

SUB – SECTION – A-18

FIRE PROTECTION AND DETECTION SYSTEM

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

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3.02.00	Spray system shall mainly comprise of the following:- - Automatic deluge valve (DV) assembly suitable size and trims - Isolation (butterfly) valve at the upstream & downstream of each DV - Y-strainer of suitable size at upstream of each dv - S.S Spray nozzles - QB Detectors - Solenoids valve for each DV - One (01) no. pressure switch each in detection line & spray discharge - One (01) no. limit switch for each isolation valve - Local control Panel with relays and interface units for each DV - GI piping for spray network at downstream of DV 25NB M.S. Black wet detection piping network.			
3.03.00	Areas to be covered by HVW Spray System i) All transformers located in transformer yard of main plant. ii) All other transformers having oil capacity above 2000Ltrs & located with-in plant boundary. iii) Steam Turbine Lube oil storage tanks, oil coolers and purifier units. iv) Central Lube oil tanks (Both Clean oil & dirty oil units) and purifier units. v) Boiler Feed Pumps lube oil tanks, coolers, purifier, consoles, etc. vi) Generator seal oil system tanks, cooler assembly, etc. vii) Turbine Oil canal pipelines in main plant. viii) Boiler burner fronts including fuel oil racks at boiler. ix) Apart from above any other equipments/systems having requirements of HWV spray protection.			
3.04.00	Areas to be covered under MVW Spray System i) All cable galleries/ cable vault/ cable spreader room in main plant including ESP control room building, FGD control building and switchyard control room, etc. ii) Employer’s facilities viz.- Feeder transfer point, Coal conveyors, ash conveying system, transfer points, crusher house, etc. iii) All the un-insulated liquid fuel oil tanks (including HFO & LDO tanks) storing fuels of flash point less than 65 deg. C.			
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	iv) All the Fuel oil pumping (unloading & pressurizing) stations and DG set oil tanks. v) For Stacker-Reclaimer machines, MVW spray system shall cover both boom conveyor & intermediate &/or tripper conveyors and associated structure. Water for spray system shall be tapped from hydrant header running along the stock-yard. For this, combination of butterfly valves & quick cam couplings (SS-304construction) with one end flanged shall be provided at every 20M interval in the hydrant header running along the stock yard. Whenever, Stacker-reclaimer is in stationary condition, a flexible hose (SS-304 construction) with suitable end coupling shall be connected to quick cam coupling installed on hydrant header. The other end of flexible hose shall be permanently connected to Deluge valve. vi) Apart from above any other equipments/systems having requirements of MVW spray protection. Note: Criteria for taking two (2) spray pumps in service:- While designing the HVW/MVW spray system for crusher house, HFO & LDO tanks, etc. where flow of one spray pump of 410m3/hr may not be adequate, operation of two (2) spray pumps shall be considered. In such a situation, suitable arrangement shall be done to start the second spray pump automatically from PLC/Fire alarm panel on receipt of fire signal from respective areas.		
3.05.00	BLADDER TYPE FOAM PROTECTION SYSTEM		
3.05.01	GENERAL The fixed foam system of bladder tank foam proportioning type consist of skid mounted foam bladder tank assembly, foam makers, discharge outlets, interconnection piping, valves, fittings and instrumentation. Semi-fixed system consisting of a separate foam solution ring main around the tank with foam hydrant valves at regular intervals shall also be provided in addition to the water hydrants. The operation of the fixed foam system shall be automatic with the aid of dedicated fire detection system provided in the tank. The semi-fixed system shall be operated through the foam hydrants/ monitors, portable type foam water monitors (wheeled type with in-built foam maker), hoses and nozzles for extinguishing spill fire in and around the tank area.		
4.00.00	FIRE EXTINGUISHERS, FIRE TENDER AND FIRE STATION EQUIPMENTS		
4.01.00	Fire Extinguishers As indicated in Bidder's Scope (Refer Relevant Sub-section, Part A, Section VI).		
4.02.00	Fire Tender & Fire Station Equipments As indicated in Bidder's Scope (Refer relevant sub-section, Part A of scope, Section VI).		
5.00.00	FIRE DETECTION, ALARM AND CONTROL SYSTEM		
5.01.00	Codes and Standards		
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5.02.00	a. The design, manufacture, testing, performance, etc. of the various components of the analog addressable Fire Detection and Alarm System shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. Nothing in this specification shall be construed to relieve the contractor of this responsibility. b. Unless otherwise specified, the Fire Detection and Alarm System and the components shall conform to the latest applicable Indian or IEC Standards. Equipment complying with any other authoritative National Standards such as British, USA, VDE, etc. will also be considered, provided the parameters specified are equivalent or better than the corresponding IS. c. The Contractor shall be solely responsible for obtaining the required approval and clearance for the different components and systems of the Fire Detection and Alarm System from the following authorities, as applicable: d. Department of Atomic Energy (Certification of safety from Radioactivity). e. Central Building Research Institute, Roorkee. f. Central Mining Research Station, Dhanbad. g. Local Fire Authorities. h. The equipment and the system shall be of types approved by any of the following bodies, as applicable: i. Loss Prevention Council, (LPC), U.K. j. National Fire Protection Association, (NFPA), USA k. Under-writers laboratories, (UL), USA i. Factory mutual(FM)			
	Areas to be covered under Fire detection and alarm System			
	a) Multisensor type detection system (Above and below the false ceiling or below the false flooring as the case may be) i) All switchgear / MCC/battery rooms of main plant, ESP, FGD, Switchyard (GIS control room building), various auxiliary buildings like ash handling system, condensate polishing plant, water treatment plant, pump houses, service building, administrative & auditorium building, Canteen, Township, etc. ii) Cable galleries of main plant, ESP, FGD & switchyard (GIS control room building) protected by MVW spray system. Further, multisensory detectors shall also be provided inside all cubicles/panels of control room, control equipment room and UPS / Battery charger areas. iii) Above and Below false ceiling areas of all air-conditioned rooms of main plant building, ESP building, FGD control building, service building, administrative & auditorium building, canteen, Township, various control rooms of auxiliaries as defined in Sl. No. (i) above and return air ducts of inert gas protected areas.			

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	b) Linear heat sensing cable detection system Coal conveyors, Boom & Tripper/ Intermediate conveyor of stacker-reclaimer machines and various Cable Galleries covered under MVW Spray System. Further, Gypsum and ash conveying system shall also be provided with LHS cable. c) Quartzoid bulb heat detection system Equipments protected by HVW spray system, coal conveyors, HFO/LDO/DAY tanks and fuel oil unloading & pressurizing pump houses protected by MVW spray system. d) Probe type heat detectors for HFO & LDO tanks. e) For buildings / enclosures - "12" as per page Page 70 of 171 of Detectors shall be provided for AMENDMENT NO. CS-9585-001-2-AMD f) Minimum twelve (14) nos. Infrared Detectors (IRDs) shall be provided at strategic location of various coal conveyors and other conveyor. Location of IRDs shall be finalized during detailed engineering.	
5.03.00	General requirements for all types of Detectors	
5.03.01	Detectors shall be housed or mounted in suitable enclosure in such a way that their performance is in no way affected. Special maintenance procedures if any required for the satisfactory operation of the detectors shall be clearly stated in the bid.	
5.03.02	Necessary mounting accessories shall be provided for all the detectors.	
5.03.03	In case the detectors are offered with their output (on sensing a fire) in the form of an electrical contact, it shall be noted that the contact shall be 'NC' type such that under fire conditions, this contact will open to initiate the fire alarm system.	
5.03.04	Detectors shall preferably be designed as plug-in units, which fit into various bases according to place and type of mounting. This would also enable interchangeability.	
5.03.05	Detectors shall be provided with the necessary compression type cable terminating glands for the incoming cables of flameproof type or PVC/metallic flexible/rigid conduits.	
5.03.06	Depending upon the environmental conditions in which detectors are installed, chlorinated rubber based or epoxy or equivalent paint shall be used for finishing the surface of the enclosure.	
5.03.07	The coverage or the zone of protection afforded by the detector and recommended height of mounting shall be furnished by the Bidder. The bidder shall furnish the test certificate in support of this.	
5.03.08	Any metal parts used for detector construction shall be inherently resistant to corrosion or shall be plated or otherwise suitably treated to afford protection against corrosion. The plating or treatment shall in no way affect the detector performance.	
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5.03.09	Any plastic material or any sealing compound used in the detector shall be such as it will not deform or fail under the maximum temperature to be expected.			
5.03.10	No detector shall contain any moving parts subject to wear and tear and must be able to operate afresh after each alarm release, without its exchange or adjustment.			
5.03.11	The detector shall be located where the largest combustion gas concentration can be expected.			
5.03.12	Adequate compensation and considerations shall be made for effects for wind velocities such as air-conditioning system and exhaust fans where dilution of particles of combustion is greater.			
5.03.13	The exact location of detectors shall be coordinated with other services like air-conditioning grills, light fittings, cable trays etc. to provide aesthetically pleasing appearance. The return air paths of air-conditioning shall be avoided for detector location.			
5.03.14	The detectors shall not be affected by temperature, humidity; air flow or by drift failures and shall not give any false alarm due to above.			
5.03.15	The detectors shall not be sensitive to vibrations. Any special mounting arrangements required to counteract vibration shall be included in the contractor scope.			
5.03.16	The quantity of multi- sensor detectors in each zone shall be based on the coverage factor of 25-sq. meter per detector. However the actual quantity of detectors required, taking into consideration obstructions due to floor beams, ventilation, doors, windows etc., shall be worked out and supplied (based on the actual layout) and installed by the contractor.			
5.03.17	The detectors shall not give false alarm due to high humidity, temperature, and velocity of air in the surroundings and static electricity conditions.			
5.03.18	Process actuated switch devices such as pressure switches, flow switches, level switches, etc. shall be provided with suitable individual addressable interface (local or remote) units or modules so that these devices are addressable from the panel.			
5.04.00	Infra-red Detectors			
	Application	Detection of Moving Fire on Coal Conveyor as well as hot spot beneath the surface		
	Sensor type	Infrared		
	Working voltage(detection)	24 V DC		
	Working voltage(purging)	230 V AC		
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5.05.00	Purging type	Air purging		
	Location	Head of the conveyor		
	Features	1. Ability to detect both black body and diffusion flame radiation. 2. Reject electric arc, heaters, artificial light sources and sunlight etc 3. Ability to function in heavily coal-dust prone atmosphere without regular maintenance 4. Insensitive to vibrations		
	Annunciations	Trouble in purging, Fault Alarm, Trip LED, Power supply ON		
	Output Controls	Two nos. Change over contacts for Alarm & Trip		
	Accessories	Air purge unit including blowers, starter for blowers, hose pipe etc		
	Linear Heat Sensor Cables			
	Application	Detection of Stationary fire		
	Type	Digital		
	Operating voltage	24 V DC		
	Approval	FM/UL		
	Conductor material	Steel		
	Insulation	Heat sensitive polymer		
	Outer Sheath	Black or colored PVC or flouropolymer suitable for the application environment		
	Installation features for LHSC/IR detectors			
	1. Mounting arrangement have been indicated in tender drawing. 2. The detection zone/loop divisions of LHSC system shall match with MVW spray zones. Conveyors where LHSC shall be installed shall be divided into no. of various zones whereas conveyor for which IR detector is installed shall be considered as one zone.			
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5.06.00	3. Linear heat sensing cable detector shall run in a zigzag fashion (with an included angle of 90 deg) on each top cable tray, bottom tray and every alternate intermediate trays of each section of cable tray without undue sagging and interfering the normal operations. All supporting materials for mounting of LHSC shall be provided by the bidder.			
	Addressable Analog Intelligent Detectors In addition to the features specified under the item General requirements for all types of Detectors, the Addressable Analog Intelligent Detectors shall be provided with the following features: a) Detectors not specifically listed for sensitivity testing from the control panel are not acceptable due to the expense involved with manual testing as required by NFPA 72E. b) The detector shall be suitable for two-wire operation and two-way communication on the intelligent analog signaling circuit. c) The detector shall display a steady LED when in the Alarm State. The LED shall flash when in stand by or normal mode. d) Each detector in a loop shall have short circuit isolator suitable for style-7 wiring as per NFPA-72. e) Address and sensitivity assignments shall be set preferably electronically. However, dip switches / rotary switches for the same are acceptable. The detectors shall be assigned a sensitivity level based on environment, time of day or any programmable function as required by the system user, and shall respond at that level whether in the "on line" or "default" mode. f) The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. g) The detectors furnished shall be listed for use in environments as covered by Factory Mutual and UL and shall be installed according to the requirements of NFPA 72E for open area coverage.			
	Multi sensor Detectors			
	5.07.01 Multi sensor detectors shall incorporate a heat detection element and a photoelectric detection element. Both the elements shall be incorporated in a single unit. Both the elements shall be operative at all times and the fire signal shall be available from any or both elements combined together. 5.07.02 The detectors shall be sensitive to very low smoke densities of the order of say 0.05 g/m³. Also it shall be possible to adjust this sensitivity on a step less basis over a range so that the optimum sensitivity could be selected at site to suit the conditions of installations. The coverage area of the smoke detection under standard NFPA test conditions shall not be less than 80-90m².			
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5.07.03	The detectors shall be complete with a mounting base that includes a terminal box into which the detector can be plugged in. Terminals for looping of the cables shall be provided.			
5.07.04	All detectors shall be provided with built-in response and indicating lamps which shall give local visual indication, when it has operated in dense smoke conditions. The failure of lamp shall not prevent the function of detector.			
5.07.05	In areas such as false ceiling where detectors themselves are not easily accessible, the remote response indicators outside the enclosed areas shall be provided to indicate the fire condition.			
5.07.06	It shall be possible to replace any type of detector head by a different type detector without requiring change in cabling/panel wiring and condition of the zone, originally covered by the detector.			
5.08.00	System Configuration			
5.08.01	Each of the Addressable Fire Alarm panel shall be able to communicate with one another as well as with repeater annunciation panel and PLC based control panels located at different places. The detectors or other devices of any other unit/area shall be addressable only from the respective Addressable Fire Alarm Panel, so that each of the Addressable Fire Alarm Panel is under the control of designated operating personnel at that location. Facility to operate pumps of booster pump house and fire water pump house shall be provided from PC based monitoring station.			
5.08.02	At least one spare loop shall be provided in each of the addressable type fire alarm panel located in control equipment room and in CHP control room with complete loop card and all other accessories so that Employer can expand the system in future. Further, at least 10% of loop capacity be left free in each of the connected loop in all the panels, so that, additional devices may be connected to the system in any of the loop by Employer in future.			
5.08.03	Fire system (as a whole including PLC control systems) shall be provided with necessary interface hardware and software for dual fibre optic connectivity & interconnection with station wide LAN for two –way transfer of signals for information sharing. The information shall be made available through Ethernet link following TCP/IP standard. The system shall be OPC compliant. All required plant data shall be transferred ensuring complete security. The exact number of points shall be finalized during detailed engineering.			
5.09.00	Analog Addressable Fire Detection and Alarm System			
5.09.01	General Requirements			
5.09.02	This specification in general covers the functional requirements, and general design aspects of Microprocessor based, Analog Addressable Fire Detection Alarm / Annunciation and Control System.			
5.09.03	The following description intends to describe only the brief hardware and functional requirements, scope of hardware requirements etc. but the actual configuration of			
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	the system shall be in line with the prevalent normal practices in the industry and shall conform to latest product range of selected manufacturer. The fire detection and control system offered shall be complete in all respects for the safe and reliable operation of the entire system. Any additional hardware/software than those mentioned herein required to make the system complete shall be included in the scope of the Bidder.			
5.09.04	All the system and its equipment specifically detectors, interface modules, panels, power supply, battery chargers etc. shall be furnished from a single source and the same shall be new and latest state of the art products of manufacturer engaged in the manufacture of Integrated Microprocessor based Analog Addressable Fire Detection and Alarm System.			
5.09.05	All equipments such as detectors, panels etc shall be approved and listed by UL/FM/LPCB/VDS.			
5.09.06	All types of smoke detectors shall be of analogue addressable type. Conventional detectors with interface modules are not acceptable. Each zone of LHSC detector and each IR detector shall be provided with interface module.			
5.09.07	All the fire detection systems, process actuated switch devices such as pressure/flow/temperature switches and relays of control functions shall be hooked up with the analogue addressable fire detection and alarm system. Required addressable interface units shall be provided for various switch devices by the bidder to make them addressable.			
5.09.08	The wiring shall be of class-A as per NFPA-72.			
5.09.09	Bidder shall provide isolators at the start & end of the loop.			
5.09.10	The complete system shall include, but not be limited to the following: a) Master system CPU. b) Analog Addressable Fire Detection and Alarm System panels including alarm modules, system supervisory control modules, auxiliary output control modules etc. c) PC based monitoring station with colour graphic display terminal with programming and historical archiving facility along with laser printer. d) Power supplies, batteries and battery chargers. e) Analog addressable type smoke detectors. f) Non addressable type conventional detectors (Linear heat sensing cable detector/ infra red type heat detector) and switching devices each with its own addressable interface modules. g) Software and hardware as required for complete operation of the system.			
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	h) Complete Wiring/cabling including its conduits/trays/fixtures etc. i) The fire alarm control panel shall function as a communication interface between central processing unit and sensors. This panel shall have facility to process the input signal and to control all the input data received from initiating and indicating devices. j) Fire alarm control panel shall have filters to ignore false alarm and increase sensitivity to real fire from sensors. The sensitivity of each detector should be automatically raised if detectors are gradually polluted due to dust and dirt entering inside the detector. If detectors are more polluted the control panel shall give a warning. The trouble report shall indicate the location of device requiring service. k) Fire alarm control panel shall have printer to print out the alarm/ trouble occurrences. l) The CPU shall serve as the systems central processor. Software shall be designed especially for fire alarm annunciation system applications and shall monitor status of processing alarms according to priorities, controlling/processing communications and synchronizing all system activities. n) The system shall be able to recognize and indicate an alarm condition in a degrade mode of operation, in the event of processor failure or the loss of system communications to the circuit interface panels. o) All devices shall be individually identifiable for its type, its zone location, alarm set value, alarm and trouble indication by an unique alpha numerical label. p) The software logic modules and system database shall be programmable using a MS - Windows compatible program (latest version) on PC at site and required hardware shall be included in scope of supply. The system software programme shall be password protected and shall include full upload and download capability and during program upload or download through the PC, the capability of alarm reporting shall be retained. The software shall be downloaded to a PC for editing. The software shall enable Employer to add the spare loop provided in the fire alarm panels or addition of additional devices/detectors in any of the fire alarm panel. q) The system shall support the use of Color Graphic display terminal for the display of information in an appropriate format. r) The system shall include software for system data base, historical event log, logic, and operating system. The system shall require no manual input to initialise in the event of a complete power down condition. It shall return to an on line state as an operating system performing all programmed functions upon power restoration. s) Activation of any fire alarm initiating device shall display (LCD alpha numeric display) message in describing the device originating the alarm condition at			
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	the Central monitoring station, at alarm panel, simultaneously at the repeater annunciation panel and shall initiate the associated protection systems & other related control functions. Similarly activation of any supervisory circuit, (supervised valve closure, air pressure abnormal, fire pump trouble, water pressure low, etc.) or receipt of trouble report (primary power loss, open or grounded initiating or signaling circuit wiring, battery disconnect etc) shall display at the fire alarm control panel the origin of supervisory condition or origin of trouble condition as the case may be. It shall also record the occurrence of the event, the time of occurrence and the device initiating the same. t) System configuration shall be menu driven and capable of being operated by, a person with no previous computer programming experience.			
5.10.00	System Functional Requirements			
5.10.01	The fire alarm panel shall evaluate the signals received from the detectors and shall handle the following functions: - System self monitoring and fault signaling. - Transmission of alarm and fault signals to the respective fire alarm panels and as well as in the repeater panel in fire station. Further, the panel shall activate a hooter/sounds in each of the area locally provided with fire/smoke detection system. Further, the system shall enable operation of spray system from the panel through monitoring station when the system operation is selected under remote, manual mode. - Initiate control functions like stoppage of conveyor, closure of fire doors, shutdown of draft fans, air-conditioning and ventilation plant/ equipment, opening smoke extraction vents, switching on smoke extraction equipment, emergency lighting etc. - Triggering stationary extinguishing systems such as clean agent system. - Supervising of unauthorised removal of a detector head from its base and giving a fault alarm on the control panel. - Supervising and monitoring the detection cabling, to indicate fault conditions in case of open/short circuit in the wiring. - Supervising by a separate annunciation window, changeover from mains supply to battery supply. "Mains On" indication shall be continuously on, as long as the main supply is available. - Facilitating simulation of fire conditions to enable the testing of circuits (without creating actual fire) under the test mode from the fire Alarm panel. - The control unit shall contain all the systems main switches lamps and fuses. Switches and lamps shall be easily identified even in closed casings. - All the circuits from the detectors to the panels and the circuits from panels to the actuating/operating devices of the respective extinguishing system shall be of closed loop type and shall be supervised for open-circuiting and			
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5.10.02	short-circuiting of cables. The cable fault shall be audio-visually annunciated on the panels. Separate hooters with different tones shall be provided for 'fault' alarms and 'fire' alarms. 11. Actuate solenoid valve in spray system in case of fire from respective fire alarm panel. For achieving this if any additional hardware is required like relays, power supply and cables, the same may be provided.			
	Analog Addressable Fire Detection and Alarm System shall also meet the following functional requirements: i. Each of the system shall support analog addressable detectors of all types, non-addressable type detectors/devices along with its addressable interface units/modules, Video display units etc. ii. Each of the devices and/or detectors shall be individually, uniquely and continuously addressable by the panel to which it is connected. iii. Detectors shall be interrogated for sensitivity settings from the control panel, logged for sensitivity changes indicating the requirement for cleaning and tested by a single technician using the field test routine. Sensitivity of each of the detectors made available in the panel shall be adjustable from the panel. iv. The system shall be capable of self-adjustment to compensate for the accumulation of contaminants that would change the detector sensitivity in either a more or less sensitive direction to prevent false indications or failure to alarm in the actual fire conditions. The system shall annunciate a trouble condition when any analog addressable smoke detector reaches 80% of its alarm threshold due to gradual contamination, signaling the need for service and eliminating unwanted alarm. v. Continuous supervision/monitoring of all the circuits and its components shall be made available from the panel for open, short circuits and grounding. vi. The system shall be able to recognize and indicate and alarm condition in a degraded mode of operation, in the event of processor failure or the loss of system communications to the circuit interface panels. vii. The system shall be programmable at site and required hardware shall be included in the scope of supply. The system software Programs shall be password protected and shall include full upload and download capability. During program upload or download the system shall retain the capability for alarm reporting. The system shall download to a PC for program editing. The software shall eligible employer to add the spare loop provided in the fire alarm panel or addition of additional devices/detectors in and of loop in any of the fire alarm panel. viii. The system shall support the use of color interactive History Reporting			
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5.11.00	video display terminal for the display of information in an appropriate format. ix. The system shall include software for system database, historical event log, logic and operating system. The system shall require no manual input to initialize in the event of a complete power down condition. It shall return to an on line state performing all programmed functions upon power restoration. x. Software logic modules and system database shall be programmable using a windows compatible program on PC. It shall be possible to program or edit the system database off site after down loading from the panel. xi. All detectors shall incorporate internal automatic temperature compensation to overcome the effects of either high or low ambient temperatures in the installed environment on the detector sensitivity. The detectors shall be tested at a specified frequency by raising the detector sensitivity level to the alarm threshold, to check the operation of the detector without system alarming automatically by the control panel. xii. In an alarm or trouble condition the following shall occur on the monitoring station: 1. Sound an audible. 2. Write details of the actuation to a system log file on the PC. 3. Print the details of the actuation to the system printer. 4. Activate the color graphic display system controls, providing functions such as zooming, scrolling of Alarms, troubles, etc. xiii. System configuration shall be menu driven and capable of being operated by a person with no previous computer programming experience.			
	Panel Display Requirements. System display shall consist of minimum 80 character back lighted alphanumeric LCD display readable at any angle. Thirty-two character customer defined custom messages shall describe the location of the active device. In addition to the above, the following features shall be available. a. The system shall be capable of programming to allow troubles occurred and restored in the system to be automatically removed from the display queue, eliminating the necessity for individual acknowledging of these events. This feature shall not affect the historical logging of events as programmed. b. As a minimum an LED display for “Alarm”, “Audible Silenced”, “Supervisory”, “Trouble”, “Security”, “Power On”, And “Partial System Disabled”. c. Touch activated membrane switches for “Alarm Acknowledge”, “Audible Silence”, “Supervisory Acknowledge”, “Security Acknowledge”, “Reset”,			
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5.12.00	"Display Hold", And "Display Next".			
	d. All membrane switches shall be tactile with audible feedback when pressed.			
	System Software Requirements			
	i) The software shall control the operation, function and display of the graphic system and provide for automatic boot up and run from the hard disk drive of the computer.			
	ii) All project specifics actuating device programming shall be capable of being carried out on site via password access.			
	iii) The system shall monitor all alarm, supervisory; trouble and security conditions detected by the fire alarm control panel and provide separate disk based files, for each condition. These logs may be enabled, disabled, or cleared with password access.			
	This log information is not to be lost upon power failure or fire alarm control panel reset. A utility file shall be provided to sort the log data by date or by device and display this information either on the screen or the system printer.			
	iv) Selective memory storage up to 800 events, shall be stored in flash memory and displayed, printed or downloaded by classification for selective event reports.			
	a. Software shall allow selection of events to be logged, including; inputs as alarms, troubles, supervisors, securities, status changes and device verification; out puts, as audible control and output activation; action, as reset, set sensitivity, arm/disarm, override, password, set time and acknowledge.			
	b. Audible and visual indications shall be generated when memory is 80% and 90% full to allow downloading of data. The system shall be programmable circular logging, assuring that at least the last 400 events will always be stored in non-volatile memory.			
v) Software has driven logic for adjusting the alarm threshold windows on detectors to compensate for accumulating contamination and keep detector response sensitivity constant. The software shall compensate for either over-sensitized or desensitized units, raising a system flag when a detector approaches the allowable limits of adjustment, indicating a requirement for cleaning.				
a. Values shall be stored in non-volatile memory allowing activation of all tracking functions within 90 sec of system initiation from a "cold boot". During the boot sequence, alarms from detectors programmed with the feature shall be suppressed.				
When the full data history is active all devices shall be checked and any active alarms displayed.				
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	b. The control panel shall place each detector in the system in an alarm condition, transparent to the system user, every twenty-four hours as a dynamic check of the accuracy of the alarm threshold setting. Upon reception of the alarm report, the system detector shall be restored to its pretest state. c. The system shall be capable of monitoring the stage of detectors and displaying a message when a detector is approaching the limits of adjustment as a result of contaminates. A second message shall be displayed when the detector reaches the limits of adjustment due to these contaminate. d. The system shall be capable of recognizing that a detector has been cleaned, initiating a series of tests to determine if the cleaning was successful and display a detector cleaned message, readjusting that detectors normal sensitivity setting reference. vi) When an alarm or trouble is registered at the fire alarm control panel the graphics system shall display the first screen image for the first actuated device. The system shall be capable of zooming in for further information if required. At all times when in the alarm or trouble mode the fire control panel status i.e. number of current alarms and or troubles is to be displayed on the graphics screen.			
5.13.00	Power Supply for Fire Alarm Panels & Repeater Alarm Panel			
5.13.01	One set of 24V DC redundant power supply system comprising of 2 x 100% chargers and 1 x 100% batteries shall be provided for each fire alarm panel and repeater alarm panel. The batteries for fire alarm system shall be sealed maintenance free lead acid type. The battery backup for each fire alarm panel and repeater alarm panel shall be 24 hours and 30 minutes (in alarm conditions). At least 25% of the devices shall be considered to be active in alarm conditions. Each of the redundant chargers shall be sized to meet connected load requirements and keep the connected batteries full charged (Float Mode). Furthermore, the charger shall be sized to enable the boost charge of a fully discharged battery in 10 hours while feeding the load.			
5.13.02	The batteries shall be sized as per relevant IEEE standard. For battery sizing calculation, an aging factor of 0.8, a temperature correction factor (based on temperature of 4 deg. C), voltage drop of 2V in cables. Capacity factor, Float Correction Factor, as per Battery Supplier Standard, shall be taken into consideration, if applicable and ambient temperature shall be considered as the electrolytic temperature. The sizing of the battery shall be as approved by Employer during detailed engineering.			
5.13.03	The battery chargers and batteries shall be placed at a suitable location inside the fire alarm panel with partitions.			
5.13.04	The detailed specification related to power supply system of fire detection & protection system shall be as specified in other sections of the technical specification.			
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5.14.00	Control & Instrumentation requirements		
5.14.01	The specification for PLC control system for fire protection system shall be as specified in other sections of the technical specification.		
5.14.02	The specification for PC, printer and other HMI items shall be as specified in other sections of the technical specification.		
5.14.03	The specification related to Basic design criteria, Measuring Instruments, Process connection & piping, Control panels, Type test requirements etc shall be as specified in other sections of the technical specification.		
5.15.00	Cabling for fire alarm system All instrumentation cables twisted & shielded, FRLS PVC insulated and sheathed data highway / fibre optical cables, short term fire proof cables including prefabricated cables (with plug-in connectors) etc shall be provided by Contractor. The contractor shall follow the cable philosophy as below:		

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5.16.00	3. Over and above, contractor may note that short term fire proof cables shall be provided for coal handling plant and inert gas protected areas. Short term fire proof cables shall be Mineral insulated copper conductor and copper sheathed type satisfying requirements of Fire resistance, safety in the industrial application areas mentioned in the specification and also, shall be approved by UL standards and certified by LPCB. The contractor shall provide all the cables so as to complete the system 4. The detailed specification of cables shall be as specified in other sections of the technical specification. Detection System for Coal Conveyors i) Linear Heat Sensor Cables: a) The LHS cable detector for each conveyor to be provided for both forward and return conveyors and shall be mounted as per the standard practice of the manufacturer/ supplier. Suspension of LHSC through flexible chains is a preferred arrangement. Further, LHS cable shall also be provided for return side of conveyors inside the bunker house. b) The detection zone/loop divisions of LHSC system shall match with the MVW spray system. c) Upon detection of fire either by QB detector or LHSC detector, the spray system shall be initiated. It shall also initiate spray system for the two adjacent zones after a time delay settable at site. d) The LHSC detector shall be provided with suitable interface unit, which shall generate/ make the signal compatible with fire alarm panel. (e.) Type: Digital, Operating Voltage: 24V DC, Conductor Material: Steel, Approval: FM/UL ii) Infra Red Detector: (a.) The infra red type (IR) detectors shall be suitable for detecting moving fires in coal conveyors. The IR detector shall stop the conveyor upon detection of fire and give audio-visual annunciation locally and in fire alarm panel. (b.) Each of the IR detector shall be provided with its own purging arrangement using blowers, hoses, etc and required power supply shall be derived from the fire alarm panel. Alternatively, bidder may offer separate blowers (2x100%) for purge air supply for all the detectors and the complete air piping from the blowers to each of the IR detector shall be provided by the bidder.			
	5.17.00	Detection System of Cable Galleries i) In cable galleries, MVW spray system shall be actuated either by detection of fire by Linear Heat sensing cable detectors or by fire signal from Multisensor detection system. Apart from the automatic operation of spray system in the detected zone, the adjacent two zones shall also be sprayed with water automatically after a set time delay simultaneously.		
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5.18.00	ii) LHSC detector shall run in a zig-zag fashion (with an included angle of minimum 90⁰ atleast) in each of the top tray, bottom tray and in every alternate trays. The mounting arrangement of LHSC detector shall be as per manufacturer's standard practice. iii) The detection zone/ loop divisions shall match with MVW spray zones. Multisensor Detection System i) Upon detection of fire, multisensor detector shall be annunciated in the respective panels and shall activate a local hooter/sounder in the areas where fire is activated and this fire signal shall be employed to initiate the fire extinguishing system of that area such as automatic MVW spray system of cable galleries, fire extinguishing system of Control rooms/Control Equipment Rooms. ii) Cross zoning of the signal from two adjacent multisensor detectors shall be employed to initiate the fire extinguishing system of inert gas protected areas and MVW spray system of cable galleries. iii) Multisensor detector shall be provided for return air ducts of main plant, which shall consist of intake probe, detector housing, and exhaust pipe etc. The detector shall be mounted outside the duct. iv) The design coverage area for detectors (to be considered) shall not exceed 25 Sq.M. for each detector.			
6.00.00	AUTOMATIC TOTAL FLOODING INERT GAS EXTINGUISHING SYSTEM			
6.01.00	General a) Fire protection system for the Central control room and other areas as defined below shall be by means of INERT gas extinguishing system. The INERT gas system shall employ any of the proven inert gas system specified under NFPA-2001. System shall be automatic and shall be activated by a dedicated detection system to be provided for each hazard area. b) System shall consist of inert gas (as per NFPA-2001) gas cylinders filled with the agent gas, cylinder mounting accessories, cylinder manifold, automatic discharge valves, discharge piping, nozzles, automatic operating devices, manual actuation devices/abort switches, associated fire detection/alarm system audio-visual safety warning devices, instrumentation associated control systems, panels etc.			
6.02.00	Areas to be covered under Automatic total flooding Inert Gas Extinguishing System a) Central control rooms, control equipment rooms, UPS/Battery charger rooms, PC room, programmer room, PADO room, panel room, etc. of main plant building. b) IT building as per NFPA-2001including associated programmer/server rooms, PC rooms, panel room, UPS/Battery charger rooms for IT building c) Training Simulator as per NFPA-2001 including simulator training room, programmer/server rooms, UPS rooms etc. for training simulator.			
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7.00.01	CLEAN AGENT DIRECT / INDIRECT LOW PRESSURE AUTOMATIC FIRE DETECTION & SUPPRESSION SYSTEM WITH LINEAR PNEUMATIC HEAT DETECTION TUBE			
7.01.00	Regulatory Requirement			
	(a) The clean agent automatic direct / indirect low pressure fire suppression system shall be approved by UL/FM/VDS/LPCB.			
	(b) Clean agent used should be NOVEC-1230			
7.02.00	System Description			
	(a) The clean agent automatic direct / indirect system consists of the following major components:			
	- Clean agent (NOVEC-1230) cylinder & valve assembly along with cylinder mounting arrangement.			
	- Linear heat detection/discharge tube along with necessary fittings.			
	- Discharge Network (applicable for indirect system) composed of copper tubing / stainless steel tubing / braided hose, necessary fittings and appropriate nozzles.			
	- Pressure switch, End of line adapters, Audio-visual indication unit.			
	(b) Each clean agent extinguishing unit shall be equipped with its own automatic (non electric) detection/discharge tubing system, which when actuated, automatically releases the suppression agent into the electrical panel.			
	(c) Clean agent cylinder / container shall be a part of UL/FM/VDS/LPCB listed/approved system. Further, cylinders shall have approval by Chief Controller of Explosives (CCOE) – India (if applicable).Each container shall be equipped with a valve, a pressure gauge to monitor container pressure, etc.			
	(d) Detection/discharge tubing shall be installed within the limitations stated in the manufacturer’s manual.			
	(e) A pressure switch shall be connected at the other end of detector/discharge tubing or on main valve to monitor system pressure and/or signal of system actuation, etc.			
7.03.00	Design Requirement:			
	(a) Design concentration of clean agent used shall be as per NFPA-2001 / manufacturer’s recommendation.			
	(b) All documents/drawings related to design of the system shall be vetted by the system manufacturer before submission to NTPC for approval.			
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8.00.00	FIRE WATER STORAGE, PUMPS & PUMP HOUSE			
	i)	Horizontal type centrifugal pumps shall be provided for hydrant, spray and jockey pumps. Maximum speed of the pumps shall be 1500 rpm. However, for jockey pumps the speed upto 3000 rpm is acceptable. The motor driven pump and the corresponding diesel engine driven pump shall completely interchangeable in respect of speed, impeller diameter, etc.		
	ii)	Capacity, discharge pressure & quantity of pumps for the hydrant water system and spray water system shall be individually designed as per Tariff Advisory committee (TAC) guidelines. However for minimum design requirement please refer Annexure- II		
	iii)	Atleast one hydrant pump of identical capacity be provided as standby pump so that in case any of the working hydrant pump is not available, the total requirement can be met by the standby pump.		
	iv)	Atleast one spray pump of identical capacity be provided as standby pump apart from the working spray pumps.		
	v)	The standby hydrant and spray system pumps shall be of diesel engine driven.		
	vi)	The headers of spray and hydrant system shall be interconnected with an isolation and a non-return valve so that hydrant pumps can feed to spray system not vice-versa.		
	vii)	The diesel engine drive of the pump shall conform to the requirements of TAC. Each of the diesel engine shall be provided with batteries (2x100%) and battery chargers (2x100%).		
	viii)	Battery of the diesel engine shall be lead acid type as per IS and shall be large enough to crank the engine twelve times successively, each for a duration of 10 sec. without any charging in between.		
	ix)	Each engine shall be provided with fuel oil tank having adequate capacity to hold sufficient fuel oil for a minimum of twelve (12) hours of full load run. The fuel oil tank shall preferably be mounted on the engine. No fuel oil tank will be provided by the Employer.		
	x)	Continuous drive motor rating (at 50 ⁰ C ambient) shall be at least 10% (ten percent) above the maximum load demand of the pump in the entire operating range of the pump.		
	xi)	The feeding line of the spray system from the header shall be provided with 2x100% capacity basket type filters to avoid any particles in the spray system.		
	xii)	The system shall be complete with required instrumentation, control recirculation pipe line with valves for each of the pumps, NRV in discharge outlet etc.		
	xiii)	Pumps shall be designed for continuous operation at its best efficiency point to meet the specific requirements of the system for which it is to be employed. Pumps of each category shall be suitable for parallel operation.		
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	xiv) Fire Water Storage Tanks: Two numbers each of 50% capacity vertical cylindrical column supported fixed cone roof type fire water storage tanks shall be provided by the bidder. To avoid vacuum creation inside the tank, two (2) nos. vents each of size 300 NB shall be provided on the roof of the tanks. Bidder shall ensure that the total capacity of fire water storage shall be as per the recommendation of TAC. xv) Fire water booster pump house: Two sets of Hydrant & Spray booster pumps (one motor driven & one diesel driven pump) alongwith associated equipment shall be installed in fire water booster pump house. Tapping shall be taken from nearest hydrant and spray header. xvi) Fire water storage tank: Two numbers each of 50% capacity vertical cylindrical column supported fixed cone roof type fire water storage tanks shall be provided by the bidder. To avoid vacuum creation inside the tank, two (2) nos. vents each of size 300 NB shall be provided on the roof of the tanks. Bidder shall ensure that the total capacity of fire water storage tank shall be as per the recommendation of TAC with a minimum capacity of each tank equal to 2300 m³.			
9.00.00	PIPING AND VALVES			
9.01.00	General Data for Pipes etc. i) Mild steel as per IS:1239 (Part-I) medium grade (upto 150 NB) & as per IS:3589 Gr 410 (above 200 NB) or Equivalent for pipes normally filled with water. ii) Mild steel as per IS:1239 (Part-I) medium grade (upto 150 NB) & as per IS:3589 Gr.410 (above 200 NB) or Equivalent and galvanised as per IS:4736 for pipes normally empty and periodically charged with water and foam system application. iii) Pipe protection shall be as follows : To prevent soil corrosion buried pipes / pipes in trench shall be properly lagged with corrosion protective tapes of coal tar type as per IS:15337 or AWWA C 203. The total thickness of protective tapes to be applied on buried pipes / pipes in trench shall be 4.0mm. This can be achieved by using 4.0mm thick tape in single layer or 2.0mm thick tape in double layer. iv) Pipe thickness: a) For Pipe sizes upto 150 NB and above: As per IS:1239 Part-I medium grade. b) For Pipe sizes 200 NB and above refer Annexure-I. v) All valves shall be as per applicable IS/BS codes & approved by TAC for specific fire protection system and shall be provided with locking arrangement (with locks) in open or close condition. Further, all gate/butterfly valves of size 200 mm & above shall be provided with spur gear reduction unit. vi) All the flanges and counter flanges shall conform to ANSI B 16.5 CI 150. vii) Strainer Body as per IS: 2062 (tested).			
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	viii) Pipe Fittings 1) The material shall conform to ASTM A 234 Gr WPB or ASTM A 105 or equivalent and dimensional standard conforming to ANSI B 16.11 (socket & threaded type), ANSI B 16.9 (for butt welded fittings) and ANSI B 16.5 (for flanges and flanged fittings) as the case may be. Further, galvanised malleable cast iron fittings as per IS:1879 in Cast iron fitting as per BS-1641 are also acceptable. 2) Grooved couplings: Vendor may also use mechanical grooved couplings type fittings in GI pipe lines for HVW / MVW spray system. All materials and products shall be either Underwriters Laboratories (UL) Listed or Factory Mutual (FM) Approved and installed in accordance with NFPA Standard 13 / equivalent Standard. 3) The fittings shall be galvanised as per IS: 4736 for galvanised pipe application. In case of branching connections from GI mains for spray piping network, socket may be welded for more than two pipe reduction instead of standard tees. 4) Fabricated fittings shall not acceptable up to pipe size to 300 NB. For sizes 350 NB and above, fittings may be fabricated as per BS: 2633/BS: 534. ix) Welding of galvanised iron pipes/fittings would be permitted provided the same is carried out by means of special electrodes suitable for the above application and the same shall be approved by Employer. After, welding, welded portions shall be applied with three coats of zinc silicate treatment/rich paint over one coat of suitable primer. Further, the Contractor shall provide proper zinc paint at the point of welding.			
10.00.00	PAINTING			
10.01.00	All the Equipments shall be protected against external corrosion by providing suitable painting.			
10.02.00	The surfaces of stainless steel, Gunmetal, brass, bronze and non-metallic components shall not be applied with any painting.			
10.03.00	Fire Water Storage Tanks: i) The Contractor shall clean the tank plates and structure steel before erection by wire brushing and air blowing. After erection of tank and hydro testing, tanks are subjected to surface preparation and painting as per procedure detailed below: ii) Surface Preparation: Outside/inside surface preparation shall be carried out by shot blasting as per SA2 ½. iii) Inside surface painting: One coat of epoxy zinc phosphate primer of min. DFT of 30-35 micron followed by three (3) coats of epoxy resin based finish paint with 25 micron as thickness of each coat.			
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10.04.00	iv) Outside surface painting: One coat of epoxy zinc phosphate primer of min. DFT of 30-35 micron followed by three (3) coats of epoxy resin based finish paint with 25 micron as thickness of each coat. v) Outside bottom surface painting: One coat of epoxy zinc phosphate primer of min. DFT of 30-35 micron followed by three (3) coats of coal tar epoxy paint with 25 micron as thickness of each coat. All Steel Surfaces (external) exposed to atmosphere (outdoor installation) (i) Surface Preparation: The steel surfaces to be applied with painting shall be thoroughly cleaned before painting by wire brushing, air blowing, etc. (ii) Painting: One (1) Coat of red oxide primer of thickness 30 to 35 microns followed up with three (3) coats synthetic enamel paint, with 25 microns as thickness of each coat. For plant at coastal area, epoxy resin based zinc phosphate primer followed by epoxy resin based paint pigmented with titanium di-oxide shall be used in place of enamel paints.												
10.05.00	All Steel Surfaces (external) inside the building (indoor installation) (i) Surface Preparation: The steel surfaces to be applied with painting shall be thoroughly cleaned before painting by wire brushing, air blowing, etc. (ii) Painting: One (1) Coat of red oxide primer of thickness 30 to 35 microns followed up with two (2) coats synthetic enamel paint, with 25 microns as thickness of each coat. For plant at coastal area, epoxy resin based zinc phosphate primer followed by epoxy resin based paint pigmented with titanium di-oxide shall be used in place of enamel paints.												
10.06.00	Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam Proportioning equipments, Foam makers, etc. Painting of all equipments /components of FDPS package shall be as per manufacturer's standard practice or as detailed below whichever is superior in quality. <table><tr><th>Environment</th><th>Paint scheme</th><th>Total DFT</th></tr><tr><td>Normal / Mild Corrosive Environment</td><td>Primer- zinc filled epoxy Finish – Aliphatic Polyurethane (shade RAL3000)(P.O Red)</td><td>Min 125 microns</td></tr><tr><td>Corrosive Environment (as in coastal areas)</td><td>Primer- zinc filled epoxy Intermediate – Epoxy MIO Finish – Aliphatic Polyurethane (shade RAL3000)(P.O Red)</td><td>Min 200 microns</td></tr></table>				Environment	Paint scheme	Total DFT	Normal / Mild Corrosive Environment	Primer- zinc filled epoxy Finish – Aliphatic Polyurethane (shade RAL3000)(P.O Red)	Min 125 microns	Corrosive Environment (as in coastal areas)	Primer- zinc filled epoxy Intermediate – Epoxy MIO Finish – Aliphatic Polyurethane (shade RAL3000)(P.O Red)	Min 200 microns
Environment	Paint scheme	Total DFT											
Normal / Mild Corrosive Environment	Primer- zinc filled epoxy Finish – Aliphatic Polyurethane (shade RAL3000)(P.O Red)	Min 125 microns											
Corrosive Environment (as in coastal areas)	Primer- zinc filled epoxy Intermediate – Epoxy MIO Finish – Aliphatic Polyurethane (shade RAL3000)(P.O Red)	Min 200 microns											
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11.00.00	The hydrant and spray lines shall be overground. It shall be laid either on pedestals, trestles etc. However, if the layout does not permit laying of overground pipe in that case it shall be laid underground with the approval of Engineer.			
12.00.00	MULTIPURPOSE NOZZLE The multipurpose nozzle should be such that water under pressure is applied on fire in the form of a jet, spray or fog. Material of construction for multipurpose nozzle shall be as per manufacturer's standard.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC. NO. : CS-9585-001-2	SUB SECTION-A-18 Fire Detection & Protection System	Page 25 of 27

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	ANNEXURE-I PIPING THICKNESS: Pipes for sizes 200 NB & above shall confirm to IS: 3589 Grade 410. The final thickness shall not be less than that specified as per IS: 3589 as indicated below. <table><tr><th>Nominal pipe Size (mm)</th><th>Outside Diameter (mm)</th><th>Wall Thickness (mm)</th></tr><tr><td>200 NB</td><td>219.1</td><td>6.3</td></tr><tr><td>250 NB</td><td>273</td><td>6.3</td></tr><tr><td>300 NB</td><td>323.9</td><td>7.1</td></tr><tr><td>350 NB</td><td>355.6</td><td>8.0</td></tr><tr><td>400 NB</td><td>406.4</td><td>8.0</td></tr><tr><td>450 NB</td><td>457</td><td>8.0</td></tr><tr><td>500 NB</td><td>508</td><td>8.0</td></tr><tr><td>600 NB</td><td>610</td><td>8.0</td></tr></table>			Nominal pipe Size (mm)	Outside Diameter (mm)	Wall Thickness (mm)	200 NB	219.1	6.3	250 NB	273	6.3	300 NB	323.9	7.1	350 NB	355.6	8.0	400 NB	406.4	8.0	450 NB	457	8.0	500 NB	508	8.0	600 NB	610	8.0
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	Annexure-II Technical Data: <table><tr><td>1. Fire water pumps</td><td>Hydrant</td><td>Spray</td><td>Booster Hydrant</td><td>Booster Spray</td><td>Jockey</td></tr><tr><td>Number of pumps</td><td>4(3 motor driven & 1 diesel engine driven)</td><td>3 (2 motor driven & 1 diesel engine driven)</td><td>2 (1 motor driven & 1 diesel engine driven)</td><td>2 (1 motor driven & 1 diesel engine driven)</td><td>2 (both motor driven)</td></tr><tr><td>Design Capacity</td><td>410 m³/hr</td><td>410 m³/hr</td><td>171 m³/hr</td><td>410 m³/hr</td><td>75 m³/hr</td></tr><tr><td>TDH of pump (MWC)</td><td>120 (min) or as per system reqt.</td><td>120 (min) or as per system reqt.</td><td>45 (min) or as per system reqt.</td><td>45 (min) or as per system reqt.</td><td>120 (min) or as per system reqt.</td></tr><tr><td>MOC</td><td colspan="5">Casing:IS:210 Gr. FG 260 (2.5% Ni), Impeller: Bronze IS:318 Gr.II, Impeller shaft, coupling :SS316</td></tr><tr><td rowspan="2">2. Hydrant Valve</td><td colspan="5">Oblique female type as per IS:5290</td></tr><tr><td colspan="5">MOC: Body/bonnet/stop valve/valve seat/trim : SS304/SS316</td></tr><tr><td rowspan="2">3. Water monitor</td><td colspan="5">As per IS:8442 Type-I, Size: 75mm, Nozzle dia: 38mm</td></tr><tr><td colspan="5">MOC: Water barrel/reducer/elbow: CS (seamless)/SS Nozzle: Copper alloy / SS confirm in to IS:3444</td></tr><tr><td rowspan="2">4. Water branch pipe & nozzle</td><td colspan="5">As per IS:903 / IS:2871</td></tr><tr><td colspan="5">MOC: Branch pipe: SS316 (Gr 4 of IS:3444) (both ends) Nozzle : SS316 (Gr 4 of IS:3444), Size: min 16mm & max 25mm</td></tr><tr><td rowspan="3">5. Water line Gate / Sluice Valve</td><td colspan="5">- Design Code: a) IS:14846 or BS:5150 (for valves coming inside fire water pump house) b) BS:5150 (for valves at other locations) - Pressure rating: PN1.6 (as per IS:14846) / PN16 (as per BS:5150) -Working Pr. :12Kg/cm2</td></tr><tr><td colspan="5">MOC: Body/bonnet/Yoke/Wedge : CI to IS:210 FG-200 Spindle: SS to ASTM-A-276 type 410</td></tr><tr><td colspan="3">6. Check Valve</td><td colspan="2">Below 50NB size</td><td>50NB & above</td></tr><tr><td></td><td colspan="3"></td><td>Design Code; IS:778 (below 50NB)</td><td>IS:5312 / BS:5153</td></tr><tr><td></td><td colspan="3"></td><td>MOC: Body/cover/flap: Lead tin bronze to IS:318 Gr. LTB-2</td><td>CI to IS:210 FG-200</td></tr><tr><td rowspan="2">7. Butterfly Valve</td><td colspan="5">Design Code: Double flanged or lugged wafer type of low leakage rate confirming to BS:EN:593/API-609/AWWA C-504 Pressure class: PN 16</td></tr><tr><td colspan="5">MOC: Body & Disc : Cast Iron, Shaft : SS 410 / SS 420 Seat Rings : EPDM</td></tr></table>						1. Fire water pumps	Hydrant	Spray	Booster Hydrant	Booster Spray	Jockey	Number of pumps	4(3 motor driven & 1 diesel engine driven)	3 (2 motor driven & 1 diesel engine driven)	2 (1 motor driven & 1 diesel engine driven)	2 (1 motor driven & 1 diesel engine driven)	2 (both motor driven)	Design Capacity	410 m³/hr	410 m³/hr	171 m³/hr	410 m³/hr	75 m³/hr	TDH of pump (MWC)	120 (min) or as per system reqt.	120 (min) or as per system reqt.	45 (min) or as per system reqt.	45 (min) or as per system reqt.	120 (min) or as per system reqt.	MOC	Casing:IS:210 Gr. FG 260 (2.5% Ni), Impeller: Bronze IS:318 Gr.II, Impeller shaft, coupling :SS316					2. Hydrant Valve	Oblique female type as per IS:5290					MOC: Body/bonnet/stop valve/valve seat/trim : SS304/SS316					3. Water monitor	As per IS:8442 Type-I, Size: 75mm, Nozzle dia: 38mm					MOC: Water barrel/reducer/elbow: CS (seamless)/SS Nozzle: Copper alloy / SS confirm in to IS:3444					4. Water branch pipe & nozzle	As per IS:903 / IS:2871					MOC: Branch pipe: SS316 (Gr 4 of IS:3444) (both ends) Nozzle : SS316 (Gr 4 of IS:3444), Size: min 16mm & max 25mm					5. Water line Gate / Sluice Valve	- Design Code: a) IS:14846 or BS:5150 (for valves coming inside fire water pump house) b) BS:5150 (for valves at other locations) - Pressure rating: PN1.6 (as per IS:14846) / PN16 (as per BS:5150) -Working Pr. :12Kg/cm2					MOC: Body/bonnet/Yoke/Wedge : CI to IS:210 FG-200 Spindle: SS to ASTM-A-276 type 410					6. Check Valve			Below 50NB size		50NB & above					Design Code; IS:778 (below 50NB)	IS:5312 / BS:5153					MOC: Body/cover/flap: Lead tin bronze to IS:318 Gr. LTB-2	CI to IS:210 FG-200	7. Butterfly Valve	Design Code: Double flanged or lugged wafer type of low leakage rate confirming to BS:EN:593/API-609/AWWA C-504 Pressure class: PN 16					MOC: Body & Disc : Cast Iron, Shaft : SS 410 / SS 420 Seat Rings : EPDM				
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