Technical Specification for Fire Detection & Alarm System Project: 2 x 500MW Mauda-I FGD

Revisions: Refer to record of revisions	Prepared by :	Checked by :	Approved by :	Date :
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1.1 **INTENT OF SPECIFICATION:**

Design, Engineering, Manufacturing, Assembly, System Integration, testing at vendor works, Inspection by Purchaser, Supply (Packing and Transportation to site), Installation Support and Commissioning of Fire Detection and Alarm (FDA) 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 to operate and maintain the system.

1.4 Supply of complete documentation covering Design, Sizing, Installation, Operation and maintenance aspects, Engineering documents including Technical data sheets, catalogues/brochures, As-built drawings, O&M manuals & Device charts of the system and tests carried out during Commissioning.

2 PROJECT DESCRIPTION

Owner	NTPC
Project	2 x 500 MW Mauda FGD
Location	Mauda Tehsil, Nagpur District, Maharastra
Nearest Railway Station	Chacher (approx.8 kms from site)

3 INSTRUCTIONS TO BIDDERS

3.1 This specification shall be read in conjunction with all its annexures listed later in this specification. In case of any discrepancy arising between this specification & its annexures, the most stringent of all (as determined by purchaser) shall be followed and the decision of Purchaser shall be final & binding on Bidder, without any cost & delivery implications. Further, if a requirement in this specification or any of the annexures, calls for a decision from the Purchaser, it shall be bidder's sole responsibility to clearly bring out/highlight the same distinctively in his pre-bid queries (Annexure-E) within one week of issue of Enquiry, so as to enable purchaser to furnish their decision/clarification. If such issues/requirements are not duly addressed by bidder during the pre-bid stage and if such issues/requirements are observed later during order execution stage, it shall be binding on the bidder to comply with the final decision made by the purchaser subsequently, without any cost, delivery, or any other commercial implications.

3.2 Offers with incomplete information as mentioned in this specification are likely to be rejected outright without any further interaction with the Bidder.

3.3 All materials supplied under this contract shall be new and unused.

3.4 All equipment/items as applicable, shall be UL/FM/VDs approved.

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

3.6 Bidder must submit the "Duly filled & Signed copy of Checklist" (Annexure-I) along with necessary supporting documents compulsorily as part of their technical offer without which offer is liable for rejection without any further interaction with the Bidder

3.7 All mounting hardware/ accessories/fittings etc. required for the erection of Fire Detection & Alarm System shall be included in the scope of bidder and the same shall be included in the base price even if such items are not explicitly mentioned in this specification.

3.8 The Bidder shall accept full responsibility for the faultless working of all the equipments and the FDA system as a whole.

3.9 Bidder offer shall be strictly as per these specification requirements. Unsolicited or Alternate offers from the bidders will not be entertained.

3.10 The design information, specifications and drawings indicate the "Minimum" requirements and are intended to enable Bidders to ascertain the extent of the work involved. Bidders are expected to supplement the information included in this specification as required and submit a comprehensive bid.

3.11 Deviations, if any, shall be clearly brought out only in Deviation format (Annexure- [J]). Any deviation or clarification shall be raised in pre-bid stage only as mentioned in 3.1 above.

4 CODES, STANDARDS & REGULATIONS

The design, engineering, installation, testing, commissioning of the package shall be as per all relevant & applicable codes/standards, however specifically the following to be followed:

4.1 Tariff Advisory Committee (TAC)/LPA India/NFPA USA
4.2 Underwriters Laboratories (UL)-USA,
4.3 VDS Standards,
4.4 Loss Prevention Certification Board (LPCB),
4.5 Factory Mutual (FM),
4.6 Indian Electricity (Supply) Act (IEA)
4.7 Rules for Fire Alarm System of India, and
4.8 IS 2189 (Selection, Installation and Maintenance of Automatic Fire Detection and Alarm System-Code of Practice).
4.9 Any other equivalent internationally recognized body acceptable to BHEL/End customer.

5 List of Annexures

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]	Specification for Fibre Optic Cable
Annexure – [L]	Specification for PC & Printer
Annexure – [M]	Specification for 24 V DC Power Supply Modules with Battery Back Up
Annexure – [N]	Typical Erection/Mounting Drawings of FDA components

6 SCOPE MATRIX :

Sl. 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 along with Dongle, third party interfaces and their Networking].	Bidder (Note-3)	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexures for inputs
2	Loop configuration duly vetted by FDA OEM to finalise number of loops	Bidder (Note-3)	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexures for inputs
3	Detectors, control modules, hooters, call points & all other devices	BHEL	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexures for inputs

4	Network Components like Switches, LIUs, Patch Cards, Media converters, etc. required for networking of Fire Alarm panels, Repeater Panels, PC and third party interfaces.	Bidder	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexures for inputs
6	Network & Fiber optic Cables	Bidder	Bidder	BHEL (Note-4)	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexures for inputs
7	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 Annexures for inputs
8	a. Special Tools & Tackles as required for erection & commissioning b. Items required for testing (like smoke detector testing kit, heat detector testing kit)and maintenance of FDA components	Bidder	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	-

Notes:

1) Termination including its accessories for 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-M. 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 post order during detailed engineering.**
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) 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 and deemed included in the main package.

7 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 technical support and necessary documentation for obtaining such approvals are in bidder's scope. 4) Addressable type repeater panel in fire station with power supply system (batteries and battery chargers, suitable for providing battery backup of 24 hours (stand by) and 30 minutes (in alarm conditions), etc. 5) Fire Alarm Panel shall be provided with 2 incoming feeders of 230V AC as indicated in Annexure-[D]. Bidder shall consider necessary hardware for accepting these two feeders in Fire Alarm Panel.
3	Cables used in FDA system	Following cables shall be supplied by BHEL for LOOP and POWER cables of FDA system. FDA components shall be suitable for termination of below mentioned cables: Loop Cable: 2C x 1.5 Sqmm (Screened & twisted armoured cable) Power Cable: 2C x 2.5 Sqmm (Armoured cable)
4	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	Fibre Optic cables along with HDPE conduits	Refer Annexure-[K] of this specification for details of Fibre Optic cable. HDPE conduit shall be 2" rodent proof.
7	Operator Workstation & A4 size color laser Printer along with Commissioning software, 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 Any other software required for complete functioning of the FDA system shall also be in the scope of the bidder. 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.
8	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). Laptop shall have the latest Windows OS with requisite license. Laptop shall be compatible with FDA Graphics software.
9	Furniture for Operator Workstation & Printer	Required furniture for mounting of HMI peripherals shall be provided. Chairs: Industry standard revolving chairs with wheels (reputed make) 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 of reputed make
10	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)
11	Spike arrester cum distribution board	spike arrester cum distribution board for extending power supply to PC (CPU, Monitor), Printer and FAPs Spike arrestor to be fixed to the furniture table being supplied.
12	24 V DC Power Supply Modules with Battery Back Up	Refer Annexure-[M] of this specification

8 BIDDER'S SCOPE OF SERVICES

8.1 Supervision of erection & commissioning, performance guarantee testing & trial run, final handing over to end customer and training for the supplied systems shall be included in bidder's scope of Service.

8.2 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. Unit rate quoted shall be applicable for this purpose.

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

8.4 Bidder to note that the supervision charges for erection & commissioning shall consists of the following:

i) Per day supervision charges of an Engineer including all other expenses like boarding, lodging, local travel, insurance etc.

ii) Travel expenses (inclusive of any clearance charges like Visa fee etc, insurance) from / to vendor works to site.

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

iv) Vendor is also required to provide on the job training to Purchaser /End Customer's operation personnel by associating them in all the day to day pre-commissioning, commissioning and maintenance activities and process operations (like control system operation, trouble procedures, emergency procedures, safety requirements etc.). Training certificate alongwith Dongle for the trained persons is to be provided by the bidder. Per man-day charges quoted by bidder shall also be applicable for the Training charges/rates.

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

8.5 Per diem charges shall be applicable from the day bidder's person reaches site, up to the day he leaves the site.

8.6 All payments towards supervision of E&C shall be made only after BHEL-site supervision.

9 **MANDATORY SPARES**

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

10 DOCUMENTATION

10.1 Following information/documents to be included with offer without which the bid is liable for rejection:

a. Duly filled & Signed copy of Checklist(Annexure-I)
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

10.2 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 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

10.3 Documents to be submitted along with the Consignment.

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

a. Complete O& M manual.
b. Approved Engineering documents
c. Test Certificates documents
d. As-Built documents
e. Guarantee certificates
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).

11 MARKING, PACKING AND DESPATCH

11.1 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.

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

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

11.4 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.

11.5 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.

11.6 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.

11.7 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.

11.8 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.

11.9 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.

12 TESTING, INSTALLATION, COMMISSIONING & ACCEPTANCE

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.

13 SYSTEM INTEGRATION TEST (SIT)

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

13.2 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.

13.3 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.

14 ACCEPTANCE CRITERION:

14.1 The reliable operation of the supplied FDA system 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.

14.2 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.

15 PRICE BID FORMAT

15.1 Price bid format is enclosed as Annexure-C, bidder to furnish the offer in line with the same.

15.2 All the items included in the price bid format shall be quoted as per tender specification and pre-bid clarifications, if any. Responsibility of ensuring correctness & completeness of Scope of Supply & Services as per this specification requirement solely lies with bidder.

15.3 Prices quoted by the bidder shall remain firm till the successful handing over of the FDA system to end customer/User.

15.4 Bidder to quote only base rates for all the items, Applicable taxes and duties shall be indicated separately.

15.5 The Priced Bid shall be submitted in Original (without any copy) duly signed and stamped on each page in a separate sealed envelope super scribing “Price Bid –Do not Open”. This shall not contain any condition whatsoever failing which the Bids shall be liable to be rejected. In case of any correction, the bidder shall put its signature and its stamp. Eraser fluid will not be allowed for making any correction.

16 VENDOR LIST

16.1 Project specific vendor list shall be as per “Annexure-[G] of this specification”. Bidder to follow the same.

16.2 Further the supplied model shall be under regular manufacturing range and have Proven Track Record (PTR).

16.3 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) shall be proposed for BHEL’s approval.

Non-acceptance of any proposed sub-vendor by bidder shall not have any commercial 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 in the last 3 years along with supporting documents like unpriced PO, customer approved datasheets, proof of supply).

RECORD OF REVISIONS				
Rev. No.	**Date**	**Revision Details**	**Revised By**	**Approved By**
00	06.07.2022	Original issue	--	P. ChandraSekhar

	Bill of material [for Main Supply]	Annexure -[A] of PY 51853
	Fire Detection & Alarm System	Rev 00
	Project: 2 x 500MW Mauda-I FGD	

BHEL MATERIAL CODE: PY9751853010

S. No.	Item Description	Quantity [A]	Unit	Remarks
1	Fire Alarm Panel (Each panel shall have 4 Loops) Floor Mounted	1	No.'s	Refer Note-1,2,3 & 6
2	Loop Card	2	No.'s	Refer Note-3
3	Repeater Panel	1	No.'s	
4	Multisensor Detectors with detector base and mounting back box (Analogue addressable) along with PVC cable glands	325	No.'s	
5	Heat Detectors with detector base and mounting back box (Analogue addressable) along with PVC cable glands	10	No.'s	
6	Beam Detectors (Addressable) along with PVC cable glands	5	No.'s	If addressable detector is not available in offered make, then Module (2 Input + 1 Output) with IP-65 enclosure to be provided along with detector.
7	Indoor Manual Call Points with mounting back box (Addressable type) along with PVC cable glands	35	No.'s	
8	Outdoor Manual call points with mounting back box (IP-65 min.) (Addressable type) along with PVC cable glands	20	No.'s	
9	Indoor Hooter cum Strobe with mounting back box (Addressable type) along with PVC cable glands	50	No.'s	Loop powered Hooter only
10	Exit Sign (Self illuminating)	40	No.'s	
11	Response Indicators	25	No.'s	
12	Digital LHS Cable for Cable Galleries	5200	Meter	
13	Digital LHS Cable for Coal Conveyors	1450	Meter	
14	Digital LHS Controllers (2 km range)	1	Lot	Refer Note-12 below
15	End of Line Resistance with Terminal Box for LHS cable termination (IP-65)	16	No.'s	
16	LHS Cable Jointing Box	10	No.'s	
17	Module for LHS Cable (1 Input) with IP-65 enclosure along with PVC cable glands	16	No.'s	
18	Module for Deluge Valve (2 Input + 1 Output) with IP-65 enclosure along with PVC cable glands	10	No.'s	
19	Module for Limit Switches (2 Input + 1 Output) with IP-65 enclosure along with PVC cable glands	10	No.'s	
20	Module for Tripping (1 Output) along with PVC cable glands	10	No.'s	

	Bill of material [for Main Supply]			Annexure -[A] of PY 51853
	Fire Detection & Alarm System			Rev 00
	Project: 2 x 500MW Mauda-I FGD			
BHEL MATERIAL CODE: PY9751853010				
21	Module for Interface with DCS (1 Output) with IP-65 enclosure along with PVC cable glands	3	No.'s	
22	24 V DC Power Supply Modules with Battery Back Up	2	No.'s	5A, 24V DC with battery backup of 30 min. Refer attached specification (Annexure-[M]) for technical details.
23	Operator Workstation & A4 size color laser Printer along with Commissioning software, Graphic software i.e., (GUI) Software with License /Dongle	1	No.'s	
24	Laptop along with Fire Alarm Panel Commissioning Software with License /Dongle	1	No.'s	
25	Furniture for Operator Workstation & Printer	1	Sets	
26	Mini-UPS for Operator Workstation & Printer (To be sized by bidder)	1	No.'s	
27	8 Fiber 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
28	Erection & Termination hardware for Optical Fibre cables	1	Lot	For BOQ refer Note-10, 11
29	All hardware & Software required required for establishing the networking between all fire alarm panels, repeater panels, DCS, PCs, Printers etc shall be considered.	1	Lot	
30	Cable Tags for 1P x 1.5 Sqmm Cable	20	No.'s	
31	Cable Saddle + Saddle Bars along with fixing screws and rawl plugs for 1P x 1.5 sqmm Cable	12500	Sets	
32	Nylon Cable Tie for 1P x 1.5 sqmm Cable	10000	No.'s	
33	Cable Lugs for 1P x 1.5 Sqmm Cable (Tinned Copper)	2200	No.'s	
34	Mounting Accessories & Erection Hardware for all above items	1	Lot	Refer Note-7 below

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/longest 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. Refer Annexure-[N] for typical erection drawings. 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 furnished during detailed Engg stage.

BHEL MATERIAL CODE: PY9751853010

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 (along with pigtails based on FO cable) =20 No's, Patch Cords = 20 No's, Media converters= 4 No's, 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)	In case, bidder offers digital LHS controller of 2-Channels with 2 kms range then the quantity shall be 3 nos. However in case bidder offers digital LHS controller of 1-Channel with 2 kms range then the quantity shall be 6 nos.
13)	NIL
14)	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
15)	Please consider alarm Temperature of LHS cable as 60 Deg (min.) for cable galleries and 80 Deg (min.) for coal conveyors.
16)	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.
17)	FAP, Repeater panel, Detectors, Devices, Modules etc. shall be under regular manufacturing range of OEM and have proven track record.
18)	Information/Status of all panels shall be available in all the workstations using GUI Software
19)	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.
20)	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 51853
	Fire Detection & Alarm System	Rev 00
	Project: 2 x 500MW Mauda-I FGD	

BHEL MATERIAL CODE: PY9751853028

S. No.	Item Description	Quantity [B]	Unit	Remarks
1	Multisensor Detectors with detector base and mounting back box (Analogue addressable)	33	No.'s	
2	Fibre Optic Cable	260	Meter	
3	Response Indicators	10	No.'s	
4	Digital LHS Cable for Cable Galleries	520	Meter	
5	Digital LHS Cable for Coal Conveyors	145	Meter	
6	FIRE ALARM PANEL & REPEATER FIRE ALARM PANEL			
i	Fuses	100% of population		
ii	Indicating lamps	100% of population		
iii	Push Button	10 Nos. of each type and rating		
iv	Power supply modules	10% or 1 No. of each type & rating whichever is more		
v	Control modules, loop cards modules, isolator cards	10% or 1 No. of each type, whichever is more.		
vi	LCD display of each type unit of panel	1 No.		
vii	Cartridges for printers	2 Nos.		
viii	Interface unit / modules for non-addressable devices, auxiliary / output relay modules, control modules, supervisory control modules and any other electronic modules	10% or 1 No. of each type whichever is more.		
ix	LED's of each type	100% of population.		
x	Power supervision relay	4 Nos. of each type		
xi	Fire screen / alarm buzzer	1 No. of each type		

ANNEXURE-B

SUB-SECTION-III-A3

FIRE DETECTION & PROTECTION SYSTEM

1.00.00 **FIRE DETECTION AND PROTECTION SYSTEM:**

The scope includes Engineering, Supply, Construction, Erection, Testing and Commissioning for Fire Detection and Protection System for FGD area. Following system has been envisaged:

1.1 Hydrant System:

Complete hydrant system (pipe, hydrant valves, landing valves, water monitors, hoses, branch pipes and nozzles etc) for FGD area shall be provided as per TAC norms. Tapping for hydrant system shall be provided from nearby existing hydrant header.

1.2 HVW Spray System:

Automatic fire detection cum high velocity water spray system shall be provided for various transformers (having oil capacity 2000 liters or more) envisaged under this package. Tapping for HVW spray system shall be provided from nearby existing hydrant header.

1.3 MVW Spray System:

Automatic fire detection cum medium velocity water spray system for the various cable galleries envisaged under this package. Tapping for MVW spray system shall be provided from nearby existing Spray header.

1.4 Fire Extinguishers

Five numbers each type of Portable fire extinguishers consisting of water type, dry chemical powder type, CO2 type shall be provided in various facilities of FGD system.

1.5 Analogue addressable type Fire Alarm System / Annunciation Panels:

Analogue addressable type Fire Alarm System consisting of Multi sensor type detectors, Linear Heat Sensing Cable (LHSC) detector, cabling, junction boxes, instrumentation, Fire Alarm cum control panels, repeater panels, etc. for various areas/equipment as detailed out below:-

a) All MCC / switch gear room / Control room shall be provided with Multisensor type detectors.
b) All Conveyors and Cable Galleries shall be provided with Linear Heat Sensing Cable detectors.
c) All cable galleries shall be provided with Multisensor type detectors.

1.6 The Contractor is responsible for getting the complete approval of the system elaborated in this specification from TAC accredited professional(s).

1.7 If the contractor feels, it is necessary to include any other items, which, in his opinion, may be required to comply with TAC regulations, other than those indicated in the specification, the same shall also be supplied, erected and commissioned. Any amendments, modified rules to the latest TAC regulations till techno-commercial bid opening date should be considered by contractor to fulfill the above condition.

1.8 Successful contractor shall furnish complete hydraulic calculation.

1.9 Supply of complete mandatory spares as specified elsewhere.

1.10 Set of commissioning spares as may be required during erection and commissioning.

1.11 One (1) set Special tools and tackles required for maintenance of all the mechanical, electrical and C & I equipment under the scope of Contractor.

1.12 Any additional item/ equipment required to make the system complete.

1.13 Grouting, dressing and final finishing of all foundations of various equipment, etc.

1.14 Supply of structural supports for piping in trench and for above ground piping wherever applicable.

1.15 Supply & application of protective coatings and wrapping for buried pipes and pipes in RCC trenches, and painting for above ground piping, valves, pipe supports, etc. as detailed in technical specifications.

1.16 Excavation, preparation of bed, laying, backfilling with compaction of soil for all underground/buried piping. Also, breaking and re-erection of paving for buried piping (if any)

1.17 Preparation of necessary detailed drawings including schematics, layouts, isometrics, fabrication drgs, erection drgs, etc. as required and also development of "As Built Drgs".

1.18 Conductance of Performance and Guarantee test as per Standard Guaranteed test procedure given elsewhere in the specification.

1.19 All pylons required for transformers, shall be anchored to soak pit base slab of individual transformer, paved area outside soak pit, etc. using anchor fasteners of adequate capacity. Subsequent to fixing the pylons, lower part of pylon which would be within filled up gravel portion shall be encased with concrete by Employer for corrosion protection.

SUB-SECTION-I-M4

FIRE DETECTION & PROTECTION SYSTEM

FIRE PROTECTION AND DETECTION SYSTEM

1.00.00 GENERAL DESCRIPTION

1.01.00 A comprehensive Fire Detection and Protection System covering all the areas of the power plant including Employer's facilities/ system /buildings (if applicable) is included in the scope of the Contract.

1.02.00 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.

2.00.00 HYDRANT SYSTEM

Hydrant system shall consist of piping, hydrant valves, landing valve, water monitors, hoses, branch pipes, nozzle, hose boxes, etc.

2.01.00 **Areas to be Covered**

Complete FGD area, ZLD area (as provided) and other auxiliary buildings / areas under the scope of the Bidder.

3.00.00 HVW AND MVW SPRAY SYSTEM

3.01.00 **General**

It shall consist of: Spray pumps, pressurization arrangements, water mains network, deluge valves, alarm valves, flow switches, isolation valves, Y-type strainers, spray nozzles/projectors, spray nozzles piping network, detection system, instrumentation, local control panels, cables etc.

3.02.00 **Areas to be covered by HVW Spray System**

i) All transformers For FGD and ZLD (as provided) System having oil capacity above 2000Ltrs & located with-in plant boundary.

3.03.00 **Areas to be covered under MVW Spray System**

i) All cable galleries/ cable vault/ cable spreader room in Bidder scope of work under FGD and ZLD (as provided) System.

4.00.00 FIRE EXTINGUISHERS AND FIRE STATION EQUIPMENTS

4.01.00 **Fire Extinguishers**

As indicated in Bidder's Scope, Part-A.

5.00.00 FIRE DETECTION, ALARM AND CONTROL SYSTEM

5.01.00 **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:

1. Loss Prevention Council, (LPC), U.K.
2. National Fire Protection Association, (NFPA), USA
3. Under-writers laboratories, (UL), USA
4. Factory mutual(FM)

5.02.00 **Areas to be covered under Fire detection and alarm System**

a) **Multisensor type detection system (Above and below the false ceiling or below the false flooring as the case may be)**

i) All switchgear / MCC/battery rooms of FGD and ZLD (as provided) control room building, various auxiliary buildings (if applicable), etc.

ii) Cable galleries of FGD and ZLD (as provided) control room building protected by MVW spray system. Further, multisensory detectors shall also be provided inside all cubicles/panels of control room, control equipment room and UPS / Battery charger areas.

iii) Above and Below false ceiling areas of all air-conditioned rooms of FGD and ZLD (as provided) control room building, various control rooms of auxiliaries as defined in Sl. No. (i) above and return air ducts of inert gas protected areas.

b) **Linear heat sensing cable detection system**

Gypsum and lime conveyor of FGD system and Cable Galleries covered under MVW Spray System.

c) **Quartzoid bulb heat detection system**

Equipments protected by HVW spray system, conveyors protected by MVW spray system.

5.03.00 General requirements for all types of Detectors

5.03.01 Detectors shall be housed or mounted in suitable enclosure in such a way that their performance is in no way affected. Special maintenance procedures if any required for the satisfactory operation of the detectors shall be clearly stated in the bid.

5.03.02	Necessary mounting accessories shall be provided for all the detectors.
5.03.03	In case the detectors are offered with their output (on sensing a fire) in the form of an electrical contact, it shall be noted that the contact shall be 'NC' type such that under fire conditions, this contact will open to initiate the fire alarm system.
5.03.04	Detectors shall preferably be designed as plug-in units, which fit into various bases according to place and type of mounting. This would also enable interchangeability.
5.03.05	Detectors shall be provided with the necessary compression type cable terminating glands for the incoming cables of flameproof type or PVC/metallic flexible/rigid conduits.
5.03.06	Depending upon the environmental conditions in which detectors are installed, chlorinated rubber based or epoxy or equivalent paint shall be used for finishing the surface of the enclosure.
5.03.07	The coverage or the zone of protection afforded by the detector and recommended height of mounting shall be furnished by the Bidder. The bidder shall furnish the test certificate in support of this.
5.03.08	Any metal parts used for detector construction shall be inherently resistant to corrosion or shall be plated or otherwise suitably treated to afford protection against corrosion. The plating or treatment shall in no way affect the detector performance.
5.03.09	Any plastic material or any sealing compound used in the detector shall be such as it will not deform or fail under the maximum temperature to be expected.
5.03.10	No detector shall contain any moving parts subject to wear and tear and must be able to operate afresh after each alarm release, without its exchange or adjustment.
5.03.11	The detector shall be located where the largest combustion gas concentration can be expected.
5.03.12	Adequate compensation and considerations shall be made for effects for wind velocities such as air-conditioning system and exhaust fans where dilution of particles of combustion is greater.
5.03.13	The exact location of detectors shall be coordinated with other services like air-conditioning grills, light fittings, cable trays etc. to provide aesthetically pleasing appearance. The return air paths of air-conditioning shall be avoided for detector location.
5.03.14	The detectors shall not be affected by temperature, humidity; air flow or by drift failures and shall not give any false alarm due to above.
5.03.15	The detectors shall not be sensitive to vibrations. Any special mounting arrangements required to counteract vibration shall be included in the contractor scope.
5.03.16	The quantity of multi- sensor detectors in each zone shall be based on the coverage factor of 25-sq. meter per detector. However the actual quantity of detectors required, taking into consideration obstructions due to floor beams, ventilation, doors, windows etc., shall be worked out and supplied (based on the actual layout) and installed by the contractor.
5.03.17	The detectors shall not give false alarm due to high humidity, temperature, and velocity of air in the surroundings and static electricity conditions.

5.03.18 Process actuated switch devices such as pressure switches, flow switches, level switches, etc. shall be provided with suitable individual addressable interface (local or remote) units or modules so that these devices are addressable from the panel.

5.05.00 **Linear Heat Sensor Cables**

Application	Detection of Stationary fire
Type	Digital
Operating voltage	24 V DC
Approval	FM/UL
Conductor material	Steel
Insulation	Heat sensitive polymer
Outer Sheath	Black or colored PVC or flouropolymer suitable for the application environment

Installation features for LHSC

1. Mounting arrangement have been indicated in tender drawing.
2. The detection zone/loop divisions of LHSC system shall match with MVW spray zones. Conveyors where LHSC shall be installed shall be divided into no. of various zones whereas conveyor for which IR detector is installed shall be considered as one zone.
3. Linear heat sensing cable detector shall run in a zigzag fashion (with an included angle of 90 deg) on each top cable tray, bottom tray and every alternate intermediate trays of each section of cable tray without undue sagging and interfering the normal operations. All supporting materials for mounting of LHSC shall be provided by the bidder.

5.06.00 **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.

5.07.00 **Multi sensor Detectors**

5.07.01 Multi sensor detectors shall incorporate a heat detection element and a photoelectric detection element. Both the elements shall be incorporated in a single unit. Both the elements shall be operative at all times and the fire signal shall be available from any or both elements combined together.

5.07.02 The detectors shall be sensitive to very low smoke densities of the order of say 0.05 g/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.

5.07.03 The detectors shall be complete with a mounting base that includes a terminal box into which the detector can be plugged in. Terminals for looping of the cables shall be provided.

5.07.04 All detectors shall be provided with built-in response and indicating lamps which shall give local visual indication, when it has operated in dense smoke conditions. The failure of lamp shall not prevent the function of detector.

5.07.05 In areas such as false ceiling where detectors themselves are not easily accessible, the remote response indicators outside the enclosed areas shall be provided to indicate the fire condition.

5.07.06 It shall be possible to replace any type of detector head by a different type detector without requiring change in cabling/panel wiring and condition of the zone, originally covered by the detector.

5.08.00 **System Configuration**

5.08.01 The Addressable Fire Alarm panel shall be able to communicate 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.

5.08.02 At least one spare loop shall be provided in each of the addressable type fire alarm panel located in FGD and ZLD (as provided) 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.

5.08.03	FGD and ZLD (as provided) Fire alarm system shall be provided with necessary interface hardware and software for communicating fire alarms from this fire alarm panel to the main plant fire alarm control panel through potential free contacts.
5.09.00	**Analog Addressable Fire Detection and Alarm System**
5.09.01	General Requirements
5.09.02	This specification in general covers the functional requirements, and general design aspects of Microprocessor based, Analog Addressable Fire Detection Alarm / Annunciation and Control System.
5.09.03	The following description intends to describe only the brief hardware and functional requirements, scope of hardware requirements etc. but the actual configuration of the system shall be in line with the prevalent normal practices in the industry and shall conform to latest product range of selected manufacturer. The fire detection and control system offered shall be complete in all respects for the safe and reliable operation of the entire system. Any additional hardware/software than those mentioned herein required to make the system complete shall be included in the scope of the Bidder.
5.09.04	All the system and its equipment specifically detectors, interface modules, panels, power supply, battery chargers etc. shall be furnished from a single source and the same shall be new and latest state of the art products of manufacturer engaged in the manufacture of Integrated Microprocessor based Analog Addressable Fire Detection and Alarm System.
5.09.05	All equipments such as detectors, panels etc shall be approved and listed by UL/FM/LPCB/VDS.
5.09.06	All types of smoke detectors shall be of analogue addressable type. Conventional detectors with interface modules are not acceptable. Each zone of LHSC detector and each IR detector shall be provided with interface module.
5.09.07	All the fire detection systems, process actuated switch devices such as pressure/flow/temperature switches and relays of control functions shall be hooked up with the analogue addressable fire detection and alarm system. Required addressable interface units shall be provided for various switch devices by the bidder to make them addressable.
5.09.08	The wiring shall be of class-A as per NFPA-72.
5.09.09	Bidder shall provide isolators at the start & end of the loop.
5.09.10	The complete system shall include, but not be limited to the following : a) Master system CPU. b) Analog Addressable Fire Detection and Alarm System panels including alarm modules, system supervisory control modules, auxiliary output control modules etc. c) Power supplies, batteries and battery chargers. d) Analog addressable type smoke detectors.

e) Non addressable type conventional detectors (Linear heat sensing cable detector/ infra red type heat detector) and switching devices each with its own addressable interface modules.

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

g) 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.

5.10.00 **System Functional Requirements**

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

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.
11. Actuate solenoid valve in spray system in case of fire from respective fire alarm panel. For achieving this if any additional hardware is required like relays, power supply and cables, the same may be provided.

5.10.02

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.

5.11.00 **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.

5.12.00 **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.

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

5.13.01 One set of 24V DC redundant power supply system comprising of 2 x 100% chargers and 1 x 100% batteries shall be provided for fire alarm panel and repeater alarm panel. The

batteries for fire alarm system shall be sealed maintenance free lead acid type. The battery backup for each fire alarm panel and repeater alarm panel shall be 24 hours and 30 minutes (in alarm conditions). At least 25% of the devices shall be considered to be active in alarm conditions. Each of the redundant chargers shall be sized to meet connected load requirements and keep the connected batteries full charged (Float Mode). Furthermore, the charger shall be sized to enable the boost charge of a fully discharged battery in 10 hours while feeding the load.

5.13.02 The batteries shall be sized as per relevant IEEE standard. For battery sizing calculation, an aging factor of 0.8, a temperature correction factor (based on temperature of 4 deg. C), voltage drop of 2V in cables. Capacity factor, Float Correction Factor, as per Battery Supplier Standard, shall be taken into consideration, if applicable and ambient temperature shall be considered as the electrolytic temperature. The sizing of the battery shall be as approved by Employer during detailed engineering.

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

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

5.14.00 **Control & Instrumentation requirements**

5.14.01 Not Used.

5.14.02 Not Used.

5.14.03 The specification related to Basic design criteria, Measuring Instruments, Process connection & piping, Control panels, Type test requirements etc shall be as specified in other sections of the technical specification.

5.15.00 **Cabling for fire alarm system**

All instrumentation cables twisted & shielded, FRLS PVC insulated and sheathed data highway / fibre optical cables, short term fire proof cables including prefabricated cables (with plug-in connectors) etc shall be provided by Contractor.

The contractor shall follow the cable philosophy as below:

Application		Type of cable
From	To	
PLC cabinets	PC, Printers etc.	As Mfr.'s Standard. However, connection between PLC and the remote I/Os shall be through fibre optic cable by Bidder if length is>300 M & coaxial cable if length<300 M
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 coal handling plant and inert gas protected areas. Short term fire proof cables shall be Mineral insulated copper conductor and copper sheathed type satisfying requirements of Fire resistance, safety in the industrial application areas mentioned in the specification and also, shall be approved by UL standards and certified by LPCB. The contractor shall provide all the cables so as to complete the system
4. 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.

5.16.00 **Detection System for Conveyors**

i) **Linear Heat Sensor Cables:**

a) The LHS cable detector for each conveyor to be provided for both forward and return conveyors and shall be mounted as per the standard practice of the manufacturer/ supplier. Suspension of LHSC through flexible chains is a preferred arrangement. Further, LHS cable shall also be provided for return side of conveyors inside the bunker house.

b) The detection zone/loop divisions of LHSC system shall match with the MVW spray system.

c) Upon detection of fire either by QB detector or LHSC detector, the spray system shall be initiated. It shall also initiate spray system for the two adjacent zones after a time delay settable at site.

d) The LHSC detector shall be provided with suitable interface unit, which shall generate/ make the signal compatible with fire alarm panel.

(e.) Type: Digital, Operating Voltage: 24V DC, Conductor Material: Steel, Approval: FM/UL

5.17.00 **Detection System of Cable Galleries**

i) In cable galleries, MVW spray system shall be actuated either by detection of fire by Linear Heat sensing cable detectors or by fire signal from Multisensor detection system. Apart from the automatic operation of spray system in the detected zone, the adjacent two zones shall also be sprayed with water automatically after a set time delay simultaneously.

ii) LHSC detector shall run in a zig-zag fashion (with an included angle of minimum 90^{o} atleast) in each of the top tray, bottom tray and in every alternate trays. The mounting arrangement of LHSC detector shall be as per manufacturer's standard practice.

iii) The detection zone/ loop divisions shall match with MVW spray zones.

5.18.00 **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 that area such as automatic MVW spray system of cable galleries, fire extinguishing system of Control rooms/Control Equipment Rooms.

ii) Cross zoning of the signal from two adjacent multisensor detectors shall be employed to initiate the fire extinguishing system of inert gas protected areas and MVW spray system of cable galleries.

iii) Multisensor detector shall be provided for return air ducts of main plant, which shall consist of intake probe, detector housing, and exhaust pipe etc. The detector shall be mounted outside the duct.

iv) The design coverage area for detectors (to be considered) shall not exceed 25 Sq.M. for each detector.

6.00.00 PIPING AND VALVES

6.01.00 **General Data for Pipes etc.**

i) Mild steel as per IS:1239 (Part-I) medium grade (upto 150 NB) & as per IS:3589 Gr 410 (above 200 NB) or Equivalent for pipes normally filled with water.

ii) Mild steel as per IS:1239 (Part-I) medium grade (upto 150 NB) & as per IS:3589 Gr.410 (above 200 NB) or Equivalent and galvanised as per IS:4736 for pipes normally empty and periodically charged with water and foam system application.

iii) Pipe protection shall be as follows :

To prevent soil corrosion buried pipes / pipes in trench shall be properly lagged with corrosion protective tapes of coal tar type as per IS:15337 or AWWA C 203. The total thickness of protective tapes to be applied on buried pipes / pipes in trench shall be 4.0mm. This can be achieved by using 4.0mm thick tape in single layer or 2.0mm thick tape in double layer.

iv) Pipe thickness:

a) For Pipe sizes upto 150 NB and above: As per IS:1239 Part-I medium grade.

b) For Pipe sizes 200 NB and above refer Annexure-I.

v) All valves shall be as per applicable IS/BS codes & approved by TAC for specific fire protection system and shall be provided with locking arrangement (with locks) in open or close condition. Further, all gate/butterfly valves of size 200 mm & above shall be provided with spur gear reduction unit.

vi) All the flanges and counter flanges shall conform to ANSI B 16.5 Cl 150.

vii) Strainer Body as per IS:2062 (tested).

viii) Pipe Fittings

1) The material shall conform to ASTM A 234 Gr WPB or ASTM A 105 or equivalent and dimensional standard conforming to ANSI B 16.11 (socket & threaded type), ANSI B 16.9 (for butt welded fittings) and ANSI B 16.5 (for flanges and flanged fittings) as the case may be. Further, galvanised malleable cast iron fittings as per IS:1879 in Cast iron fitting as per BS-1641 are also acceptable.

2) **Grooved couplings :** Vendor may also use mechanical grooved couplings type fittings in GI pipe lines for HVW / MVW spray system. All materials and products shall be either Underwriters Laboratories (UL) Listed or Factory Mutual (FM) Approved and installed in accordance with NFPA Standard 13 / equivalent Standard.

3) The fittings shall be galvanised as per IS : 4736 for galvanised pipe application. In case of branching connections from GI mains for spray piping network, socket may be welded for more than two pipe reduction instead of standard tees.

4) Fabricated fittings shall not acceptable up to pipe size to 300 NB. For sizes 350 NB and above, fittings may be fabricated as per BS:2633/BS:534.

ix) Welding of galvanised iron pipes/fittings would be permitted provided the same is carried out by means of special electrodes suitable for the above application and the same shall be approved by Employer. After, welding, welded portions shall be applied with three coats of zinc silicate treatment/rich paint over one coat of suitable primer. Further, the Contractor shall provide proper zinc paint at the point of welding.

7.00.00 PAINTING

7.01.00 All the Equipments shall be protected against external corrosion by providing suitablepainting.

7.02.00 The surfaces of stainless steel, Gunmetal, brass, bronze and non-metallic components shall not be applied with any painting.

7.04.00 **All Steel Surfaces (external) exposed to atmosphere (outdoor installation)**

(i) **Surface Preparation :** The steel surfaces to be applied with painting shall be thoroughly cleaned before painting by wire brushing, air blowing, etc.

(ii) **Painting:** One (1) Coat of red oxide primer of thickness 30 to 35 microns followed up with three (3) coats synthetic enamel paint, with 25 microns as thickness of each coat. For plant at coastal area, epoxy resin based zinc phosphate primer followed by epoxy resin based paint pigmented with titanium di-oxide shall be used in place of enamel paints.

7.05.00 **All Steel Surfaces (external) inside the building (indoor installation)**

(i) **Surface Preparation :** The steel surfaces to be applied with painting shall be thoroughly cleaned before painting by wire brushing, air blowing, etc.

(ii) **Painting:** One (1) Coat of red oxide primer of thickness 30 to 35 microns followed up with two (2) coats synthetic enamel paint, with 25 microns as thickness of each coat. For plant at coastal area, epoxy resin based zinc phosphate primer followed by epoxy resin based paint pigmented with titanium di-oxide shall be used in place of enamel paints.

7.06.00 **Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam Proportioning equipments, Foam makers, etc.**

Painting of all equipments /.components of FDPS package shall be as per manufacturer's standard practice or as detailed below whichever is superior in quality.

Environment	Paint scheme	Total DFT
Normal / Mild Corrosive Environment	Primer- zinc filled epoxy Finish – Aliphatic Polyurethane (shade RAL3000)(P.O Red)	Min 125 microns
Corrosive Environment (as in coastal areas)	Primer- zinc filled epoxy Intermediate – Epoxy MIO Finish – Aliphatic Polyurethane (shade RAL3000)(P.O Red)	Min 200 microns

ANNEXURE-I

PIPING THICKNESS:

Pipes for sizes 200 NB & above shall confirm to IS: 3589 Grade 410. The final thickness shall not be less than that specified as per IS: 3589 as indicated below.

Nominal pipe Size (mm)	Outside Diameter (mm)	Wall Thickness (mm)
200 NB	219.1	6.3
250 NB	273	6.3
300 NB	323.9	7.1
350 NB	355.6	8.0
400 NB	406.4	8.0
450 NB	457	8.0
500 NB	508	8.0
600 NB	610	8.0

Annexure-II

Technical Data:

1. **Hydrant Valve**	Oblique female type as per IS:5290
	MOC: Body/bonnet/stop valve/valve seat/trim : SS304/SS316
2. **Water monitor**	As per IS:8442 Type-I, Size: 75mm, Nozzle dia: 38mm
	MOC: Water barrel/reducer/elbow: CS (seamless)/SS Nozzle: Copper alloy / SS confirm in to IS:3444
3. **Water branch pipe & nozzle**	As per IS:903 / IS:2871
	MOC: Branch pipe: SS316 (Gr 4 of IS:3444) (both ends) Nozzle : SS316 (Gr 4 of IS:3444), Size: min 16mm & max 25mm
4. **Water line Gate / Sluice Valve**	- Design Code: a) IS:14846 or BS:5150 (for valves coming inside fire water pump house) b) BS:5150 (for valves at other locations) - Pressure rating: PN1.6 (as per IS:14846) / PN16 (as per BS:5150) -Working Pr. :12Kg/cm2
	MOC: Body/bonnet/Yoke/Wedge : CI to IS:210 FG-200 Spindle: SS to ASTM-A-276 type 410
5. **Butterfly Valve**	Design Code: Double flanged or lugged wafer type of low leakage rate confirming to BS:EN:593/API-609/AWWA C-504 Pressure class: PN 16
	MOC: Body & Disc : Cast Iron, Shaft : SS 410 / SS 420 Seat Rings : EPDM

SUB-SECTION-I-M5

EQUIPMENT COOLING WATER SYSTEM

	Price Bid format [for Main Supply + Mandatory Spares+Services]	Annexure -[C] of PY51853
	Fire Detection & Alarm System	Rev.00
	Project: 2 x 500MW Mauda-I FGD	

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 indicatinf "QUOTED" 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 "% Weightage" with the Grand Total BASIC Price quoted. Unit Rates of the Individual items thus arrived, shall be binding on the bidder, in case of any repeat order/Amendment of Purchase Order as per this specification and BHEL policies. Please refer sheet 3 & 4 for this purpose and information.
8	Nil
9	The Bid Evaluation is on Overall L1 Basis. Partial offers will not be considered for evaluation and the same are liable for rejection.
10	Bidders will be required to quote Grand Total BASIC Price only 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 PY51853
		Fire Detection & Alarm System					Rev.00
		Project: 2 x 500MW Mauda-I FGD					
S. No	**Material Code**	**Item Description**	**Quantity [I]**	**Unit**	**TOTAL PRICE (Rs.) [I*II]**	**Weightage (%) for Calculation of Line Item Prices**	**REMARKS**
[A]	**MAIN SUPPLY**						
	PY9751853010	Main Supply- Fire Detection & Alarm System Components	1	Set	**Not to be filled by Bidder**	**92.08%**	
[B]	**MANDATORY SPARE**						
	PY9751853028	Mandatory Spares- Fire Detection & Alarm System Components	1	Set	**Not to be filled by Bidder**	**6.16%**	
[C]	**SERVICES**						
(i)	PY9751853036	Supervision of Erection & Commissioning Services charges at site including lodging, boarding, local travel, insurance, etc. [Unit Rate = Per man day charges]	5	Days	**Not to be filled by Bidder**	**1.47%**	
(ii)	PY9751853044	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	**Not to be filled by Bidder**	**0.29%**	
Grand Total Basic price for overall L1 evaluation ([A]+[B]+[C]) (Rs.) ::					**Refer Note-10; To be filled by Bidder**	**100.00%**	

	Price Bid format [for Main Supply]	Annexure -[C] of PY51853
	Fire Detection & Alarm System	Rev.00
	Project: 2 x 500MW Mauda-I FGD	

S. No	Type of instrument	% Weightage for calculation of Line Item Unit Price (Refer Note-7)	
1	Fire Alarm Panel (Each panel shall have 4 Loops) Floor Mounted	8.74698%	
2	Loop Card	1.06642%	
3	Repeater Panel	2.54089%	
4	Multisensor Detectors with detector base and mounting back box (Analogue addressable) along with PVC cable glands	0.04878%	
5	Heat Detectors with detector base and mounting back box (Analogue addressable) along with PVC cable glands	0.04874%	
6	Beam Detectors (Addressable) along with PVC cable glands	0.76611%	
7	Indoor Manual Call Points with mounting back box (Addressable type) along with PVC cable glands	0.05226%	
8	Outdoor Manual call points with mounting back box (IP-65 min.) (Addressable type) along with PVC cable glands	0.12377%	
9	Indoor Hooter cum Strobe with mounting back box (Addressable type) along with PVC cable glands	0.09898%	
10	Exit Sign (Self illuminating)	0.02029%	
11	Response Indicators	0.00433%	
12	Digital LHS Cable for Cable Galleries	0.00276%	
13	Digital LHS Cable for Coal Conveyors	0.00473%	
14	Digital LHS Controllers (2 km range)	2.01095%	
15	End of Line Resistance with Terminal Box for LHS cable termination (IP-65)	0.00685%	
16	LHS Cable Jointing Box	0.00956%	
17	Module for LHS Cable (1 Input) with IP-65 enclosure along with PVC cable glands	0.06276%	
18	Module for Deluge Valve (2 Input + 1 Output) with IP-65 enclosure along with PVC cable glands	0.06276%	
19	Module for Limit Switches (2 Input + 1 Output) with IP-65 enclosure along with PVC cable glands	0.06276%	
20	Module for Tripping (1 Output) with IP-65 enclosure along with PVC cable glands	0.06256%	
21	Module for Interface with DCS (1 Output) with IP-65 enclosure along with PVC cable glands	0.06248%	

	Price Bid format [for Main Supply]	Annexure -[C] of PY51853
	Fire Detection & Alarm System	Rev.00
	Project: 2 x 500MW Mauda-I FGD	

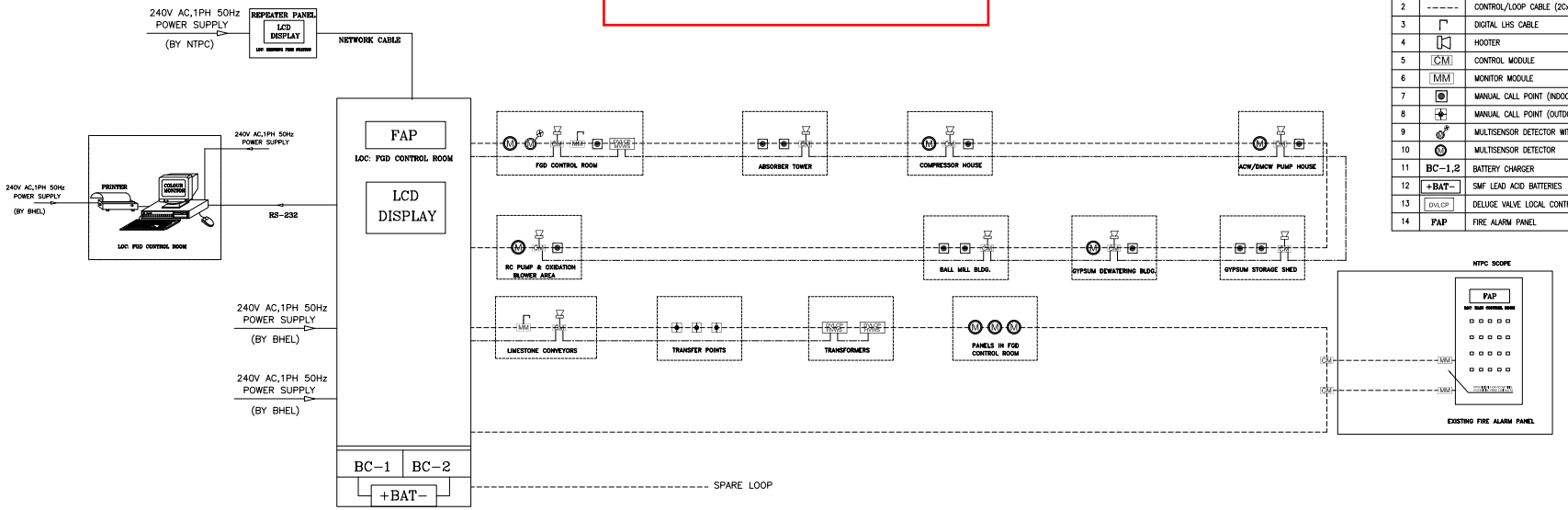
S. No	Type of instrument	% Weightage for calculation of Line Item Unit Price (Refer Note-7)	
22	24 V DC Power Supply Modules with Battery Back Up	0.48614%	
23	Operator Workstation & A4 size color laser Printer along with Graphic software i.e., (GUI) Software with License /Dongle	5.38010%	
24	Laptop along with Fire Alarm Panel Commissioning Software with License /Dongle	1.42360%	
25	Furniture for Operator Workstation & Printer	0.10291%	
26	Mini-UPS for Operator Workstation & Printer (To be sized by bidder)	0.68181%	
27	8 core Armoured single mode Optical Fiber Cable with 2" rodent proof HDPE conduits (for fire alarm panels and PC networking)	0.00201%	
28	Cable Saddle + Saddle Bars along with fixing screws and rawl plugs for 1P x 1.5 sqmm Cable	0.00005%	
29	Nylon Cable Tie for 1P x 1.5 sqmm Cable	0.00001%	
30	Cable Lugs for 1P x 1.5 Sqmm Cable (Tinned Copper)	0.00011%	
31	Cable Glands for 1P x 1.5 Sqmm Cable (Double Compression PVC) for all FDA Components/devices	0.00374%	
32	Cable Glands for 2C x 2.5 Sqmm Cable (Double Compression PVC)	0.00374%	
33	Mounting Accessories & Erection Hardware for all above items	6.13841%	

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. PY-PL-1-M120-8683-01 SH. 01 OF 01

ANNEXURE-D



LEGEND:–

SL NO	SYMBOL	DESCRIPTION
1	———	POWER CABLE (2Cx2.5 SQ.MM)
2	- - - - -	CONTROL/LOOP CABLE (2Cx1.5 SQ.MM)
3		DIGITAL LHS CABLE
4		HOOTER
5	CM	CONTROL MODULE
6	MM	MONITOR MODULE
7		MANUAL CALL POINT (INDOOR)
8		MANUAL CALL POINT (OUTDOOR)
9		MULTISENSOR DETECTOR WITH RESPONSE INDICATOR (ABOVE FALSE CEILING)
10		MULTISENSOR DETECTOR
11	BC-1,2	BATTERY CHARGER
12	+BAT-	SMF LEAD ACID BATTERIES
13	DVLCP	DELUGE VALVE LOCAL CONTROL PANEL
14	FAP	FIRE ALARM PANEL

NOTES:–

1. FIRE ALARM PANEL SHALL BE PROVIDED WITH 24 V D.C BATTERY BACKUP, COMPRISING OF 2x100% CHARGERS AND 1x100% SMF BATTERIES
2. ALL DETECTORS SHALL BE LOOPED AS PER IS: 2189.
3. DELUGE VALVE, HOOTERS AND STROBES ARE INTERFACED WITH THE FIRE ALARM SYSTEM THROUGH CONTROL MODULE (CM).
4. 10% OF EACH LOOP CAPACITY SHALL BE LEFT FREE IN EACH OF THE LOOP FOR FUTURE ADDITION. ONE LOOP SHALL BE PROVIDED AS SPARE.
5. LOOP & POWER CABLES SHALL BE TWISTED, SHIELDED, PVC CU FRLS CABLES.
   (a) LOOP CABLE:– 2Cx1.5MM^2
   (b) POWER CABLE:– 2Cx2.5MM^2
6. MAIN FIRE ALARM PANELS SHALL BE PROVIDED WITH NECESSARY CONTACTS / INTERFACING MODULES FOR INITIATING REQUIRED ALARM / OPERATION OF DELUGE VALVE AND TRIPPING OF HVAC, PACKAGE AIR CONDITIONER, CONVEYOR MOTOR, ETC.
7. THE ABOVE SCHEME IS ONLY A CONCEPTUAL DOCUMENT. ACTUAL DETAILS OF NO. OF LOOPS, DEVICES AND DETECTORS SHALL BE FURNISHED DURING DETAIL ENGINEERING
8. FAULT ISOLATOR SHALL BE PROVIDED AS PER IS 2189/OEM RECOMMENDATION.
9. SPACING OF DETECTORS AND MANUAL CALL POINTS SHALL AS PER IS 2189.
10. HOOTER CUM STROBE SHALL BE PROVIDED AT ALL FLOOR EXITS.
11. SELF ILLUMINATING EXIT SIGN BOARDS SHALL BE PROVIDED AT ALL BUILDING AND FLOOR EXITS.
12. THE FOLLOWING SIGNALS SHALL BE REPEATED IN MAIN FIRE ALARM PANEL THROUGH POTENTIAL FREE CONTACTS:–
    (a) SYSTEM HEALTHY/TROUBLE
    (b) SYSTEM ON FIRE
13. INSTALLATION OF LHS CABLE SHALL BE AS MENTIONED BELOW:–
    (a) IN CABLE GALLERIES – ZIG–ZAG IN THE TOP TRAY, BOTTOM TRAY AND ALTERNATE TRAY
    (b) IN GYPSUM & LIMESTONE CONVEYORS – STRAIGHT LINES FOR BOTH FORWARD & RETURN CONVEYOR

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME | REF. DRG. NO. | SIGN. AND DATE | INVENTORY NO

REV.	DATE	ALTERED	CHD/APPD
02	15.11.19	NO REVISION IN THIS DOCUMENT.	VINEET SUJATHA
01	10.08.19	REVISED IN LINE WITH NTPC COMMENTS	VINEET SUJATHA

CUSTOMER: NTPC Limited (A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT: 2 x 500MW MAUDA STAGE-1 (FGD PACKAGE)

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD
PROJECT ENGG & SYSTEMS DIVISION

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	VINEET	–SD–	24.05.19	N.A.
CHD.	SUJATHA	–SD–	24.05.19	
APPD.	ANANDBABU	–SD–	25.05.19	

DEPT. PED	UNTOL. DIMS. OR	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE 450	g/M/f	N.T.S	N.A.	N.A.	N.A.	N.A.

TITLE: SCHEMATIC DIAGRAM FOR FIRE DETECTION AND ALARM SYSTEM

CARD CODE: NA | DRG. NO. PY-PL-1-M120-8683-01 | REV. 02 | DIST. DRG. NO. | SHT. No 01 | No. OF SHT. 01 | SIZE – A1

BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING & SYSTEMS DIVISION

PROJECT: - 2 x 500MW Mauda FGD

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 PY51853
	Project: 2 x 500MW Mauda FGD	

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 PY51853
	Project: 2 x 500MW Mauda FGD	

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 PY51853
	Project: 2 x 500MW Mauda FGD	

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 PY51853
	Project: 2 x 500MW Mauda FGD	

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								

ANNEXURE - G

SUB – VENDOR LIST

Sl. No.	Vendor Name	Remarks
1.		
2.		
3.		
4.	-- NIL --	
5.		
6.		
7.		

NOTE: -

1. Bidder to comply with sub-vendor list as listed above. The sub-vendors for any item that is not appearing in the above list shall be proposed for BHEL's approval.

2. Non-acceptance of any proposed sub-vendor by bidder shall not have any commercial implication. While submitting sub-vendors for approval of BHEL, bidder shall furnish following documents:
   a) UL / FM / Vds / LPCB / CE etc. certificates of Sub-vendors
   b) Proven track record (references for makes and models supplied in the last 3 years along with supporting documents like unpriced PO, customer approved datasheets, proof of supply).

QAP GUIDELINES & FORMAT

`

(ANNEXURE - H)

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

	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, H.Gowrishankar, B.D.Prasad

Approved By

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	To be filled by NTPC		
एनटीपीसी NTPC		CONFIRMING TO CODE : IEC 60794-1	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 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		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"

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: PY51853, 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	Bidder to submit Pre-Qualification criteria along with necessary docments like: 1) Unpriced Purchase Order copy 2) Commissioning Certificate / Job Completion Certificate / Performance Certificate from End Customer 3) Customer Approved Documents like Datasheets etc.	
5	All items are manufactured conforming to latest version of material grade standard and manufacturing standard mentioned in this specifications	
6	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.	
7	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	
8	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.	
9	Vendor shall supply all the material to meet the performance, sizing & technical requirement as per specification & its Annexures, scope matrix etc.	
10	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.	
11	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.	
12	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	
13	Bidder to note that hooters shall be loop powered only. Hooters along with control modules are not Acceptable.	

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

ANNEXURE - J

LIST OF DEVIATIONS

Project: FDA SYSTEM FOR 2 x 500 MW MAUDA-I FGD

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.

ANNEXURE-L

14.00.00 SPECIFICATIONS OF PC BASED OWS

CPU	Latest generation CPU
Main memory	2 GB expandable to 4 GB
DVD R/W	16 x Or higher
Hard disk	160 GB SAS
Removable bulk storage drive	500 GB (minimum)
Monitor	20" Full Flat TFT Resolution with non interfaced refresh rate min 75 Hz.
Graphic Memory	128 MB
Communication port	2 serial plus, one parallel, 1 USB port, Dual 100 Mbps Ethernet.
Expansion slots	3
Other Features	101 Keys Keyboard and Optical Mouse
Software	a) General MS Windows latest version, MSOffice, Microsoft Visual Studio, Adobe Acrobat, anti-virus McAfee or equivalent, etc. b) Application software - to suit project specific requirement

15.00.00 PRINTER

15.01.00 A4 size color laser printer shall be provided as a part of the HMIS system as per Part-A. It shall print out all alarm/trip conditions and event changes in plant status along with date and time of occurrence.

16.00.00 **ANNUAL MAINTENANCE CONTRACT (AMC)**

16.01.00 The Bidder shall provide maintenance services of complete control System under a comprehensive Annual Maintenance Contract (AMC) for period of one year after Warranty period and thereafter AMC for only hardware support for next two years.

16.02.00 The AMC shall cover total maintenance of all hardware & software coming under the scope of control system and shall include free repair/replacement of all cards/ modules/ peripherals/ cables/ components etc., correction of software problems and supply of expendable items. The Bidder shall ensure 99.7% availability of the system with the AMC. Bidder to ensure that system expert is available at site within 48 hours

ANNEXURE-M
Specification for Power Supply Modules (SMPS with Battery)

1. SCOPE

This technical specification covers the Design, Engineering, Manufacturing, Assembly, testing at vendor works, inspection by purchaser, packing and transportation to site with necessary documentation like data sheets, statutory approvals, O&M manuals etc., as required for Power supply modules.

2. SCOPE of SUPPLY – As per enquiry

3. INSTRUCTIONS TO BIDDERS

3.1 Bidders are advised to contact BHEL for essential technical queries in writing within one week of issue of Enquiry. Offers with incomplete information will not be considered for evaluation, and are likely to be rejected outright without any further interaction with the Bidder.

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

3.3 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 and only after obtaining the same shall proceed with the manufacture of the items in question.

4. TECHNICAL SPECIFICATIONs

4.1 SMPS with batteries shall be shall be supplied in fully wired condition. BHEL terminal point shall be at 230VAC incomer [cable size: 3Cx2.5mm2] and 24V DC outgoing feeder [Cable size:3Cx2.5sq.mm].

4.2 All our cables (indicated in S.no. (4.2) above) are armoured cables. Hence, bidder shall include suitable cable glands & lugs to meet the IP-class in scope of supply for all incoming / & outgoing cables of SMPS.

4.3 Bidder shall supply all the erection material required for installation of SMPS.

4.4 The Power Module shall be provided with AC to DC conversion circuits and the battery charger circuits. The SMPS panels having requirement of equal to and less than 16 Amp., A.C. power supply shall be suitable to receive, 240 Volt ±10%, single phase, 50 Hz ±5%, phase and neutral, through MCB.

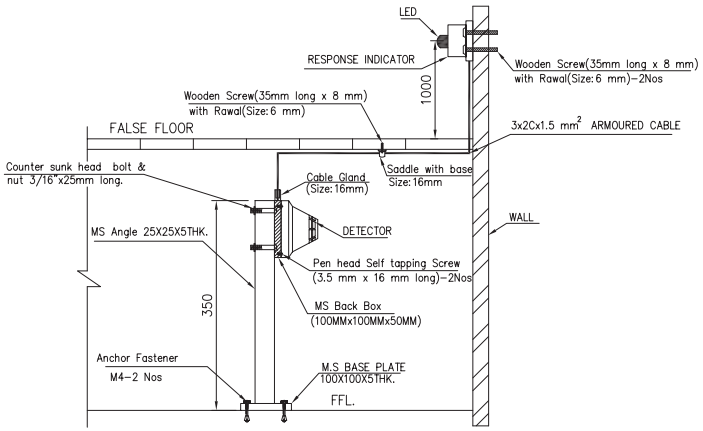
4.5 The Power Supply Module shall provide 24V DC outputs with a current capacity of 6A. Two nos. of 24V DC outputs shall be provided in each Power Supply Module. The application of Power Supply module shall be such that only one output of 6A current capacity or two outputs with a total current capacity of 6A shall be used.

4.6 The panel shall have in-built stabilized power supply unit for its electronic circuitry which rectifies A.C. power supply to D.C. for system operation. Power supply to the detectors, manual call points, external hooters, solenoid valves etc. shall be provided in the panel.

4.7 The automatic with manual over-ride change over inclusive of all metering, control, indication and interlock system shall be provided.

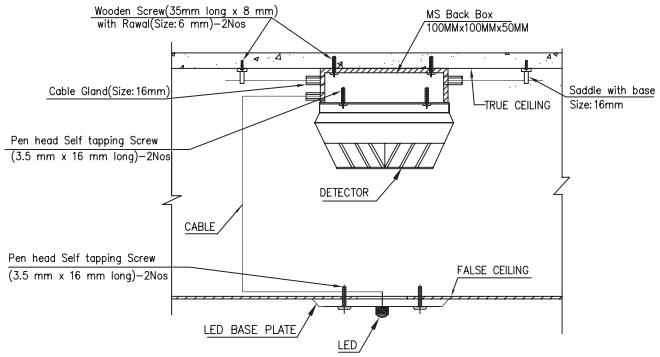
4.8 Parallel redundant (2 x 100% rating) Regulated power supply modules shall be used for operation of various components / cards. LED indications for system ON and blow fuses shall be provided on the Facia of Power Module.

ANNEXURE-N



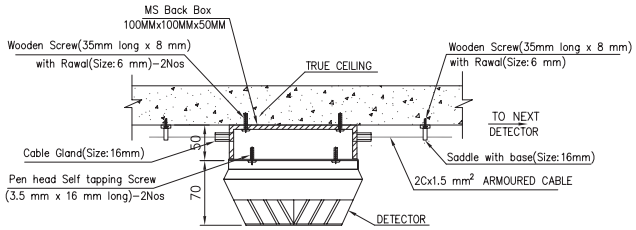
INSTALLATION DETAIL FOR DETECTORS
BELOW FALSE FLOOR

DETECTOR WITH RESPONSE INDICATOR BELOW FALSE FLOOR			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	MS ANGLE(SIZE:25 X 25 X 5 MM,350 LONG)	Nos	1
2	MS Back Box(Size:100 x 100 x 50 mm)	Nos	1
3	MS Base Plate(Size:100 x 100 x 5 mm)	Nos	1
4	Anchor Fastener (Size: M–4)	Nos	2
5	Saddle with base(Size:16mm)	Nos	9
6	Counter sunk head bolt & nut 3/16"x25mm long.	Nos	2
7	Wooden Screw(35mm long x 8 mm) with Rawal(Size:6 mm)	Nos	2
8	Cable Gland(Size:16mm)	Nos	3
9	Cable Lug(Size:1.5Sqmm)	Nos	6
10	Pen head Self tapping Screw(3.5 mm x 16 mm long)	Nos	2



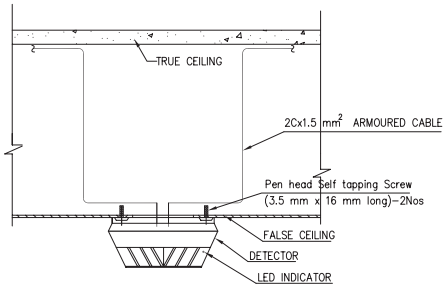
MOUNTING ARRANGEMENT OF
RESPONSE INDICATOR ON FALSE CEILING

DETECTOR ABOVE FALSE CEILING WITH RESPONSE INDICATOR ON FALSE CEILING			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	MS Back Box–(100 x 100 x 50 mm)	Nos	1
2	Saddle with base(Size:16mm)	Nos	2
3	Pen head Self tapping Screw(3.5 mm x 16 mm long)	Nos	4
4	Cable Gland(Size:16mm)	Nos	3
5	Cable Lug(Size:1.5Sqmm)	Nos	6
6	Wooden Screw(35mm long x 8 mm) with Rawal(Size:6 mm)	Nos	4



MOUNTING ARRANGEMENT OF
DETRCTOR ON TRUE CEILING

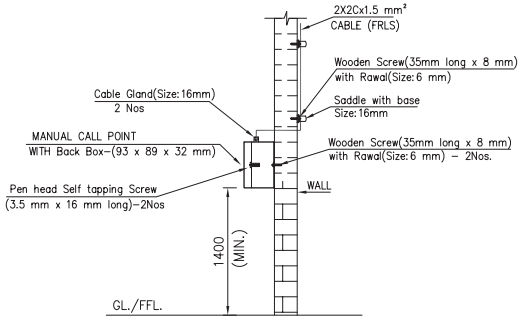
DETECTOR ON TRUE CEILING			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	MS Back Box–(100 x 100 x 50 mm)	Nos	1
2	Wooden Screw(35 mm x 8 mm) with Rawal(Size:6 mm)	Nos	2
3	Cable Gland(Size:16mm)	Nos	2
4	Cable Lug(Size:1.5Sqmm)	Nos	4
5	Saddle with base(Size:16mm)	Nos	2
6	Pen head Self tapping Screw(3.5 mm x 16 mm long)	Nos	2



MOUNTING ARRANGEMENT OF
DETECTOR ON FALSE CEILING

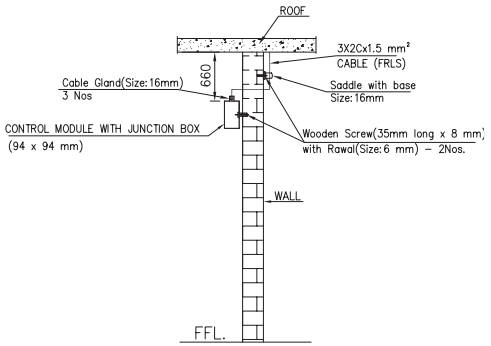
DETECTOR ON FALSE CEILING			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	Pen head Self tapping Screw(3.5 mm x 16 mm long)	Nos	2
2	Cable Lug(Size:1.5Sqmm)	Nos	4
2	Cable Gland(Size:16mm)	Nos	2

ANNEXURE-N



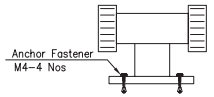
TYPICAL MOUNTING ARRANGEMENT OF MANUAL CALL POINT

MANUAL CALL POINT			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	MANUAL CALL POINT -(93 x 89 x 32 mm)	Nos	1
2	Wooden Screw(35 mm x 8 mm) with Rawal(Size:6 mm)	Nos	4
3	Cable Gland(Size:16mm)	Nos	2
4	Cable Lug(Size:1.5Sqmm)	Nos	4
5	Saddle with base(Size:16mm)	Nos	2
6	Pen head Self tapping Screw(3.5 mm x 16 mm long)	Nos	2

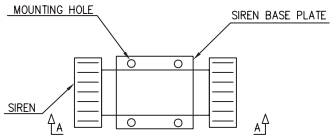


TYPICAL MOUNTING ARRANGEMENT OF CONTROL MODULES

MANUAL CALL POINT			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	CONTROL MODULE WITH JUNCTION BOX (94 x 94 mm)	Nos	1
2	Wooden Screw(35 mm x 8 mm) with Rawal(Size:6 mm)	Nos	3
3	Cable Gland(Size:16mm)	Nos	3
4	Cable Lug(Size:1.5Sqmm)	Nos	6
5	Saddle with base(Size:16mm)	Nos	1

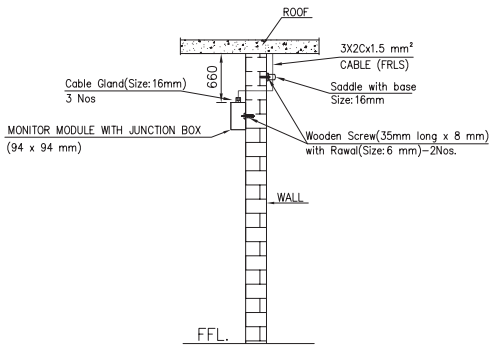


VIEW A-A



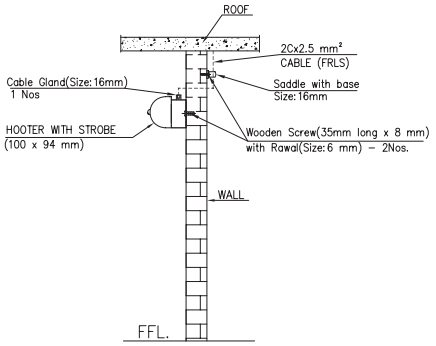
TYPICAL MOUNTING ARRANGEMENT OF SIREN

SIREN			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	Anchor Fastener (Size: 6ø)	Nos	4
2	Cable Gland(Size:16mm)	No	1
3	Cable Lug(Size:2.5Sqmm)	Nos	3



TYPICAL MOUNTING ARRANGEMENT OF MONITOR MODULES

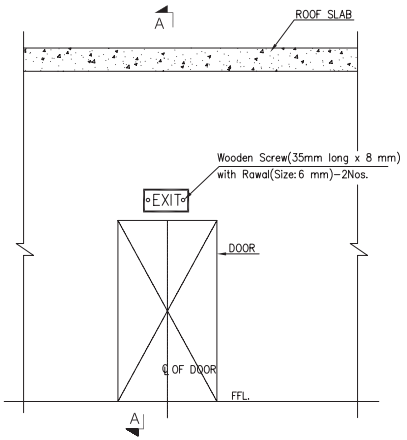
MANUAL CALL POINT			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	MONITOR MODULE WITH JUNCTION BOX (94 x 94 mm)	Nos	1
2	Wooden Screw(35 mm x 8 mm) with Rawal(Size:6 mm)	Nos	3
3	Cable Gland(Size:16mm)	Nos	3
4	Cable Lug(Size:1.5Sqmm)	Nos	6
5	Saddle with base(Size:16mm)	Nos	1

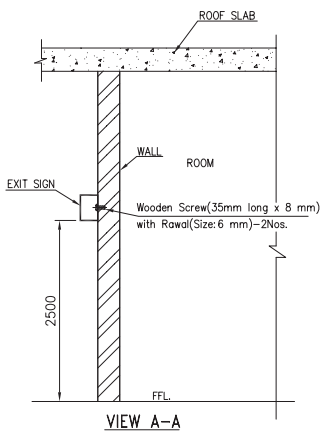


TYPICAL MOUNTING ARRANGEMENT OF HOOTER WITH STROBE

HOOTER WITH STROBE			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	HOOTER WITH STROBE (100 x 94 mm)	Nos	1
2	Wooden Screw(35 mm x 8 mm) with Rawal(Size:6 mm)	Nos	3
3	Cable Gland(Size:16mm)	Nos	1
4	Cable Lug(Size:2.5Sqmm)	Nos	2
5	Saddle with base(Size:16mm)	Nos	1

ANNEXURE-N

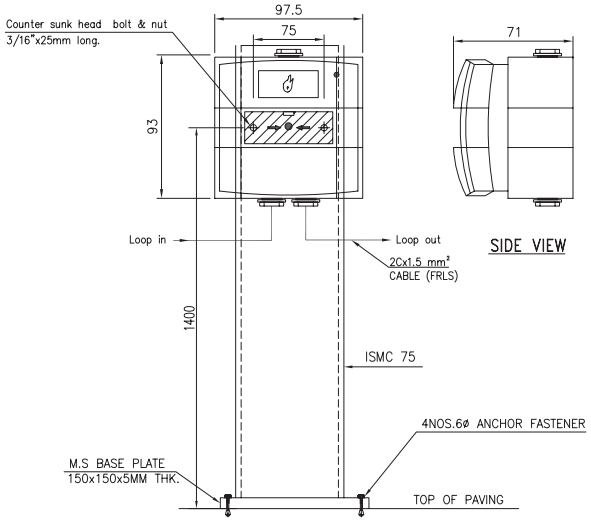




VIEW A–A

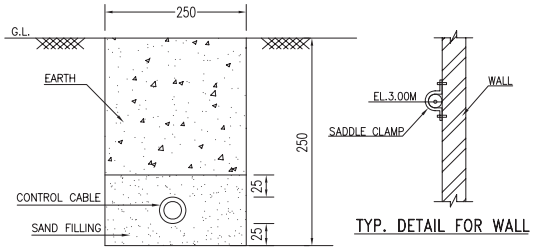
TYPICAL MOUNTING ARRANGEMENT
WALL MOUNTED TYPE EXIT SIGN

WALL MOUNTED TYPE EXIT SIGN			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	EXIT SIGN (200X200)	Nos	1
2	Wooden Screw(35 mm x 8 mm) with Rawal(Size:6 mm)	Nos	2



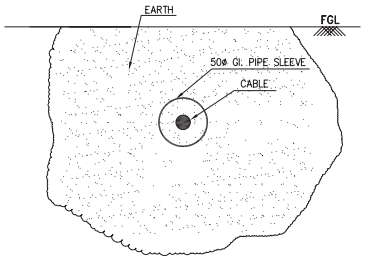
MOUNTING ARRANGEMENT OF OUTDOOR
MANUAL CALL POINT

OUTDOOR MANUAL CALL POINT			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	MS Base Plate(Size:150 x 150 x 5 mm)	Nos	1
2	Anchor Fastener (Size: 6ø)	Nos	4
3	Counter sunk head bolt & nut 3/16"x25mm long.	Nos	2
4	Cable Gland(Size:16mm)	Nos	2
5	Cable Lug(Size:1.5Sqmm)	Nos	4
5	Ismc 75 (Length 1500mm)	Nos	1

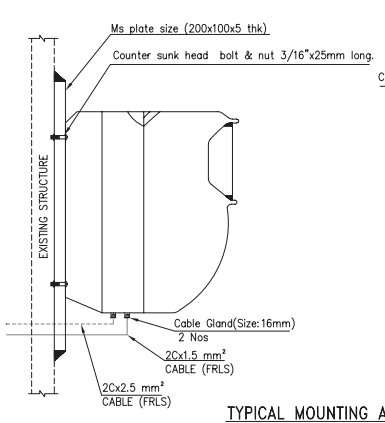


TYP. DETAIL FOR WALL

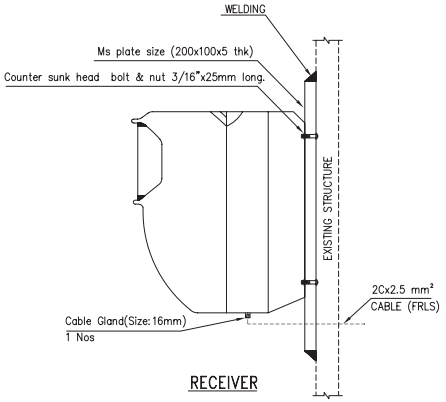
TYP. DETAIL FOR LAYING
OF BURIED CABLE



TYP. DETAIL FOR ROAD CROSSING
CABLE LAYING DETAIL



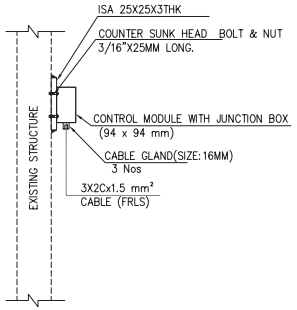
EMITTER



RECEIVER

TYPICAL MOUNTING ARRANGEMENT
BEAM DETECTOR

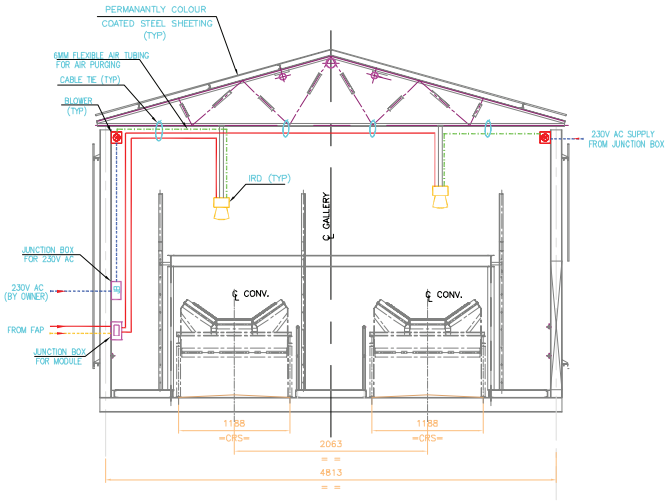
BEAM DETECTOR			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	Counter sunk head bolt & nut 3/16"x25mm long.	Nos	4
2	MS PLATE SIZE (200X100X5 THK)	Nos	2
3	Cable Gland(Size:16mm)	Nos	3
4	Cable Lug(Size:1.5Sqmm)	Nos	2
5	Cable Lug(Size:2.5Sqmm)	Nos	4



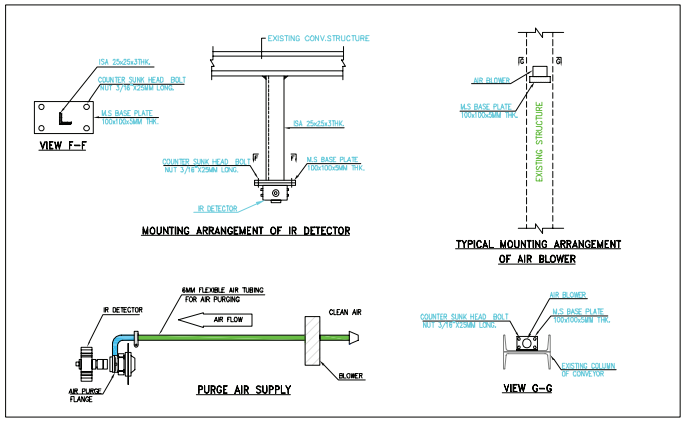
TYPICAL MOUNTING ARRANGEMENT OF
INPUT OUTPUT MODULE FOR COAL CONVEYOR

INPUT OUTPUT MODULE FOR COAL CONVEYOR			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/ITEM
1	Control module with junction box (94 x 94 mm)	Nos	1
2	Counter sunk head bolt & nut 3/16"x25mm long.	Nos	2
3	Cable Gland(Size:16mm)	Nos	3
4	Cable Lug(Size:1.5Sqmm)	Nos	6
5	MS ANGLE(SIZE:25 X 25 X 5 MM,100MM LONG)	Nos	1

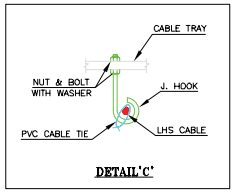
ANNEXURE-N



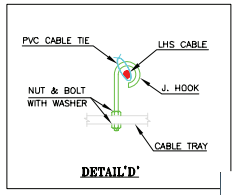
TYPICAL MOUNTING ARRANGEMENT FOR IRD FOR COAL CONVEYOR



INFRA RED DETECTOR & BLOWER			
Sr.No	ITEM DESCRIPTION	UNIT	QTY/1TEM
1	MS Base Plate(Size:100 x 100 x 5 mm)	Nos	4
2	Counter sunk head bolt & nut 3/16"x25mm long.	Nos	8
3	MS ANGLE(SIZE:25 X 25 X 5 MM,500MM LONG)	Nos	2
4	JUNCTION BOX FOR 230V AC SUPPLY	No.	1

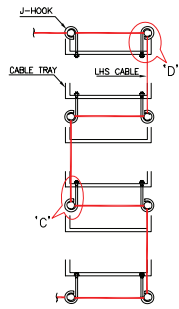


DETAIL'C'

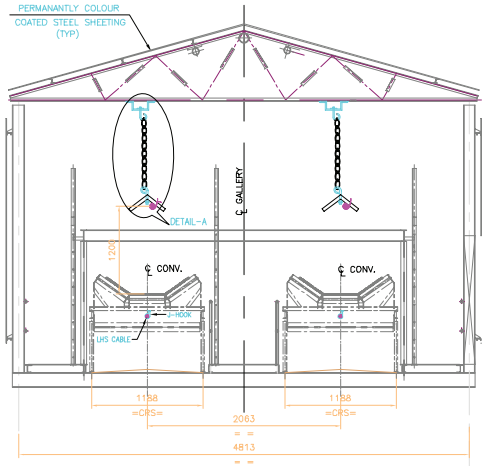


DETAIL'D'

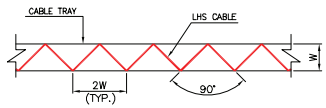
200mm long J- Hook for every 1 metre



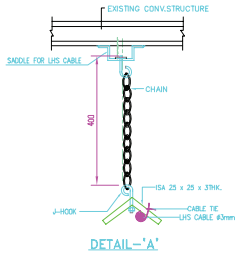
LHS MOUNTING DETAIL FOR CABLE TRAY



TYPICAL MOUNTING ARRANGEMENT FOR LHS CABLE FOR COAL CONVEYOR



TYPICAL LHS ZIG-ZAG ARRANGEMENT (FOR CABLE GALLERY)



DETAIL-'A'