Technical Specification for Fire Detection & Alarm System Project: 2 x 660MW KHURJA STPP TG & Associated Packages

Revisions: Refer to record of revisions	Prepared by :	Checked by :	Approved by :	Date :
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1. SCOPE:

1.1 Design, Engineering, Manufacturing, Assembly, System Integration, testing at vendor works, Inspection by purchaser, Supply (Packing and Transportation to sites), Installation Support and commissioning of Fire Detection and Alarm System.

1.2 The material supply and installation shall be done as per the applicable codes and standards. Responsibility of the bidder is up to final handover of FDA systems to End user.

1.3 Training of End user / purchaser's manpower at site to operate and maintain the system.

1.4 Supply of complete documentation covering design, sizing, installation, operation and maintenance aspects and technical details of bought out components, as-built drawings, O&M manuals & Device charts of the system and tests carried out during commissioning.

2 INSTRUCTIONS TO BIDDERS

2.1 Bidders are advised to contact BHEL for essential technical queries in writing within one week of issue of Enquiry. In the event of any conflict between these specifications, data sheets, related standards, codes etc. the vendor shall refer the matter to the purchaser for clarifications before bid submission and the decision of Purchaser shall be final & binding on Bidder, without any cost & delivery implications. However, in the event of conflict, most stringent requirements shall be followed.

2.2 Offers with incomplete information will not be considered for evaluation, and are likely to be rejected outright without any further interaction with the Bidder.

2.3 Any technical features [over & above BHEL enquiry specification requirements] proposed by Bidder will not be given preference for the purpose of evaluation.

2.4 Bidder shall submit the "Duly filled & Signed copy of Check list" along with necessary supporting documents compulsorily along with technical offer without which offer is liable for rejection without any further interaction with the Bidder

3 CODES, STANDARDS & REGULATIONS

3.1 Tariff Advisory Committee (TAC)/LPA India/NFPA USA

3.2 Underwriters Laboratories (UL)-USA,

3.3 VDS Standards,

3.4 Loss Prevention Certification Board (LPCB),

3.5 Factory Mutual (FM),

3.6 Indian Electricity (Supply) Act (IEA)

3.7 Rules for Fire Alarm System of India, and

3.8 IS 2189 (Selection, Installation and Maintenance of Automatic Fire Detection and Alarm System-Code of Practice).

3.9 Any other equivalent internationally recognized body acceptable to BHEL/End customer.

4 **List of Annexures (To followed along with this specification)**

Document No.	Document Name
Annexure – [A]	Bill of material [for Main Supply + Mandatory Spares]
Annexure – [B]	Technical Specification for FDA System
Annexure – [C]	Price Bid format [for Main Supply + Mandatory Spares+Services]
Annexure – [D]	Schematic Diagram for Fire Detection & Alarm System
Annexure – [E]	Pre Bid Query Format
Annexure – [F]	Master Document Schedule
Annexure – [G]	Vendor List
Annexure – [H]	Quality Requirements
Annexure – [I]	Checklist
Annexure – [J]	Deviation Format
Annexure – [K]	Typical Erection/Mounting Drawings of FDA components

5 SCOPE MATRIX FOR SUPPLY, ENGG AND INSTALLATION & COMMISSIONING

S.No.	Description	Engineering by	Supply by	Erection by	Supervision of Erection by	Commissioning by	Remarks
[A]	Fire Detection & Alarm System						
1	FDA System [Fire alarm panels, repeater panel, Operating Station, Softwares, including all erection & commissioning hardware].	Bidder (Note-3)	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexure-[A], [B], [C], [D] & [G] for inputs
2	Detectors, control modules, hooters, call points & all other devices	BHEL	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexure-[A] for BOM
3	Network Components like Switches, LIUs, Patch Cards, Media converters, etc.	Bidder	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	
4	Network & Fiber optic Cables	Bidder	Bidder	BHEL (Note-4)	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Bidder refer annexure-[A], [B] & [D] for inputs
6	a. Erection hardware & cable terminations (lugs, glands, splicing kits etc) required for all FDA items supplied under this contract b. Erection hardware (saddle with saddle bars and screws) for BHEL supplied cables.	Bidder	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexure-[A] to [D] for inputs
7	Tools & Tackles Tools & Tackles required for erection & commissioning of FDA system shall be in scope of bidder	Bidder	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	

Notes:

1) Termination accessories and termination of all types of cables at bidder-supplied items/panels shall be in Bidder scope.
2) **Details of typical Erection/Mounting drawings of FDA components are furnished in Annexure-K. Bidder to note that the items mentioned in the Erection/Mounting drawings are minimum. Bidder to also note that, detailed Erection/Mounting drawings as per the make of FDA components selected shall be furnished along with its BOM.**
3) BHEL will provide the necessary man power required for commissioning. However, system commissioning shall be done by bidder only.
4) Any special activities involved in erection like FO cable splicing, termination, etc. shall be by bidder.

5) Supply of all items required for testing and maintenance of FDA components mentioned in the contract shall also be in the scope of bidder.
6) All commissioning spares as required during erection and commissioning of all the systems are included in bidder's scope & shall be supplied along with the main supply/package.
7) Bidder to ensure that all the spares are procured from the original equipment manufacturers (as per their recommendation) and shall make them available at site well before the start of commissioning activities.

6 TECHNICAL SPECIFICATIONS

S. No.	System	Technical specifications
[A]	**Fire Detection & Alarm System**	
1	Bill of material	Refer Annexure-[A] of this specification for Main Supply + Mandatory Spares
2	Technical requirements	1) Refer Annexure-[B] & [D] of this specification 2) Software Licenses shall be valid for life time. 3) Bidder to confirm that entire FDA System shall be subject to approval by TAC accredited agency to qualify maximum premium discount. Responsibility to get approval from TAC Accredited agencies shall rest on BHEL. However, all necessary documentation for obtaining such approvals are in bidder's scope. 4) Addressable type Fire Alarm Panel in each CER with power supply system 1 X 100% batteries and 2 X 100% battery chargers, suitable for providing battery backup of 24 hours (stand by) and 30 minutes (in alarm conditions), etc. 5) Addressable type repeater annunciation panel in central fire station with power supply system (1 X 100% batteries and 2 X 100% battery chargers, suitable for providing battery backup of 24 hours (stand by) and 30 minutes (in alarm conditions), etc.
3	Cable sizes for selecting the FDA system make and models	Following cables shall be supplied by BHEL for LOOP and POWER cables of FDA system. Bidder shall select the detectors / panels / devices models considering below cable sizes: Loop Cable: 1P x 1.5 Sqmm (Twisted, armoured and overall screened cable) Power Cable: 2C x 2.5 Sqmm (Armoured cable) Mineral Insulated Copper Cable (MICC) cable shall be used for Inert gas protected areas i.e, • Main Control Room • Control Equipment Room • Programmer/Server Rooms • PC and Panel Rooms • UPS/Battery Charger Rooms
4	Other technical requirements	1) Bidder to ensure the Vetting of the above sizing and selection by OEM.
5	Network Switch	All the network switches shall be of high quality and shall be sized to meet the functional requirements as specified. All the interconnecting cables between network switches shall be fiber optic only. All fiber optic cables shall be terminated directly to network switches through optical fiber port without using media converters. Bidder to ensure that minimum 100% cores are kept as spares in all type of optical fiber cables.
6	Junction Boxes	Junction box shall be made of Fire retardant material. Material of JB shall be Thermoplastic or thermosetting or FRP type. The box shall be provided with the terminal blocks, mounting bracket and screws etc. The JB shall have suitable cable glands of suitable size on the bottom of the box. The JB shall be suitable for surface

		mounting on ceiling/structures. The JB shall be of grey color RAL 7035. All the metal parts shall be corrosion protected. Junction box surface should be such that it is free from crazings, blisterings, wrinkling, colour blots/striations. There should not be any mending or repair of surface. JB's will be provided with captive screws so that screws don't fall off when cover is opened. JB's mounting brackets should be of powder coated MS. Type test reports for the following tests shall be furnished:- (a) Impact resistance for impact energy of 2 Joules (IK07)as per BS EN50102 (b) Thermal ageing at 70deg C for 96 hours as per IEC60068-2-2Bb. (c) Class of protection shall be IP 55. d) HV test. Terminal blocks shall be 1100V grade, of suitable current rating, made up of unbreakable polyamide 6.6 grade. The terminals shall be screw type or screw-less (spring loaded) / cage clamp type with lugs. Marking on terminal strips shall correspond to the terminal numbering in wiring diagrams. All metal parts shall be of non-ferrous material. In case of screw type terminals the screw shall be captive, preferably with screw locking design. All terminal blocks shall be suitable for terminating on each side the required cables/wire size. All internal wiring shall be of cu. Conductor PVC wire.
7	Cable glands	Cable shall be terminated using double compression type cable glands. Testing requirements of Cable glands shall conform to BS:6121 and gland shall be of robust Construction capable of clamping cable and cable armour (for armored cables) firmly without injury to insulation. Cable glands shall be made of heavy-duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands shall be suitable for the sizes of cable supplied/erected.
8	Cable lugs/ferrules	Cable lugs/ferrules for cables shall be tinned copper solderless crimping type suitable for copper compacted conductor cables. Cable lugs and ferrules for cables shall be tinned copper type. The cable lugs for cables shall be provided with insulating sleeve and shall suit the type of terminals provided on the equipments.
10	Fibre Optic cables	Refer Annexure-[K] of this specification Optic Fiber cable shall be 8 core, Electrolytically chrome plated corrugated steel taped (ECCST), fully water blocked with dielectric central member for outdoor/indoor application so as to prevent any physical damage. The cable shall have multiple single-mode or multi mode fibers on as required basis so as to avoid the usage of any repeaters. The outer sheath shall have Flame Retardant, UV resistant properties and are to be identified with the manufacturer's name, year of manufacturer, progressive automatic sequential on-line marking of length in meters at every meter. The cable core shall have suitable characteristics and strengthening for prevention of damage during pulling viz. Dielectric central member, Loose buffer tube design, 4 fibers per buffer tube (minimum), Interstices and buffer tubes duly filled with Thixotropic jelly etc. The cable shall be suitable for a maximum tensile force of 2000 N during installation, and once installed, a tensile force of 1000 N minimum. The compressive strength of cable shall be 3000 N minimum& crush resistance 4000 N minimum. The operating temperature shall be –20 deg. C to 70 deg.C

		All testing of the fiber optic cable being supplied shall be as per the relevant IEC, EIA and other international standards. Bidder to ensure that minimum 100% cores are kept as spares in all types of optical fibre cables. Cables shall be suitable for laying in conduits, ducts, trenches, racks and underground buried installation. Spliced / Repaired cables are not acceptable. Penetration of water resistance and impact resistance shall be as per IEC standard.
11	Operator Workstation & A4 size color laser Printer along with Graphic software i.e., (GUI) Software	Refer Annexure-[L] of this specification Software : a General MS Windows latest version, MS-Office, Microsoft Visual Studio, Adobe Acrobat, anti-virus McAfee or equivalent, etc. b Application software - to suit project specific requirement Free upgrades to new versions and introductory training for the new version of the software and programming software shall be provided free of cost during the warranty period.
12	Laptop along with Fire Alarm Panel Commissioning Software License /Dongle	The screen size of the laptops should be 15 – 17 inches. All the Laptop will also be used as pluggable temporary programmer's station and operator station functionalities of the programming stations mentioned in the specifications shall be provided (including requisite license).
13	Furniture for Operator Workstation & Printer	Required furniture for mounting of HMI peripherals shall be provided. Chairs: Industry standard revolving chairs with wheels and with provision for adjustment of height (hydraulically/gas lift) shall be provided for the operators, unit-in-charge & other personnel in control room area. These shall be designed for sitting for long duration such that these are comfortable for the back. Chair pedestal shall be made of 5mm thick MS plate covered with poly-propylene cladding. Arm-rests in one piece shall be of poly-urethane and twin wheel castor of glass filled nylon. The exact details shall be finalized & approved by Employer during detailed engineering. Tables -- Industry standard tables
14	Mini-UPS for Operator Workstation & Printer (To be sized by bidder)	Online Interactive UPS with 30 mins. battery backup on machine load (for PC & its printer)
15	Spike arrester cum distribution board	spike arrester cum distribution board for extending power supply to PC (CPU, Monitor), Printer and FAPs

7 BIDDER'S SCOPE OF SERVICES

10.1 Supervision of erection & commissioning, performance guarantee testing & trial run and final handing over to end customer for the supplied systems.

10.2 Number of man days and number of visits as specified in the "Annexure-[B] of this specification" shall be considered. However, either or both of the number of man days or no. of visits may increase / decrease based on the actual site requirement.

10.3 Bidder to mobilize concerned competent person for supervision of Erection & commissioning activities within a period of 7 days of receipt of intimation in this regard from BHEL.

10.4 Following shall be the scope of work for services:

10.5 Services charges shall include the travel to & fro travel from vendors work to site, lodging, boarding & local travel. Vendors shall arrange their own lodging, boarding & traveling.

10.6 Vendors shall arrange their own Test equipment's, commissioning tools, manpower etc as required.

10.7 Above services shall be ordered by BHEL Site at the time of commissioning. However vendor shall submit the price offer for services as per "Annexure-[B] of this specification" and same shall be considered for L1 evaluation.

8 MANDATORY SPARES

Spares requirement shall be as per enquiry & "Annexure-[A] of this specification".

9 DOCUMENTATION

14.1 Following information/documents to be included with offer:

a. Duly filled & Signed copy of Check list
b. Duly Signed Deviation format (Annexure-J) indicating "NO DEVIATION".
c. Duly Signed Unpriced price schedule (ANNEXURE-C) indicating "QUOTED".
d. Documents in support of Pre-Qualification Criteria

14.2 Documentation after P.O. Placement

a. Submission of documents as per "Master documents schedule" (which will be finalized in Kick-off meeting after award of the contract) within 2 weeks of placement of LOI (for approval by BHEL and / or BHEL's customer in 4 sets)
b. Further BHEL will provide comments on vendor submitted document within 15 working days for revision & resubmission. Vendor shall follow up with BHEL for non-receipt of comments/approvals.
c. Revised drawings / Documents shall be submitted by Bidder in 07 days of receipt of comments / observations from BHEL. BHEL shall revert within 15 days on receipt of these revised documents / drawings from vendor for approvals.
d. All the approvals required for manufacturing shall be completed within 4 months from P.O to meet the P.O delivery schedule. Accordingly, vendor shall ensure the submission of approval category documents (which are required for manufacturing) and obtain their approvals.
e. Vendor shall obtain final approvals on all technical and quality aspect documents before inspection dates.
f. It is vendor's responsibility to obtain approvals from BHEL as earliest as possible to meet PO delivery schedules. Accordingly, vendor to plan and execute the supplies in time.
g. Erection drawings for FDA components indicating erection hardware to be submitted for approval.
h. Drawings of furniture for PC and printer to be submitted for approval

14.3 Documents to be submitted during final shop testing and before equipment dispatch.

(Note: submission of these documents are commercially linked) - all in 16 sets (2 sets to be included with item dispatch and balance to BHEL purchase department).

a. Complete O& M manual.
b. Approved Engg documents
c. As-Shipped documents
d. As-Built documents
e. Guarantee and all test certificates for review and acceptance by BHEL and / or BHEL's Customer
f. 3 sets of CD-ROM – containing O&M manual and Engineering documents (1 set to be included with item dispatch and balance to BHEL purchase department).

10 MARKING, PACKING AND DESPATCH

15.1 All items shall be marked (stamped/etched) in accordance with the applicable code/standard/specification. In addition, the item code, if available, shall also be marked.

15.2 For ease of identification, the color of painted strip (wherever required) shall be as per the applicable standard.

15.3 Part number/Dispatch link-up of all the equipments/items supplied and also their co-relation with system/drawing/approved BOQ.

15.4 Paint or ink for marking shall not contain any harmful metal or metal salts which can cause corrosive attack either ordinarily or in service. Special items/smaller items shall have attached corrosion resistant tag providing salient features.

15.5 The equipment shall be transported to site by the vendor in fully assembled condition. However, in case some components are liable to be damaged during transit, the same shall be dismantled and supplied separately, to be reassembled at site the vendor. Assembly of the item supplied loose at site and repairing of any item damaged during transport shall be in the vendor's scope. The vendor shall send each consignment to site with a detailed packing list.

15.6 All the equipment shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by ship/rail or trailer. The equipment shall be wrapped in polythene sheets before being placed in crates/cases to prevent damage to the finish. Crates/cases shall have skid bottom for handling.

15.7 Special notations such as 'Fragile', 'This side up', 'Center of gravity', 'Weight', 'Owner's particulars', 'PO Nos.' etc. shall be clearly marked on the package together with other details as per purchaser order.

15.8 The equipment/items may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains/high ambient temperature, unless otherwise agreed.

15.9 The following minimum packing procedures shall be followed: -

a. All items shall be dry, clean and free from moisture, dirt and loose foreign material of all kinds.
b. All items shall be protected from rust, corrosion, and mechanical damage during transportation and handling.
c. Each variety and size of item shall be supplied in separate packaging marked with the purchase order no., item code (if available), and the salient specifications.
d. All electrical, instrumentation etc, shall be properly packed to prevent damage during transport, storage, handling at site.
e. All the items which the Bidders considered liable to be damaged during shipment or storage, shall be packaged for separate shipment. If instruments are removed from the panel, they and their connection shall be suitably tagged to ensure simple re installation at the job site. Each instrument shall be sealed in plastic bags containing moisture absorbing desiccants.
f. It shall be bidder's sole responsibility to protect all the material during period of dispatch, storage and erection against corrosion, incidental damage due to vermin, sunlight, rain, high temperature, humid atmosphere, rough handling in transit and including delays in transit.
g. Mandatory Spare parts shall be packaged separately and clearly marked as 'Mandatory Spares'.
h. If mandatory spare items are ordered, same shall be sent in pre-decided lots in containers/secure boxes distinctly marked in GREEN color with boldly written "S "mark on each face of the containers /secure boxes
i. Commissioning spares, Tools & tackles to be packed separately & suitably tagged.

11 TESTING, INSTALLATION, COMMISSIONING & ACCEPTANCE

Following major items, Final Inspection including document verification as per approved QAP shall be carried out by CUSTOMER /CONSULTANT/ CUSTOMER's Third Inspection Agency & BHEL/BHEL's Third Party Inspection Agency at vendor works.

12 SYSTEM INTEGRATION TEST (SIT)

17.1 The Fire alarm equipment including various sub units shall be completely wired and interconnected for the purpose of integrated tests.

17.2 Fire and fault alarm conditions shall be simulated on each line and channel and the complete operational sequence shall be checked. The channels shall be tested for their capability for various detector combinations and types of detectors.

17.3 The following tests shall be simulated, including any other test as required:

a. Single Fire Alarm, Multiple alarms in single loop & multiple loops
b. Single fault and Multiple faults (Earth fault, open circuit and short circuit fault)
c. Multiple alarms & Multiple faults
d. System diagnostic tests
e. System response time, time taken for sound mute/ acknowledge & reset actions at various locations etc. shall be checked.

13 ACCEPTANCE CRITERION:

18.1 The reliable operation of the supplied FAS has to be demonstrated after testing and commissioning by conducting a test run of the entire system for one week (24x7), during which no failure of the system shall occur.

18.2 The final acceptance of the system will be based on on-field testing of the devices as well as the complete system. Code conformances shall be demonstrated in the acceptance tests. The service check of the system shall be done for 15 days. The equipment will be considered as commissioned after 15 days of uninterrupted successful operation.

18.3 After complete handing over, System Architecture Drawings, as built drawings for all building, technical catalogues & literatures, O & M manual, checklist & recommendation from manufacturers, acceptance Reports, pre-commissioning test reports in soft (in CDs) & hard (printed) form shall be submitted by vendor.

14 VENDOR LIST

20.1 Project specific vendor list is shall be as per "Annexure-[G] of this specification". Bidder to follow the same.

20.2 Further the supplied model shall be under regular manufacturing range and have ProvenTrack Record (PTR).

20.3 Bidder to comply with sub-vendor list enclosed with the specification. The sub-vendors for any item that is not appearing in the sub-vendor list (annexure-G) may be proposed for BHEL's approval.

20.4 Non-acceptance of any sub-vendor by BHEL / customer shall not have any commercial & delivery implication. While submitting sub-vendors for approval of BHEL, bidder shall furnish following documents :

a) ISO certificate of Sub-vendors

b) Proven track record & references for makes and models supplied earlier.

RECORD OF REVISIONS				
Rev. No.	Date	Revision Details	Revised By	Approved By
00	20.06.2022	Original issue	--	P.ChandraSekhar

	Bill of material [for Main Supply]	Annexure -[A] of PY 51846
	Fire Detection & Alarm System	Rev 00
	Project: 2 x 660MW Khurja STPP TG & Associated Pkgs	

BHEL MATERIAL CODE: PY9751846013

S. No.	Item Description	Quantity [A]	Unit	Remarks
1	Fire Alarm Panel (Each panel shall have 04 Loops) Floor Mounted	2	No.'s	Location of Panels: a) TG Building CER Unit #1 b) TG Building CER Unit #2
2	Repeater Panel	1	No.'s	Location of Panels: a) Fire Station
3	Loop Card	2	No.'s	Refer Note-3
4	Multisensor Detectors with detector base and mounting back box (Analogue addressable)	880	No.'s	
5	Duct type smoke Detector	6	No.'s	
6	Heat Detectors with detector base and mounting back box (Analogue addressable)	10	No.'s	
7	Indoor Manual Call Points with mounting back box (Addressable type)	8	No.'s	
8	Indoor Hooter cum Strobe with mounting back box (Addressable type)	8	No.'s	Loop powered Hooter only
9	Exit Sign (Self illuminating)	8	No.'s	
10	Response Indicators	180	No.'s	
11	Module for Tripping (1 Output)	4	No.'s	
12	Module for Interface with IGES (1 Input + 1 Output) with IP-65 enclosure	6	No.'s	
13	Operator Workstation & A4 size color laser Printer along with Graphic software i.e., (GUI) Software with License /Dongle	2	No.'s	Location of OWS: a) CCR
14	Laptop along with Fire Alarm Panel Commissioning Software with License /Dongle	1	No.'s	Handing over of license shall be done after commissioning of complete system
15	Furniture for Operator Workstation & Printer	2	Sets	
16	Mini-UPS for Operator Workstation & Printer (To be sized by bidder)	2	No.'s	Location : CCR
17	8 core Armoured single mode Optical Fiber Cable with 2" rodent proof HDPE conduits (for fire alarm panels and PC networking)	3000	Meter	Refer Note-10, 11 below & Item sl no 1 for panel locations
18	Cable Tags for 1P x 1.5 Sqmm Cable	20	No.'s	
19	Cable Saddle + Saddle Bars along with fixing screws and rawl plugs for 1P x 1.5 sqmm Cable	8500	No.'s	
20	Nylon Cable Tie for 1P x 1.5 sqmm Cable	1000	No.'s	
21	PVC Cable Glands for 1P x 1.5 sqmm Cable	2100	No.'s	

	Bill of material [for Main Supply]			Annexure -[A] of PY 51846
	Fire Detection & Alarm System			Rev 00
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BHEL MATERIAL CODE: PY9751846013				
22	Cable Lugs for 1P x 1.5 sqmm Cable	4200	No.'s	
23	All hardware, mounting accessories & Software required (including OPC Licenses etc.) required for establishing the networking between all fire alarm panels, repeater panels, DCS, PCs, Printers, OFC Cable etc shall be considered.	1	Lot	Refer Note-7 below
24	OWS for OPC Server along with software	1	No.'s	

Technical Notes:

1	Battery sizing of FDA panels is in the scope of bidder. Bidder to considering the panels as fully loaded for sizing purpose. The standby power source (battery bank to power fire detection and alarm system) should be sized for 24 hours of continuous load or 30 minutes in alarm condition (at least 25% devices considered active in alarm condition).
2	Power supply to all the detectors/components specified in the BOQ above, should be extended from the Fire alarm Panels Only. Sizing of powersupply modules, batteries size for secondary power, calculation of notification appliance circuit voltage drops, selection of internal components of FDA Panels etc. to be carried out by bidder & panel model need to be selected accordingly. Battery & Power supply calculation sheet verified by OEM and to be submitted to BHEL during detailed Engg for approval.
3	In case the bidder offered system is having multiple variants of loop cards, bidders are advised to select loop cards which cater to largest distance.
4	Bidder to note that all the above detectors/devices shall be loop powered. In case loop powered devices are not available in the make offered, bidder shall consider the necessary modules as per above BOM.
5	Each addressable loop device (Detectors, MCP, Module etc) shall have inbuilt short circuit isolator suitable for Class A wiring.
6	Fire alarm panels shall be floor mounted only.
7	All erection hardware including back box, fixing screws, lugs, glands, clamps, structural steel, anchor fastner, chains, J-bolts/J-hook, nuts, bolts, flanges etc. for the above items shall be considered in the offer by the bidder. In addition to this, an additional 10% of all erection hardware shall be considered in the scope of bidder.Post order, the vendor need to submit detailed erection document indicating BOQ of erection hardware for each variety of detector/device etc. i.e., Erection hardware for detectors/devices -calculation sheet to be furnsihed during detailed Engg stage.
8	All interface modules shall be provided with enclosure suitable for outdoor application.
9	Unit rates for addition/deletion (+10% to -20%)for Main and mandatory spares shall be applicable
10	Also necessary erection hardware (jointing kits, termination kits, LIU, patch card, media converter, pit tails, etc) for FO cable shall be considered in the scope bidder. In addition, splicing and termination of FO cable and it's accessories are in bidder scope. Minimum BOM for meeting this reuqirement is: Splicing tool kit=1 Set, LIU / Media converters=6 No's, Pigtails = 12 No's, Network interface card= 6 No's, Duplex patch cords = 6 No's and bidder to add other items (if any) for completeness of the system.
11	Fire alarm panels, repeater panels specified in the BOM are to be connected in ring topology using fiber optic cable. Quantity of Single Mode Optical Fiber cable (for networking of Fire Alarm Panels, Repeater Panels, Workstations, Printers etc) is indicated in the BOQ
12	For Interface / integration of FDA system with DCS redundunt OPC Connectivity through FO Cable- necessary hardwares + softwares are to be included in the scope.
13	LIUs (Fiber Patch Panels / Light interface units) - are to be used for routing, terminating and managing optical cable terminations and should be mounted inside the FAPs & Repeater Panel enclosures
14	Supply items for which no definite “make/brand” is indicated, shall be procured only from reputed makes & models having proven records of accomplishmet and requires purchaser approval.
15	FAP, Repeater panel, Detectors, Devices, Modules etc. shall be under regular manufacturing range of OEM and have proven track record.
16	Information/Status of all panels shall be available in all the workstations using GUI Software
17	All the network switches shall be of high quality and shall be sized to meet the functional requirements as specified. The common switch to which all networks are connected shall be Layer-III switch/router. All the interconnecting cables between network switches shall be fiber optic only. All fiber optic cables shall be terminated directly to network switches through optical fiber port without using media converters.
18	Bidder to derive the BOM for hardware material based on the make and model components selected for main FDA panel. Accordingly, mandatory spares quantities shall be derived / populated based on defintion against mandatory spares sheet . The quantities will be verified during detailed Engg.

	Bill of material [for Mandatory Spares Supply]	Annexure -[A] of PY 51846
	Fire Detection & Alarm System	Rev 00
	Project: 2 x 660MW Khurja STPP TG & Associated Pkgs	

BHEL MATERIAL CODE: PY9751846021

S. No.	Item Description	Quantity [B]	Unit
A	FIRE DETECTORS		
1	Multisensor detectors (Addressable)	44	No.'s
2	Indicators assembly for smoke detectors provided in false ceiling (Response indicator)	9	No.'s
3	Manual Call Points	1	No.'s
B	FIRE ALARM PANEL & REPEATER FIRE ALARM PANEL		
1	Fuses	100% of population	No.'s
2	Indicating lamps	100% of population	No.'s
3	Push Button	10 Nos. of each type and rating	No.'s
4	Power supply modules	10% or 1 No. of each type & rating whichever is more	No.'s
5	Loop Card	10% or 1 No. of each type,	No.'s
6	Network Card	1	No.'s
7	Module for Tripping (1 Output)	1	No.'s
8	Module for Interface with IGES (1 Input + 1 Output) with IP-65 enclosure	1	No.'s
9	LCD display of each type unit of panel	1	No.'s
10	Cartridges for printers	2	No.'s
11	LEDs of each type	100% of population	No.'s
12	Power supervision relay	4 Nos. of each type	No.'s
13	Fire screen / alarm buzzer	1 No. of each type	No.'s

FIRE PROTECTION AND DETECTION SYSTEM

1.00.00 GENERAL DESCRIPTION

1.01.00 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.

1.02.00 All major equipments/system components in the entire fire protection & detection system shall have the approval from one of the following:

a) Underwriters Laboratories of USA
b) LPCB-UK
c) VDS
d) BIS for the approval of pumps and valves (as applicable)
e) FM-USA

However, design and installation of complete system and requirements shall be approved by TAC accredited professional(s)-India.

1.03.00 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.

2.00.00 FIRE DETECTION, ALARM AND CONTROL SYSTEM

2.01.00 **Codes and Standards**

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:

i. Department of Atomic Energy (Certification of safety from Radioactivity).

ii. Central Building Research Institute, Roorkee.

iii. Central Mining Research Station, Dhanbad.

iv. Local Fire Authorities.

d. 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.

ii. National Fire Protection Association, (NFPA), USA

	iii. Under-writers laboratories, (UL), USA iv. Factory mutual (FM)
2.02.00	**General requirements for all types of Detectors**
2.02.01	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.
2.02.02	Necessary mounting accessories shall be provided for all the detectors.
2.02.03	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.
2.02.04	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.
2.02.05	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.
2.02.06	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.
2.02.07	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.
2.02.08	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.
2.02.09	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.
2.02.10	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.
2.02.11	The detector shall be located where the largest combustion gas concentration can be expected.
2.02.12	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.
2.02.13	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.

2.02.14	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.
2.02.15	The detectors shall not be sensitive to vibrations. Any special mounting arrangements required to counteract vibration shall be included in the contractor scope.
2.02.16	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.
2.02.17	The detectors shall not give false alarm due to high humidity, temperature, and velocity of air in the surroundings and static electricity conditions.
2.02.18	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.
2.03.00	**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.

2.04.00	**Multi sensor Detectors**
2.04.01	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.
2.04.02	The detectors shall be sensitive to very low smoke densities of the order of say 0.05 g/m^3. 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 80-90m^2.
2.04.03	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.
2.04.04	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.
2.04.05	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.
2.04.06	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.
2.05.00	**System Configuration**
2.05.01	Each of the Addressable Fire Alarm panel shall be able to communicate with one another as well as with repeater annunciation panel 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.
2.05.02	At least one spare loop shall be provided in each of the addressable type fire alarm panel located in control equipment 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.
2.05.03	Fire alarm system 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.

2.06.00	**Analog Addressable Fire Detection and Alarm System**
2.06.01	General Requirements
2.06.02	This specification in general covers the functional requirements, and general design aspects of Microprocessor based, Analog Addressable Fire Detection Alarm / Annunciation and Control System.
2.06.03	The following description intends to describe only the brief hardware and functional requirements, scope of hardware requirements etc. but the actual configuration of 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.
2.06.04	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.
2.06.05	All equipments such as detectors, panels etc shall be approved and listed by UL/FM/LPCB/VDS.
2.06.06	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.
2.06.07	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.
2.06.08	The wiring shall be of class-A as per NFPA-72.
2.06.09	Bidder shall provide isolators at the start & end of the loop.
2.06.10	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 and switching devices each with its own addressable interface modules.

g) Software and hardware as required for complete operation of the system.

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 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.

2.07.00 **System Functional Requirements**

2.07.01 The fire alarm panel shall evaluate the signals received from the detectors and shall handle the following functions:

1. System self monitoring and fault signaling.
2. 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.
3. 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.
4. Triggering stationary extinguishing systems such as clean agent system.
5. Supervising of unauthorised removal of a detector head from its base and giving a fault alarm on the control panel.
6. Supervising and monitoring the detection cabling, to indicate fault conditions in case of open/short circuit in the wiring.
7. 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.
8. Facilitating simulation of fire conditions to enable the testing of circuits (without creating actual fire) under the test mode from the fire Alarm panel.

	9. The control unit shall contain all the systems main switches lamps and fuses. Switches and lamps shall be easily identified even in closed casings. 10. 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 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.
2.07.02	**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 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.

2.08.00 **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”, “Display Hold”, And “Display Next”.

d. All membrane switches shall be tactile with audible feedback when pressed.

2.09.00

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.

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.

2.10.00 **Power Supply for Fire Alarm Panels & Repeater Alarm Panel**

2.10.01 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.

2.10.02 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.

2.10.03 The battery chargers and batteries shall be placed at a suitable location inside the fire alarm panel with partitions.

2.10.04 The detailed specification related to power supply system of fire detection & protection system shall be as specified in other sections of the technical specification.

2.11.00 **Control & Instrumentation requirements**

2.11.01 The specification for PC, printer and other HMI items shall be as specified in other sections of the technical specification.

2.11.02 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.

2.12.00 **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:

Application		Type of cable
From	**To**	
Detectors (including detectors mounted inside panels) /Any loop device	Detector (including detectors mounted inside panels) / Isolator/ Interface unit	Shielded, Twisted, PVC Cu. FRLS cables type "S" Refer Note 2, 3, 4 and 5 below.
Detectors (including detectors mounted inside panels) / Isolator / Interface Unit	JB	Shielded, Twisted, PVC Cu. FRLS cables type "S" Refer Note 2, 3, 4 and 5 below.
JB	Fire alarm Panel	Shielded, Twisted, PVC Cu. FRLS cables type "S" Refer Note 2, 3, 4 and 5 below.

Notes:

1. 10% spare pair shall be provided for all cables having more than four pairs.
2. Type "S" cable shall be multicore control cable having overall shielding & specification similar to instrumentation cable except insulation thickness and voltage grade which shall be 1100 V. Type "S" cable shall also satisfy requirements of Article 760 of NFPA 70.
3. Over and above, contractor may note that short term fire proof cables shall be provided for 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. Cable size of 2 core 1.5 sq.mm shall be used for loop wiring in-case of both control cable and short term fire proof cable.

5. Cable size of 2 core 2.5 sq.mm shall be used to provide power supply to various devices in the loop in-case of both control cable and short term fire proof cable.

6. The detailed specification of instrumentation cables and optical fiber cable shall be as specified in other sections of the technical specification.

7. Detector cables outside the building shall be corrugated steel taped armoured laid through cable trays wherever available and for rest of the areas, cable shall be buried at 600 mm depth with sand filling and brick covering at the top.

8. Detector cable within the building shall be either unarmoured & laid through galvanized iron (GI) conduits or armoured cables, as per the standard and proven practice of the manufacturer.

2.13.00 **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 Control rooms/Control Equipment Rooms, etc.

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.

iii) Duct mounted 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.

3.00.00 **AUTOMATIC TOTAL FLOODING INERT GAS EXTINGUISHING SYSTEM**

3.01.00 General

a) Fire protection for main control room, control equipment rooms and associated C&I rooms like programmer/server rooms, PC rooms, panel room, UPS/Battery charger rooms, etc. shall be by means of inert gas fire 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.

3.02.00 **Design Philosophy (Minimum Requirements)**

3.02.01 **General**

a) Complete design and all critical components / equipment like cylinder, cylinder valve assembly, hoses, check valve, actuation controls, restrictor/pressure reducer, directional/selector valve, pressure relief device/safety valve, pressure gauge, pressure switch, nozzle, etc. shall be approved and listed by UL/FM /VDS /LPCB or equivalent and the system shall also be approved by TAC accredited professional(s) before installation.

b) Basic design parameters of inert gas extinguishing system like type of inert gas agent, extinguishing/design concentration, safety factor, discharge time, etc. shall be considered in strict accordance with NFPA-2001 (latest edition). Piping design/layout, nozzle arrangement/orientation, etc. shall conform to UL/FM/VDS/LPCB or equivalent.

3.03.00 **Agent Supply, Design Concentration, Quantity & Discharge time**

a) System shall be designed to meet the minimum requirements of total flooding inert gas extinguishing system as per NFPA 2001. However higher concentration may be used if it is specified by the agent manufacturer/ system supplier for the area protected.

b) The complete volume of the rooms including the above false ceiling shall be considered for estimation of quantity of gas and containers. When determining the gas quantity, the leakage losses from the enclosure shall be taken into account by the supplier. Further volume of re-circulating type air conditioning system & its duct work (at least up to the automatic fire dampers of the ducts) shall be considered as a part of the total volume so that the design concentration is achieved throughout the hazard area. Further gas quantity shall be adjusted for ambient pressure & temperature conditions. Bidder to provide primary supply of gas & its cylinders, along with 100% (one hundred percent) standby reserve gas quantity and cylinders for each room/area.

c) However, if the system design permits provision of a common “ENGINEERED STORAGE SYSTEM” with directional valves for multiple rooms / areas of one unit, such a design is acceptable provided the total primary supply and/or reserve supply is equivalent to the requirement of largest area / room and such rooms /areas are perfectly separated from each other by means of wall / metal cladding or floor of minimum required fire rating. Such common storage system should have been listed & approved by UL/FM/VDS/LPCB or equivalent and bidder should produce documentary evidences for design and installation of such systems elsewhere in the past by them.

d) In either of the case mentioned in above two clauses, both the main & reserve supply cylinders shall be permanently connected to the distribution piping through manifold and arranged for easy changeover from the panel. Suitable selector switches be provided for “Normal /Standby “supply selection.

e) The discharge time period shall be such that the design concentration is achieved within time duration specified in NFPA-2001 (latest edition/amendment). The flow calculations shall establish this criteria.

f) The quality of gas shall conform to relevant design standard such as NFPA – 2001 (latest edition) or as specified by listing authorities.

3.04.00 Storage containers

a) The storage cylinders offered shall be of seamless type & brand new. Welded cylinders are not permitted.

b) All the storage containers shall be provided under an enclosure. It shall not be kept open to atmosphere.

c) The storage containers shall be securely installed as per the listed installation manual with a provision for convenient individual servicing and container weighing. Such servicing or weighing shall be possible without shutting down the system.

d) Automatic means such as check valves shall be provided to prevent gas loss if the system is operated when any containers are removed for maintenance.

e) The storage containers shall not be charged to a fill density or super pressurization level different from the manufacturer's listing.

f) The design pressure for storage cylinders shall be suitable for the maximum pressure developed at 55 °C and shall be designed to meet the requirements in NFPA-2001.

g) All cylinders shall bear the marking as detailed out in NFPA -2001 and shall be duly listed by UL / FM /VDS/LPCB or equivalent in addition to approval by Chief Controller of Explosives -INDIA.

h) The storage cylinders shall have accessories such as pressure gauges/ switches, liquid level indicators (if applicable), refilling connections, relief devices (if applicable) etc. A reliable means of indication other than weighing shall be provided to determine the pressure in cylinders.

i) All the pressure gauges/switches, manifold connections etc shall be easily removable for servicing / maintenance without any loss of gas.

3.05.00 DISTRIBUTION

a) Both main & reserve cylinders shall be permanently connected to the distribution piping through manifold and arranged for easy & auto changeover. Cylinder Manifold, directional valve manifolds, Piping, fittings & pressure relieving device shall be designed for the maximum design pressure of the system and shall conform to the requirements of NFPA -2001 (latest edition) or as specified by listing authorities. Material of construction for manifolds shall be as per listed design manual and shall be hydro-tested as per design manual or at 1.5 times the maximum design pressure, whichever is higher.

b) Discharge nozzles along with deflector shields shall be listed for the intended use including the flow characteristics and area of coverage and quantity & design shall be such that complete quantity of gas is uniformly distributed throughout the hazard volume within the specified discharge time without disturbing the ceilings, lighting fixtures etc.

c) The fire detection system to be employed shall be as specified elsewhere. Operating devices shall be by mechanical, electrical and pneumatic means conforming to NFPA-2001. The power supply to electrical actuators shall be backed up with reliable battery supply. Such batteries shall be charged automatically by battery chargers. Power supply be taken from the Fire detection /alarm system panels of the respective units. Required annunciations such as "Gas released", "Failure of automatic actuation" etc shall be exhibited in the fire alarm panel.

d) Where pilot cylinders are employed for actuation of the cylinder banks, the number of pilot cylinders shall be as per the listed design manual.

e) Facility for manual release of gas through push buttons be provided along with selection facility of "Auto/Manual" from the panel.

f) In addition to this, local manual release through lever operation shall also be provided near the cylinder banks.

g) All manual-operating devices shall be identified to the hazard they protect by fluorescent paint.

h) Manual abort switches shall be provided for each of the area/zone and the same shall be provided as per NFPA -2001 or as specified by listing authorities.

i) The gas releasing devices at cylinder outlets shall be of re-usable type after discharge at any instant.

j) Supervision of automatic actuation devices, power supply, manual actuation circuits, and complete wiring shall be provided through control system /panel and the healthiness shall be reported or indicated in the panel automatically. Complete control system shall be listed and approved by UL/FM/ VDS/LPCB.

3.06.00 Design, Installation & Testing

a) System design, specifications, working plans, flow calculations etc shall be prepared in line with the NFPA-2001 or as specified by listing authorities and shall be approved by Employer. The system flow calculations shall be performed using a calculation listed or approved by UL/FM /VDS/LPCB.

b) Calculation shall be provided by the designer to prove that the area is not pressurized and extinguishing capability is not affected due to provided ventilation of that area. Bidder to provide additional ventilation arrangement if required.

c) After installation, the complete system shall be inspected and tested as per the recommendations of Chapter-4 & relevant Clauses of Appendix-A of NFPA-2001. Wherever testing is mentioned at a regular frequency in these chapters, the bidder shall carry out initial testing and records shall be presented to Employer for approval of the installation.

d) Prior to handing over of the system to Employer, the supplier shall provide operational training to Employer's operating personnel which shall consist of control system operation, trouble procedures, emergency procedures, safety requirements etc.

e) The complete installation, testing, commissioning & training shall be carried out by the Contractor under the supervision of the Manufacturer/ designer at site.

f) The performance test of the system shall be carried out by releasing the agent gas in a selected area and design parameters shall be measured. All equipments, refilling of gas after test, instruments, etc. shall be provided by the contractor for the same.

3.07.00 SAFETY

(a) All the safety requirements recommended in NFPA -2001 or as specified by listing authorities shall be incorporated in the installation by the bidder.

(b) Appropriate warning signs shall be fixed outside of those areas protected by the system and also in areas where the gas may spread indicating clearly the hazard associated with the system such as Noise, turbulence, cold temperature, physiological effects on personnel etc.

(c) Apart from written warning signs, audio-visual type warning signs (i.e) hooters & strobe lights shall be provided for pre-discharge and post-discharge activity. The sounder shall have selectable tone options.

(d) The gas shall be discharged after a set time delay on receiving signal from the fire detection system. The duration of the timer shall be upto a range of 0- 5 minutes (adjustable in I minute variation) at site after conducting test to find out the duration for evacuation of the personnel from the area.

(e) To prevent the loss/release of gas automatically or manually during maintenance, the system shall have the facility of "LOCKOUT". The status of the system lockout condition shall be annunciated audio-visually in the panel.

3.08.00 Pressure Venting

Since huge quantity of gas is envisaged to be released, proper pressure relief and ventilation systems such as fans, dampers, etc. shall be provided by the contractor. Required openings in the civil structure shall be provided by the owner. The contractor shall submit pressure relief, venting calculations, its requirement and suggestive mode of ventilation during detailed engineering for approval.

	Price Bid format [for Main Supply + Mandatory Spares+Services]	Annexure -[C] of PY51846
	Fire Detection & Alarm System	Rev.00
	Project: 2 x 660MW Khurja STPP	

BHEL ENQUIRY NO : Vendor Offer ref no:

Ref. date: Ref. date:

NOTES ::

1	This document details the price schedule format for the enquiry. **No other format will be entertained.** Applicable taxes and duties shall be indicated separately in commercial offer.
2	Duly signed & stamped un-priced price schedule format shall be submitted by vendor in the technical offer as a token of concurrence that price schedule would be submitted in this format. Any tampering / modification / additions, etc. are NOT allowed and not considered binding and is liable for rejection of the offer.
3	**Bidders shall be evaluated on overall L1 basis.**
4	For addition/reduction of quantity, unit rate quoted in the present offer shall be considered during order execution and shall be valid up to execution of the contract to the extent of + 10%, - 20% of overall order Value. These would include the cost up to engineering, installation of the item, wiring up in the panel and seamless integration with main system at works/site without any cost implications. All accessories as required for this purpose also shall be included in the Price Quoted
5	Components/Items for addition/deletion, spares shall be identical to the main equipment.
6	Billing will be as per BOM of actual supplied main equipment (including accessories) & spares.
7	Unit Rates of the individual package items shall be derived by multiplying the "Unit Price Fixing Factor" with the Lumpsum Price quoted. Unit Rates of the Individual items thus arrived, shall be binding on the bidder, in case of any repeat order/Ammendment of order as per BHEL policies. Observations / Objections, if any, of the Bidder, to the "Unit Price Fixing Factor" shall be brought to the notice of BHEL, during Pre-Bid Stage. No Observations / Objections shall be enterained after the Techno-Commercial Bid is opened.
8	Bidder to indicate "Quoted" in the column "Bidder's Confirmation" as a confirmation of their bid to the respective item.
9	The Bid Evaluation is on Overall L1 Basis. Each and Every item of the Package shall be quoted by the bidder. Partial offers will not be considered for evaluation and the same are liable for rejection.
10	Bidders will be required to quote Total BASIC Price only (For Main items and Mandatory spares)in Price Bid Form in the e-procurement portal, considering all items as per this Price Format. Basic Prices of various line items shall be calculated by BHEL by multiplying the quoted Total Basic Price with the Weightages mentioned in this Price Format against the respective line items.

	Price Bid format [for Main Supply + Mandatory Spares+Services]						Annexure -[C] of PY51846	
	Fire Detection & Alarm System						Rev.00	
	Project: 2 x 660MW Khurja STPP							
S. No	**Material Code**	**Item Description**	**Quantity [I]**	**Unit**	**Unit Rate (Rs.) [II]**	**TOTAL PRICE (Rs.) [I*II]**	**Weightage (%) for Calculation of Line Item Prices by BHEL (Refer Note-7)**	**REMARKS**
[A]	**MAIN SUPPLY**							
(a)	PY9751846013	Main Supply- Fire Detection & Alarm System Components	1	Set			**90.41%**	
					MAIN SUPPLY Total prices (Sub-total of [A]) (Rs.) ::			**-------- [1]**
[B]	**MANDATORY SPARE**							
(b)	PY9751846021	Mandatory Spares- Fire Detection & Alarm System Components	1	Set			**7.62%**	
					MANDATORY SUPPLY Total prices (Sub-total of [B]) (Rs.)=			**-------- [2]**
[C]	**SERVICES**							
(c)	PY9751846030	Supervision of Erection & Commissioning Services charges at site including lodging, boarding, local travel, insurance, etc. [Unit Rate = Per man day charges]	6	Days			**1.67%**	**-------- [3]**
(d)	PY9751846048	Supervision of Erection & Commissioning visit charges [i.e. travel expenses like travel to & fro from vendors work to site, clearance charges like visa fee, etc.] [Unit rate = per visit travel expenses]	1	Visits			**0.30%**	**-------- [4]**
					Total prices for overall L1 evaluation ([1]+[2]+[3]+[4]) (Rs.) ::			

	Bill of material [for Main Supply]			Annexure -[C] of PY 51846	
	Fire Detection & Alarm System			Rev 00	
	Project: 2 x 660MW Khurja STPP TG & Associated Pkgs				
BHEL MATERIAL CODE: PY9751846013					
S. No	**Type of instrument**	**Supply Quantity**	**Units**	**Weightage (%) for Calculation of Line Item Prices by BHEL Weightage of each item / unit price fixing factor (%)**	**Bidders Confirmation**
1	Fire Alarm Panel (Each panel shall have 04 Loops)	2	No.'s	16.26%	
2	Repeater Panel	1	No.'s	3.71%	
3	Loop Card	2	No.'s	2.61%	
4	Multisensor Detectors with detector base and mounting back box (Analogue addressable)	880	No.'s	36.93%	
5	Duct type smoke Detector	6	No.'s	0.25%	
6	Heat Detectors with detector base and mounting back box (Analogue addressable)	10	No.'s	0.40%	
7	Indoor Manual Call Points with mounting back box (Addressable type)	8	No.'s	0.57%	
8	Indoor Hooter cum Strobe with mounting back box (Addressable type)	8	No.'s	0.69%	
9	Exit Sign (Self illuminating)	8	No.'s	0.06%	
10	Response Indicators	180	No.'s	0.28%	
11	Module for Tripping (1 Output)	4	No.'s	0.20%	
12	Module for Interface with IGES (1 Input + 1 Output) with IP-65 enclosure	6	No.'s	0.32%	
13	Operator Workstation & A4 size color laser Printer along with Graphic software i.e., (GUI) Software with License /Dongle	2	No.'s	10.66%	
14	Laptop along with Fire Alarm Panel Commissioning Software with License /Dongle	1	No.'s	1.17%	
15	Furniture for Operator Workstation & Printer	2	Sets	0.19%	
16	Mini-UPS for Operator Workstation & Printer (To be sized by bidder)	2	No.'s	0.98%	
17	8 core Armoured single mode Optical Fiber Cable with 2" rodent proof HDPE conduits (for fire alarm panels and PC networking)	3000	Meter	3.92%	
18	Cable Tags for 1P x 1.5 Sqmm Cable	20	No.'s	0.01%	
19	Cable Saddle + Saddle Bars along with fixing screws and rawl plugs for 1P x 1.5 sqmm Cable	8500	No.'s	0.79%	
20	Nylon Cable Tie for 1P x 1.5 sqmm Cable	1000	No.'s	0.04%	
21	Cable Glands for 1P x 1.5sq.mm cable for above devices	2100	No.'s	2.41%	
22	Cable Lugs for 1P x 1.5 sqmm Cable	4200	No.'s	0.23%	
23	All hardware, mounting accessories & Software required (including OPC Licenses etc.) required for establishing the networking between all fire alarm panels, repeater panels, DCS, PCs, Printers, OFC Cable etc shall be considered.	1	Lot	7.09%	
24	OWS for OPC Server along with software	1	No.'s	0.63%	
				90.40%	

	Bill of material [for Mandatory Spares Supply]	Annexure -[C] of PY 51846
	Fire Detection & Alarm System	Rev 00
	Project: 2 x 660MW Khurja STPP TG & Associated	

BHEL MATERIAL CODE: PY9751846021

S. No.	Item Description	Quantity [B]	Unit	Weightage (%) for Calculation of Line Item Prices by BHEL Weightage of each item / unit price fixing factor (%)	Bidders Confirmation
A	**FIRE DETECTORS**				
1	Multisensor detectors (Addressable)	44	No.'s	1.72%	
2	Indicators assembly for smoke detectors	9	No.'s	0.01%	
3	Manual Call Points	1	No.'s	0.05%	
B	**FIRE ALARM PANEL & REPEATER FIRE ALARM PANEL**				
1	Fuses	100% of population	No.'s	0.54%	
2	Indicating lamps	100% of population	No.'s	0.21%	
3	Push Button	10 Nos. of each type and rating	No.'s	0.02%	
4	Power supply modules	10% or 1 No. of each type &	No.'s	1.04%	
5	Loop Card	10% or 1 No. of each type,	No.'s	1.31%	
6	Network Card	1	No.'s	0.91%	
7	Module for Tripping (1 Output)	1	No.'s	0.05%	
8	Module for Interface with IGES (1 Input + 1 Output) with IP-65 enclosure	1	No.'s	0.05%	
9	LCD display of each type unit of panel	1	No.'s	0.75%	
10	Cartridges for printers	2	No.'s	0.11%	
11	LEDs of each type	100% of population	No.'s	0.05%	
12	Power supervision relay	4 Nos. of each type	No.'s	0.64%	
13	Fire screen / alarm buzzer	1 No. of each type	No.'s	0.16%	
				7.62%	

PY-FL-4-M151-8316-01

LCD DISPLAY

FAP

LOC: TG BUILDING (UNIT 1) CENTRAL CONTROL ROOM

230V AC, NORMAL POWER SUPPLY

230V AC, NORMAL POWER SUPPLY

TO DCS AT CCR (REFER NOTE-10)

RS-232/485

240V AC, UPS POWER SUPPLY

PRINTER

COLOUR MONITOR

CENTRAL CONTROL ROOM-1

BATTERY CHARGER

BATTERY

EXIT

TG BUILDING EL: 8.5M UNIT #1

TG BUILDING EL: 17.0M UNIT #1

PANELS/CUBICLES OF CCR&ER,UPS & BATTERY CHARGER ROOM (UNIT #1)

OUTPUT CONTACTS TO MAIN DCS (REFER NOTE: 10)

INTERLOCKS FOR AC, VENTILLATION ETC

INTERLOCKS FOR HVAC, AND INERT GAS SYSTEM

SPARE LOOP

02

LCD DISPLAY

FAP

LOC: TG BUILDING (UNIT 2) CENTRAL CONTROL ROOM

230V AC, NORMAL POWER SUPPLY

230V AC, NORMAL POWER SUPPLY

TO DCS AT CCR (REFER NOTE-10)

RS-232/485

240V AC, UPS POWER SUPPLY

PRINTER

COLOUR MONITOR

CENTRAL CONTROL ROOM-1

BATTERY CHARGER

BATTERY

EXIT

TG BUILDING EL: 8.5M UNIT #2

TG BUILDING EL: 17.0M UNIT #2

PANELS/CUBICLES OF CCR&ER,UPS & BATTERY CHARGER ROOM UNIT #2

SPARE LOOP

02

NTPC DRG. No. 9915-371-110-PESD-PVM-B-003 REV. 02

2 X 660 MW, KHURJA STPP - TG PACKAGE

THDC INDIA LIMITED.
(A JV of GOVT. OF INDIA & GOVT. OF UP)

CONSULTANT: NTPC LTD.
(A GOVERNMENT OF INDIA ENTERPRISE)
CONSULTANCY WING

CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD.

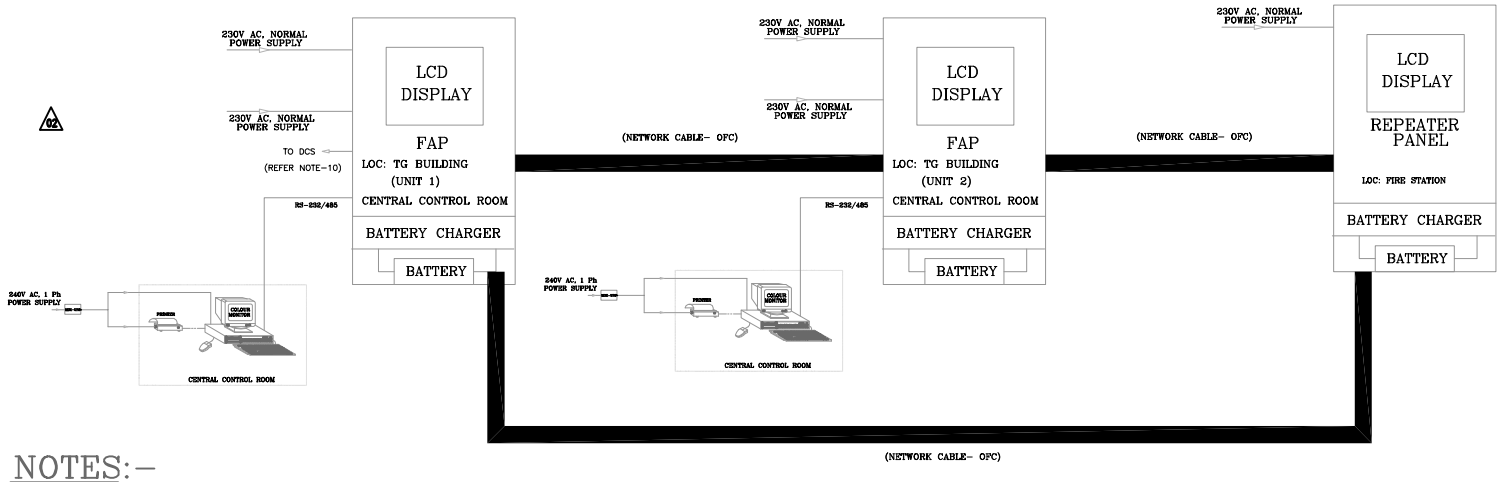
BHARAT HEAVY ELECTRICALS LTD
PROJECT ENGG & SYSTEMS DIVISION
HYDERABAD

TITLE: SCHEMATIC OF FIRE DETECTION & ALARM SYSTEM

DRAWING NO. PY-FL-4-M151-8316-01

SHEET 01 OF 02 REV. 02

SIZE: A4



NOTES:–

1. FIRE ALARM PANEL SHALL BE PROVIDED WITH 24 V SEALED MAINTENANCE FREE D.C BATTERY BACKUP, COMPRISING OF 2x100% CHARGERS AND 1x100% SMF BATTERIES AS PER OEM RECOMMENDATION.
2. FIRE ALARM PANELS SHALL HAVE A BATTERY BACK UP FOR 24 HRS NORMAL OPERATION AND 30 MIN. OF ALARM CONDITION.
3. ALL FIRE ALARM PANELS AND REPEATER PANELS SHALL BE WALL MOUNTED.
4. FIRE ALARM PANELS SHALL BE PROVIDED WITH NECESSARY CONTACTS / INTERFACING MODULES FOR INITIATING REQUIRED ALARM / TRIPPING OF HVAC, PACKAGE AIR CONDITIONER, INERT GAS EXTINGUISHING SYSTEM, ETC.
5. THE NUMBER OF LOOPS AND DEVICES/DETECTORS CONNECTED TO THE FIRE ALARM PANEL ARE INDICATIVE ONLY. ACTUAL DETAILS OF BUILDINGS COVERED BY EACH FIRE ALARM PANEL SHALL BE FURNISHED DURING DETAIL ENGINEERING
6. SPACING OF DETECTORS AND MANUAL CALL POINTS SHALL BE AS PER CL.NO.6 OF IS 2189.
7. OPERATOR WORKSTATION AND PRINTER SHALL BE OF THE FOLLOWING CONFIGURATION:–
   (a) 24" LED MONITOR
   (b) I5 PROCESSOR OR EQUIVALENT
   (c) ONE 4 GB RAM
   (d) ONE 500 GB HARD DISK
   (e) ONE DVD(RW) DRIVE
   (f) TWO NOS. OF USB PORTS
   (g) BLACK & WHITE LASER PRINTER (A4 SIZE), QWERTY KEYBOARD AND OPTICAL MOUSE
8. THE FOLLOWING SOFT SIGNALS SHALL BE TAKEN FROM MAIN FIRE ALARM PANEL TO DCS THROUGH OPC SERVER:–
   (a) SYSTEM HEALTHY
   (b) SYSTEM FAULT
   (c) SYSTEM UNDER FIRE
9. FIRE ALARM CABLES SHALL BE AS FOLLOWS:
   LOOP CABLE : 1P x 1.5 SQ.MM COPPER CONDUCTOR, PVC/FRLS PVC LOOP CABLE, ARMOURED, TWISTED, OVERALL SHIELDED.
   POWER CABLE : 2C x 2.5 SQ.MM COPPER CONDUCTOR XLPE INSULATED PVC INNERSHEATH, FRLS, PVC OUTERSHEATH, ARMORED CABLE.
10. MINERAL INSULATED COPPER CONDUCTOR (MICC) CABLE SHALL BE USED FOR INERT GAS PROTECTED AREAS.

LEGEND:–

SL NO	SYMBOL	DESCRIPTION
1	———	POWER CABLE (2Cx2.5 SQMM)
2	- - - - - -	LOOP CABLE (1Px1.5 SQMM)
3	———	NETWORK CABLE / OPTICAL FIBER CABLE
4		HOOTER CUM STROBE
5	CM	CONTROL MODULE
6	MM	MONITOR MODULE
7	EXIT	SELF-ILLUMINATING EXIT SIGN BOARD
8	H	HEAT DETECTOR
9	M	MULTISENSOR DETECTOR
10		MULTISENSOR DETECTOR WITH RESPONSE INDICATOR (ABOVE FALSE CEILING & BELOW FALSE FLOORING)
11	BC-1,2	BATTERY CHARGER
12	MFAP	MAIN FIRE ALARM PANEL
13	RP	REPEATER PANEL
14		MANUAL CALL POINT (INDOOR)

NTPC DRG. No. 9915-371-110-PESD-PVM-B-003 REV. 02

PROJECT: 2 X 660 MW, KHURJA STPP – TG PACKAGE

THDC INDIA LIMITED.
(A JV of GOVT. OF INDIA & GOVT. OF UP)

CONSULTANT: NTPC LTD.
(A GOVERNMENT OF INDIA ENTERPRISE)
CONSULTANCY WING

CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD.

JOB NO.:
STATUS:
DISTRIBUTION:

REV.	DATE	A/TD	CHD	APPD
01	11.05.22	ANAND	DVP	PCS
02	29.05.22	ANAND	DVP	PCS

BHARAT HEAVY ELECTRICALS LTD
PROJECT ENGG & SYSTEMS DIVISION
HYDERABAD

TITLE: SCHEMATIC OF FIRE DETECTION & ALARM SYSTEM

DRAWING NO.: PY-FL-4-M151-8316-01

SHEET 02 OF 02 REV. 02

BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING & SYSTEMS DIVISION

PROJECT: - 2 x 660MW Khurja STPP

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ANNEXURE-E

PREBID QUERIES FORMAT					
Sl. No.	**Bidding document Reference**			**Subject**	**Bidder's Query**
	Spec/Annexure	**Page No**	**Clause No**		

Master Document Schedule

Annexure-F of PY51846

Project: 2 x 660MW Khurja STPP

S. NO	Drawing / Document Name	VENDOR Drg/ Document No	Category (A/I)	Schedule of submission from P.O. Date	First Submission (Rev -00)			Current Revision			Current Status (Approved / commented)	BHEL APPD CATEGORY
					Rev No	Actual Date of Submission	Return Date	Rev No	Actual Date of Submission	Return Date		
A.	**Project Execution Plan**											
1	Project Organization Chart		I	2 WEEKS								
2	Project Schedule		A	2 WEEKS								
3	Document Schedule & Control Register		A	2 WEEKS								
4	Quality Plan		A	2 WEEKS								
5	Billing Schedule		A	2 WEEKS								
6	Sub-vendor List		A	2 WEEKS								
7	Progress report monthlywise		I	2 WEEKS								
B.	**Design Output documents**											
1	Project Overview		I	2 WEEKS								
2	Operation write up of FDA & LHS System		I	2 WEEKS								
3	FDA Block Diagram (Field + Network + Loops)		A	2 WEEKS								
4	Complete Bill of Material		A	2 WEEKS								
5	Boughtout Items List		I	2 WEEKS								
6	Power Consumption & Heat Load Calculation		I	2 WEEKS								
7	Power Distribution Diagram		A	2 WEEKS								
8	System Grounding Diagram		A	2 WEEKS								
9	Detailed GA drawings		A	2 WEEKS								
10	Software Deisgn Manual		A	3 WEEKS								
11	Software Licenses		I	2 WEEKS								
12	FAT procedures		I	2 WEEKS								
13	SAT procedures		I	2 WEEKS								

	Master Document Schedule	Annexure-F of PY51846
	Project: 2 x 660MW Khurja STPP	

S. NO	Drawing / Document Name	VENDOR Drg/ Document No	Category (A/I)	Schedule of submission from P.O. Date	First Submission (Rev -00)			Current Revision			Current Status (Approved / commented)	BHEL APPD CATEGORY
					Rev No	Actual Date of Submission	Return Date	Rev No	Actual Date of Submission	Return Date		
14	Logic diagram (If any)		I	8 WEEKS								
15	Cable Schedule with in vendor scope of items		I	10 WEEKS								
	Data Sheets											
1	Technical Datasheet of Fire Alarm Control Panel		A	2 WEEKS								
2	Technical Datasheet of Repeater Panel		A	2 WEEKS								
3	Technical Datasheet of Multisensor Detector with detector base		A	2 WEEKS								
4	Technical Datasheet of Heat Detectors with detector base		A	2 WEEKS								
5	Technical Datasheet of Probe Detectors (ROR type) for Fuel tanks with Flameproof Junction box		A	2 WEEKS								
6	Technical Datasheet of Beam Detector		A	2 WEEKS								
7	Technical Datasheet of IR Ember Detector with Air purge Unit		A	2 WEEKS								
8	Technical Datasheet of Manual Call Point (Indoor, Outdoor & Flame Proof)		A	2 WEEKS								
9	Technical Datasheet of Hooter cum strobe		A	2 WEEKS								
10	Technical Datasheet of Monitor Module		A	2 WEEKS								
11	Technical Datasheet of Control module		A	2 WEEKS								
12	Technical Datasheet of Isolator module		A	2 WEEKS								
13	Technical Datasheet of Response Indicator		A	2 WEEKS								
14	Technical Datasheet of Digital LHS Controller		A	2 WEEKS								
15	Technical Datasheet of Digital LHS Cables (For Cable galleries , Coal Conveyors)		A	2 WEEKS								
16	Technical Datasheet of Exit Sign (Self illuminating)		A	2 WEEKS								

	Master Document Schedule	Annexure-F of PY51846
	Project: 2 x 660MW Khurja STPP	

S. NO	Drawing / Document Name	VENDOR Drg/ Document No	Category (A/I)	Schedule of submission from P.O. Date	First Submission (Rev -00)			Current Revision			Current Status (Approved / commented)	BHEL APPD CATEGORY
					Rev No	Actual Date of Submission	Return Date	Rev No	Actual Date of Submission	Return Date		
17	Technical Datasheet of Siren with Siren Control Panel		A	2 WEEKS								
18	Technical Datasheet of Hooter cum Strobe		A	2 WEEKS								
19	Technical Datasheet of Graphics Software		A	2 WEEKS								
20	Technical Datasheet of Work Station		A	2 WEEKS								
21	Technical Datasheet of Printer		A	2 WEEKS								
22	Technical Datasheet of Laptop		A	2 WEEKS								
23	Technical Datasheet of Mini- UPS		A	2 WEEKS								
24	Technical Datasheet of Furniture		A	2 WEEKS								
25	Technical Datasheet of Optical Fibre Cable		A	2 WEEKS								
26	Technical Datasheet of 24V DC Power Supply Modules with Battery-Back UP		A	2 WEEKS								
27	Technical Datasheet of End of Line Resistance with Terminal Box		A	2 WEEKS								
28	Technical Datasheet of LHS Cable Jointing Box		A	2 WEEKS								
29	Technical Datasheet of Junction box for Terminating MICC Cable of Size 2PX2.5 Sq MM		A	2 WEEKS								

	Master Document Schedule	Annexure-F of PY51846
	Project: 2 x 660MW Khurja STPP	

S. NO	Drawing / Document Name	VENDOR Drg/ Document No	Category (A/I)	Schedule of submission from P.O. Date	First Submission (Rev -00)			Current Revision			Current Status (Approved / commented)	BHEL APPD CATEGORY
					Rev No	Actual Date of Submission	Return Date	Rev No	Actual Date of Submission	Return Date		
D.	**ERECTION**											
1	Typical Connection ,GA & Wiring Diagram of Fire alarm system		I	3 WEEKS								
2	Installation diagram for Fire alarm componenets		I	3 WEEKS								
3	Fire Alarm networking details (Interconnection between FAP & RP)		I	3 WEEKS								
4	Battery Sizing Calculation		I	3 WEEKS								
5	Electrical Load List		I	3 WEEKS								
6	Installation manual & Erection procedures		I	3 WEEKS								
7	Fire Alarm And Detection Operating Manual		A	3 WEEKS								
8	Billing Break up		A	3 WEEKS								
9	Certificates(Factory tests, calibration reports, statutory approval certificates)		I	3 WEEKS								
10	Packing procedure + Packing list		I	3 WEEKS								
11	Erection drawings		I	3 WEEKS								
12	Field quality plans		I	3 WEEKS								
13	Commissioning procedure		I	3 WEEKS								

	Project : THDC 2x660 MW KHURJA TG PACKAGE				Doc No	QA-C&I-FDPS-01
एनटीपीसी NTPC	Package : FDPS Package		Sub-Vendor List for controlled items		Rev No	0
	Main Contractor : BHEL,PE&SD Hyderabad		Control & Instrumentation Items		Date	27.05.2022
	Contract No. : THDC-RKSH-CC-9915-371					

Sl No.	Item	QP/ Insp. Cat.	Acceptable Supplier As Per Database	Place of Manufacturing	Approval Status	Remarks
1	Fire Alarm Panel - Microprocessor Based	II	Notifier	USA	A	
			Tyco	USA	A	
			Autronica	Norwey	A	
			Schrack	Austria	A	
			Edward	USA	A	
			Bosch Ltd.	Bangalore	A	
			ESSER (Honeywell)	Germany	A	
2	ADDRESSABLE DETECTORS (MULTI SENSOR, PHOTO & HEAT DETECTORS TYPE), INTERFACE UNITS & MANNUAL CALL POINTS	II	Notifier	USA	A	
			Tyco	USA	A	
			Autronica	Norwey	A	
			Schrack	Austria	A	
			Edward	USA	A	
			Bosch Ltd.	Bangalore	A	
			ESSER (Honeywell)	Germany	A	
5	Fiber Optic Cable	II	HFCL	Goa	A	
			Aksh Fibre	Bhiwadi	A	
			Finolex	Pune/Goa	A	
			M/S Birla Cable Limited	Rewa	A	
			R&M	Switzerland	A	
			Apar Industries Limited	MUMBAI	A	
			RPG Cables Limited	Thane	A	
6	Instrument Cables (F, G & T/C Cables) Note-2	I	Paramount Communication Ltd	Khuskhera	A	PVC, FRLS type
			Polycab	Daman	A	PVC, FRLS type
			Delton	Faridabad	A	PVC, FRLS type
			Kei	Bhiwadi	A	PVC, FRLS type
			Elkey Telelinks	Faridabad	A	PVC, FRLS type
			Cords	Kaharani	A	PVC, FRLS type
			Cords	Bhiwadi	A	PVC, FRLS type
			Nicco	Kolkata	A	PVC, FRLS type
			Universal Cable	Satna	A	PVC, FRLS type
			Thermocables	Hyderabad	A	PVC, FRLS type
			Gupta Power Inftrastructure Ltd.	Khurdha	A	PVC, FRLS type
			Cmi	Faridabad	A	PVC, FRLS type
			Advance Cables Pvt Ltd	Banglore	A	PVC, FRLS type
			Gemscab Industries Ltd	Bhiwadi	A	PVC, FRLS type
			Apar Industries Limited	Valsad	A	PVC, FRLS type
9	IR Detectors	III	Neola Corporation (ODTI)	Pawane	A	
			Patol		A	
			AGNI Controls	Chennai	A	
12	Short term fire proof cables, MICC Cables	III	Pentair	UK	A	
			Wrexham Mineral	UK	A	
			KME	Italy	A	
			TYCO	UK / China	A	

अविनाश कुमार रंजन
AVINASH KUMAR RANJAN
वरिष्ठ अधिकारी / क्रय
Sr. Officer / Purchase
बी.एच.ई.एल. हैदराबाद BHEL, HYD-32

	Project : THDC 2x660 MW KHURJA TG PACKAGE				**Doc No**	QA-C&I-FDPS-01
एनटीपीसी NTPC	**Package :** FDPS Package		**Sub-Vendor List for controlled items**		**Rev No**	0
	Main Contractor : BHEL,PE&SD Hyderabad		**Control & Instrumentation Items**		**Date**	27.05.2022
	Contract No. : THDC-RKSH-CC-9915-371					
Sl No.	**Item**	**QP/ Insp. Cat.**	**Acceptable Supplier As Per Database**	**Place of Manufacturing**	**Approval Status**	**Remarks**
	Following C&I items (as applicable) to be supplied as per main contractor approved sources meeting the NTPC Specification requirement					
1	Beam Detector	III	Main Contractor approved sources			
2	Desk for Ows/Ews/Printer/Server	III	Main Contractor approved sources			
3	Lead Acid Battery for Fire Alarm Panel	III	Main Contractor approved sources			
4	Printer (Inkjet / Laser)	III	Main Contractor approved sources			
5	Siren	III	Main Contractor approved sources			
6	Exit Sign	III	Main Contractor approved sources			
7	LHS Cable	III	Main Contractor approved sources			
8	Other items other than listed above	III	Main Contractor approved sources			

LEGENDS :

	1.0 SYSTEM SUPPLIER / SUB SUPPLIER APPROVAL STATUS CATEGORY
	A - For those items proposed vendor is acceptable to Customer. To be indicated with letter "A" in the list alognwith the condition of approval, if any.
	DR - For those items "Detailed Required" for Customer review. To be identified with letter "DR" in the list. For these items, vendor shall be proposed for owner acceptance with-in the agreed contract schedule of the package
	2.0 QP INSPECTION CATEGORY :
	CAT - I : For those items the Quality Plans are approved by Customer and final acceptance will be on physical inspection witness by Customer
	CAT - II : For those items the Quality Plans are approved by Customer. However no physical inspection shall be done by Customer. The final acceptance by Customer shall be on the basis of review of documents.
	CAT - III : For those items Main supplier approves Quality Plans. The final acceptance by Customer shall be on the basis of Certificate of Conformance by main supplier.
	UNITS/WORKS : Place of manufacturing- Place of main supplier of multi units/works.

NOTES: As applicable (if required)

Note 1 :	Approval is conditional and subject to Sub QR / Provennes clearance as specified in the contract specification. Further for any change in the Technical specificaiton at later stage vendor approval will be reviewed accordingly.
Note 2 :	For Insrument cable up to 1 KM inspection category CAT - III, For 1 KM to 2.5 KM Inspecton category CAT - II.
Note 3 :	For the items not appearing in the preaward list and falls in the scope of supply of the bidder, bidder and Customer will mutually discussed in future.
Note 4 :	Mandatory Spares to be treated as NTPC inspection category CAT - III.

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QAP GUIDELINES & FORMAT

`

(ANNEXURE -)

The QAP format and guidelines for filling up the format shall be used by vendor for preparation and submission of QAP after order placement.

Note :

1. Typical /Indicative /Standard QAP(s) for equipment /package attached is reference document and to use by successful bidder in future for preparation and submission of QAP for BHEL /CUSTOMER approval.

2. No deviation to reference document is acceptable.

GUIDELINES TO VENDORS FOR PREPARATION OF QUALITY ASSURANCE PLAN

1. QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10.

2. Each page of QAP shall contain the following information.
   a) Vendor's name & address.
   b) Customer: BHEL, Hyderabad.
   c) Project.
   d) BHEL Product Standard Number/revision number as referred in P.O.
   e) BHEL Purchase Order Number & Date.
   f) Product as per P.O. description.
   g) QAP Number (unique and shall not repeat)/revision number/date.
   h) Page number and number of pages

3. QAP shall contain four parts / stages as follows.
   a) Raw materials and bought out items.
   b) In process Control / Inspection.
   c) Final assembly, Inspection & Testing.
   d) Painting, preservation & packing.

4. Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc).

5. Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT,DP etc.), hydrostatic test, calibration check etc.)

6. Under 'Class', indicate minor, major or critical depending on the importance of characteristic.

7. Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.)

8. Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.)

9. Under 'Reference document' and 'Acceptance norms', appropriate National & International standards, BHEL standards, approved drawing references etc. should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practice etc.". If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review & approval by our Engineering dept.

10. Under 'Format of record', indicate appropriately supplier's test certificate, calibration certificate, lab report, inspection report etc.

11. Please refer 'Agency' in QAP format.
    Under P: Perform, W: Witness, V: Verify
    Indicate against each characteristic 1: (BHEL CQS/Nominated inspection agency), OR
    2: (Vendor / Sub vendor)

Note: Performing agency is normally vendor or his sub vendor (Legend 2). Where witness points are indicated in specification, P.O., Drawing etc., for such operations, under Witness (W) column use 1. Under 'Verify' column, use code1.

12. Under 'D' please put (□ Tick) against each characteristic where vendor proposes to submit test certificate/report etc. OR as required as per BHEL Specification.

13. Vendor's signature & stamp should be available on each page of QAP.

14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only inline and relevant to the Specification & Approved Drawings.

15. The following operations/characteristics/check points may be included (AS APPROPRIATE)
   a) Visual check
   b) Dimensional check
   c) Mechanical and Chemical properties.
   d) Surface preparation before painting (by chemical cleaning, sand blasting, shot blasting etc. as the case may be.)
   e) Painting check for shade, Dry Film Thickness (DFT), Adhesion/ peel off test etc.
   f) Check for correctness for all components mounted as per General arrangement Drawing, Bill Of Materials (BOM), etc. for range, rating, make, color, size, location as per GA, quantity, label description including tag nos., annunciator facia, loose components, accessories, spares etc.
   g) Verification of test certificate for protection class for the enclosures.
   h) Mechanical functioning of switches.
   i) Continuity of earthing and provision of earth points.
   j) Colour coding of wiring, size, tightness & dressing of wiring.
   k) Review of test certificates of assembled items, raw materials, internal test reports etc.
   l) Witness of functional checks, which may include mechanical run & electrical run, H.V.test, IR measurement, Electrical and Mechanical tests etc.
   m) PQR, WPS, Welder Qualification Record, welding records (fit up, DP) etc.
   n) Material identification (for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc.)
   o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non Destructive Tests.
   p) Tests on Galvanised items (Visual, Hammer Test, Knife Test, Thickness, Pierce Test (Copper sulphate test), Hydrogen evaluation test, Stripping test (for Mass of Zinc coating)
   q) All tests as per BHEL Product Standard & approved drawings including Type tests and Routine tests on individual items and on System as a whole.
   r) For loose items test certificate or COC is required.
   s) Packing and Preservation.

16. **QAP Format enclosed.**

17. Typical Manufacturing QAP is attached.

VENDOR'S NAME & ADDRESS:	**MANUFACTURING QUALITY PLAN**		QP. NO.:	
	CUSTOMER: BHEL, HYDERABAD – 32. PROJECT: PRODUCT:	BHEL P.O.NO.: P.O.DATE: BHEL SPEC: REV:	REV NO:	DATE:
			PAGE 1 OF 1	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
									D	P	W	V	
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
2.0	**INPROCESS INSPECTION**												
3.0	**FINAL INSPECTION & TESTING**												
4.0	**PRESERVATION & PACKING**												

VENDOR TO NOTE: THIS FORMAT IS IN MICROSOFT WORD. HEADER & FOOTER SHALL BE AVAILABLE IN EACH PAGE OF QP. QP SHALL BE IN LANDSCAPE & A4 SIZE ONLY. FONT SIZE SHALL BE MIN 10. VENDOR SHALL SIGN & STAMP IN EACH PAGE OF QP. LOI REF. & DATE ARE NOT ACCEPTABLE. P.O.NO. & DATE SHALL BE INDICATED. QP NO. SHOULD BE UNIQUE AND SHALL NOT REPEAT. ALL THE TESTS / CHECKS INDICATED IN THE BHEL SPEC. SHALL BE INDICATED IN THE QP.

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.	PREPARED BY VENDOR'S SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP

ANNEXURE - I

CHECK LIST FOR OFFER SUBMISSION

SL No	Description	Bidder's Confirmation
1	Technical offer complies with the specifications and its associated annexures, pre-bid clarifications in Toto and there are no technical deviations. Signed and stamped copy of this specification along with annexures enclosed along with technical offer.	
2	Bidder to submit the No Deviation letter w.r.t. BHEL spec: PY51846, Rev-00 along with offer.	
3	Bidder to quote as per BHEL price format only. No other format is acceptable. Bidder to attach un-priced price bid format by indicating "QUOTED" against each item and submit with technical offer duly signed & stamped.	
4	All items are manufactured conforming to latest version of material grade standard and manufacturing standard mentioned in this specifications	
5	For addition/reduction of quantity, unit rate quoted in the present offer shall be considered during ordering and shall be valid up to execution of the contract to the extent of ± 10% of order Value.	
6	In case of deviation, vendor to confirm that these are technically not feasible deviations and same are submitted in BHEL format. In case technically feasible deviations are proposed by the bidder and subsequently withdrawn, no commercial implications can be claimed by the bidder	
7	It shall be bidder's responsibility to get all his queries and deviations addressed by the purchaser during the pre-bid stage itself. No queries / deviations shall be acccepted by purchaser from the bidder after the closure of pre-bid.	
8	Vendor shall supply all the material to meet the performance, sizing & technical requirement as per specification & its Annexures, scope matrix etc.	
9	Confirm that the quote includes training, commissioning spares, special tool & tackles, erection & mounting hardware/ accessories, terminations, networking components, dongle etc. as required for erection & commissioning activities.	
10	Bidder to confirm that supply of software and hardware as required for complete functioning and maintenance of the system shall be in the scope of the bidder..	
11	All the equipments / items / sensors / detectors etc., supplied by bidder are having valid statutory approval certificates and same will be produced at any stage of contract execution to BHEL. The same were eligible to take local statutory regulatory body approval during commissioning of the system	

BIDDER'S SIGNATURE:
NAME:
DATE:
COMPANY SEAL:

ANNEXURE - J

LIST OF DEVIATIONS

Project: FDA SYSTEM FOR 2 x 660 MW KHURJA STPP

Sl. No.	Part No./ Volume	Page no.	Clause No.	Subject	Deviation/Clarification	Reason for Deviation
1						
2						
3						
4						
5						
6						

NOTES:

1. Deviations, if any, shall be clearly brought out only in this format. Deviations mentioned / taken elsewhere or in any other format will be ignored.
2. Additional sheets in the same format can be attached by the vendor, if necessary.
3. Nature of Deviations shall only be of Design / Manufacturing constraints and non-availability of items / components / makes in market.
4. No price implications shall be entertained for deviations withdrawn during the technical scrutiny. If any deviations are accepted by BHEL during technical scrutiny then also there will be no price implication. Hence, in no case there will be consideration of Price implications.
5. Reasons for the deviations shall be specified in the Remarks column.
6. If there are no deviations from the specifications, bidder still has to submit the signed copy of this format by writing "NO Deviations" on this format.
7. If the "Deviation Schedule" is not submitted along with the offer, the bidder's offer is likely to be rejected without any further interaction with the bidder. Only the accepted deviations in conjunction with the original tender shall constitute the contract document for the award of job to the bidder.
8. Technical offer of the bidder will be evaluated only on the basis of Deviation Schedule. Deviation Schedule constitutes this sheet (with these Notes) duly signed and stamped.

SIGNATURE OF THE BIDDER_____

NAME_____

DESIGNATION_____

COMPANY SEAL DATE_____

Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	Type-C cable
Flammability	Shall pass flammability as per IEEE-383 read in conjunction to this specification			As per manufacturer's standard subject to employer's approval
I. CABLE DRUM				
Type	Non-returnable wooden drum (wooden drum to be constructed from seasoned wood free from defects with wood preservative applied to entire drum) or steel drum.			
Length	1000 m ± 5% for up to & including 12 pairs 500 m ± 5% for above12 pairs			

Note: Heat resistant instrumentation cable shall have same specification as of G/F type instrumentation cable as specified above, except that insulation and outer sheath material shall be Teflon and cable shall be suitable for continuous operation at 205 Deg. C

3.00.00 SPECIFICATION OF OPTICAL FIBER CABLES (OFC)

3.01.00 Optic Fiber cable shall be 4/8/12 core, Electrolytically chrome plated corrugated steel taped (ECCST), fully water blocked with dielectric central member for outdoor/indoor application so as to prevent any physical damage. The cable shall have multiple single-mode or multi mode fibers on as required basis so as to avoid the usage of any repeaters. The outer sheath shall have Flame Retardant, UV resistant properties and are to be identified with the manufacturer's name, year of manufacturer, progressive automatic sequential on-line marking of length in meters at every meter.

3.02.00 The cable core shall have suitable characteristics and strengthening for prevention of damage during pulling viz. Dielectric central member, Loose buffer tube design, 4 fibers per buffer tube (minimum), Interstices and buffer tubes duly filled with Thixotropic jelly etc. The cable shall be suitable for a maximum tensile force of 2000 N during installation, and once installed, a tensile force of 1000 N minimum. The compressive strength of cable shall be 3000 N minimum& crush resistance 4000 N minimum. The operating temperature shall be – 20 deg. C to 70 deg.C

3.03.00 All testing of the fiber optic cable being supplied shall be as per the relevant IEC, EIA and other international standards.

3.04.00 Bidder to ensure that minimum 100% cores are kept as spares in all types of optical fibre cables.

3.05.00 Cables shall be suitable for laying in conduits, ducts, trenches, racks and under ground buried installation.

3.06.00 Spliced / Repaired cables are not acceptable.

11.02.00 The system shall display history of alarms in chronological order on any of the OWS. The system shall have all alarm functions and related function keys like alarm acknowledge, reset, paging, summaries etc. The alarm display/report format shall be as approved by the Employer.

11.03.00 Facility of audio annunciation shall be provided in OWS upon the occurrence OWS alarms irrespective of whether alarms are displayed or not. Facility to disable the audio annunciation shall be provided.

12.00.00 SOFTWARE DOCUMENTATION AND SOFTWARE LISTINGS

12.01.00 All technical manuals, reference manuals, user's guide etc., in English required for modification/editing/addition/deletion of features in the software of the PLC/ Control system shall be furnished. The Contractor shall furnish a comprehensive list of all system/application software documentation after system finalization for Employer's review and approval.

12.02.00 All The software listings including source code for application software, All special - to-project data files etc. shall be submitted by the Contractor.

13.00.00 SOFTWARE LICENCES

The Contractor shall provide software license for all software being used in Contractor's System. The software licenses shall be provided for the project (e.g. organisation or site license) and shall not be hardware/machine-specific. That is, if any hardware/machine is upgraded or changed, the same license shall hold good and it shall not be necessary for Employer to seek a new license/renew license due to upgradation/change of hardware/machine in Contractor's System at site. All licenses shall be valid for the continuous service life of the plant.

As a customer support, the Contractor shall periodically inform the designated officer of the Employer about the software upgrades/new releases that would be taking place after the system is commissioned so that if required, same can be procured & implemented at site.

14.00.00 (A) SPECIFICATIONS OF OWS

The minimum requirement for PC based OWS shall be as below:	
CPU	Latest generation CPU
Main memory	As per process requirement and latest recommendation of system supplier
Drives	As per system requirement and latest recommendation of system supplier

	Hard disk		As per system requirement and latest recommendation of system supplier
	Removable bulk storage drive (MOD / DVD / DAT)		As per system requirement and latest recommendation of system supplier
	Removable Bulk Storage Media for above		10 nos
	Monitor		Better than 19" Full Flat TFT Resolution 1600 x 1280, refresh rate min 85 Hz.
	Graphic Memory		As per system requirement and latest recommendation of system supplier
	Communication port		As per system requirement and latest recommendation of system supplier, Ethernet ports as per system requirement with minimum Dual 100 Mbps Ethernet.
	Expansion slots		As per system requirement and latest recommendation of system supplier
	Other Features		As per system requirement and latest recommendation of system supplier
	UPS		1 no. On-line Interactive UPS with 30 mins. battery backup on machine load (for PC & its printer)
	Software	a	General MS Windows latest version, anti-virus McAfee or equivalent, etc.
		b	Application software - to suit project specific requirement
	Accessories		Required furniture for mounting of HMI peripherals shall be provided.

(B) GIU **Refer Appendix to Part-A FOR QTY.**

15.00.00 **PRINTER**

15.01.00 One number A4 size color laser printer at hydrogen generation plant control room shall be provided as a part of the HMIS system. It shall print out all alarm/trip conditions and event changes in plant status along with date and time of occurrence.

	ITEM : FIBER OPTIC CABLES. (SINGLE MODE)	STANDARD QUALITY PLAN CONFIRMING TO CODE : IEC 60794-1	To be filled by NTPC QP No.: 0000-999-QOI-S-036 Revision:00 Date:02/01/2013 Page:1 OF 3 Valid up to : 01/01/2016	Reviewed By: Archana Nath S.Samanta B.D.Prasad	Approved By अनुमोदित Approved J.Gowrishankar

Sl No	Component & Operations	Characteristics	Class	Type of check	Quantum of check M	Quantum of check C,N	Reference Document	Acceptance Norms	Format of record	D*	Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9		10			11
A	**RAW MATERIAL**													
	FO Cable-Fiber	1.Fiber Geomerty a) Core diameter b) Cladding diameter c) Coated Fiber diameter d) Core-clad concentricity error e) Cladding non-circularity f) Colour coding	Maj.	Measu.	100%	1 sample/each drum	NTPC Approved data sheet/ Manufacturer's standard	NTPC Approved data sheet/TR	IMR/ TC		P	V	V	Fiber Supplier Test report to be reviewed incase of Bought-Out-item.
		2.Attenuaton @ 1310 nm @ 1550 nm b) Cut-off wave length on 2 meter sample of Fiber(In cable)	Maj.	Measu.	100%	1 sample/each drum	NTPC Approved data sheet/ Manufacturer's standard	NTPC Approved data sheet/TR	IMR/ TC		P	V	V	
		3. Chromatic dispersion @ 1310 nm @ 1550 nm b) Zero dispersion slope c) Zero dispersion wave length	Maj.	Measu.	100%	1 Sample / each drum	NTPC Approved data sheet/ Manufacturer's standard	NTPC Approved data sheet/TR	IMR/ TC		P	V	V	
B	**IN PROCESS INSPECTION**													
	Fiber	a) Length,loss & continuity b) winding c)Colourness d) Fiber diameter e)Rub test	Maj.	Visual/ Measu.	Mfr's standard	Sample	NTPC Approved data sheet/ Manufacturer's standard	NTPC Approved data sheet/TR			P	V		
C	**FINAL INSPECTION**													
	Finished Fiber optic cable-	**1.VISUAL** a) Cable surface finish b) winding c) Ends availability d) Printing/Marking e) length checking f) Colour of Outer sheath	Maj.	Visual	100%	100%	NTPC Approved data sheet/ Manufacturer's standard	NTPC Approved data sheet/TR	IMR/ TC	√	P	W	W	

LEGEND : * RECORDS, IDENTIFIED WITH " TICK" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION .M:MANUFACTURER/ SUB SUPPLIER C:MAIN SUPPLIER,N:NTPC, P:PERFORM ,'W: WITNESS and V: VERIFICATION AS APPROPRIATE, "CHP" NTPC SHALL INDICATED IN COLOUM "N" AS "W"

	ITEM : FIBER OPTIC CABLES. (SINGLE MODE)	STANDARD QUALITY PLAN CONFIRMING TO CODE :IEC 60794-1	To be filled by NTPC QP No.: 0000-999-QOI-S-036 Revision:00 Date:02/01/2013 Page:2 OF 3 Valid up to : 01/01/2016	Reviewed By: Archana Nath S.samanta B.D.Prasad	Approved By H.Gowrishankar

Sl No	Component & Operations	Characteristics	Class	Type of check	Quantum of check M	Quantum of check C,N	Reference Document	Acceptance Norms	Format of record		Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9	D*	10			11
		2.ELECTRICAL												
		a) Loss & Continuity	Cri.	Measu	100%	1 Sample / each drum	NTPC Approved data sheet/Manufacturer's catalogue	NTPC Approved data sheet/Manufacturer's catalogue	IMR/ TC	√	P	W	W	
		b).Attenuation,Band width, Chromatic dispersion @ 1310 nm @ 1550 nm	Maj.	Measu	100%	1 Sample / each drum	NTPC Approved data sheet/Manufacturer's catalogue	NTPC Approved data sheet/Manufacturer's catalogue	IMR/ TC	√	P	W	W	
		c)Outer sheath-Flame retardant & UV resistance performance test	Maj.	Measu	100%	1 Sample / lot	NTPC Approved data sheet/Manufacturer's catalogue	NTPC Approved data sheet/Manufacturer's catalogue	IMR/ TC	√	P	W	W	
		3.DIMENSIONAL												
		a) Cable Constructional checks and dimensions b)Outer sheath thickness c) Overall diameter of cable	Maj.	Measu	100%	1 Sample / each drum	NTPC Approved data sheet/Manufacturer's catalogue	NTPC Approved data sheet/Manufacturer's catalogue	IMR/ TC	√	P	W	W	
		4.MECHANICAL TESTING												
		a) Tensile Test	Maj.	Mech	1 Sample / lot	1 Sample / lot	NTPC Approved data sheet/Manufacturer's catalogue/IEC 60794-1-2-E1	ADS/2000 N with fiber strain of 0.25% maximum.Change in attenuation after test<=0.15dB/KM	IMR/ TC	√	P	W	W	
		b) Crush Test	Maj.	Mech	1 Sample / lot	1 Sample / lot	NTPC Approved data sheet/Manufacturer's catalogue/IEC 60794-1-2-E3	ADS/4000 N between 100 x 100 mm plate for 10 minutes.Change in attenuation after test<=0.15dB/KM	IMR/ TC	√	P	W	W	
		c) Impact Test	Maj.	Mech	1 Sample / lot	1 Sample / lot	NTPC Approved data sheet/Manufacturer's catalogue/IEC 60794-1-2-E4	ADS/3 nos, 5 kg from the height of 0.5 m .Change in attenuation after test<=0.15dB/KM	IMR/ TC	√	P	W	W	
		d) Kink Test	Maj.	Mech	1 Sample / lot	1 Sample / lot	NTPC Approved data sheet/Manufacturer's catalogue/IEC 60794-1-2-E10	ADS/Loop of 20D should be made .Change in attenuation after test<=0.15dB/KM	IMR/ TC	√	P	W	W	

LEGEND : * RECORDS, IDENTIFIED WITH " TICK" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION .M:MANUFACTURER/ SUB SUPPLIER C:MAIN SUPPLIER,N:NTPC, P:PERFORM ,'W: WITNESS and V: VERIFICATION AS APPROPRIATE, "CHP" NTPC SHALL INDICATED IN COLOUM "N" AS "W"

	ITEM : FIBER OPTIC CABLES. (SINGLE MODE)	STANDARD QUALITY PLAN CONFIRMING TO CODE : IEC 60794-1	To be filled by NTPC QP No.: 0000-999-QOI-S-036 Revision:00 Date:02/01/2013 Page:3 OF 3 Valid up to : 01/01/2016	Reviewed By: Archana Nath S.samanta B.D.Prasad	Approved By P.Gowrishankar

Sl No	Component & Operations	Characteristics	Class	Type of check	Quantum of check M	Quantum of check C,N	Reference Document	Acceptance Norms	Format of record		Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9	D*	10			11
		e) Bend Test	Maj.	Mech	1 Sample / lot	1 Sample / lot	NTPC Approved data sheet/Manufacturer's catalogue/IEC 60794-1-2-E11	ADS/Diameterof mandral=250mm,4 turns 10 times wrapped & unwrapped.Change in attenuation after test<=0.15dB/KM	IMR/ TC	√	P	W	W	
		f) Repeated Bend Test	Maj.	Mech	1 Sample / lot	1 Sample / lot	NTPC Approved data sheet/Manufacturer's catalogue/IEC 60794-1-2-E6	ADS/30 times with weight of 5 kg .Change in attenuation after test<=0.15dB/KM	IMR/ TC	√	P	W	W	
		g) Torsion Test	Maj.	Mech	1 Sample / lot	1 Sample / lot	NTPC Approved data sheet/Manufacturer's catalogue/IEC 60794-1-2-E7	ADS/10 times with weight 0f 10 kg for 180 degree.Change in attenuation after test<=0.15dB/KM	IMR/ TC	√	P	W	W	
		h) Water penetration Test	Cri.	Mech	1 Sample / lot	1 Sample / lot	NTPC Approved data sheet/Manufacturer's catalogue/IEC 60794-1-2-F5	ADS/ 3 MTR Cable sample with 1 mtr water head for 24 hrs.No water should be observed on other end of cable	IMR/ TC	√	P	W	W	
		5.ENVIRONMENTAL												
		Drip test(Loss/Change due toTemperature cycling)	Cri.	Measu	1 Sample / lot	1 Sample / lot	NTPC Approved data sheet/Manufacturer's catalogue/IEC 60794-1-2-F1	ADS/ 30 cm Cable sample will be placed in a chamber for 24 hrs at 70 deg C.No jelly should be observed	IMR/ TC	√	P	W	W	
D	**Packaging and dispatch**	Stencileing, completeness & Verification with packing list on drums	Maj.	Visual.	100%	-	Mfg. Practice	Mfg. Practice			P	V	-	

NOTE 1 : Where witnessing and verification of records is done only by main contractor (Coloum "C"), NTPC inspection Engineer may do a survilience Verification/ Witnessing as per his discretion.

NOTE 2 : IMR : Inword Material Register, TC : Test Certificates, Mfg. : Manufacturer, FIR : FInal Inspection Report.,TR-Manufacturer Test Report,ADS-Approved Data Sheet

NOTE 3: NTPC Inspection Enginner to check,approval date,revision no of reference documents at the time of Inspection.

LEGEND : * RECORDS, IDENTIFIED WITH " TICK" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION .M:MANUFACTURER/ SUB SUPPLIER C:MAIN SUPPLIER,N:NTPC, P:PERFORM ,'W: WITNESS and V: VERIFICATION AS APPROPRIATE, "CHP" NTPC SHALL INDICATED IN COLOUM "N" AS "W"