaced at not more than 3 m from each other.

Provision for manual operation of the system shall also be made to operate the system in case of failure of the automatic mode.

For the protection of deluge valves from mechanical damage and atmospheric conditions civil rooms shall be provided. Standard fence and door shall be provided in addition to illumination facility. Inside the buildings structural room can be provided with ceiling.

Water drainage is to be ensured particularly in cable tunnels / cable basement & oil premises where HVWS/MVWS system have been provided. In no case, water accumulated after spray would find its way to floors / equipments at lower elevations. Proper slope is to be provided in the cable galleries and other premises so that all the sprayed water flow through the specifically constructed drains and no water gets accumulated in the area. To stop water fall to lower elevation (below cable galleries / premises) all the openings shall be closed / properly barricaded.

EQUIPMENT SPECIFICATION

Deluge Valve Assembly

Deluge valve assembly functions on differential pressure operation allowing quick opening of the valve and thereby rush of water to the protection system. The valve consists of inlet, outlet and priming chamber. The inlet and outlet chambers are separated from the priming chamber by the valve chamber and a diaphragm. In the 'Set' position, pressure is applied to the priming chamber through a restricted prime line. The pressure is trapped in the priming chamber and holds the clapper on the seat due to the differential design. In the 'Set' position the clapper separates the inlet from the outlet keeping the system piping dry. When the pressure is released from priming chamber, the clapper moves and allows the inlet water supply to flow through the outlet and to the fire extinguishing system. All component / equipment of the system including Deluge valve shall be UL / FM approved and marked.

The deluge valve assembly will consist mainly of the following:

- Isolation valves on both upstream and downstream sides.
- Inline strainer
- Deluge valve proper
- Actuator/pilot assembly
- Drain valve
- Pressure gauges
- Solenoid valve
- Deluge valve housing

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The deluge valve shall be of resetting type, taking minimum time for resetting.
The deluge valve shall be UL/FM/TAC/IS approved make.

Spray nozzles (Projectors and sprayers)

Water spray nozzles for the system shall be of suitable orifice size and varying discharge angles to cover fully all the area supposed to be protected. The nozzles shall be of Stainless steel. The nozzles shall be normally open type with blowoff cap & internal strainer. Spray nozzles(projectors) shall bear UL/FM approval.

Strainer

Y type strainer shall be provided on the inlet side of each deluge valve assembly. The strainer shall prevent deposition of foreign particles in the valves and thereby malfunctioning of control valves. The material of construction of the strainer shall be of carbon steel and straining element shall be stainless steel.

Quartzoid bulb detectors

The Q.B. detectors shall bear UL/FM approval and shall have a temperature rating of minimum 79 degree centigrade. However the Bidder shall take into account the temperature at which they shall operate.

Fire Detectors (Part of Fire Detection & alarm system)

For details refer the FDA system described elsewhere in the specification.

Pipes, valves & fittings (HVWS & MVWS)

Pipes and pipe fittings in general shall comply with the requirements of BIS codes. Piping layout must follow good engineering practice. Proper attention shall be given to obtain full functional requirement of piping system with a layout which provides sufficient clearance for other equipment and other personnel and easy access for operation and maintenance.

All piping shall be complete in all respects and shall consist of necessary valves, fittings, supports, air release and drain valves and other accessories. The air release and drain valves shall be provided at high and low points respectively. Each of the branch connection taken from the network shall be provided with an isolation valve.

Wherever over-ground pipelines are crossing roads and railway tracks, they shall be laid on pipe bridges to provide the necessary clearance for the traffic movement. A minimum clear height of 6.0 m above road top level shall be maintained.

All pipe work shall be designed to provide complete flexibility to prevent

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development of undesirable forces or moments at points of connection to equipment, at anchorages or at guide points, due to thermal expansion. Flexibility shall be provided by changes of direction or by use of bends, loops, offsets etc.

The specification of pipes are as below.

T.S. for Pipes between deluge valve and main header

- | | | | |
|-----|--------------------------|---|---|
| i) | Upto 150 mm nominal size | - | M.S ERW Black pipes conforming to IS-1239- 1984 Part-I (heavy grade) With Plain ends. |
| ii) | 200 mm to 400 mm size | - | M.S. ERW Pipes conforming to IS-3589 -1973 but thickness as specified below |

Nominal Dia O.D X Thickness in mm

DN 200 mm	: 219.1 x 6.35
DN 250 mm	: 273.0 x 7.14
DN 300 mm	: 323.9 x 7.14
DN 350 mm	: 355.6 x 7.14
DN 400 mm	: 406.4 x 7.14

T.S. for Pipes and valves after deluge valve

The material of construction and manufacturing standard of pipes, fittings, valves, fasteners, gaskets, etc. shall be as described in table below:-

Nominal pressure (PN) - 10 Kg/Cm²
Test Pressure (PT) - 15 Kg/Cm²

S. No.	Items	Nominal dia.(mm)	Specification
1.	Pipe	65 and below	IS-1239 (Part-1) - 'Heavy, G.I.
		80	IS-1239 (Part-1) - Medium, G.I.
		100 to 150	IS-1239 (Part-1) - Medium, G.I.
		200 to 450	IS-3589 Gr.410 ERW pipe commercial quality or equivalent. Thickness same as in clause 11.02 (ii) above.
2.	Pipe fittings		A 234 Gr. IS-1239/3589/2062
2.1	Screwed fittings	65 & below	IS-1239 (Part-1) - Galvanised
2.2	Fabricated fittings		
	Bends	150 and above	Mitred bends with radius 1.5 DN from black pipe.

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S. No.	Items	Nominal dia.(mm)	Specification
	Tees/Crosses	150 and above	Fabricated from black pipes by smithing.
	Reducers	150 and above	Fabricated from black pipes by taper cutting and welding.
3.	Bolting	All sizes	IS - 1367
4.	Gaskets	All sizes	Sheets rubber to IS-635-`79 type-A, 3 mm thick compressed Asbestos to IS-2712-`79
5.	Flanges	All sizes	Slip on flanges to IS-6392 - `71 machined from Carbon Steel plates to IS-2002-`92 Gd. 2 with bore to suit pipe O.D.
6.	Valves		
	Isolation	50 & below	CI gate valves, screwed, as per IS-780 - `84 class - PN - 1.6
		65 to 300	CI gate valves, flanged as per IS- 780-84 class - PN - 1.6
		350 and above	CI gate valve, flanged as per IS-2906-`84, Class - PN - 1.6
	Throttling		
		50 and below	Gunmetal globe valve, Screwed, as per IS-778-`84 Class-2.
		65 to 300	CI globe valve with brass/bronze renewable seat rays flanged.

Fittings shall be supplied as per IS:1239-1992 Part II for pipes upto 150 mm dia and shall be fabricated from pipes for dia 200 mm and above.

Technical specification for valves:

The valves & sluice gates shall be designed, manufactured and tested as per relevant Indian Standards or as per other International standards acceptable to the Owner and will be suitable for the duty conditions specified below. All underground valves will be provided with valve chambers with RCC covers. The size of chambers shall be suitable for easy maintenance of the valve. Complete civil work for this is in the Bidder's scope.

S. No.	Items	Nominal dia.(mm)	Specification
1.	Isolation	Below 50	Forged Carbon steel gate valve, screwed as per API – 602 standard, class 800 # ASTM A-105, trim 13% Cr, Bolt/Nut – B7/2H, Socket end threading as per ANSI B.16.11 Gasket SPW S.S. 304 with CAF Hand Wheel - Cast steel