







CLAUSE NO.	TECHNICAL REQUIREMENTS			
FIRE DETECTION & PROTECTION SYSTEM				
1.00.00	GENERAL This section of specification covers specifications and broad design basis for various equipment and services of fire detection and protection system. Fire water spray pumps, spot protection hydrant system, storage tanks, its filling arrangement.			
2.00.00	All equipments/system components of complete fire detection and protection system shall be in accordance with the following: <ul style="list-style-type: none"> a) Underwriters Laboratories of USA b) LPCB-UK c) VDS d) FM-USA e) BIS (For the approval of pumps and valves) However, design and installation of complete system and requirements shall be approved by TAC accredited professional(s) – India. For situations, which are not covered by the standards, system shall be supplied and installed to ensure effective protection. The complete fire detection and protection systems shall be as per the guidelines/codes/standards/rules of the TAC/NFPA/IS:3034 / OISD etc and all the systems /equipments and installation shall be got approved from TAC accredited professionals by the bidder to enable Employer to obtain maximum applicable rebate on insurance premium. The responsibility of getting approval from TAC accredited professionals rests exclusively on contractor. Any other additional equipment not specifically mentioned in the technical specification but are found necessary to meet the requirements of TAC and also for safe and sound operation of the plant are to be included at no extra cost to Employer.			
3.00.00	GENERAL DESIGN CRITERIA			
3.01.00	Protection System The main fire protection system shall consist of fire detection cum medium velocity water spray (MVW) system for the various coal conveyors, transfer points, etc. For this, MS fire water storage tanks shall be created near available water source. These tanks would get water from existing available water line. Besides this, spot hydrants near strategic locations (JHs) shall also be provided, tapping for same shall be taken from spray header running along the conveyor structure.			
3.02.00	Detection System QBD, LHSC and IRDs shall be provided for coal conveyors.			
4.00.00	SYSTEM DESCRIPTION			
4.01.00	FIRE WATER STORAGE & PUMPING SYSTEM			
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4.01.01	<p>Two (2) numbers above ground MS tanks (each of 50% capacity) for fire water as per TAC guidelines shall be provided by the bidder. Minimum (effective) water storage requirement for fire protection system envisaged is 1000 m3.</p>			
4.01.01	<p>Each tank shall be provided with Ultrasonic type level transmitters and Level indicators, etc. Further, suitable filling, drainage connection shall also be provided for each tank.</p>			
4.01.02	<p>Fire water pumps (MVW spray system) shall be of horizontal centrifugal type.</p>			
4.01.03	<p>Two nos. fire pumps (one motor driven + one diesel engine driven) each of minimum capacity 410 Cu.M/Hr shall be provided for fire protection system for conveyors and TPs. Pump head shall be designed suitably to get minimum pressure of 1.4 Kg/Sq.Cm. at the remotest spray nozzle and 3.5 Kg/Sq.Cm. at the remotest hydrant point.</p> <p>Maximum speed of the pumps to be supplied for the fire protection system shall be 1500 r.p.m. The motor driven pump and the corresponding diesel engine driven pump shall be completely interchangeable in respect of speed, impeller, diameter etc. Pressure transmitter at each pump discharge and on common header along with all instrumentation cables (F type) shall be wired to the panel. Pressure transmitters shall be 24 volt DC operative, 2 wire microprocessor based with HART interface and indicating type suitable for field mounting and environment having 0.025% accuracy. Pressure and other switches shall be with contacts suitable for 0.5 amp. 220 volt DC and field mounted type having IP-65 degree of protection of housing. Repeatability shall be (+)/(-) 0.5%.</p>			
4.01.04	<p>The diesel engine drive of the pump shall conform to the requirements of TAC. Diesel engine shall be provided with batteries (2x100%) and battery chargers (2x100%).</p>			
4.01.05	<p>Battery of the diesel engine shall be lead acid type as per IS and shall be large enough to crank the engine twelve times successively, each for a duration of 10 sec. without any charging in between.</p>			
4.01.06	<p>The continuous engine brake horse power rating (after accounting for all auxiliary power consumption) and correction for temperature and altitude at the site conditions shall be atleast 20% greater than the requirement at the duty point of pump at rated RPM and in no case, less than the maximum power requirement at any condition within the operating range of the pump.</p>			
4.01.07	<p>Continuous drive motor rating (at 50 deg.C ambient) shall be at least 10% (ten percent) above the maximum load demand of the pump in the entire operating range.</p>			
4.01.08	<p>Pumps shall be designed for continuous operation at its best efficiency point to meet the specific requirements of the system for which it is to be employed.</p>			
4.01.09	<p>Pumps shall have continuously rising head characteristic from its operating point towards shut off without any zone of instability and power capacity characteristic shall be preferably non-overloading type.</p>			
4.01.10	<p>Pump shall be capable of furnishing not less than 150% of rated capacity at a head of not less than 65% of the rated head. The shut-off head shall not exceed 120% of rated head in the case of horizontal pumps as per TAC manual.</p>			
4.01.11	<p>The fire water pump house layout shall have sufficient space for the maintenance of the pump and diesel engine. Further, the fire water pump house shall be provided</p>			
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	with a electrically operated monorail hoist of capacity capable of lifting heaviest component but not less than 3 metric tones capacity.			
4.02.00	MVW SPRAY SYSTEM			
4.02.01	System shall be pressurized continuously to normal working pressure up to the Deluge valves and spray nozzles.			
4.02.02	It shall consist of Spray pumps, water mains network, Deluge valves, flow switches Isolation valves, Y-type strainers, spray nozzles/projectors / spray nozzles piping network, detection system, instrumentation (pressure switch, pressure gauge, flow switch & limit switch for isolation valves, etc), local control panels, cables etc.			
4.02.03	The system shall be automatic and shall be activated by a dedicated detection system i.e. QBD and LHSC to be provided for each of the equipment/area.			
4.03.00	Design Philosophy (Minimum Requirements)			
4.03.01	For MVW spray system, minimum running water pressure at any projector/spray nozzles shall not be 1.4 bar for Coal conveyor/TPs.			
4.03.02	Design discharge density shall be as per the rules of water spray system of Tariff Advisory Committee (TAC) and/or NFPA standards.			
4.03.03	In cable galleries (if applicable) the water spray shall cover the exposed area of all the trays and racks.			
4.03.04	An isolation valve shall be provided at both upstream and downstream of each of the deluge valve. The size shall be same as that of the deluge valve.			
4.03.05	The spray system for the coal conveyor system shall cover the exposed area of both the forward and return conveyors and idlers. In transfer points, the water spray shall cover the drive equipments, pulleys, chutes, other equipments of the floor, complete floor area at various elevations.			
4.03.06	The deluge valve (externally resetting type) assembly shall consist of accessories such as water motor gong, alarm test valves, drain valves, strainers for these valves, hydraulic releasing system, solenoid valves, etc. Deluge valve shall be provided with enclosure (modular type).			
4.03.07	A strainer ('Y' type) shall be provided at upstream of deluge valve.			
4.03.08	Strainer wire shall be SS (AISI 316), 30 SWG, 30 mesh. Strainer area shall be at least 4 times the pipe cross section at the pipe inlet. Pressure drop across strainer in clean condition shall not exceed 1.5 kg/cm ² at design flow of deluge valve.			
4.03.09	Pressure gauges and pressure switches at upstream and downstream of deluge valves shall be provided.			
4.03.10	The design features and make of all the projectors/ spray nozzles shall be UL/FM or equivalent approved / listed.			
4.03.11	Wet type detector network with venting arrangement shall be provided for spray system using quartzoid bulb detectors.			
4.03.12	Apart from automatic operation of deluge valve, it shall have provision for manual operation 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. DV local control panel shall be suitably interfaced with respective fire alarm panels located at RIO rooms in JHs.			
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4.03.13	<p>Various area of coal conveyers shall be divided into several zones, each of which shall be protected by an individual deluge valve. The zone divisions shall be designed in such a way that water requirement for any of the zone shall be limited to 1/3 (one-third) of single fire water pumping capacity (i.e. 135 m³/hr.) which supply water to this system.</p>			
5.00.00	<p>HYDRANT SYSTEM</p> <p>Hydrants valves shall be provided at strategic locations (JHs). The same shall be tapped from the spray header running along the conveyors.</p> <p>All hydrant valves shall be of stainless steel construction female oblique type conforming to IS: 5290 or Equivalent.</p> <p>Hoses shall be of non-percolating flexible type as per IS: 636 (Type-A) and or Equivalent.</p> <p>Branch pipes shall be constructed of stainless steel SS-316 at both ends. One end of the branch pipe will receive the quick coupling while the nozzles will be fixed to the other end.</p>			
6.00.00	<p>Hose Cabinets</p> <p>The external / internal hose cabinets shall be mounted on ground (outdoor /Wall mounted or column mounted type depending on site conditions.</p> <p>External & Internal hose cabinets shall have a 6 mm thick glass panel in front door with the word 'FIRE' painted on it with 150 mm (6") red letters.</p> <p>External & Internal hose cabinets shall be made of 16 gauge or thicker M.S. Sheets.</p> <p>The External & Internal hose cabinets shall have rubber bushings to prevent ingress of water and dust.</p>			
7.00.00	<p>FIRE DETECTION AND ALARM SYSTEM</p>			
7.01.00	<p>General (System Configuration)</p>			
7.02.00	<p>The fire detection and alarm system shall consist of various types of fire detectors, control cabling, fire alarm panels, etc. and the same shall be microprocessor based, analogue addressable type. Further, IRDs & LHSC (digital type) shall be provided for coal conveyors.</p>			
8.00.00	<p>Design Philosophy</p>			
8.01.00	<p>GENERAL</p> <p>a) PLC based panel at fire water pump house shall indicate the status of each pump, system pressure, operation of spray system, failure of starting of pumps, healthiness & failure of batteries/ chargers, main supply, low level of fuel oil of diesel engines, tripping of pumps, low level / very low level of water level in the water supply system, status of batteries & chargers of panels and diesel engines etc. Alarms from these panels shall also be available to operator at fire alarm addressable panel.</p> <p>b) Due to long distance between fire alarm panel at CHP control room and various field devices, suitable qty. of fire alarm panels shall be required at intermediate locations. These panels shall be located at RIO room envisaged in JHs. All these fire alarm panels shall be interconnected with each other as well as with fire alarm panel at CHP Control room through fibre optic cables.</p>			
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<p>8.02.00</p> <p>8.03.00</p>	<p>c) All the fire detection systems, process actuated switch devices such as pressure/flow switches and relays of control functions shall be hooked up with the analogue addressable fire detection and alarm system. Required addressable interface units shall be provided for various switch devices by the bidder to make them addressable.</p> <p>d) Detection System for Coal Conveyors</p> <p>(i) The LHS cable detector for each conveyor to be provided for both forward and return conveyors and shall be mounted as per the standard practice of the manufacturer/ supplier. The mounting arrangement shall be designed such a way that the same shall not hinder the normal operation and maintenance. Suspension of LHSC through flexible chains is a preferred arrangement.</p> <p>(ii) The detection zone/loop divisions of LHSC system shall match with the MVW spray system.</p> <p>(iii) Upon detection of fire either by QB detector or LHSC detector, the spray system shall be initiated. It shall also initiate spray system for the two adjacent zones after a time delay settable at site.</p> <p>(iv) The LHSC detector shall be provided with suitable interface unit, which shall generate/ make the signal compatible with fire alarm panel. In case, 24 V DC supply is not feasible for LHS signal then higher DC/AC voltage can be used. However, at FAP end conversion to 24V DC shall be done by the Contractor.</p> <p>(v) The infra red type (IR) detectors shall be suitable for detecting moving fires in coal conveyors.</p> <p>(vi) The IR detector shall stop the conveyor upon detection of fire and give audio-visual annunciation locally and in fire alarm panel.</p> <p>(vii) The IR detector shall be outdoor type weather proof and shall be able to function continuously in heavily coal-dust prone atmosphere without regular maintenance.</p> <p>(viii) The IR detector shall be designed to reject deceptive phenomenon such as electric arc, heaters, artificial light sources (HPSV/LPSV/incandescent lamps etc.) Sunlight etc. while retaining the inherent detection characteristics.</p> <p>(ix) Each of the IR detector shall be provided with its own purging arrangement using blowers, hoses, etc and required power supply shall be derived from the fire alarm panel. Alternatively, bidder may offer separate blowers (2x100%) for purge air supply for all the detectors and the complete air piping from the blowers to each of the IR detector shall be provided by the bidder.</p> <p>Short term fire proof cable shall be used for coal conveyors detection system as follows: Detector to detector / isolator/interface unit and detector/ interface/ isolator unit to JB.</p> <p>Operator work station for PLC system shall be PC with 19 inch TFT SVGA monitor, scrolled mouse and A4 size laser printer in FWPH and a GIU on panel. The PC & GIU shall be interfaced with the PLC system network. Network shall be redundant. Further, from operation and monitoring from CHP control room Fibre optical connectivity to be provided.</p>			
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8.04.00	Fibre optical transmission is envisaged for signal transmission between PLC Panel and Fire alarm panel at CHP Control room and shall include transmitters, receivers, fibres, amplifiers, multiplexers taking care of wavelength, attenuation and repeaters so as to have error free bi-directional signal transmission. Fibre optical cables shall be provided with mechanical protection from surrounding.			
8.05.00	Instrumentation cables to be used for switches shall be G type (individual Pair Shielding) and for transmitters F type (individual Pair & Overall Shielding) and of 0.5 Sq. mm. conductor.			
8.06.00	Detection system cables for Fire alarm panels shall be 1.5 Sq.mm. 1100 volt grade 1.5 Sq. mm. size armoured cables of instrumentation quality. Cables wiring to PLC shall be 225 volt grade as PLC shall handle 24 V DC.			
8.07.00	All interconnection power cables wherever required shall be as per NTPC standard quality Plans and voltage grades.			
8.08.00	Junction boxes shall be provided for intermittent connection.			
8.09.00	PLC system shall be provided with hot redundant processors, communication module, monitoring modules, I/O modules, networks, fibre optic connectivity interfaces for remote signals, bi-directional transmissions along with power supply of 24 volt DC batteries (Ni-Cd type) and microprocessor based redundant chargers with all cables and hardwares. For pumps interlock/protection redundancy in I/O modules shall be provided.			
8.10.00	All makes shall be as per NTPC(QA).			
8.11.00	All earthing required for panels, instruments, etc. shall be provided by Contractor, details of which shall be finalized during detailed engineering.			
8.12.00	Type test reports of all items to be furnished for NTPC review/ approval.			
9.00.00	PIPING AND VALVES			
9.01.00	GENERAL			
9.02.00	Piping for all fire protection systems shall generally be laid over ground except in locations such as road crossings. At road crossings, fire water pipes shall be laid inside hume pipes of suitable ratings. For calculating friction loss in piping system: WILLIAM & HAZEN formula shall be used with C value as 100 .			
9.03.00	Inserts/ Embedment required for all pipe/ valve / equipment supports, clamps, channels, bolts, nuts etc to support/mount piping/valves/equipments shall be supplied and erected by the Contractor.			
9.04.00	Material of Construction			
9.04.01	Mild steel as per IS: 1239 (Part-I) medium grade (upto 150 NB) & as per IS: 3589 Gr 410 (above 200 NB) or Equivalent for pipes normally filled with water.			
9.04.02	Mild steel as per IS: 1239 (Part-I) medium grade (upto 150 NB) & as per IS:3589 Gr.410 (above 200 NB) or Equivalent and galvanised as per IS:4736 for pipes normally empty and periodically charged with water and foam system application.			
9.04.03	Pipe thickness: a. For Pipe sizes upto 150 NB and above: As per IS:1239 Part-I medium grade. b. For Pipe sizes 200 NB and above refer Annexure-II.			
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9.04.04	To prevent soil corrosion buried pipes / pipes in trench shall be properly lagged with corrosion protective tapes of minimum thickness of 4 mm (in one layer) or 2 mm (in two layers) of coal tartype as per IS : 15337 or AWWA C 203.			
9.04.05	All valves shall be as per applicable IS/BS codes & approved by LPA /TAC accredited professionals for specific fire protection system and shall be provided with locking arrangement (with locks) in open or close condition. Further, all gate/butterfly valves of size 200 mm & above shall be provided with spur gear reduction unit.			
9.04.06	All the flanges and counter flanges shall conform to ANSI B 16.5 CI 150. Unless otherwise specified all elbows / bends shall be long radius type Fabricated fittings shall not be acceptable up to pipe size of 300 NB. For sizes 350.			
10.00.00	FIRE WATER STORAGE SYSTEM			
10.01.00	Two numbers each of 50% capacity fire water storage tanks shall be provided by the bidder. The fire water storage tanks shall be vertical cylindrical steel tanks. Bidder shall ensure that the total capacity of fire water storage shall be as per the recommendation of TAC or as given elsewhere, which ever is higher.			
10.02.00	The fire water make up connection shall be from nearby available water source. Bidder shall interconnect the same to each of the fire water tank through individual motorized isolation valve.			
10.03.00	The design construction, material of construction, corrosion allowance etc of the vertical fire water storage tank shall be as per IS : 803.			
10.04.00	The discharge pipe each of the tank shall be interconnected through isolation valve. From the discharge headers, individual suction lines with isolation valve & strainer shall be provided for each of the pump.			
10.05.00	Each tank shall be provided with Level indicators, ultrasonic type level transmitters. The instrumentation and control shall include annunciations of low-level, very low level, high level, automatic opening of make up water connection at low level, closure of valves at high level etc as per system requirement.			
11.00.00	PAINTING			
11.01.00	All the Equipments shall be protected against external corrosion by providing suitable painting.			
11.02.00	Painting requirements specified for certain equipments in respective chapter, the same shall govern for those equipments. For balance equipments following requirements shall be applicable.			
11.03.00	The surfaces of stainless steel, Gunmetal, brass, bronze and non-metallic components shall not be applied with any painting.			
11.04.00	Fire Water Storage Tanks The Contractor shall clean the tank plates and structure steel before erection by wire brushing and air blowing. After erection of tank and hydro testing, tanks are subjected to surface preparation and painting as per procedure detailed below:			
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<p>11.05.00</p> <p>11.05.01</p>	<p>(i) Surface Preparation: Outside/inside surface preparation shall be carried out by shot blasting as per SA2 ½.</p> <p>(ii) Inside surface painting: One coat of epoxy zinc phosphate primer of min. DFT of 30-35 micron followed by three (3) coats of epoxy resin based finish paint with 25 micron as thickness of each coat.</p> <p>(iii) Outside surface painting: One coat of epoxy zinc phosphate primer of min. DFT of 30-35 micron followed by three (3) coats of epoxy resin based finish paint with 25 micron as thickness of each coat.</p> <p>(iv) Outside bottom surface painting: One coat of epoxy zinc phosphate primer of min. DFT of 30-35 micron followed by three (3) coats of coal tar epoxy paint with 25 micron as thickness of each coat.</p> <p>Piping</p> <p>The contractor shall clean the external and internal surfaces before erection by wire brushing and air blowing.</p> <p>Painting</p> <p>(a) For all the steel surfaces (external) exposed to atmosphere (outdoor installation), a coat of epoxy resin based zinc phosphate primer of minimum thickness DFT of 30 to 35 microns followed up with three (3) coats of epoxy resin based paint pigmented with Titanium dioxide with 25 microns as thickness of each coat, shall be applied.</p> <p>(b) For all the steel surfaces (external)inside the building (indoor installation), a coat of epoxy resin based zinc phosphate primer of minimum thickness DFT of 30 to 35 microns followed up with two (2) coats of epoxy resin based paint pigmented with Titanium dioxide with 25 microns as thickness of each coat, shall be applied.</p>			
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