Technical Specification for Fire Detection & Alarm System Project: 5x800MW Yadadri TPS

Revisions:	**Prepared by :**	**Checked by :**	**Approved by :**	**Date :**
Refer to record of revisions	Nahid	Sunil	K.Anandbabu	05.11.21

1. SCOPE:

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

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

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

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

2 INSTRUCTIONS TO BIDDERS

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

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

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

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

3 CODES, STANDARDS & REGULATIONS

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

3.2 Underwriters Laboratories (UL)-USA,

3.3 VDS Standards,

3.4 Loss Prevention Certification Board (LPCB),

3.5 Factory Mutual (FM),

3.6 Indian Electricity (Supply) Act (IEA)

3.7 Rules for Fire Alarm System of India, and

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

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

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

Document No.	Document Name
Annexure – [A]	Bill of material & Price format [for Main Supply + Mandatory Spares]
Annexure – [B]	Technical Specification for FDA System
Annexure – [C]	Specification for SMPS Battery
Annexure – [D]	Specification for Cable tray
Annexure – [E]	Control Room Layout with Zones marked for air sampling detectors
Annexure – [F]	Fire Alarm Panel List
Annexure – [G]	Pre-bid query format
Annexure – [H]	Master document Schedule
Annexure – [I]	Quality Requirements
Annexure – [J]	FDA Schematic Diagram

5 **CHECK LIST** (To be filled by BIDDER and submitted along with Technical offer compulsorily)
Vendor shall submit the following documents mandatorily as part of COMPLTE technical offer.
Enquiry No. / Date
Name of the Bidder
Project Name
Item Description

Sl.No	Document	Bidder confirmation (Yes/No)	Remarks
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	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		
3	All items are manufactured conforming to latest version of material grade standard and manufacturing standard mentioned in this specifications		
4	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.		
5	For addition/reduction of quantity, unit rate quoted in the present offer shall be considered during ordering and shall be valid up to execution of the contract to the extent of ± 10% of order Value.		
6	Bidder to agree that Bill of materials / list of equipment furnished in the offer is only for information; Vendor shall supply all the material to meet the performance, sizing & technical requirement as per specification & its Annexures, scope matrix etc.		
7	Confirm that the quote includes training, commissioning spares, special tool & tackles, mounting hardware/ accessories, terminations, networking components etc. as required for commissioning activities.		
8	Bidder to confirm that all networking components/ hardware software, licenses as required for complete functional operation of the all systems are included.		
9	All the equipment's / items / sensors / detectors etc., supplied by bidder are having valid statutory approval certificates and same will be produced at any stage of contract execution to BHEL. The same were eligible to take local statutory regulatory body approval during commissioning of the system		

(Bidder's Signature and stamp with date)

6 SCOPE MATRIX FOR SUPPLY, ENGG AND INSTALLATION & COMMISSIONING

S.No.	Description	Engineering by	Supply by	Erection by	Supervision of Erection by	Commissioning by	Remarks
[A]	Fire Detection & Alarm System						
1	FDA System [Fire alarm panels, repeater panel, Operating Station, Software's, including all erection & commissioning hardware's.	Bidder (Note-3)	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexure-[A], [B], [C], [D] for inputs
2	Detectors, control modules, hooters, call points & all other devices	BHEL	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexure-[A] for BOM
3	Network Components like Switches, LIUs, Patch Cards, Media converters, etc.	Bidder	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	
4	Network & Fiber optic Cables	Bidder	Bidder	BHEL (Note-4)	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Bidder refer annexure-[A], [B} for inputs
5	Interface / integration of FDA system with DCS (including supply of necessary hardware's + soft wares)	Bidder	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	
6	Erection hardware required for FDA system including accessories required for termination of BHEL supplied cables.	Bidder	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexure-[A] to [B] for inputs

Notes:

1) Termination accessories and termination of all types of cables at bidder-supplied items/panels shall be in Bidder scope.
2) BHEL will provide the necessary man power required for commissioning. However, system commissioning shall be done by bidder only.
3) Engineering of Panels, Loop cards, model selections, configuration of software etc. are part of Bidder scope.
4) Any special activities involved in erection like FO cable splicing, termination, etc. shall be by bidder.

7 TECHNICAL SPECIFICATIONS

S. No.	System	Technical specifications
[A]	**Fire Detection & Alarm System**	
1	Bill of material & price format	Refer Annexure-[A] of this specification for Main Supply + Mandatory Spares
2	Technical requirements	1) Refer Annexure-[B], [C], & [D] of this specification 2) Software Licenses shall be valid for life time. 3) Bidder to confirm that entire FDA System shall be subject to approval by TAC accredited agency to qualify maximum premium discount. Responsibility to get

		approval from TAC Accredited agencies shall rest on BHEL. However, all necessary documentation for obtaining such approvals are in bidder's scope. 4) Addressable type repeater annunciation panel in central 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) Software and hardware as required to provide a complete functioning of the system.
3	Cable sizes for selecting the FDA system make and models	Following cables shall be supplied by BHEL for LOOP and POWER cables of FDA system. Bidder shall select the detectors / panels / devices models considering below cable sizes: Loop Cable: 1P x 1.5 Sqmm (Screened & twisted armored cable) Power Cable: 2C x 2.5 Sqmm (Screened & twisted armored cable)
4	Other technical requirements	1) Engineering of Panels, Loop cards, model selections, configuration of software's, etc. are part of Bidder scope. 2) Bidder to ensure the Vetting of the above sizing and selection by OEM. 3) Remote manual operation of the deluge valves shall be possible from the respective fire alarm control panel through the keyboard operation of PC monitoring station when the system is selected in remote manual mode
5	Network Switch	All the network switches shall be of high quality and shall be sized to meet the functional requirements as specified. All the interconnecting cables between network switches shall be fiber optic only. All fiber optic cables shall be terminated directly to network switches through optical fiber port without using media converters. Bidder to ensure that minimum 100% cores are kept as spares in all type of optical fiber cables.
6	Junction Boxes	Junction box shall be made of Fire retardant material. Material of JB shall be Thermoplastic or thermosetting or FRP type. The box shall be provided with the terminal blocks, mounting bracket and screws etc. The cable entry shall be through galvanized steel conduits of suitable diameter. The JB shall have suitable for installing glands of suitable size on the bottom of the box. The JB shall be suitable for surface mounting on ceiling/structures. The JB shall be of grey color RAL 7035. All the metal parts shall be corrosion protected. Junction box surface should be such that it is free from crazings, blisterings, wrinkling, colour blots/striations. There should not be any mending or repair of surface. JB's will be provided with captive screws so that screws don't fall off when cover is opened. JB's mounting brackets should be of powder coated MS. Type test reports for the following tests shall be furnished: - (a) Impact resistance for impact energy of 2 Joules (IK07) as per BS EN50102 (b) Thermal ageing at 70deg C for 96 hours as per IEC60068-2-2Bb. (c) Class of protection shall be IP 55. d) HV test. Terminal blocks shall be 1100V grade, of suitable current rating, made up of unbreakable polyamide 6.6 grade. The terminals shall be screw type or screw-less (spring loaded) / cage clamp type with lugs. Marking on terminal strips shall correspond to the terminal numbering in wiring diagrams. All metal parts shall be of non-ferrous material. In case of screw type terminals, the screw shall be captive, preferably with screw locking design. All terminal blocks shall be suitable for terminating on each side the required cables/wire size. All internal wiring shall be of cu. Conductor PVC wire.
7	Cable glands	Cable shall be terminated using double compression type cable glands. Testing requirements of Cable glands shall conform to BS:6121 and gland shall be of robust Construction capable of clamping cable and cable armour (for armored cables) firmly without injury to insulation. Cable glands shall be made of heavy-duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron. All washers and hardware shall also be made of brass with nickel

		chrome plating Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands shall be suitable for the sizes of cable supplied/erected.
8	Cable lugs/ferrules	Cable lugs/ferrules for power cables shall be tinned copper solderless crimping type suitable for aluminium compacted conductor cables. Cable lugs and ferrules for control cables shall be tinned copper type. The cable lugs for control cables shall be provided with insulating sleeve and shall suit the type of terminals provided on the equipments. Cable lugs and ferrule shall conform to DIN standards.
9	Cable Clamps & Ties	The cable clamps/ties required to clamp multicore cables shall be of SS-316 material, 12mm wide, polyster coated ladder lock type. The clamps/ties shall have self locking arrangement & shall have sufficient strength. The cable clamps/ties shall be supplied in finished individualpieces of suitable length to meet the site requirements.
10	Optical fibre cables	Optic Fiber cable shall be 8 core, Electrolytic ally chrome plated corrugated steel taped (ECCST), fully water blocked with dielectric central member for outdoor/indoor application so as to prevent any physical damage. The cable shall have multiple single-mode or multi mode fibers on as required basis so as to avoid the usage of any repeaters. The outer sheath shall have Flame Retardant, UV resistant properties and are to be identified with the manufacturer's name, year of manufacturer, progressive automatic sequential on-line marking of length in meters at every meter. The cable core shall have suitable characteristics and strengthening for prevention of damage during pulling viz. Dielectric central member, Loose buffer tube design, 4 fibers per buffer tube (minimum), Interstices and buffer tubes duly filled with Thixotropic jelly etc. The cable shall be suitable for a maximum tensile force of 2000 N during installation, and once installed, a tensile force of 1000 N minimum. The compressive strength of cable shall be 3000 N minimum& crush resistance 4000 N minimum. The operating temperature shall be –20 deg. C to 70 deg.C All testing of the fiber optic cable being supplied shall be as per the relevant IEC, EIA and other international standards. Bidder to ensure that minimum 100% cores are kept as spares in all types of optical fibre cables.Cables shall be suitable for laying in conduits, ducts, trenches, racks and under ground buried installation.Spliced / Repaired cables are not acceptable. Penetration of water resistance and impact resistance shall be as per IEC standard.
11	Operator Workstation & A4 size color laser Printer along with Graphic software i.e., (GUI) Software	Configuration of OWS shall be: - (a) 24" Monitor, Full Flat TFT Resolution 1600 x 1280, refresh rate min 85 Hz. (b) CPU: Latest generation CPU Minimum i7 processor or equivalent (c) 4 GB RAM (d) 500 GB Hard Disk (e) UPS for PC & Printer with 60 minutes' backup (f) Color laser printer (A4/A3 size), QWERTY keyboard and optical mouse (g) Removable bulk storage drive (MOD / DVD / DAT): 6 GB (minimum) Removable Bulk Storage Media for above: 10 no's (h) Software: a General MS Windows latest version, MS-Office, Microsoft Visual Studio, Adobe Acrobat, anti-virus McAfee or equivalent, etc. (i) Application software - to suit project requirement
	Laptop along with Fire Alarm Panel Commissioning Software License /Dongle	One industrial grade laptop shall be provided with following specification:- a) 15" Screen b) Minimum i7 Processor or equivalent. c) One 16 GB RAM. d) One 2 TB Hard Disk.

		All the Laptop will also be used as pluggable temporary programmer's station and operator station functionalities of the programming stations mentioned in the specifications shall be provided (including requisite license).
13	Furniture for Operator Workstation & Printer	Required furniture for mounting of HMI peripherals shall be provided. Chairs: Industry standard revolving chairs with wheels and with provision for adjustment of height (hydraulically/gas lift) shall be provided for the operators, unit-in-charge & other personnel in control room area. These shall be designed for sitting for long duration such that these are comfortable for the back. Chair pedestal shall be made of 5mm thick MS plate covered with poly-propylene cladding. Arm-rests in one piece shall be of poly-urethane and twin wheel castor of glass filled nylon. The exact details shall be finalized & approved by Employer during detailed engineering. Tables -- Industry standard tables
14	Mini-UPS for Operator Workstation & Printer (To be sized by bidder)	Online Interactive UPS with 30 mins. battery backup on machine load (for PC & its printer)
15	Cable Tray	Type: 50mm width Perforated type straight run cable tray for branch cable Size; Each tray of size[50(W)x2500(L)x25(H)]mm with +2mm tolerance

8 POWER SUPPLY

8.1 Purchaser shall provide the power supplies as per scope markings indicated in Annexure-[J] of this specification (Single feeder of 230 V UPS power at all fire alarm panels). Further conditioning & distribution within Fire Alarm Panels & HMIs shall be in bidder scope. Bidder to consider Power supply unit with battery along with spike arrester cum distribution board for extending power supply to PC (CPU, Monitor), Printer and FAPs.

8.2 Vendor shall supply accessories (like cable glands, plugs, etc.) required for termination of purchaser's as well as vendor power & control cables at vendor supplied equipment.

8.3 Vendor shall furnish above feeders' capacity during order execution with calculations.

8.4 All internal distributions shall be designed such that a single power fault in any instrument branch system shall not cause a trip of the entire system. Each consumer shall be provided with separate switch & isolation fuse.

9 EARTHING

9.1 Each system earthing shall be carried in-line with industry standard practices. Scheme for recommended earthing system/earth pit shall be furnished by vendor during order execution for approval.

9.2 Earth points of all panels shall be looped together and shall be terminated at BHEL's earth raisers at single point provided at control room floor.

9.3 All hardware with in package required for earthing & connectivity up to BHEL's earth points shall be in vendor scope.

10 BIDDER'S SCOPE OF SERVICES

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

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

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

10.4 Following shall be the scope of work for services:

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

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

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

11 MANDATORY SPARES

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

12 ERECTION & COMMISSIONING SPARES

12.1 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.

12.2 Bidder to ensure that all the spares are procured from the original equipment manufacturers (as per their recommendation) and shall make them available at site well before the start of commissioning activities.

13 TRAINING

13.1 Bidder shall arrange training for Owner's personnel. Different type of courses shall be offered for operation / process engineers and operators, instrument maintenance engineers and technician.

13.2 Travel and living expenses of the owner's personnel shall be borne by the Owner. Apart from the hardware and software maintenance training and site training, bidder shall also offer operation training basically meant for operating personnel.

13.3 The various facilities available in the system for operation, actions required during emergencies and identifying the various diagnostic messages shall be the main contents of the operation training.

13.4 The duration & location of the training shall be as per "Annexure-[A] of this specification".

14 DOCUMENTATION

14.1 Information to be included with offer

a. Vendor shall make the offer in detail, with respect to every item of the Purchaser's specifications. Any offer not conforming to this shall be summarily rejected.
b. Duly filled & Signed copy of Check list
c. Deviation list, if any (as per "No deviation format" given in this specification).
d. Unpriced price schedule (To be submitted compulsorily without fail)

14.2 Documentation after P.O. Placement

a. Submission of documents as per "Master documents schedule" (which will be finalized in Kick-off meeting after award of the contract) within 2 weeks of placement of LOI (for approval by BHEL and / or BHEL's customer in 4 sets)
b. Further BHEL will provide comments on vendor submitted document within 15 working days for revision & resubmission. Vendor shall follow up with BHEL for non-receipt of comments/approvals.
c. Revised drawings / Documents shall be submitted by Bidder in 07 days of receipt of comments / observations from BHEL. BHEL shall revert within 15 days on receipt of these revised documents / drawings from vendor for approvals.
d. All the approvals required for manufacturing shall be completed with 2months 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.

14.3 Documents to be submitted during final shop testing and before equipment dispatch.
(Note: submission of these documents are commercially linked) - all in 16 sets (2 sets to be included with item dispatch and balance to BHEL purchase department).
a. Complete O& M manual.
b. Approved Engg documents
c. As-Shipped documents
d. As-Built documents
e. Guarantee and all test certificates for review and acceptance by BHEL and / or BHEL's Customer
f. 3 sets of CD-ROM – containing O&M manual and Engineering documents (1 set to be included with item dispatch and balance to BHEL purchase department).

15 MARKING, PACKING AND DESPATCH

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

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

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

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

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

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

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

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

15.9 The following minimum packing procedures shall be followed: -
a. All items shall be dry, clean and free from moisture, dirt and loose foreign material of all kinds.
b. All items shall be protected from rust, corrosion, and mechanical damage during transportation and handling.
c. Each variety and size of item shall be supplied in separate packaging marked with the purchase order no., item code (if available), and the salient specifications.
d. All electrical, instrumentation etc., shall be properly packed to prevent damage during transport, storage, handling at site.

e. All the items which the Bidders considered liable to be damaged during shipment or storage, shall be packaged for separate shipment. If instruments are removed from the panel, they and their connection shall be suitably tagged to ensure simple re installation at the job site. Each instrument shall be sealed in plastic bags containing moisture absorbing desiccants.

f. It shall be bidder's sole responsibility to protect all the material during period of dispatch, storage and erection against corrosion, incidental damage due to vermin, sunlight, rain, high temperature, humid atmosphere, rough handling in transit and including delays in transit.

g. Mandatory Spare parts shall be packaged separately and clearly marked as 'Mandatory Spares'.

h. Commissioning spares, Tools & tackles to be packed separately & suitably tagged.

16 TESTING, INSTALLATION, COMMISSIONING & ACCEPTANCE

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

S.No	Item	Inspection by
1	Fire Alarm panels & Detectors	CUSTOMER /CONSULTANT/ CUSTOMER's Third Inspection Agency & BHEL/BHEL's Third Party Inspection Agency
2	All other items	BHEL/BHEL's Third Party Inspection Agency

17 SYSTEM INTEGRATION TEST (SIT)

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

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

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

a. Single Fire Alarm, Multiple alarms in single loop & multiple loops

b. Single fault and Multiple faults (Earth fault, open circuit and short circuit fault)

c. Multiple alarms & Multiple faults

d. System diagnostic tests

e. System response time, time taken for sound mute/ acknowledge & reset actions at various locations etc. shall be checked.

18 ACCEPTANCE CRITERION:

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

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

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

19 WARRANTY:

19.1 Warranty shall be as per GCC & SCC.

20 VENDOR LIST

If project specific vendor list is specified in project specification, bidder to follow the same. If the project specification does not inform any specific vendor list, then bidder to propose vendors with following criteria.

S NO.	Item Description	Suggested make	Remarks
1	FDA OEM items (Fire Alarm panels, detectors/ modules/ devices	Bidder shall propose minimum 3 makes meeting technical requirements, project specific approval/standards of the specification during order execution along with credentials.	Refer Note – (1) below
2	UPS	Bidder shall propose minimum 3 makes meeting technical requirements of the specification during order execution along with credentials.	Refer Note – (1) below
3	Fiber optics cable	Bidder shall propose minimum 3 makes meeting technical requirements of the specification during order execution along with credentials.	Refer Note – (1) below

Notes:

1) Bidder's proposed makes shall be submitted to customer approval during order execution and based on customer approval bidder to proceed with manufacturing.
2) Make and type of detectors shall be subject to Purchaser's approval

21 DEVIATION FORMAT

Enquiry No.:

Item:

Name of Bidder:

Offer Ref. No.:

Sl. No.	Clause no. & Spec. no.	Description as per Specification	Deviation taken	Nature of Deviation	Remarks

NOTES**:**

1. 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.
2. Deviations, if any, shall be clearly brought out only in this format. Deviations mentioned / taken elsewhere or in any other format will be ignored.
3. Additional sheets in the same format can be attached by the vendor, if necessary.
4. Nature of Deviations shall only be of Design / Manufacturing constraints and non-availability of items / components / makes in market.
5. 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.
6. Reasons for the deviations shall be specified in the Remarks column.
7. 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.
8. 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

SIGNATURE OF THE BIDDER_____

NAME_____

DESIGNATION_____

COMPANY SEAL
DATE_____

RECORD OF REVISIONS				
Rev. No.	Date	Revision Details	Revised By	Approved By
00	05.11.21	Original issue	--	K. Anand Babu

		BOQ & Price Bid format [for Main Supply + Mandatory Spares+Services]				Annexure -[A] of PY56397	
		Fire Detection & Alarm System				Rev.00	
		Project: 5 x 800MW Yadadri					
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.~~ GeM Prices shall be inclusive of GST.
2	Duly signed & stamped un-priced price schedule format shall be submitted by vendor in the technical offer as a token of concurrence that price schedule would be submitted in this format. Any tampering / modification / additions, etc. are NOT allowed and not considered binding and is liable for rejection of the offer.
3	**Bidders shall be evaluated on overall L1 basis.**
4	For addition/reduction of quantity, unit rate quoted in the present offer shall be considered during order execution and shall be valid up to execution of the contract to the extent of + 10%, - 20% of overall order Value. These would include the cost up to engineering, installation of the item, wiring up in the panel and seamless integration with main system at works/site without any cost implications. All accessories as required for this purpose also shall be included in the Price Quoted
5	Components/Items for addition/deletion, spares shall be identical to the main equipment.
6	Billing will be as per BOM of actual supplied main equipment (including accessories) & spares.
7	Unit Rates of the individual package items shall be derived by multiplying the "Unit Price Fixing Factor" with the Lumpsum Price quoted. Unit Rates of the Individual items thus arrived, shall be binding on the bidder, in case of any repeat order/Ammendment of order as per BHEL policies. Observations / Objections, if any, of the Bidder, to the "Unit Price Fixing Factor" shall be brought to the notice of BHEL, during Pre-Bid Stage. No Observations / Objections shall be enterained after the Techno-Commercial Bid is opened.
8	Bidder to indicate "Quoted" in the column "Bidder's Confirmation" as a confirmation of their bid to the respective item.
9	The Bid Evaluation is on Overall L1 Basis. Each and Every item of the Package shall be quoted by the bidder. Partial offers will not be considered for evaluation and the same are liable for rejection.
10	Bidders will be required to quote Total BASIC Price only (For Main items, Mandatory spares,special tools, Switchyard BOQ, switchyard spares BOQ)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.

Engg Estimates [for Main Supply + Mandatory Spares]

5 x 800MW Yadadri

S. No	Material Code	Item Description	Quantity [I]	UNITs	Unit Rate [II]	TOTAL PRICE [I*II]	Weightage (%) for Calculation of Line Item Prices by BHEL (Refer Note-10)	REMARKS
1	Main Supply							
(a)	PY9756397004	Main Supply- Fire Detection & Alarm System Components	1	Set			Rs. 91.3881	
(b)	PY9756397047	Main Supply- Fire Detection & Alarm System Components (Switchyard Portion)	1	Set			Rs. 2.7133	
					MAIN SUPPLY Total prices ::			--------- [A]
2	Mandatory spares Supply							
(a)	PY9756397012	Mandatory Spares- Fire Detection & Alarm System Components	1	Set			Rs. 3.8241	
(b)	PY9756397055	Mandatory Spares- Fire Detection & Alarm System Components (Switchyard Portion)	1	Set			Rs. 0.0236	
					MANDATORY SUPPLY Total prices ::			--------- [B]
3	Vendor site Services							
(a)	PY9856397022	Supervision of Erection & Commissioning Services charges at site including lodging, boarding, local travel, insurance, etc. [Unit Rate = Per man day charges]	70	Days			Rs. 1.8144	--------- [C]
(b)	PY9856397030	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]	10	Visits			Rs. 0.2360	--------- [D]
					Total prices for overall L1 evaluation ([A] + [B]+[C]+[D]) (Rs.) ::		**Rs. 100.000**	

	Price Bid format			Annexure -[A] of PY56397			
	Fire Detection & Alarm System			Rev.00			
	Project: 5 x 800MW Yadadri						
BHEL ENQUIRY NO :				Vendor Offer ref no:			
Ref. date:				Ref. date:			
S. No	Item Description	MAIN BOQ	UNITs	INTERFACE	APPLICATION	Weightage (%) for Calculation of Line Item Prices by BHEL (Refer Note-7)	REMARKS
1 (a)	Main Supply- Fire Detection & Alarm System Components (Material code - PY9756397004)						
1	Fire Alarm Panel (12-Loop) - Floor mounted	10	Nos.	-	-	4.1	Refer attached panel list for locations. All fire alarm panels & repeater panels shall be interconnected in ring topology through redundant Fiber optic communication cable.
2	Fire Alarm Panel (6-Loop) - Floor mounted	6	Nos.	-	-	1.966	
3	Fire Alarm Panel (2-Loop) - Floor mounted	2	Nos.	-	-	0.5168	
4	Repeater Panel	12	Nos.	-	-	1.9999	
5	Multisensor Detectors with detector base and mounting back box	5090	Nos.	to be connected to fire alarm panel	for all closed buildings	14	
6	Multisensor Detector (Ex-Proof) with detector base and mounting back box	55	Nos.	to be connected to fire alarm panel	for hazardous areas	0.2387	
7	Heat Detectors with detector base and mounting back box	120	Nos.	to be connected to fire alarm panel	for battery rooms	0.3549	
8	ROR Type Probe Detector for Fuel tanks with Flameproof Junction box	15	Nos.	probe detectors to be connected to fire alarm panel through interface module	for fuel oil tanks	0.3612	Min. 50 ft x 50 ft coverage for each detector alon with counter flange and gasket suitable for 40 NB SORF nozzle on tank
9	Module for Probe Detector (1 Input + 1 Output)	15	Nos.			0.0613	Refer Note - 2
10	Beam Detector	25	Nos.	beam detectors to be connected to fire alarm panel through interface module	for high ceiling areas like stores & workshops	1.2229	
11	Modules for Beam Detectors (1 Input + 1 Output)	25	Nos.			0.1021	Refer Note - 2
12	Solar Blind Infrared Ember Detector with inbuilt Air Purge Unit	213	Nos.	solar blind IR detectors to be connected to fire alarm panel through interface module	for detection of hot ember on moving coal conveyors	25.2459	
13	Modules for Solar Blind Infrared Ember Detector (1 Input + 1 Output)	213	Nos.			0.8699	Refer Note - 2
14	Dual Wavelength Infrared Flame Detector with Flameproof Junction box	25	Nos.	Dual Wavelength Infrared Flame Detecto to be connected to fire alarm panel through interface module	for detection of flames in boiler burner fronts and oil rooms	5.305	
15	Modules for Dual Wavelength Infrared Flame Detector (1 Input + 1 Output)	25	Nos.			0.1021	Refer Note - 2
16	Response Indicator	1180	Nos.	for all multisensor & heat detectors located above false ceiling	for notification of above false ceiling detectors	0.1726	
17	Manual Call Points with mounting back box (Indoor)	485	Nos.	to be connected to fire alarm panel	for all closed buildings	1.4254	
18	Manual call points (Outdoor) with mounting back box (IP-65 min.)	345	Nos.	to be connected to fire alarm panel	for transformard yard and transfer points	2.3821	
19	Manual call points (Flame proof) with mounting back box	10	Nos.	to be connected to fire alarm panel	for fuel oil pressurizing pump house	0.1431	Refer Note - 3
20	Hooter cum Strobe with mounting back box	465	Nos.	to be connected to fire alarm panel	for audio notification in all closed buildings	2.3911	Refer Note - 3
21	Hooter cum Strobe (Ex-Proof) with mounting back box	5	Nos.	to be connected to fire alarm panel	for fuel oil pressurizing pump house	0.0487	Refer Note - 3
22	Modules for Deluge Valves (2-Input + 1-Output)	612	Nos.	for interfacing with deluge valve local control panel	for connecting pressure switches of deluge valves. These shall be housed inside DVLCP	2.5936	Refer Note - 2
23	Module for LHS Cable (1 Input + 1 Output)	430	Nos.	for interfacing with OLHS controller	for connecting with OLHS controller to get the details of zone under fire	1.8223	Refer Note - 2

S. No	Item Description	MAIN BOQ	UNITs	INTERFACE	APPLICATION	Weightage (%) for Calculation of Line Item Prices by BHEL (Refer Note-7)	REMARKS
24	Modules for Third Party Interface like HVAC and Conveyor tripping, Inert Gas System, DCS etc (1 Input + 1 Output)	58	Nos.	to be connected to fire alarm panel	to give commands signal to respective system	0.2468	Refer Note - 2
25	Monitor Modules for Pump Status (1 Input + 1 Output)	40	Nos.	to be connected to fire alarm panel	to get the status of fire pumps	0.1695	Refer Note - 2
26	24 V DC Power Supply Modules with Battery Back Up	104	Nos.	230 V AC input power suppy shall be provided by BHEL for these modules	for powering up of conventional fire alarm devices and DVLCP	5.4029	IP 20 type - 69 nos IP 66 type - 35 nos. Refer attached specification for technical details
27	24 V DC Back-Lit Exit Sign	505	Nos.	back lit exit signs to be connected to fire alarm panel through interface module	for all closed buildings	0.5567	
28	Modules for Exit Signs (1 Input + 1 Output)	505	Nos.			1.9828	Refer Note - 2
29	6F Single Mode Optical Fiber cable (for networking of Fire Alarm Panels) with Conduit	41000	Mtrs.	-	for interconnecting all fire alarm panels in dual ring topology	3.1438	Refer Note - 7
30	Operator Work Station (OWS) with latest Windows OS	4	Nos.	shall be connected to fire alarm panel	-	0.6408	Location:- a) CCR-1 b) CCR-2 c) CCR-3 d) Fire Station
31	FAP Graphics Software	4	Nos.	-	for graphical representation of FDA system	0.8317	
32	Printer	4	Nos.	shall be connected to OWS of fire alarm panel	for printing logs of fire alarm panel	0.2376	Location:- a) CCR-1 b) CCR-2 c) CCR-3 d) Fire Station
33	Furniture for OWS and Printer	4	Nos.	-	-	0.1133	Location:- a) CCR-1 b) CCR-2 c) CCR-3 d) Fire Station
34	Laptop	1	Nos.	-	for programming of fire alarm panels	0.093	
35	Mini UPS for Fire Alarm Panel, OWS & Printer	1	Nos.	for powering fire alarm panel	for power backup to fire alarm panel, OWS and printer	0.0445	Backup time of 24 hrs for normal operation and 30 min. for alarm condition.
36	Siren (10 km) with Siren Control Panel	1	Nos.	siren shall be connected to fire alarm panel through interface module	for audio notification throughout the plant	0.3418	415 V Operated Siren and 230 V Operated Siren Control Panel
37	Interface Module for Siren	1	Nos.			0.0037	Refer Note - 2
38	Air Sampling Type Smoke Detection System for Control Rooms and Control Equipment Rooms of TG Building (including modules for interfacing with fire detection & alarm system)	21	Sets	air sampling detector shall be connected to fire alarm panel through interface module	for detection of fire/smoke in control room areas of TG building	3.2401	Engineering is in Bidder scope. Bidder to estimate the BOQ. Control Room Drawings attached.
39	50 mm cable Tray [50(W)x2500(L)x25(H)]mm	3600	No's	-	for routing of outdoor cables (1P x 1.5 sqmm and 2C x 2.5 sqmm)	2.5633	
	Erection Hardware - Consist of the following listed minmum requirements.					4.3502	
a)	Cable Tags for 1P x 1.5 Sqmm Armoured Cable	308		-	-		
b)	Cable Tags for 2C x 2.5 Sqmm Armoured Cable	366		-	-		
c)	Cable Saddle + Saddle Bars along with fixing screws and rawl plugs for 1P x 1.5 sqmm Armoured Cable	218700		-	-		
d)	Cable Saddle + Saddle Bars along with fixing screws and rawl plugs for 2C x 2.5 sqmm Armoured Cable	122600		-	-		
e)	Nylon Cable Tie for 1P x 1.5 sqmm Armoured Cable	170700		-	-		
f)	Nylon Cable Tie for 2C x 2.5 sqmm Armoured Cable	41300		-	-		

S. No	Item Description	MAIN BOQ	UNITs	INTERFACE	APPLICATION	Weightage (%) for Calculation of Line Item Prices by BHEL (Refer Note-7)	REMARKS
g)	All hardware required for network (i.e. network switches, patch cards, LIU etc.) required for establishing the networking between all fire alarm panels, repeater panels, PCs, etc alongwith their mounting/erection hardware shall be included in main offer.	1	Lot	-	-		Engineering is in Bidder scope. Bidder to estimate the BOQ.
h)	Erection & Commissioning Hardware required for completeness of above FDA items	1	Lot	-	-		Engineering is in Bidder scope. Bidder to estimate the BOQ.
						91.3881	

Notes:

1) Battery sizing is in bidder's scope and shall be sized for fully loaded Fire Alarm panel for 48 hours of normal operation and 30 mins of Alarm condition. The sizing of the battery shall be done as per TAC guidelines.

2) All interface modules shall be provided with enclosure suitable for outdoor application.

3) Bidder to note that these items shall be loop powered. In case loop powered devices are not available in the make offered, bidder shall consider the necessary modules along with the devices.

4) In case the bidder is offering a system, where the addressable devices do not have in-built fault isolator, then required number of isolator modules shall be provided as per IS:2189 considering all the above devices.

5) All erection hardware including back box, fixing screws, lugs, glands, clamps, structural steel, anchor fastner, nuts, bolts, flages etc. for the above items shall be considered in the offer by the bidder. In addition to this, an additional 10% of all erection hardware shall be considered in the scope of bidder.

6) Above BOQ is estimated based on preliminary/incomplete inputs from sister units. Hence there shall be variation in BOQ during PO execution for FDA package +10% to -20% of PO value.

7) This is the quantity of optical fiber cable . This shall be used for networking of panels. Also, bidder shall provide 2 spare cores which shall be used in case of fault in working cores. Also necessary erection hardware for FO cable (jointing kits, termination kits etc.)shall be considered in the scope bidder. In addition, splicing of FO cable for 50 nos. of joints shall be in the scope of bidder.

8) BHEL shall supply 280 kms of Cu conductor armoured 1P x 1.5sq.mm as Loop cable and 125 kms of Cu conductor armoured 2C x 2.5sq.mm as Power cable. Accordingly bidder to take care of all the terminations for the supplied items.

	Price Bid format [for Main Supply + Mandatory Spares+Services]			Annexure -[A] of PY56397	
	Fire Detection & Alarm System			Rev.00	
	Project: 5 x 800MW Yadadri				
BHEL ENQUIRY NO :			Vendor Offer ref no:		
Ref. date:			Ref. date:		

S. No	Item Description	BOQ	UNITs	Weightage (%) for Calculation of Line Item Prices by BHEL (Refer Note-7)	REMARKS
2 (a)	Mandatory Spares- Fire Detection & Alarm System Components (material code - PY9756397012)				
1	Multisensor Detectors with detector base and mounting back box	204	Nos.	0.5614	
2	Multisensor Detector (Ex-Proof) with detector base and mounting back box	3	Nos.	0.013	
3	Heat Detectors with detector base and mounting back box	5	Nos.	0.0148	
4	ROR Type Probe Detector for Fuel tanks with Flameproof Junction box	1	Nos.	0.0241	Min. 50 ft x 50 ft coverage for each detector alon with counter flange and gasket
5	Module for Probe Detector (1 Input + 1 Output)	1	Nos.	0.004	Refer Note - 2
6	Beam Detector	2	Nos.	0.0978	
7	Modules for Beam Detectors (1 Input + 1 Output)	2	Nos.	0.0082	Refer Note - 2
8	Solar Blind Infrared Ember Detector with inbuilt Air Purge Unit	9	Nos.	1.0667	
9	Modules for Solar Blind Infrared Ember Detector (1 Input + 1 Output)	9	Nos.	0.0368	Refer Note - 2
10	Dual Wavelength Infrared Flame Detector with Flameproof Junction box	2	Nos.	0.4244	
11	Modules for Dual Wavelength Infrared Flame Detector (1 Input + 1 Output)	2	Nos.	0.0082	Refer Note - 2
12	Response Indicator	48	Nos.	0.007	
13	Manual Call Points with mounting back box (Indoor)	10	Nos.	0.0294	
14	Manual call points (Outdoor) with mounting back box (IP-65 min.)	8	Nos.	0.0552	
15	Manual call points (Flame proof) with mounting back box	1	Nos.	0.0143	Refer Note - 3
16	Air Sampling Type Smoke Detection System for Control Rooms and Control Equipment Rooms of TG Building (including modules for interfacing with fire detection & alarm system)	1	Sets	0.1543	Engineering is in Bidder scope. Bidder to estimate the BOQ.
B	FDA Panel Items				
1	Power Supply Module	4	Nos.	0.2591	each type & rating
2	CPU Card/Main Control Board	4	Nos.	0.2648	each type & rating
3	Network Interface Items	4	Nos.	0.0826	each type & rating
4	Zone Control Card/Module	4	Nos.	0.0755	each type & rating
5	Input/Output Control Modules	4	Nos.	0.0755	each type & rating
6	Any Other Electronic Cards/Modules used in theSystem	4	Nos.	0.0766	each type & rating
7	Battery	4	Nos.	0.4704	each type & rating

	Price Bid format		Annexure -[A] of PY56397				
	Fire Detection & Alarm System		Rev.00				
	Project: 5 x 800MW Yadadri						
BHEL ENQUIRY NO :			Vendor Offer ref no:				
Ref. date:			Ref. date:				

S. No	Item Description	MAIN BOQ	UNITs	INTERFACE	APPLICATION	Weightage (%) for Calculation of Line Item Prices by BHEL (Refer Note-7)	REMARKS
1(b)	Main Supply- Fire Detection & Alarm System Components (Switchyard Portion) (material code - PY9756397047)						
1	Fire Alarm Panel (6-Loop) - Floor mounted	1	Nos.	-	-	0.3269	
2	Multisensor Detectors with detector base and mounting back box	110	Nos.	to be connected to fire alarm panel	for all closed buildings	0.3027	
3	Response Indicator	20	Nos.	for all multisensor & heat detectors located above	for notification of above false ceiling detectors	0.0029	
4	Manual Call Points with mounting back box (Indoor)	15	Nos.	to be connected to fire alarm panel	for all closed buildings	0.0441	
5	Manual call points (Outdoor) with mounting back box (IP 65 min.)	5	Nos.	to be connected to fire alarm panel	for transformard yard and transfer points	0.0345	
6	Hooter cum Strobe with mounting back box	15	Nos.	to be connected to fire alarm panel	for audio notification in all closed buildings	0.0771	Refer Note - 3
7	Modules for Deluge Valves (2-Input + 1-Output)	25	Nos.	for interfacing with deluge valve local control panel	for connecting pressure switches of deluge valves. These shall be housed inside DVLCP	0.1059	Refer Note - 2
8	Module for LHS Cable (1 Input + 1 Output)	5	Nos.	for interfacing with OLHS controller	for connecting with OLHS controller to get the details of zone under fire	0.0212	Refer Note - 2
9	Modules for Third Party Interface like HVAC and Conveyor tripping, Inert Gas System, DCS etc (1 Input + 1 Output)	2	Nos.	to be connected to fire alarm panel	to give commands signal to respective system	0.0085	Refer Note - 2
10	24 V DC Power Supply Modules with Battery Back Up	6	Nos.	230 V AC input power suppy shall be provided by BHEL for these modules	for powering up of conventional fire alarm devices and DVLCP	0.3059	IP 20 type - 0 nos IP 66 type - 6 nos. Refer attached specification for technical details
11	24 V DC Back-Lit Exit Sign	15	Nos.	back lit exit signs to be connected to fire alarm panel through interface module	for all closed buildings	0.0166	
12	Modules for Exit Signs (1 Input + 1 Output)	15	Nos.			0.059	Refer Note - 2
13	6F Single Mode Optical Fiber cable (for networking of Fire Alarm Panels) with Conduit	7000	Meters	-	for interconnecting all fire alarm panels in dual ring topology	0.5374	Refer Note - 7
14	50 mm Tray [50(W)x2500(L)x25(H)]mm	400	No's	-	for routing of outdoor cables (1P x 1.5 sqmm and 2C x 2.5 sqmm)	0.2848	
15	Operator Work Station (OWS) with latest Windows OS	1	Nos.	shall be connected to fire alarm panel	-	0.1602	Location:- a) Switchyard Control Room
16	FAP Graphics Software	1	Nos.	-	for graphical representation of FDA system	0.2079	
17	Printer	1	Nos.	shall be connected to OWS of fire alarm panel	for printing logs of fire alarm panel	0.0594	Location:- a) Switchyard Control Room
18	Furniture for OWS and Printer	1	Nos.			0.0283	Location:- a) Switchyard Control Room
19	Erection Hardware - Consist of the following listed minmum requirements.						
a)	Cable Tags for 1P x 1.5 Sqmm Armoured Cable	12				0.13	
b)	Cable Tags for 2C x 2.5 Sqmm Armoured Cable	22					
c)	Cable Saddle + Saddle Bars along with fixing screws and rawl plugs for 1P x 1.5 sqmm Armoured Cable	2700					
d)	Cable Saddle + Saddle Bars along with fixing screws and rawl plugs for 2C x 2.5 sqmm Armoured Cable	1400					
e)	Nylon Cable Tie for 1P x 1.5 sqmm Armoured Cable	2700					
f)	Nylon Cable Tie for 2C x 2.5 sqmm Armoured Cable	1400					
g)	All hardware required for network (i.e. network switches, patch cards, LIU etc.) required for establishing the networking between all fire alarm panels, repeater panels, PCs, etc alongwith their mounting/erection hardware shall be included in main offer.	1	Lot				Engineering is in Bidder scope. Bidder to estimate the BOQ.
h)	Erection & Commissioning Hardware required for completeness of above FDA items	1	Lot				Engineering is in Bidder scope. Bidder to estimate the BOQ.
						2.7133	

Notes:

1) Battery sizing is in bidder's scope and shall be sized for fully loaded Fire Alarm panel for 48 hours of normal operation and 30 mins of Alarm condition. The sizing of the battery shall be done as per TAC guidelines.

S. No	Item Description	MAIN BOQ	UNITs	INTERFACE	APPLICATION	Weightage (%) for Calculation of Line Item Prices by BHEL (Refer Note-7)	REMARKS
2) All interface modules shall be provided with enclosure suitable for outdoor application.							
3) Bidder to note that these items shall be loop powered. In case loop powered devices are not available in the make offered, bidder shall consider the necessary modules along with the devices.							
4) In case the bidder is offering a system, where the addressable devices do not have in-built fault isolator, then required number of isolator modules shall be provided as per IS:2189 considering all the above devices.							
5) All erection hardware including back box, fixing screws, lugs, glands, clamps, structural steel, anchor fastner, nuts, bolts, flages etc. for the above items shall be considered in the offer by the bidder. In addition to this, an additional 10% of all erection hardware shall be considered in the scope of bidder.							
6) Above BOQ is estimated based on preliminary/incomplete inputs from sister units. Hence there shall be variation in BOQ during PO execution for FDA package of +10% to -20% of PO value.							
7) This is the quantity of optical fiber cable for estimating price by C&I. This shall be used for networking of panels. Also, bidder shall provide 2 spare cores which shall be used in case of fault in working cores. Also necessary erection hardware for FO cable (jointing kits, termination kits etc.)shall be considered in the scope bidder. In addition, splicing of FO cable for 50 nos. of joints shall be in the scope of bidder.							
8) BHEL shall supply 280 kms of Cu conductor armoured 1P x 1.5sq.mm as Loop cable and 125 kms of Cu conductor armoured 2C x 2.5sq.mm as Power cable. Accordingly bidder to take care of all the terminations for the supplied items.							

	Price Bid format			Annexure -[A] of PY56397	
	Fire Detection & Alarm System			Rev.00	
	Project: 5 x 800MW Yadadri				
BHEL ENQUIRY NO :			Vendor Offer ref no:		
Ref. date:			Ref. date:		
S. No	Item Description	BOQ	UNITs	Weightage (%) for Calculation of Line Item Prices by BHEL (Refer Note-7)	REMARKS
2(b)	Mandatory Spares- Fire Detection & Alarm System Components (Switchyard Portion) (material code - PY9756397055)				
1	Multisensor Detectors with detector base and mounting back box	5	Nos.	0.0138	
2	Manual Call Points with mounting back box (Indoor)	1	Nos.	0.0029	
3	Manual call points (Outdoor) with mounting back box (IP-65 min.)	1	Nos.	0.0069	
				0.0236	

The below specification is for complete Fire Protection system. Bidders are advised to read this specification in conjunction with all its annexures and are requested to select and design the FDA panels and detectors as per project BOQ.

In addition to the above, interface requirements for FDA system with other systems (if any), shall be considered for the system. All Networking components as required for complete functional operation of system are part of bidder's scope of supply.

VOLUME-IIIE

SECTION-II

TECHNICAL SPECIFICATION FOR FIRE PROTECTION SYSTEM

CONTENT

ATTACHMENT

VOLUME: IIIE

SECTION-II

TECHNICAL SPECIFICATIONS FOR FIRE DETECTION, ALARM AND PROTECTION SYSTEM

1.00.00 GENERAL INFORMATION

This section covers the requirements envisaged for Fire Detection and Protection System including Alarm and Communication which will be used to control any outbreak of fire in the proposed1 x 800 MW Sri Kothagudem Thermal Power Station (KTPS), Stage-VII, Unit-12 for Telangana State Power Generation Corporation Limited (TSGENCO) at Kothagudem, Telangana to reduce consequential damages by containing and extinguishing the same. This section of the Specification shall have two parts – Fire Extinguishing System and Fire Detection & Alarm System. Bidder's scope of work covers supply, erection, commissioning and testing of the entire fire detection, alarm and protection system including supply of all fire extinguishing equipment and systems, fire detectors, manual call points, linear heat sensing cables, all local, remote Fire detection alarm cum MIMIC panels , repeater fire alarm panels, PCs and peripherals, hardware and licensed versions of software as detailed hereunder, meeting all code requirements to make the system complete.

2.00.00 CODES AND STANDARDS

The system shall be designed keeping in view the recommendations of Tariff Advisory Committee (TAC) of Insurance Companies of India/LPA India/NFPA USA. Any other International Standard having equivalent stringent codes may also be considered. However, the system shall be approved by statutory authorities.

3.00.00 SYSTEM DESCRIPTION

For protection against fire, all yard equipment will be protected by a combination of hydrant system, automatic sprinkler spray system (emulsifier system), fixed foam system for oil handling areas, automatic high velocity and medium velocity sprinkler spray system, auto-modular clean agent system for control rooms apart from portable and mobile fire extinguishers located at strategic areas of plant buildings and adequate Passive Fire Protection measures.

Fire extinguishing system is broadly divided into following sub-systems:

3.01.01 **Hydrant System**

The Hydrant System of Fire Protection essentially consists of a large network of pipe, both underground and over ground which feeds water to a number of hydrants valves – indoor as well as outdoor and to a number of outdoor type fixed installations. Water in the pipe network is kept pressurized by hydro-pneumatic tank and jockey pump arrangement. These hydrant valves are located in the entire power station including all the auxiliaries and buildings in the plant area. Hosepipes of suitable lengths fitted with standard accessories like branch pipes, nozzles etc. are kept in "Hose Houses" (for outdoor hydrants) and in "Hose Boxes" (for indoor hydrants). When the fire hoses are coupled to the hydrant valves through the instantaneous coupling, jet of water is directed towards the fire. Hydrant system protects the following building/facilities.

a) Raw Water Pump House

b) Entire Power House including Boiler Area and Turbine House.

c) Mill Building.

d) Mill reject system compressor house.

e) ESP Control Building.

f) Generator & Unit transformer, Station Transformers in transformer Yard, switchyard area.

g) CW Pump House including chlorination plant and dosing pump house.

h) DG & Compressor building.

i) HFO & LDO/ HSD unloading and transfer pump house, pressurizing pump house area, HFO, LDO/HSD Day tank area.

j) DM plant

k) Coal Handling Plant including conveyors, TPs, Coal stack yard etc.

l) Ash water pump house.

m) Ash Slurry Pump House

n) Ash Handling Plant Electrical cum Control Room

o) Ash Handling Plant Compressor Room

p) Fly Ash Vacuum Pump House

q) AHP Chemical House in AHP Clarifier Area

r) Effluent treatment Plant.

s) Stores.

t) Clarified Water Pump House

u) Filtered water Reservoir and Pump House

v) Sludge Sump & Pump House

w) Filter Backwash Waste Sump & Pump House

x) Chemical House

y) Chlorination Building

Note: Buildings not specifically identified above but required to be covered by hydrant system shall also be included in the scope of the Bidder.

3.01.02 **High Velocity Water Spray System (HVWS System)**

a) Category- A

This system shall automatically detect, control and extinguish any out-break of fire and simultaneously give audible alarm. The system shall also be designed for remote operation. Water line forms a ring around the equipment to be protected with projected outlets at various selected points fitted with the specially designed nozzles. The water supply to the HVW spray system is controlled by deluge valve, which shall be operated hydraulically. This valve is normally closed by water pressure in the water piping. The same water pipe forms a ring around the equipment to be protected and frangible bulb type detectors are mounted on this water line at selected places. When the surrounding temperature rises more than the rated temperature of the detector, detector quartzoid bulb collapses releasing water and consequently pressure in water line will fall sharply. This fall of pressure opens the deluge valve and water starts projecting out from the projectors. Local audible alarm shall be produced by water motor alarm gong. The operation of the Deluge Valve shall be annunciated in the Local Zonal Fire Alarm Panel as well as in the Central Fire detection alarm cum MIMIC panel.

The system shall also have a manual over riding facility along with regular testing facility

Category – A type HVW Spray Protection shall be provided for the following equipment:

- Three (3) nos. single phase generator transformer.
- Two (2) nos. Unit transformers.
- Unit and Station Auxiliary transformers as per design requirement.

- Spare Generator Transformer

b) Category- B

In this system fire shall be detected by use of heat detectors, flame detectors depending upon the area. Upon detection of fire, HVW Spray System shall be brought in operation automatically by opening deluge valves.

Category – B type HVW Spray System shall be provided for the following areas:

- Turbine oil tanks and purifiers.
- Boiler Firing Floors.
- Lube oil piping in turbine areas.
- Generator seal oil system.
- Lube oil system for turbine driven boiler feed pumps.
- All oil filled transformer below 10 MVA.

3.01.03 **Medium Velocity Water Spray System**

This system essentially consists of a network of sprayers fitted with a special deflector to give required angle of discharge for the water around the area to be protected. The sprayers discharge a cone of water spray consisting of medium size droplets of water. The droplet size shall be so designed to achieve efficient cooling of the flame zone by evaporation and sufficiently large to penetrate the flame so as to reach and cool surfaces heated by the fire. The operation of the deluge valves in MVW Spray System shall be annunciated in the respective local zonal panels and in the central Fire detection alarm cum MIMIC panel with repeat alarm at fire station buildings. For avoiding overall flooding of the area, in the event of fire, only the two adjacent zones on either side shall only operate.

The Medium Velocity Water Spray System shall be provided for the protection of following areas:

- All conveyor galleries, transfer points, and bunker bay conveyors in coal handling plant. In this connection, it may be noted that full length of each conveyor both top and bottom belt shall be protected with MVW Spray System.

  Spray system for coal conveyor galleries shall be divided in several zones fed through individual deluge valves. Spray system for each zone shall consist of spray nozzles mounted, on a water network. Spray system shall cover both forward and return belts of conveyor including hoppers, feeders & head end pulley. Detection system shall consist of quartz bulb detectors, IR detectors, LHS cables.

- Cable vault and cable galleries of main plant, switchyard control room, and ESP control room. Detection system shall consist of smoke detectors, LHS cables.

- Fuel oil storage and day tank area, DG set diesel tanks.

3.01.04 **Fixed Foam Protection System**

Water based automatic activated low expansion foam protection system shall be provided for HFO & LDO/ HSD storage and day tanks.

Foam protection systems are based on the principle of blanketing the burning surface of oil stored inside the tanks by pouring foam mixed with water, enabling to cut-off the oxygen to the burning fuel thus achieving immediate Extinguishments of fire.

Foam concentrate will be pumped from the foam concentrate storage tank by two (1W + 1S) foam pumps to foam proportioner skids one provided for each fuel oil (FO) tank. Pressurized water connection is provided to the eductor of each foam proportioner skid. In the event of fire, the foam system for respective tank shall be automatically activated on detection of fire by ROR/Probe type heat detectors provided inside the FO tanks. Water will start flowing through the eductor where foam concentrate is induced and mixed with the flowing water in definite proportion.

This foam water mixture flows to tank, where the foam solution expands by sucking air from the atmosphere and foam thus formed fills the oil surface inside tank by suitably designed deflectors.

3.01.05 **Inert gas flooding system / Auto modular clean agent system**

One centralized total flooding type clean inert gas extinguishing system shall be provided for the following areas as a protection for fire damage.

- Control room, Control equipment room, computer room and other electrical and electronic equipment rooms.

The inert gas flooding system for the above areas shall consist of battery of inert gas storage cylinders of adequate capacity, which shall be located suitably at a centralized location. Discharge nozzles shall be provided on the gas distribution pipe network suitably located on the areas to be protected.

In the event of fire, the fire detectors initiate an alarm in the local panel, and main fire alarm panel. Simultaneously, the detection signal opens the valves automatically and the protected area is filled up by rapid injection of required quantity of inert gas through the pipe network and discharge nozzles to create a homogenous air/inert gas atmosphere within.

The pipe network shall be connected to a gas manifold, through a manually operated valve. The manifold shall be connected to a group of inert gas cylinders

3.01.06 Portable and mobile (wheel mounted) fire extinguishers, such as soda acid type, pressurized water type, carbon-dioxide type, foam type , dry chemical powder type shall be located at strategic locations throughout the plant area.

3.02.00 Microprocessor based addressable analog type multi criteria smoke detectors connected in cross-zoning principle as per NFPA recommendation and in two wires circuitry shall be provided in the following areas:

- All cable Spreader Rooms & Cable Vaults, cable gallery in powerhouse and in all ancillary plant buildings.
- All Electrical Switchgear/MCC Rooms located in Power House and in all ancillary plant buildings.
- Central Control Rooms, Control equipment room housing DDCMIS, UPS etc. and in all ancillary plant building control rooms.

3.03.00 Heat detection system (microprocessor based analogue addressable based heat detector) shall be provided in the following areas in order to avoid spurious operation of the smoke detectors due to fumes, smoke & dust which are present in these areas:

- Battery and battery charger rooms.
- Turbine oil tanks and purifiers.
- Boiler Firing Floors.
- Lube oil piping in turbine areas.
- Generator seal oil system.
- Lube oil system for turbine driven boiler feed pumps.
- All oil filled transformer below 10 MVA.

3.04.00 Quartzoid bulb detector shall be used in all transformers rated more than 10 MVA.

3.05.00 Heat sensing cable, as detector shall be used for coal conveyor gallery including bearings and both drive pulley and non-drive pulley, transfer points. This shall be used in whole length of top belt and bottom belt (in a zig-zag fashion). These detectors shall also be used for tripping the conveyor drives.

3.06.00 Solar Blind Infra-red detectors with inbuilt air purging unit shall be used in coal conveyor gallery for detection of moving fire. Rate of rise cum fixed

temperature heat detectors shall be used for Boiler burner fronts, turbine oil tanks and HFO and LDO/HSD storage day tank inside. Heat detectors shall be analogue addressable type.

3.07.00 The entire Power House Building and the outdoor yard of plant have been divided into a number of zones with a few addressable manual call points in each zone. The outdoor call points shall be installed on approximately 1M high angle iron supports for ease of operation. The manual call points inside the Power House Building shall be suitable for wall mounting. Manual call points of "break glass push button station type" or "lever type" shall be provided specifically in the following areas:

a) Switch gear and MCC room in Power house.

b) Outdoor transformer yard.

c) All floors in power House, including Boiler House.

d) All areas of boiler house.

e) Coal bunker and coal mill area.

f) Transfer points.

g) All pump houses namely CW Pump House, Ash Water Pump House, Fire Water Pump House etc.

i) All buildings like Compressor and DG area etc.

Adequate number of manual call points along with automatic fire alarm system shall be provided for the respective areas. Location of the manual call points shall be near to the respective areas. Annunciations from the manual call points shall be received to the nearest satellite fire alarm panel and directly on the fire alarm panels located in the Control room and fire station.

3.08.00 All detectors shall be located and spaced as per NFPA-72E and shall be UL/FM approved. On receipt of impulse from the detectors, in the event of fire, suitable annunciation signals shall be exhibited in the respective repeater fire panels as well as Main and Master Fire Panels. The areas including electrical control rooms, switchgear rooms, cable vault, coal conveyors etc shall be suitably sectionalized as far as the fire detection is concerned and as such the affected Zone can also be spotted.

3.09.00 Passive Fire Protection System for all outdoor transformers and indoor transformers having rating more than 10 MVA, Cable Vault, Cable Spreader Room & Enclosed Cable Risers (Cable Shafts) shall be provided.

3.09.01 The Transformer to be protected by automatic High Velocity Water Spray System shall be separated from each other by explosion proof barrier walls of 120 minutes fire rating so that fire in one does not affect the adjacent Transformers.

3.09.02 The Cable Spreader Room and Cable Vault shall be divided into a smaller

risk zones. These zones shall be separated by 120 minutes rating fire barrier walls.

3.10.00 For containment of fire and preventing it from spreading in cable galleries, unit wise fire barriers with self-closing fire doors will be provided. In addition, all cable entries / openings in the cable galleries, tunnels, floors will be sealed with non-inflammable / fire resistant sealing materials to prevent fire propagation for at least three (3) hour. Fire protection cable coating compound over cables at switchgear entry points, power station building entry points and trays shall be provided to prevent damage from fire for at least thirty (30) minutes. The number of fire doors as prescribed by the TAC/LPA shall be provided. Atleast two fire escape exit openings to the open areas shall be provided for the TG area as prescribed by the TAC/LPA.

3.11.00 Back Lit maintained type emergency "exit light" shall be provided in control room, control equipment rooms, switchgear and MCC rooms, battery charger rooms, escape stair case in power house and transfer points in coal conveyor area and other buildings in the plant. These shall be switched on upon detection of fire.

3.12.00 Addressable analog smoke detector shall also be provided in all false ceiling in power house i.e. Control room, Control equipment room, ESP control room.

3.13.00 “First aid fire protection system" shall be provided for Power house.

3.14.00 Gas sensing fire detectors working on air sampling shall be provided for all control rooms, and control equipment room.

3.15.00 Provision should be kept for automatic closing of fire dampers in ventilation ducts or tripping of related ventilation fans as required on detection of fire.

3.16.00 The main source of water to the fire pumps and jockey pumps shall be from steel made fire water storage tank which is to be sized by the EPC contractor based on TAC/LPA guideline. However, the minimum capacity of the steel tank shall be 5000 m^3 with two compartments . The Water for both hydrant and High/Medium Velocity Water Spray System shall be supplied by six (6) nos. automatic firewater pumps. Out of six (6) pumps two (2) nos. motor driven working hydrant pumps and one (1) no. diesel engine driven standby hydrant pumps for hydrant system and one (1) no. motor driven and one (1) no. diesel engine driven (both are working) spray pumps for HVW & MVW spray water system and one (1) no. diesel engine driven pump is common standby for spray system. Out of these six (6) nos. fire water pumps three nos. (3) will be motor driven and three (3) nos. will be diesel engine driven. The pumps will be started automatically in proper sequence when a large quantity of water flows out from pressurized water circuit. There shall be adequate arrangement of meeting up system leakages and at the same time the system pressure shall be maintained by providing a hydro pneumatic tank along with two (2) nos. motor driven jockey pumps, one (1) working and one (1) standby and two (2) nos., one (1) working & one (1) standby compressors. Booster Pumps shall be provided as per the TAC/LPA guidelines. However, the no. of pumps and their capacity, head etc. are to be finally decided by the Contractor during detail engineering stage.

3.17.00 If water pressure in the hydrant pipe network is not adequate to maintain minimum 3.5 kg/cm² (g) at the hydraulically furthest hose station at elevated floors of boiler houses and turbine building, then 2x100% motor driven booster pumps shall be provided for individual areas for supplying pressurized water to the hose stations. Booster pumps are installed online to the branch header to riser pipes. The booster pumps if required shall start through pressure switch when pressure on their discharge side falls below the set pressure.

3.18.00 Adequate separating distances will be maintained between different process blocks and hazardous equipment. To prevent fire from spreading through ventilation & air conditioning ducts, dampers with auto closing arrangements will be provided at appropriate locations. FRLS power and control cables will be used.

3.19.00 **Nitrogen Injection System**

Nitrogen Injection Fire Prevention and extinguishing system designed for oil filled transformer (for Generator Transformer) shall prevent tank explosion and the fire during internal faults resulting in the arc where tank explosion will normally take few seconds after arc generation and also to extinguish the external oil fires on transformer top cover due to tank explosion and/ or external failures like bushing fires, due to OLTC fires and fire from surrounding equipments.

Nitrogen Injection System shall be provided along with the emulsifiers for the transformers.

The system shall work on the principle of DRAIN and STIR and on activation, shall drain a pre determined quantity of oil from the tank top through outlet valve, to reduce the tank pressure and inject nitrogen gas at high pressure from the lower side of the tank through the inlet valves to create stirring action and reduce the temperature of top oil surface below flash point to extinguish the fire.

Conservator tank oil shall be isolated during the bushing bursting, tank explosion and oil fire, to prevent aggravation of oil fire.

Transformer isolation shall be an essential pre condition for activation of the system.

The system shall be designed to operate manually, in case of failure of power source.

The details including Design, description, control, scope, etc. of this system are attached with Annexure-IX of this specification.

3.20.00 Two (2) nos. Mobile Fire tenders shall be envisaged for this project. However as no fire station is envisaged, these two (2) nos. mobile fire tenders shall be placed in the new fire Station of the unit of this project. For details of Fire Tender, refer to Annexure-X of this Volume.

4.00.00 **OPERATIONAL PHILOSOPHY**

4.01.00 **Hydrant System**

4.01.01 Operation of hydrant system shall be semi-automatic. A pressurized hydrant main shall be maintained through the combination of hydro pneumatic tank, jockey pumps and compressors. When the header pressure of fire water pumps falls below a preset limit, diesel engine driven fire water pump placed in "auto mode" shall be automatically cut-in. If the header pressure is not built-up even after the running of diesel engine driven pump and falls further down, this low pressure shall actuate another pressure switch which in turn shall cut in automatically the standby Diesel Engine driven hydrant pump. In each case above, if any of the above pumps is not started even after the signal from pressure switch is through, "pump fails to start" alarm shall be annunciated in the local control panel.

4.01.02 Hydro-pneumatic tank shall be filled up with water up to 2/3rd portion of its height. Air space shall be kept above the water- filled portion. The hydro-pneumatic tank will be equipped with necessary level switches and pressure switches. Minor leakage in the pressurized fire water system shall be replenished from hydro-pneumatic tank. When the level of hydro pneumatic tank is low, jockey pump shall be started automatically to replenish the level of water in the tank. Jockey pump shall be cut-out automatically when the level of water in the hydro pneumatic tank reaches its higher limit. Pressure switches provided in the hydro pneumatic tank shall be interlocked with the cut-in/cut-out operation of compressor which is used to maintain a constant pressure in the hydro pneumatic tank and there by to the whole fire fighting system.

4.02.00 **Spray Water System**

4.02.01 Operation of Spray Water System shall be automatic.

4.02.02 Header pressure of spray water system shall be maintained at a constant value with the help of hydro pneumatic tank as stated earlier in case of hydrant system.

4.02.03 When the pressure of spray water system falls down to a preset value, it will actuate a pressure switch which in turn shall send starting signal to the motor/ diesel engine driven HVW/ MVW spray water pump for automatic starting. If the pressure falls further below, common standby Diesel Engine driven pump shall be started automatically from the signal of it's pressure switch. Further, if necessary to arrest the falling pressure pumps for hydrant system shall also be started automatically and deliver water to the spray water system.

In each case above, "pumps fail to start" alarm shall be annunciated in LCP if any pump does not start even the start-up of signal from it's pressure switch is through.

4.02.04 Any Fire water pump, if started automatically, shall not be stopped without manual intervention.

4.02.05 In case of detection of fire in HT transformer, "deluge valve" in spray water line shall be opened automatically and spray water system shall come into operation fully automatically. Operation shall be annunciated.

4.02.06 In all other areas of spray water system, detection of fire shall produce annunciation in the respective local fire panel and the spray water system shall be brought into operation by opening automatically the deluge valves of the particular area.

4.03.00 **Inert Gas Flooding System**

Nitrogen Injection Fire Prevention and extinguishing system designed for oil filled transformer (for Generator Transformer) shall prevent tank explosion and the fire during internal faults resulting in the arc where tank explosion will normally take few seconds after arc generation and also to extinguish the external oil fires on transformer top cover due to tank explosion and/ or external failures like bushing fires, due to OLTC fires and fire from surrounding equipments.

4.04.00 Fire Alarm Panel

Bidder shall provide necessary local control panels for the fire protection system, which shall contain the following components and perform the following functions as minimum.

4.04.01 Fire water pumping and pressurizing system

Hot redundant PLC based system shall be provided for control and monitoring of hydrant system and spray water system. The system shall be provided with Graphic User Interface (GUI) with LCD screen based display unit , control switches and other operational keys and hardwired annunciation system. Necessary hardwired interface along with cables shall be provided for remote Operation & monitoring in the Main Fire Alarm Panel & workstations to be located in CCR .

4.04.03 Fire alarm detection and protection system

Hot redundant Microprocessor based Fire detection alarm cum MIMIC panels shall be provided in the following locations

i) Master Fire detection alarm cum MIMIC panel along with PC based operator station, 24 inch TFT LCD monitor, A3/A4 color laser jet printer , in fire station.

ii) Main Fire detection alarm cum MIMIC panel along with PC based operator station , 24 inch TFT LCD monitor , A3/A4 color laser jet printer , in CCR

iii) Repeater Fire detection alarm cum MIMIC panels , one each , in local area rooms eg , DM plant , AHP , CHP , CW pump house etc.

4.04.04 Volume VI of this specification shall be referred for technical requirements of different items eg. operator station, printer , panel , field instruments , cable

etc.

5.00.00 SCOPE OF WORK

5.01.00 Mechanical

a) One (1) no. automatic electric motor driven horizontal centrifugal fire water pumps with accessories for hydrant service.

b) Two (2) no. automatic diesel engine driven horizontal centrifugal fire water pumps with accessories for hydrant service.

c) One (1) no. automatic electric motor driven horizontal centrifugal fire water pumps with accessories for high velocity spray service.

d) One (1) no. automatic diesel engine driven horizontal centrifugal fire water pumps with accessories for medium velocity spray service.

e) One (1) no. automatic diesel engine driven horizontal centrifugal fire water pumps with accessories for common standby service for both HVW and MVW spray service.

f) Two (2) nos. (1 working + 1 standby) automatic electric motor driven vertical centrifugal jockey pumps.

However, the no. of hydrant and spray pumps shall be finalized by the EPC bidder during detail engineering.

g) Two (2) nos. electric motor driven vertical centrifugal type booster pumps (1W+1S) with accessories, as required, for individual area.

h) One (1) no hydro pneumatic tank and one (1) fire water storage tank of 5000 m^3 capacity with two (2) compartments.

i) Two (2) nos. (1 working + 1 standby) air compressor.

The capacity and head of hydrant, spray and jockey pumps and the sizing of compressors and hydro-pneumatic tank shall be finalized by the EPC bidder during detail engineering.

j) One centralized inert gas flooding system for the areas specified, complete with cylinder rack, gas manifold, pressure reducing stations, detection system components and panel, nozzles, piping, fittings and valves.

k) Foam tank skids for foam concentrate storage, complete with foam concentrate feed pumps, piping, fittings, valves, tank sludge trap and sludge disposal arrangement, safety valves, pressure gauges, level transmitter, level indicator and other required accessories.

l) Foam proportional skids, complete with skid base frame, foam and water piping, deluge valve, adductor, foam nozzles, ROR heat

detector and alarm system, local alarm panel and other required accessories for the protected areas as specified elsewhere in the specification.

m) Required nos. of portable fire extinguisher.

n) Outdoor hydrant valves with hoses, solid jet/triple purpose/fog type branch pipes with nozzles and quick coupling as required for the entire outdoor hydrant system specified. The equipment shall be as per specification.

o) Indoor hydrants (landing valves) with hoses, triple purpose branch pipe with nozzles and quick coupling end & "hose boxes" as required for the entire indoor hydrant system specified as per TAC/LPA rules.

p) Out of total nozzles provided in indoor & outdoor hydrant system, at least 10% shall be "fog type" and balance shall be of ordinary type.

q) The number of hose houses and hoses shall be as per TAC/LPA stipulations.

r) 32 mm NB connections for first aid hose reels, first aid hose reels along with branch pipe fitted with nozzles and quick coupling ends and isolating valves, hose boxes as required for the entire first aid fire protection system specified.

s) Sets of hydraulically operated deluge valves with bypass valve, isolating valve & test valve for all HT transformers as specified.

t) Sets of solenoid operated deluge valves with bypass valve, isolating valve & test valve for entire spray system for coal conveyors, turbine lub oil tank, boiler burner front and cable vault/spreader rooms.

u) Two (2) nos. of basket type strainers to be located at the discharge of spray water pumps.

v) Sets of Chrome plated frangible bulb type detectors for areas identified elsewhere in the specification.

w) Sets of addressable analog optical type of smoke detection arranged in X-zoning fashion for areas identified in the specification.

x) Sets of addressable analog multi criteria smoke detectors arranged in X-zoning fashion for areas identified in the specification.

y) Sets of Analogue Addressable type heat detectors for the areas identified in specification.

z) Solar blind Infrared detectors with inbuilt air purging unit for each conveyor. Dual wavelength Infrared flame detectors for boiler burner fronts and turbine oil tanks.

aa) Lot of linear heat sensing cables (non-electrically operated Fibre Optic LHSC) for the areas mentioned in the specification.

bb) Gas sensing fire detectors working on air sampling for all control rooms and control equipment room.

cc) Required nos. of addressable manual call points for the areas mentioned in the specification.

dd) Lot of open sprayers for HVW & MVW spray system.

ee) For periodic testing of deluge valve, one frangible bulb detector with GI pipe & isolating valve connected to detector network shall be provided for each of HT transformers.

ff) One (1) no. of siren of 10 KM range (minimum diametric).

gg) Complete lot of pipelines including all fittings for

- Entire hydrant system.
- Entire spray water (both HVW & MVW) system including network of sprayers.
- Entire compressed air piping for pressurising hydro pneumatic tank.

hh) Lot of cut-off gate valves, globe type instrument root valves and discharge valves for pumps & also for compressors. NRV's as required for firewater & compressed air lines.

ii) RCC Pipe enclosures/hume pipes of appropriate class for buried pipelines for all road crossings, rail crossing & for all places where bulldozer may operate.

jj) Vents and drains as required. Vent and drain valves shall be lockable type and drain lines shall be terminated to nearest surface drain.

kk) Pressure break-down orifices as required for hydrant system, spray system and first-aid-fire protection system.

5.02.00 **Civil**

For civil works refer to Volume VII.

5.03.00 **Electrical**

All electrical equipment and accessories as required for this system shall be supplied. These equipment and accessories shall meet the technical requirements of individual equipment specification covered under “Electrical Equipment & Accessories - Volume V” of this Bid Document.

5.04.00 **Control and Instrumentation**

Scope of supply shall not be limited to the following:

5.04.01 All field mounted instruments viz. process transmitters, local indicators / gauges,process switches, sensors, converters, etc. along with accessories as per specification and approved P & ID. All process transmitters shall be smart type with HART protocol.

5.04.02 All type of analogue addressable Fire sensors / detectors and associated detector loop cable and addressable interface modules.

5.04.03 Floor mounted vertical Fire detection alarm cum MIMIC panel & repeater panels complete with panel, racks, redundant electronic modules, redundant power supply units, battery & battery charger, redundant CPU module, zone modules, redundant communication modules, display units, indicating lamps, relays, communication / networking & interconnection cables, prefabricated cables, network components etc. in fully wired condition with all accessories viz, terminal blocks, gland plates, base channel, anti-vibration mountings etc.

5.04.04 PC based Operator station

5.04.05 A3 / A4 Laser Jet type Printer .

5.04.06 Hot redundant PLC.

5.04.07 Industrial grade Laptop based engineering station loaded with all latest version licensed software required for programming, troubleshooting and analysis for Fire detection alarm cum MIMIC panel & Repeater panel. This laptop shall also have licensed Office documentation software and Antivirus software.

5.04.08 Licensed version of all software for the Fire detection alarm cum MIMIC panels , PLC systems, MMI & Peripherals etc.

5.04.09 Ergonomically designed Control desks complete with all accessories and operator's chair for all Operator stations.

5.04.10 24V DC (2X12V DC) Battery and Battery charging units for each Fire detection and alarm panel & repeater panel .

5.04.11 240V AC, 50Hz, +/- 1% Mini UPS system for Operator station of Fire detection alarm cum MIMIC panel & Repeater Panels.

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5.04.12 Optical fiber cable, networking hardware comprising of LIU & Media converter to establish communication link in between the Fire detection alarm cum MIMIC panel & Repeater panel.

5.04.13 Complete process hook up materials such as. Impulse pipes & tubes of different grades, pneumatic tubing, stub, root valves, instrument isolation & blow down drain valves, valve manifolds, gauge valves, fittings, stands, brackets, supports, stanchions, frames, racks, foundation bolts, nuts and others erection hardware as applicable for installation of all field instruments /

racks.

5.04.14 All instrument racks, gauge board, Junction boxes and enclosure complete with all accessories. Canopy shall be provided for all outdoor applications.

5.04.15 All safety grounding cable

5.04.16 All instrumentation signals, control, power, detector loop cable, special, prefabricated cable, fiber optic cable , Linear heat sensing cable and grounding cable with all accessories such as cable glands, lugs, ferrules etc. as required for interconnecting Bidder's supplied Instruments, panels, annunciators, junction box or any other equipments
within Bidder's scope of supply.

5.04.17 All perforated trays, flexible & rigid conduits, cable tray supports and hangers, cable accessories including pull / cable boxes, inspection covers, lugs, ferrules,fittings etc for the above cables.

5.04.18 All special tools and tackle viz. Copper cable splicing & crimping tool, Optical fiber splicing & jointing tool kit, Hand held programmer / calibrator (HART) for configuration of smart Transmitter, Fire detector testing kits as required for erection, commissioning & maintenance.

5.04.19 Supply of all start-up / commissioning spares.

5.04.20 All consumables like lubricants, tapes, markers, printer papers etc. up to handing over of I&C system.

5.04.21 Any other hardware / software, not mentioned explicitly, but essential for successful completion of work shall be considered in the scope of the Bidder.

5.04.22 Scope of Works

All items supplied by Bidder shall be erected, tested and commissioned by Bidder The quality of erection work shall conform to industry standards and shall take into cognizance of dust & water ingress.

5.04.23 Volume VII of this specification shall be referred for technical requirements of different items eg. operator station, printer , panel , field instruments , cable etc.

6.00.00 DESIGN BASIS AND INPUT

6.01.00 Mechanical

6.01.01 Hydrant System

a) Provision of "double headed hydrants" as per the configuration of "risk area" shall be acceptable.

b) Spacing of hydrant (outdoor) shall be 45 M in general and for internal

hydrant/landing valves spacing shall be 30 M (max.)

c) Pressure at each hydrant point (both outdoor & indoor) shall be minimum 3.5 Kg/Sq.cm(g).

d) Based on total nos. of hydrants (outdoor), nos. of branch pipes, triple purpose nozzles & hoses shall be determined as per guideline of TAC/LPA.

e) Based on total nos. of indoor hydrants (landing valves), nos. of hoses branch pipe, triple purpose nozzles & hose boxes shall be determined as per guideline of TAC/LPA.

6.01.02 **Spray Water System (HVW & MVW System)**

a) Minimum pressure at HVW nozzles and MVW nozzles shall be 3.5 bar and 1.4 bar respectively. Maximum pressure at HVW nozzles and MVW nozzles shall be 5 bar and 3.5 bar respectively. However, for cable vaults, same shall be as per TAC/LPA regulations.

b) Water density for top & bottom conveyor belt shall be 10.2 lpm/ sq.m.(min.)

c) Water density for all surfaces of Transformer shall be 10.2 lpm/Sq.m only.

d) Water density for Cable Spreader Room/ Cable Vault shall be 12.2 lpm/sq.m. (min.) of cable tray area.

e) For turbine oil tank and purification area, burner front water density shall be 10.2 lpm/sq.m. (min.).

f) Chrome plated nozzles shall be arranged in the form of ring to all transformers and nos. of such rings/tiers shall be decided considering maximum gaps between two (2) consecutive tier of rings as 3.0 M. The distance of the deluge valves from the transformers shall be approx. 6 metres.

g) All nozzles shall be open sprayer type and chrome plated.

h) No. of nozzles for any particular risk shall be selected considering the characteristic of nozzles provided by the bidder and also the density of water needed to protect completely the risk as per sl. no. (b) to (e) above/NFPA.

i) Cable vaults/cable spreader rooms shall be suitably zoned. Total water requirement for each zone shall be limited to one-third the capacity of each spray water pump.

j) Conveyor belt shall be suitably zoned. Length of each zone shall be so selected such that water requirement of each zone shall be limited to one-third the capacity of each spray water pump and in case of fire, three (3) zones (one forward and one backward and the zone under

fire) shall be flooded.

6.01.03 **Inert gas flooding system**

a) Proprietary inert gas shall be used for inert gas flooding system.

b) The centralized inert gas flooding system shall be designed considering the single largest protected volume.

c) Required number of pressure reducing stations shall be provided in the gas manifold for gas pressure reduction from cylinder pressure to required gas flooding pressure.

d) The inert gas flooding system and its components shall be designed as per NFPA 2001 recommendations.

e) The cylinder rack shall be designed to accommodate sufficient number of inert gas cylinders so that the largest protected volume can be flooded.

6.01.04 **Detection System (Microprocessor Based)**

a) Coverage of Frangible bulb type detectors, Infra red type heat detectors and multi criteria smoke detectors shall be considered. One smoke detector for every 100 m^2 or one heat detector for every 50m^2 of the compartment area shall be considered.

b) Solar blind IRD with inbuilt air purging unit shall be 3 nos. minimum for each conveyor, 1 no. each at a distance of 1-2 M from tail end and head end and 1 no. at middle. However, same shall be verified with the covering range indicated by the manufacturer.

c) Linear heat sensing cable shall be provided along the whole length of the top belt and bottom belt of each conveyor and on bearing and pulley of driving and non driving ends.

6.01.05 **General**

a) Each zone of cable spreader room shall be provided with one (1) no. cut-off quick opening type Deluge valve.

b) Each zone of conveyor belt shall be provided with one (1) no. Solenoid operated deluge valve.

c) Water velocity in Fire water pipes shall be as per TAC/LPA recommendation.

d) Frictional drop shall be calculated based on Hazen-Williams equation considering "C" as 120. Hardy-cross Method shall be applied to find out total frictional drop during selection of pump head. 10% margin in frictional head shall be considered during pump head selection.

e) Actual pipe size & TDH of pumps shall be selected by Bidder based on "design basis & inputs" specified herein and as approved by the Owner/Consultant.

f) Cut-off gate valves shall be provided for each small and big loops on as required basis.

g) Pressure break-down orifice shall be provided as necessary to restrict pressure of all hydrant point upto 3.5 Kg/cm.sq.(g).

h) Water sprayer shall be placed in such a way so that the "spray cone" overlaps each other. This is applicable for all transformers, cable vaults, conveyor belts and other areas where MVW or HVW spray system has been asked for.

6.02.00 Fire Detection Panel and repeater panel ,Linear Heat sensing cable

6.02.01 Fire Detection, Alarm and Protection system proposed through the Fire detection and Repeater panels shall provide continuous surveillance against fire in the areas of plant. All Fire detection and repeater panels shall be colored MIMIC based.

6.02.02 The Main Objectives of the of these panels are as follows:

a) To detect fire in its early stages and activate or alert for implementation of Emergency action, thus protecting personnel and equipment.

b) To provide an appropriate level of monitoring in the event of fire and audiovisual annunciation at respective Fire detection alarm cum MIMIC panel Repeater panel and the PC based operator station.

c) Opening of the deluge valve in case of fire detection.

d) The sensing of fire is accomplished through various types of fire detectors / LHS cable.

e) To ensure high reliability and availability of the system with quick and exact identification of the fire location without false alarm.

f) To provide contact output in the loop / from fire detection and protection panel & repeater panel for fire protection & other systems viz. opening of deluge valves, tripping of Ventilation System Fans / Dampers / Air Handling Units / tripping of belt conveyor / activating foam system / inert gas flooding system on detection of fire in specific area for effective fire protection.

6.02.03 Fire detection and alarm & Repeater cum MIMIC panel shall be provided in accordance with all codes and standards to annunciate fire alarm signals from fire protection and detection systems provided for the facility, annunciate system / device fault and to provide supervisory functions as required.

6.02.04 In case of fire, the audio-visual fire alarm shall be generated at Fire detection

and alarm & Repeater panel and also initiate a signal to operate hooter(s) in the area where the fire signal is detected.

6.02.05 Indication (bright LED type) and Graphic Display (LCD type) shall be provided ineach Fire detection and alarm & Repeater panel . Information / data from these Fire detection alarm cum MIMIC panel s shall also be available in a dedicated computer based operator station in.. This computer shall be an UL/FM Listed PC used to display event information from the network in a text and graphical format. Graphic screens shall be created with a built-in drawing utility of the protected area and are linked to fire alarm devices. Should a device go into alarm, the appropriate graphic floor plan is displayed along with operator instructions. This shall provide a quick and easy way to inform operators of a fire's location in the buildings. The computer shall have features including event logging, event history tracking, fire panel programming and control.

6.02.06 Each Fire detection alarm cum MIMIC panel shall be capable of operating in stand-alone mode. All Fire detection alarm cum MIMIC panel, Repeater panels and PC based operator stations shall be connected by a dedicated fault tolerant Local Area Network (LAN) through redundant Fiber optic communication cable.

6.02.07 Fire detection alarm cum MIMIC panel shall have multiple loop processing capability. Each area / zone shall be
monitored by one independent loop and a loop shall not be shared between different zones. Each Fire detection alarm cum MIMIC panel shall have additional capacity of handling at least ten alarms per zone, requiring only field wiring, as a spare for future modification or expansion.

6.02.08 The Fire detection alarm cum MIMIC panel shall continuously monitor the status of the detectors and connecting lines. The panel shall evaluate the analogue information received from each addressable detector and compare with set value to check for alarm condition.

6.02.09 Fire detection alarm cum MIMIC panel comprises of loop interface boards with specified loop capacity. The individual elements (detectors / sensors / control / fault isolation modules / interface modules) are looped together and connected to the loop interface board on the Fire detection alarm cum MIMIC panel on a 2-wire circuit (class B wiring).

6.02.10 Minimum indications to be provided on the Fire detection alarm cum MIMIC panel shall be Fire , Fault , Isolate , Pre-alarm, Multiple alarms.

6.02.11 Minimum controls to be provided on the Fire detection alarm cum MIMIC panel shall be Push button -Acknowledge , Push button- Reset , Push button -Test ,Push button - switch -Isolate.

6.02.12 Minimum information to be provided on the panel shall be Detector identification number, Connecting line identification number, Zone / Area description, Detector in isolated condition

6.02.13 Display of the status of the detector, sequence of the events, alarm and trouble summary etc. shall be displayed on the display unit of Fire detection

alarm cum MIMIC panel and as well as on the operator station and printer.

6.02.14 Alarms and indications of Fire detection alarm cum MIMIC panel s are repeated in the repeater panel. Repeater panels shall be provided with a 24" LCD display unit indicating major events, alarm, trouble etc., which shall repeat the information related to sector / area,zone, floor Elevation, room no. and detector no. etc., which are being displayed in the related Fire detection alarm cum MIMIC panel. Repeater panels shall allow acknowledgement of all alarm
signals generated by fire alarm system.

6.02.15 The fire detection and alarm system shall be in normal operation even during mains 240V AC power failure. The stand by DC power supply from the battery in Fire detection alarm cum MIMIC panel shall be capable of maintaining the system in normal operation & in alarm condition for a period of not less than 48 hours after the failure of mains supply.

Battery backup required 48 hours in normal operation and 30 min in Alarm condition

6.03.00 **Electrical**

6.03.01 The automatic fire detection and alarm system shall be designed with electronics having built-in redundancy to ensure availability at all times.

6.03.02 Bidder shall offer microprocessor based Intelligent/ analogue addressable type fire detection and alarm system. Fire alarm system working on microprocessor based system shall have dual redundant fibre optic data highway.

The fire detection and alarm system shall essentially consist of Fire detection alarm cum MIMIC panels with respective CRT Key Board Stations located in CCR, Fire detection alarm cum MIMIC panel, Master Fire Alarm Panel with CRT Key Board Station located in Fire Station, Satellite Fire Alarm panels located in various Plant areas, detectors, Manual Call stations, alarm devices, accessories, wiring and all connections to devices.

6.03.03 The Fire detection alarm cum MIMIC panels in CCR and the Satellite Fire Alarm Panels shall be used for fire detection, associated annunciation system, power supply distribution etc. of the fire protection system. Satellite Fire Alarm panels shall be strategically located in different areas of the Power Plant considering zone-wise detection.

The Fire detection alarm cum MIMIC panels in CCR and the Satellite Fire Alarm Panels shall be microprocessor based and their primary function shall be to raise an effective alarm by visual and audible means upon receipt of an alarm signal from any of its detection circuit(s) and to activate any device(s) that may be connected to the system(s).

Each detection circuit shall be continuously monitored for fire and fault. Alphanumeric indications shall be provided for fire and fault. Facility shall also be provided for simulation, for test purposes, of these conditions by operation of a control switch, which shall also have a facility to isolate and reset the alarm-receiving group.

6.03.04 The Fire detection alarm cum MIMIC panels located in CCR shall be used to

hook-up with each Satellite Fire Alarm Panel to indicate group zone-wise fire annunciation from Satellite Fire Alarm Panels. Fire detection alarm cum MIMIC panels shall also supervise, monitor and annunciate the abnormal condition of the circuitry of the fire detection system through local panels.

6.03.05 External circuit supervision shall not require additional wires other than the pair used for detection or alarm. These two wires shall provide both supervision and alarm signals.

6.03.06 Upon activation of any detection device installed in the circuit, the system shall automatically report the status and initiate the sequence of operations with the following functions as minimum :

a) Sound an alarm on audible devices.

b) Notify automatically central fire station.

c) Light an indicating lamp on device initiating the alarm.

d) Display "zone" and / or device no. on the panel with defined message.

e) Activate the output relays for shutdown of ventilation/air- conditioning system, coal conveyor etc. as per requirement.

f) Actuate in fire protection devices & deluge valves etc.

6.03.07 Alarm shall have priority over trouble. All trouble conditions shall be reported to include the zone / device no., location etc.

6.03.08 In the event of detection of fire, auxiliary systems like ventilation, air-conditioning may require shutdown. For this purpose potential free contacts from the output of the fire protection system shall be made available in the local / main fire panel and terminated in the terminal block

6.03.09 The Fire detection alarm cum MIMIC panels as well as Master Fire Alarm Panel shall have provision and facilities for connection to Intel i5 (or latest version at the time of supply) WIN NT (or latest at the time of supply) based Personal Computer with SVGA Monitor and dot matrix printer to be provided by the Bidder. Fire response program shall be furnished on screen and automatic action shall be initiated by keyboard / mouse operation.

6.04.00 **Civil**

6.04.01 Buried piping shall be laid generally at a depth of 1.0 M below grade. In case of road crossing, same shall be 1.5 M minimum.

6.04.02 Construction of Valve chamber for under ground pipes, Hose house and shed for deluge valves and compressor as per good engineering practice.

7.00.00 **DESIGN AND CONSTRUCTION**

7.01.00 **Fire Water and Jockey Pumps**

7.01.01 **Performance Requirement**

a) Performance requirement for the pumps shall be guided by the `Data Sheet' enclosed in this section and TAC/LPA recommendation.

b) Pumps shall be capable of furnishing not less than 150 % of rated capacity at a head of not less than 65 % of the rated head. The shut-off head shall not exceed 120 % of rated head in the case of horizontal pumps and 140 % in the case of vertical turbine type pumps.

c) Pump-Motor sets shall be capable of continuously delivering the rated output for the voltage variation of (±) 10% and frequency variation of (±) 5% occurring separately or combined voltage and frequency variation of (±) 10% (absolute sum).

7.01.02 **Constructional Features**

a) The design and Testing Standards of the Pumps shall conform to the standards as indicated in the TAC/LPA recommendation.

b) The pumps shall comply with the regulations of Tariff Advisory Committee (TAC)/LPA and National Fire Protection Association (NFPA), USA as applicable.

c) Drive Unit Power rating for the fire water pumps shall be selected such that it is equal to higher of the two conditions:

i) 110% of the duty point power requirement.

ii) Motor input power required at 150% of the duty point capacity of pump

7.02.00 **Diesel Engine**

7.02.01 Performance requirement of the diesel engine shall be guided by TAC/LPA recommendations.

7.02.02 The engine shall be capable of operating continuously on full load at the site conditions for a period of at least six (6) hours.

7.02.03 The engine shall be naturally aspirated, super charged or turbo-charged as recommended by the manufacturer. (Ref. Fire Protection Manual by TAC/LPA).

7.02.04 The continuous engine brake horse power rating (after accounting for all auxiliary power consumption) at the site conditions shall be at least 20% greater than the brake horse power required to drive the pump at it's duty point at rated R.P.M. and in no case less than the brake horse power required to drive the pump at 150% of rated discharge or at any condition of operation of pump. Deaerating Factors considered by the manufacturer to arrive at the shaft power of the diesel engine at site, shall not be less than the following for

normally aspirated engines only:

a) 3% for each 305 metre elevation above MSL (Ref. NFPA, Volume-2, 1978).

b) 1% for each 5.6° C rise in air temperature above 15.6° C (Ref. NFPA, Volume-2, 1978).

The base power rating of the diesel engine shall be referred to any accepted datum like BS/SAE Standard condition or equivalent. In any case, horsepower rating shall not be higher than the limit set by Tariff Advisory Committee.

7.02.05 Design and construction of the diesel engine shall be guided by the TAC/LPA recommendations.

7.02.06 **Starting**

a) The engine shall be capable of both automatic and manual start.

b) Automatic cranking shall be effected by a battery driven D.C. motor having high starting torque to overcome full engine compression. Starting power shall be supplied from two (2) sets of storage batteries. One (1) set of battery is for automatic starting of the engine and the other provided for manual starting. A selector switch shall be provided at the automatic starting control panel to select any of the two (2) sets of battery for manual/auto starting of the engine.

The automatic starting arrangement shall include, as a safeguard, a "Repeat Start" feature so that if the pinion of the starting motor does not engage the flywheel at the first attempt, it is automatically retracted and after a short pause again will advance towards the flywheel.

This repeat start cycle will continue until five (5) kicks after which there will be suitable annunciation. The battery capacity shall be adequate for ten (10) consecutive starts without recharging with a cold engine under full compression.

c) Arrangement for both trickle and booster charge of the batteries shall be provided. When the engine starts running, provision should be kept to ensure that the charger is automatically disconnected and the battery is charged by engine dynamo.

Each diesel engine shall be provided with two (2) battery charger units of air cooled design. Each charger unit shall be capable of charging one (1) set of battery at a time. Provision shall, however, be kept so that any of the charger units of a particular engine can be utilised for charging any one of the two (2) batteries of that engine.

7.02.07 **Governing System**

a) The engine shall be fitted with a speed control device that will control the speed under all conditions of load.

b) The governor shall offer following features:

i) Engine should be provided with an adjustable governor capable of regulating engine speed within 10% of it's rated speed under any condition of load up to the full load rating. The governor shall be set to maintain rated pump speed at maximum pump load. (Refer Fire Protection Manual by TAC/LPA).

ii) Engine shall be provided with an over speed shut-down device. It shall be arranged to shut-down the engine at a speed approximately 20% above rated speed and for manual reset, such that the automatic engine controller will continue to show an over speed signal until the device is manually reset to normal operating position. (Refer NFPA).

c) The governor shall be suitable for operation without external power supply.

7.02.08 **Fuel System**

a) The diesel engine will run on High Speed diesel oil, analysis of which has been indicated elsewhere in specification.

b) Each engine shall be provided with fuel oil tank having storage capacity sufficient to run the engine at full load for at least six (6) hours.

c) For each compression ignition engine driven pump set, there shall be individual fuel tank and fuel feed pipes.

d) A suitable 1 phase 240 Volt fuel pump (portable) to be provided to fill up diesel oil from Diesel Drum received from supplier of Diesel. This pump should also have facility to be operated by hand, in case electricity fails.

7.02.09 **Lubricating Oil System**

Automatic pressure lubrication shall be provided by a crankshaft driven oil pump, taking suction from a sump and deliver pressurized oil through cooler and fine mesh filters to a main supply header fitted in the bed plate casing. High pressure oil shall be supplied to main and big end bearings, cam-shaft bearings, cam-shaft chain and gear drives, governor, auxiliary drive gears etc. Valve gear shall be lubricated at reduced pressure through a reducing valve and the cams by an oil bath. The above lubricating oil sump shall be equipped with adequate heaters having thermostat control to maintain the lubricating oil at recommended temperature for maintaining oil at low viscosity.

7.02.10 **Cooling Water System**

The cooling water system shall conform to any one of the systems specified in Fire Protection Manual of the Regional committee of the Tariff Advisory Committee / LPA / NFPA. The Contractor shall clearly indicate in his offer the type of cooling system adopted. In case fire water is used as a cooling media by tapping of the water from the fire water pump discharge (before the pump discharge valve), the capacity of the fire pump shall be increased, so that the net capacity meets the specification requirement.

7.02.11 **Instrumentation & Control**

The diesel engine shall be provided with adequate instrumentation. These shall include but not limited to the following:

a) Temperature indicator (contact type) in cooling water inlet and outlet.

b) Temperature indicator in lubricating oil outlet from the oil cooler.

c) Pressure gauges (contact type) for lubricating oil system.

d) Differential pressure gauges (contact type) across strainers/ filters.

e) Speed indicator.

f) Running hour meter.

g) Dip stick type lubricating oil sump level indicator.

h) Gauge glass type Fuel Oil Tank level indicator.

i) Voltmeter & Ammeter in dynamo type battery charging circuit.

7.03.00 **Air Compressors**

7.03.01 Air Compressors shall be designed for intermittent operation with high efficiency to satisfy the requirement as specified in the data sheets.

7.03.02 Compressor shall be mounted on an air receiver of suitable size so that delivery air pressure is kept within (±) 5% of rated pressure without excessive start-stop operations in the working cycle.

7.03.04 **Instrumentation and Miscellaneous Accessories**

The package air compressor and drive shall be supplied complete with the following instrumentation and accessories as minimum.

a) Discharge air pressure gauge.

b) Pressure switch to control actuation of compressor drive motor.

c) Starter for drive motor.

d) Pressure relief valve.

e) Drain valve.

f) Delivery valve.

7.04.00 **Fire Water Storage Tanks and Hydro-pneumatic Tank**

7.04.01 Fire Water Storage tanks hall be of Steel made of 5000 m^3 capacity with two compartments.

7.04.02 Design of Hydro pneumatic tank shall conform to IS-2825/ASME Section-VIII, Div.1. Design pressure should be the maximum expected pressure to which the vessel may be subjected plus 5% extra margin. Maximum expected pressure for vessel placed in the discharge line of pumps shall be based on the shut off head of the pump plus static head at pump suction, if any.

7.04.03 Design temperature of vessel shall be 10°C higher than the maximum temperature that any part of the vessel is likely to attain in course of operation.

7.04.04 Corrosion allowance of 2 mm (minimum) on shell and dished ends shall be considered while designing the tank. Suitable mill-allowance shall also be considered for shell and dished ends. Thinning/scaling allowance of 2 mm (minimum) shall be considered for dished ends.

7.04.05 Plates shall be cold rolled through plate bending machine by several number of passes to true curvature and joined by welding.

7.04.06 Tank seams shall be so positioned that they do not pass through vessel connections. Inside seam weld shall be ground smooth, suitable for application of corrosion resistant coating.

7.04.07 All welding shall be as per IS-816 or equal. Bidder shall state clearly in his proposal the make and type of welding rods necessary for construction work.

7.04.08 The tank should preferably be fabricated complete and tested at Manufacturer's works to ensure better workmanship.

7.04.09 **Tank Connections**

a) Bidder shall furnish all pipe material required for vessel connections. All flanged connections should be supplied complete with matching counter flanges, nuts, bolts and gasket materials.

b) Bolts and nuts shall be of hexagonal head conforming to IS-1367 or equal.

c) Gaskets shall be full-face type.

d) Level gauge with isolating valve shall be provided.

e) All connection as required for pressure gauge, pressure switch, level switch etc.

f) Manholes/inspection hole shall be provided in the tank for providing easy access into the same.

g) Suitable ladders attached to the tank shall be provided for easy access to various instruments mounted there on.

7.05.00 **Piping, Fittings, Valves and Specialties**

7.05.01 All pipelines under Bidder's scope of work shall be sized considering flow velocities as per TAC/LPA.

7.05.02 Design condition of piping and material of construction, galvanization etc. for pipes and fittings, handling different fluid shall conform to piping data sheet enclosed.

7.05.03 Pipes shall be provided with vent connection and vent valves at all high points and drain connection & drain valves at all low points. Drain valves shall be lock-closed type.

7.05.04 All pipe bends shall be long radius forged elbow and having bend radius R=1.5D.

7.05.05 Hangers and supports shall be capable of carrying the sum of all concurrently acting loads. They shall be designed to provide the required supporting effects and allow pipe lines movements as necessary. All guides, anchors, braces, dampener, expansion joint and structural steel to be attached to the building/structure/ trenches etc. shall be provided. Type of hangers and components for all piping shall be selected by Contractor and approval of the same shall be obtained from the Purchaser.

7.05.06 All piping system shall be capable of withstanding the maximum pressure arising from any condition of operation and testing, including water hammer effects.

7.05.07 Gate, Globe and check valves shall be used respectively for isolation, regulation and non-return services in general for compressed air and water line upto a certain size as indicated in valve data sheet. Suitable size of drain valves shall be used in drain lines.

7.05.08 All valves shall be suitable for service conditions i.e. flow, temperature and pressure under which they are required to operate.

7.05.09 Gate valves shall be outside screw rising spindle type

7.05.10 Gate valves shall be provided with hand wheel, position indicator, pressure-equaliser for valves 350 mm NB and above and drainage arrangement. Locking facility shall also be required where necessary. Gate valve shall be provided with back seating bush to facilitate gland renewal during full open condition. Globe valve shall have adequate profile for controlling action, check valve shall be swing check type and shall have arrow inscription to show the direction of flow.

7.05.11 Whenever any valve is found to be so located that it cannot be approached manually from the nearest floor/gallery/platform, hand wheel with floor stand or chain operator shall be provided for the same.

7.05.12 For the operation of valves located in the valve pits, suitable arrangement shall be provided to operate the valves from the ground level (i.e. from the top of Valve Pit). For this purpose wrench-operated valve may be looked for.

7.05.13 **Safety Relief Valves**

Design and construction shall be as per Volume : II-D, Section-II.

7.05.14 **Deluge Valves**

Deluge valves shall be used for automatic HVW spray system and MVW spray system. In automatic HVW Spray System, deluge valve in spray water line shall be kept closed normally by water pressure. Same water line will form the water circuit of fire detector. When the detector quartzoid bulb collapses in the event of fire, the water pressure in the deluge valve will fall resulting in the opening of deluge valve. Fast acting butterfly valves shall be provided as a bypass valve to the deluge valve, so that the butterfly valve can be operated manually in the event of fire, if there is any malfunction of deluge valve. Isolation valves on upsteam and downstream side of deluge valve shall be provided.

But the deluge valves, which will be used in the MVW spray system shall be of solenoid-operated type, will remain normally closed but in the event of fire, the solenoid will be energised to open the valve.

Wherever deluge valves are located, they shall be located in protective room For further details of Specification of all valves mentioned above, Data Sheet shall be referred to.

7.05.15 **Strainers**

a) For basket strainer details Data Sheet shall be referred to.

b) Y-type Inline Strainer (If required) - Body shall be constructed of mild steel as per IS:2062 (tested quality). Strainer wires shall be of stainless steel AISI:316, 18 BWG, 30 mesh. Blowing arrangement shall be provided with removable plug at the outlet. Screen open area shall be at least 4 times pipe cross-sectional area at inlet.

7.05.16 **Hydrant Valve (Outdoor) & Stand Post Assembly**

The general design of hydrant valve shall conform to IS:5290 type A and shall be suitable for outdoor operation and for further details data sheet shall be referred to.

The general arrangement of outdoor stand post assembly, consisting of a column pipe and a hydrant valve with a quick coupling end shall be as approved by the Regional Committee of the Tariff Advisory Committee/NFPA.

7.05.17 **Indoor Hydrant Valves (Internal landing valves)**

The general arrangement of the indoor hydrant valves (also known as internal landing valves) shall be as approved by the Regional Committee of the Tariff Advisory Committee/NFPA.

The general design of hydrant valve shall conform to IS:5290 Type-A and shall be suitable for indoor operation. It shall be identical with hydrant valves (outdoor) as outlined above to facilitate interchangeability.

7.05.18 **Hydrant Valves for First Aid Fire Protection System**

The Water Supply connection for the first aid hose reels shall be taken/tapped from the closest hydrant riser.

The general design and construction of the hydrant valves for first aid fire protection system shall conform to IS: 5290 Type-A and shall be suitable for indoor operation.

7.05.19 Hoses, nozzles, branch pipes and hose boxes

a) The first aid hose shall be provided with cotton-reinforced hoses as per IS: 884 with corrugated external surfaces. Each fire hose shall be provided with quick coupling, branch pipes, nozzles, spanners, etc. The hoses for the internal and external hydrant system should be Rubber impregnated woven jacketed type conforming to IS:636 Type-II.

b) Branch pipes shall be constructed of Stainless steel (SS-304) and have rings at both the ends. One end of the branch pipe will receive the quick coupling while the nozzle will be fixed to the other end.

c) The nozzle sizes shall be of not less than 16mm (or 5/8 inch.) in diameter, nor more than 25 mm (or 1 inch.) in diameters for indoor and outdoor hydrants and 6.35 mm (or 1/4 inch) for first aid fire protection system.

d) 2 Nos. 15m long Hose pipe fitted with quick coupling ends, branch pipes, nozzles, spanner etc. shall be kept in a hose box, which shall be located near point of use. The furnished design must meet the approval of the Regional Committee of the Traffic Advisory Committee/NFPA. The general design and construction of instantaneous couplings, branch pipes and nozzles shall comply with IS:903 (latest revision).

e) All instantaneous couplings, shall be of identical design (both male and female designs shall be utilised) so that any one can be interchanged with another. One male/female combination shall get locked in by mere pushing of the two valves together but will provide leak tightness at a pressure of 21 Kg/sq.cm. Designs employing screwing or turning to have engagement shall not be accepted.

7.05.20 **First Aid Hose Reels (Small Bore Hose Reels)**

a) First aid hose reels shall be provided inside the power house building only to provide facilities of preliminary fire fighting by people other than fire personnel.

b) At each floor 32 mm (or 1 and 1/4 inch) diameter first aid hose connection shall be provided from the hydrant risers. The first aid hose reels shall comprise of one no. SS (AISI- 304) isolation valve, reinforced (cotton) rubber hose pipe and one no. SS (AISI-304) nozzle (with isolation arrangement) duly mounted on a swing type (90 deg. min) hose reel.

c) The number and distribution of hose reels shall be such that the whole or each floor is protected and that no part of the floor is more than 6m (or 20 ft.) distant from a hose nozzle when the hose is fully extended.

7.05.21 All instrument root valves shall be stainless steel Gr. 316 globe type.

7.06.00 **Detectors (Microprocessor Based)**

7.06.01 Detectors shall be intelligent analogue addressable type. Detectors shall be housed or mounted in suitable enclosures 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 described.

7.06.02 In case detectors having electrical contact signal output on sensing fire, it shall be noted that the contact shall be "NC" type so that under fire conditions, this contact will open to initiate fire alarm system.

7.06.03 Normally the detectors, which has sensed fire and operated to give fire alarm could be easily located by the numbering scheme both on the detectors and zone-panel, for fire alarm system.

7.06.04 The various fire detectors serving a particular area/zone of plant may be wired-up in group and one common signal for each area or zone is transmitted to the zone indicating panel. The number of detectors to be installed shall be governed by total area to be protected, type of building construction, air movement, ceiling construction and sensitivity required.

7.06.05 The detectors shall be located where the largest combustion gas concentration can be expected.

7.06.06 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, thereby making it possible for a smoke detector to be replaced by either heat or flame type or vice versa.

7.06.07 All detectors shall be provided with built-in response indicating Lamp/LED which shall give local visual indication, in dense smoke condition when it will operate. The failure of lamps shall not prevent the function of detector.

7.06.08 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.

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

7.06.10 Make and type of detectors shall be subject to Purchaser's approval.

7.06.11 The indigenous detectors shall have the approval of ISI/ISO in addition to the approval of FM/UL/. Detectors and panels shall be preferably from the same manufacturer for compatibility.

7.06.12 The detectors shall not be effected by temperature, humidity, air flows.

7.06.13 **Multi Criteria Smoke Detectors**

a) The multi criteria smoke detectors shall be capable of sensing the fire in the incipient or smoldering stage itself, long before the fire matures to a visible flame. For achieving this requirement, the detector shall be capable of sensing visible combustion gases (in the form of smoke) or invisible combustion gases, which are the only clues for a long time in smoldering fires.

b) The detectors shall be sensitive to very low smoke densities of the order of 0.05 gm/cu.m.

c) The detectors shall be of Multisensor type with a combination of photoelectric and heat sensing elements. The multicriteria smoke detector provides photoelectric sensing and heat sensing combined in a single sensor/base assembly. The multisensor base provides two sequentially addressable points, automatically assigned with one address selection.

d) The sensitivity of multicriteria smoke detectors shall be selected depending upon the environmental condition.

e) For further specification of multicriteria smoke detector, data sheet shall be referred to.

7.06.14 Rate-of-Rise and Fixed Temperature Heat Detector (IC Type)

a) The detector shall be solid thermal detector.

b) It shall operate on electronic-principle to provide precise fire detection.

c) The detector shall be of integrated circuit design enclosed in a robust moulded base.

d) It shall be completely moisture proof and air tight with exposed metal part specially treated to allow the device to be used in particularly

corrosive atmospheres.

e) The detector should work on rate-of-rise and fixed temperature modes of operation.

f) It shall have no moving mechanical parts.

g) The detector shall be either surface mounted or with the body concealed above the ceiling and only the detecting element in view.

h) The rate-of-rise detector shall function when the rate of temperature increase exceeds a pre-determined value, around 7 to 8 Deg C per min. This detector shall be designed to compensate with the normal changes in ambient temperature, less than 6.7 Deg C per min., which are expected under non-fire conditions.

i) For further details, data sheet shall be referred to.

7.06.15 Detection System by Linear Heat Sensing Cable

a) Linear Heat sensing cable shall be non-electrically operated optical fibre type.

b) The detector system shall consist of an optical fibre sensor and the detection unit. The detector unit shall house the electronic circuitry that interfaces with the optical fiber sensor.

c) The optical fibre shall be connected to the detector unit in a single continuous loop to ensure redundancy and full coverage of the protected zones even if the cable is broken/cut/damage at one point.

d) The fire or excessive temperature condition shall be sensed by the fibre. The detector unit shall recognize the change in optical transmittance of the fiber and cable breaker Fire/Alarm condition shall be identified within 1 mtrs locational accuracy.

e) For details of linear heat sensing cable, data sheet shall be referred to.

7.06.16 **Frangible (Quartzoid) Bulb Type Detector**

a) In frangible bulb type detectors a small amount of gas along with heat sensitive liquid (colored) is entrapped and hermetically sealed. This detector shall generally be mounted on the pressurized water line which forms a ring around the equipment to be protected. When the surrounding temperature rises more than the rated temperature of the detector, the gas inside the detector shall expand and as a result the quartzoid bulb shall collapse releasing water and consequently pressure in the water line shall fall sharply. This fall in pressure will give signal/annunciation in the Panel.

b) The frangible bulb shall be capable of withstanding the hydraulic test pressure (19 Kg/Cm^2 g) in normal practice.

c) Type and make of frangible bulb shall be of Owner's choice /approval.

d) For further details data sheet shall be referred to

7.06.17 **Infra red Spark/Ember Detector**

a) The detector must respond satisfactorily even when the lens, through which the detection is sensed are covered with coal dust or oily dust substance.

b) The detectors shall be designed to work satisfactorily in the event of vibration in any axis.

c) To prevent false alarms, the detectors shall be provided with purge air facility to keep the lines clean.

d) Facility for remote response indication shall be envisaged in each detector.

7.06.18 **Infra Red Flame Detector**

The Dual wavelength Infrared Flame Detector shall be provided in Boiler Burner front and Turbine Oil tanks to provide an alarm in case of fire.

7.06.19 **Gas Sensing Fire Detector**

Gas sampling type fire detectors working on the principle of air sampling shall be provided for early detection of fire in the high value control rooms.

7.07.00 **Manual Call System of Fire Alarm (Intelligent Addressable Type)**

7.07.01 Each Manual Call point unit shall comprise of a push button of reputed make enclosed in a M.S Box. The push button shall have minimum 1 NO and 1NC contact. The push button shall not be shrouded and the same shall be projected out from the surface the MS box. This whole assembly of push button in MS box shall again be enclosed in an external MS enclosure with all sides covered except the front side. The front side shall be sealed with breakable glass cover using neoprene or equivalent gasket.

The glass cover shall be fixed in such a way that the actuating push button is kept depressed (with NC contact closed and NO contact Open) so long as the glass cover is intact. In case of fire, when glass cover is broken to give fire warning, the push button shall be released due to spring action hence giving remote fire alarm through NC contact which is now changed over. The status of the change over of contact may be conveyed digitally also.

7.07.02 The MS Box and the external MS enclosure shall be completely dust, weather and vermin proof. The housing of the electronic circuitry shall have minimum IP 65 protection

7.07.03 The complete unit shall be suitable for wall/column mounting with necessary mounting accessories.

7.07.04 Clear inscription reading (in English) "FIRE ALARM - IN CASE OF FIRE BREAK GLASS" shall be provided for each manual call point unit, either on the MS enclosure or on a separate metal plate mounted behind the glass cover. The metal plate for inscription shall not tarnish under the atmospheric conditions.

7.07.05 Each manual call point unit shall be provided with the following accessories:

i) An iron hammer of sufficient weight, which could be used to break the glass cover. The iron hammer shall be suspended on a hook fixed to the external MS enclosure by means of a non-corrodible iron chain of sufficient length and play to facilitate easy breaking of the glass cover.

ii) Two numbers diametrically opposite earthing studs located on the outside surface of the external MS enclosure.

iii) An identification number (on a number plate) which will be invariably same as the number given to the fire alarm, indicating point on the Zonal and Main Fire Alarm panel. The identification number shall match with the address of the intelligent addressable Manual call point for easy identifying the Call Point unit.

iv) A dust sealing gland or equivalent on the external MS enclosure for outgoing cable from the unit.

v) A compression type cable terminating brass gland of reputed make for out going cable from the internal MS enclosure.

vi) In addition to this a red lamp Response Indicator shall be provided which will light up on actuation of manual call point to locate the manual call point station, which is operated.

7.08.00 **Control and Instrumentation**

For features and requirements of the control and instrumentation items including field instrument, Panels and Panel mounted instruments, relays, annunciators, selector switches, PLCs and other hardware and peripherals under scope of supply for the Fire Detection and Protection system. Bidder shall also refer the relevant clauses of the Volume VI of this Specification.

Specifications and data sheets for Detectors are furnished at the end of present Specification volume.

7.09.00 **Battery and Battery Charger**

7.09.01 **Battery**

a) Battery to be located in Plant Service Water Pump House shall be suitable to meet starting requirements of Diesel Engine driven pumps. Besides these all controls, indications, annunciations etc. (including multiplication of process interlock relays and auxiliary relays) shall have power supply from 24 V (2 X 12 V) Battery and Battery Charger

unit.

b) All controls, interlocks, indications, annunciation system etc. for each of the Fire detection alarm cum MIMIC panels (located in Central Control room) and the Repeater Panel (located in Fire Station), shall have power supply from 24 V (2 X 12V) Battery and Battery Charging Units. The Battery of each of the above Panels shall be located in the bottom portion of the same Panel. The PC with Printer in the central control room shall be powered up by the respective UPS Power of the Plant Instrumentation and Control System.

c) Diesel Engine Driven Fire Water Pump

The Battery shall have the capacity to start the Diesel engine at least for eleven starts. Further Battery shall have capacity to meet auxiliaries & other loads of Local Control Panel (if any) for a minimum period of 10 hours. Minimum Ampere-hour capacity of the Battery shall be selected accordingly.

d) The Battery driven Power supply shall be available to main and repeater fire alarm panel shall be designed to provide supply for a minimum period of 10 hours. Minimum ampere hour capacity of the Battery shall be selected accordingly.

e) Bidder shall compute the ampere hour capacity at suitable discharge rate based on above duty and furnish the calculation along with the Bid which shall consider the duty cycle and 25% & 15% compensation for ageing & unforeseen future growth respectively of each battery unit. The maximum and minimum ambient shall be 42°C and 11.7°C respectively.

The minimum voltage at the end of the load cycle shall not be less than 1.8 volts per cell.

7.09.02 **Battery Charger**

For design and construction of Battery Charger refer Volume V.

7.09.03 **Layout of Battery & Battery Charger**

a) The battery and charger of the respective panels shall be an integral part of each of the main fire panel / local fire panel / repeater panel.

b) Bidder shall indicate his own layout of 24 volt Battery and Charger to suit the space available.

7.09.04 Fittings & Accessories

Battery

Each battery shall be furnished with necessary accessories required.

8.00.00 **INSPECTION AND TESTING**

8.01.00 **Pipes/Fittings**

8.01.01 Hydraulic test or Eddy Current test shall be carried out at manufacturer works on pipes as per IS: 1239 Part 1/ IS: 3589. Fittings (bends, elbow, etc.) shall be as per IS 1239 Part 2 or equivalent specification.

8.01.02 Butt welds joints on buried as well as on above ground pipes shall be subjected to radiographic inspection as per TAC/LPA's manual.

8.02.00 **Water and Air Line Valves**

8.02.01 All valves shall be tested as per relevant design code of valve.

8.02.02 Valve trim material shall be subjected to NDT if diameter is equal to or grater than 50 mm.

8.02.03 Air tests shall be conducted as per applicable codes to detect seat leakages.

8.02.04 As cast heat marks shall be provided on castings and must be co-related with test certificates.

8.03.00 **Hydrant Valves and Stand Post Assembly**

8.03.01 The stand post assembly along with the hydrant valve (valve being open and outlet closed) shall be pressure tested to detect any leakage.

8.03.02 Flow test shall be conducted on the hydrant valves. The flow through the valve shall not be less than 900 liters/min. Vender may submit type test report of similar size of valves duly certified by reputed TPIA (eg Lloyds, BV etc) or by ISI

8.03.03 Leak tightness test of the valve seat shall be conducted.

8.04.00 **Indoor Hydrant Valves (Internal landing valves)**

Each internal landing valve shall be tested for pressure, flow and leak tightness as in clause no. 8.03.00 above.

8.05.00 **Hydrant Valves for First Aid Fire Protection System**

Each hydrant valve for first aid fire protection system shall be tested for pressure, flow and leak tightness as in clause no. 8.03.00 above.

8.06.00 **Fire Water Monitors**

Tests shall be done on Fire Water Monitor as per Code and Data Sheet.

8.07.00 **Hoses, Nozzles, Branch Pipes and Hose Boxes**

8.07.01 Rubber lined impregnated woven jacketed hoses shall be tested as per IS-636, Type-II and first aid fire protection hose shall be tested as per IS-444.

In both cases, following tests shall be included.

a) Percolation test b) Pressure test c) Burst test

The branch pipe, coupling and nozzles shall be subject to a hydrostatic test pressure to detect any leakage.

8.08.00 **Strainers**

Pressure drop test shall be carried out for basket strainers as well as Y-type line strainers.

8.09.00 **Battery and Battery Charger**

All equipment and components thereof shall be subject to shop tests as per relevant IS/IEC standards. The tests shall also include dielectric tests on Battery Charger.

8.10.00 **Fire detection alarm cum MIMIC panels and Repeater panels**

8.10.01 All equipment shall be completely assembled, wired, adjusted and tested at the factory as per the relevant standards.

8.10.02 Routine Tests

The tests for the panels shall include but not necessarily limited to the following :

a) Operation under simulated service condition to ensure accuracy of wiring, correctness of control schemes/annunciation system and proper functioning of the equipment/devices and continuity test of printed circuit cards.

b) All wiring and current carrying part shall be given appropriate High Voltage Test.

c) Routine test shall be carried out on all equipment such as contactors, relays, switch, fuse, instrument transformers, meters etc.

d) Power frequency withstand test shall be performed on control/ secondary wiring.

8.10.03 Type Test

Type test on typical section of a panel consisting of Transformer Panel, Power pack module unit, Control and operation unit, Annunciation unit etc. shall be performed as per relevant IEC/Fire codes.

8.10.04 Auxiliary Equipment

All component parts and auxiliary equipment such as space heater, insulator etc. shall be routine tested as per relevant IS/IEC.

8.11.00 **Type Tests on Fire Proof Sealing System and Fire Stop System**

The type tests for fireproof sealing system for floor/wall opening/fire stop system for bottom of Electrical Switchgear MCCs/Panel are as under:

a) Fire rating test

b) Hose stream test

c) Accelerated ageing test

d) Fire rating test on the penetration seal system built of accelerated aged components followed by Hose Stream Test.

e) Temperature rise test for cable in the fire stop.

f) Water absorption test followed by fire rating test.

g) Flame resistance test for fire protection coating material.

h) Anti-rodent Test.

The detailed test procedures for each of these tests are to be submitted by the bidder and is subject to approval by Owner/ Consultant.

9.00.00 **DRAWING, DATA AND MANUALS TO BE SUBMITTED BY BIDDER**

9.01.00 **Drawings to be Submitted by the Bidder**

9.01.01 Flow diagram showing the complete fire protection scheme with associated controls for the following :

i) Hydrant System both Indoor and Outdoor.

ii) Automatic type High Velocity Water Spray System with quartzoid bulb detection system in pressurized water loop.

iii) Automatic type Medium Velocity water spray system with digital type heat sensing cable as detector.

iv) Multicriteria smoke detection system arranged in cross-zoning principle.

v) Heat Detection System (IC type).

vi) Diagram showing the lubricant system etc.

9.01.02 Schematic and wiring diagram for Battery Charger.

9.01.03 Layout arrangement of battery with catalogues.

9.01.04 Mounting arrangement of battery charger.

9.01.05 Typical general arrangement drawing showing constructional features, space required in front & back, Power/Control/Signal Cable entry points, etc. of local fire panels, main fire panel, repeater fire panels and local control panel.

9.01.06 Typical Control Schematic diagram for solenoid operated valves, drive motors, Fire-detector circuits.

9.01.07 Contact multiplication diagram for hook-up with Air-conditioning System, Ventilation System, Coal Handling System.

9.01.08 Typical Annunciation System Schematic Diagram along with control and instrumentation scheme of the Fire Protection System.

9.01.09 Layout arrangement of Battery Charger inside.

9.01.10 Typical drawings for Fireproof Sealing System indicating fixing details and dimensions.

9.01.11 Write up on control and operating philosophy of complete Fire Fighting System.

9.01.12 System configuration of Fire water pumping & pressurizing system , Fire alarm detection & protection system etc. along with interface technique of other systems.

9.01.13 Proposed GA drawing of different panels.

9.01.15 I/O list

9.01.16 Technical data sheets

9.01.17 Bill of Materials

9.01.18 P&I diagrams

9.01.19 Details of Spares

9.01.20 Details of Training

9.01.21 Filled up Bid Proposal Sheets

9.01.22 Deviation Sheet.

9.02.00 **Data and Curves**

9.02.01 Battery cell voltage characteristics and data for different discharge rates.

9.02.02 Schedule of projectors in MVW spray system and various types of detectors i.e. quartzoid bulb, smoke detector, heat detectors & fire sensing cable, indicating nos. selected for each type of equipment/area.

9.02.03 Technical Leaflets on fireproof sealing system and Fire Protection Coating System.

9.02.04 Type Test Certificate for all the tests specified elsewhere in the specification.

9.03.00 **Design Basis & Back-up Calculations to be submitted by Bidder after award of contract**

9.03.01 Final version of all drawings and data submitted along with bid.

9.03.02 Back-up calculation for no. of quartzoid bulb detectors provided for detection of fire in transformers.

9.03.03 Back-up calculation for no. of multi criteria smoke detectors (optical type arranged in X-zoning fashion), provided for cable spreader room/cable vault/switchgear room/ control room etc.

9.03.04 Back-up calculation of IC type heat detectors provided for Indoor/outdoor type LT Transformers (Rating less than 10MVA).

9.03.05 Back-up calculation of heat sensing cable provided for detection in coal conveyor.

9.03.06 Basis of selecting no. of high velocity spray nozzles in LT transformer. One typical calculation each type of transformer shall be furnished.

9.03.07 Basis of selecting no. of medium velocity sprayer nozzles in coal conveyor, cable spreader room etc. One typical calculation in each case shall be furnished.

9.03.08 Pipe sizing calculation including thickness calculation considering allowable velocity of fluid in pipe line as furnished in "Design basis and input".

9.03.09 All civil/structural design calculations as applicable within civil scope of work.

9.03.10 Calculation for sizing of Battery and Battery chargers for each category of service.

9.03.11 Detail dimensional drawings of various panels , cabinets , equipment , components / sub assemblies with internal views.

9.03.11 Complete layout diagrams with foundation details of all panels , cabinets etc.

9.03.12 Junction Box / Rack GA & schedule and Instrument / JB location drawing.

9.03.13 Complete interconnection and cable schedule

9.03.14 JB / Panel Wiring drawings

9.03.15 Power Distribution Drawing

9.03.16 Pneumatic / Process Hookup drawing.

9.03.17 Complete loop and Logic diagrams

9.03.18 Logs and Graphics

9.03.19 List of special tools and tackle

9.03.20 List of consumables

9.03.21 Erection drawings and documents

9.03.22 Calibration and shop test certificates

9.03.23 QAP

ANNEXURE-I

DATA SHEET
FOR
FIRE WATER PUMPS

			Elec. Motor Driven	Diesel Eng. Driven	Jockey Pumps	Booster Pumps, if required
1.00.00	Service	:	a) ←- Fire Hydrant System -→ b) ← Fire spray water system →		For Pressurization of fire water system	Fire Hydrant & Spray System
2.00.00	Duty	:	←---------- Intermittent ----------→			
3.00.00	Location	:	←---------- Indoor ----------→			
4.00.00	Number of Pumps Required	:	a) Hydrant Pump – 1 No. b) High Velocity Water Spray Pump – 1 No c) Medium Velocity Water Spray Pump – 1 No.	Hydrant Pump – 2 Nos. Out of two one (1) is standby for hydrant system. Common standby for HVW & MVW Spray Water System – 1 No	Two (motor driven)	Two nos. for individual area
5.00.00	Pump Performance Requirement					

			Elec. Motor Driven	Diesel Eng. Driven	Jockey Pumps	Booster Pumps, if required
	a) Performance standard	:	<---------- Hydraulic institute standard ---------->			
	b) Rated capacity (Cu.m/hr.)	:	410	410	By Bidder	By Bidder
	c) Total head, (MLC) not less than	:	Bidder shall decide to meet TAC/LPA requirements		Bidder shall decide to meet TAC/LPA requirements	Bidder shall decide to meet TAC/LPA requirements
	d) Rated speed (rpm) Max.	:	<---------- 1500 ---------->			
	e) Permissible tolerance in rated capacity (%)	:	<---------- As per IS : 5120 ---------->			
	f) Permissible tolerance in efficiency at rated capacity (%)	:	<---------- No negative tolerance ---------->			
	g) Range of operation	:	<---------- 25% to 130%---------->			
6.00.00	Design standard	:	<----------HIS/ IS 5120/Equivalent Standard---------->			
7.00.00	Impeller type	:	<----------Semi open---------->			
8.00.00	Type of gland lubrication and sealing	:	<----------By Bidder---------->			
9.00.00	Shaft sealing arrangement	:	<---------- Mechanical seal ---------->			

			Elec. Motor Driven	Diesel Eng. Driven	Jockey Pumps	Booster Pumps, if required
10.00.00	Axial thrust balancing device to be designed for pump shut-off operation	:	←---------- Yes ----------→			
13.00.00	Type of pump-motor connection	:	←----------Direct ----------→			
14.00.00	Type of coupling	:	←---------- Flexible Coupling ----------→			
15.00.00	Mode of pump starting	:	←-- Discharge valve fully open ---→			
16.00.00	Material of Construction					
	a) Casing	:	← 2.5% NiCI as per IS:210 Gr. FG 260 →			
	b) Casing liner	:	←---------- Do ----------→			
	c) Impeller	:	<--------ASTM - A 743 GR. CF 8 M-------→			
	d) Wearing rings	:	<------ SS-304 -------→			
	e) Pump shaft	:	←--------- AISI 410 (Hardened) ----------→			
	f) Gland	:	← 2.5% NiCI as per IS:210 Gr. FG 260 →			
	g) Base plate	:	←----- Carbon Steel as per IS-2062 -----→			
	h) Mechanical Seal	:	<----- As per Manufacturer's Standard-------→			
	i) Wetted Fastners	:	←---------- SS-316 ----------→			

			Elec. Motor Driven	Diesel Eng. Driven	Jockey Pumps	Booster Pumps, if required
	j)	Companion Flange	:	←----- Carbon Steel as per IS-2062 -----→		
17.00.00		Supply of accessories & services				
	a)	Base plate	:	←---------- Yes ----------→		
	b)	Foundation bolts, nuts, sleeves etc.	:	←---------- Yes ----------→		
	c)	Suction & Discharge companion flanges with bolts, nuts & gaskets	:	←---------- Yes ----------→		
	d)	Priming connection with 3 way SS isolating valve	:	←---------- Yes ----------→		
	e)	Suction & Discharge pressure indicator	:	←---------- Yes ----------→		
	f)	Vent with 3 way SS isolating valve	:	←---------- Yes ----------→		
	g)	Pump-motor coupling and guard	:	←---------- Yes ----------→		
	h)	Drain connection with valve		←---------- Yes ----------→		
	i)	Eye-bolts, lifting tackle etc.	:	←---------- Yes ----------→		

ANNEXURE-II

DATA SHEET FOR DIESEL ENGINE

1.00.00	**GENERAL INFORMATION**		
1.01.00	Service	:	Plant Service Water Pump House
1.02.00	Designation	:	Internal combustion Diesel Engine.
1.03.00	Type	:	Compression ignition, mechanical (air less) direct injection, multi cylinder and four stroke cycle and cold starting type.
1.04.00	No. of engine required	:	Three (3)
1.05.00	Duty	:	Intermittent
1.06.00	Location	:	Indoor
2.00.00	**ENGINE PARAMETERS**		
2.01.00	Nominal output of engine at site operating under ambient conditions	:	Bidder to indicate during detailed engineering.
2.02.00	Speed of the engine	:	Not more than 2300 rpm.

ANNEXURE-III

DATA SHEET FOR AIR COMPRESSOR

1.00.00	Service	:	For Pressurization of Hydro pneumatic Tank
2.00.00	Number required	:	Two (2) (1- working + 1- standby)
3.00.00	Type	:	Oil free, water cooled, Rotary Screw Compressor.
4.00.00	Duty	:	Intermittent from receiver pressure
5.00.00	Location	:	Indoor
6.00.00	Drive		Electric motor as per Volume V and V-Belt drive

ANNEXURE-IV

DATA SHEET FOR FIRE WATER STORAGE TANK & HYDRO-PNEUMATIC TANK

Description	:	Hydro-pneumatic Tank	Type	:	Vertical Cylindrical
Installation	:	Outdoor			
Fabricated	:	At shop	Water space capacity	:	To be indicated by Bidder
Construction	:	Welded	Working Pressure	:	Discharge pressure of Compressor
Steel	:	As per IS-2002 Gr. 2A	Design & Testing Code	:	IS-2825/ASME Section VIII Div. I
(*) Plate Thickness (Min.)	:	To be indicated by Bidder			
Shell (for all Houses)	:	Bidder to indicate			
Dished ends	:	Bidder to indicate			
Corrosion Allowance	:	2.0 mm (Min.)			
Joint Efficiency Factor	:	0.85			

Description	:	Fire Water Storae Tank	Type	:	Vertical Cylindrical
Installation	:	Outdoor	Nos.	:	1 (one) with 2 (two) compartments
Fabricated	:	At shop	Water space capacity	:	To be indicated by Bidder. However, minimum capacity of the tank shall be 5000 m^3.
Construction	:	Welded	Working Pressure	:	Atmospheric

Steel	:	As per IS-2002 Gr. 2A	Design & Testing Code	:	IS-2825/ASME Section VIII Div. I
(*) Plate Thickness (Min.)	:	To be indicated by Bidder			
Shell (for all Houses)	:	Bidder to indicate			
Dished ends	:	Bidder to indicate			
Corrosion Allowance	:	2.0 mm (Min.)			
Joint Efficiency Factor	:	0.85			

(*) Bidder to indicate plate thickness after giving back-up calculation as per ASME SEC.VIII DIV.-I, Boiler & PV Code/ IS 2825.

ANNEXURE-V

DATA SHEET FOR PIPING, FITTINGS, VALVES AND SPECIALTIES

A. PIPING AND FITTINGS

1.00.00	Type	Buried pipes	Overground pipes normally full of water	Overground pipes normally empty but periodically charge with water & foam system applications	Overground compressd air pipes
		(i)	(ii)	(iii)	(iv)
2.00.00	Material	M. S. ERW pipes as per IS-1239, Part – 1 heavy grade (for pipes of sizes 150 mm NB or below) and IS-3589 Gr.410 ERW (For sizes 200 mm NB and above) or equivalent and galvanized as per IS 4736 for pipes normally empty and periodically charged with water and foam system application.			
3.00.00	Piping Thickness	Pipes for sizes 200 NB & above shall conform 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

Note : a) To prevent soil corrosion buried pipes shall be properly lagged with two coat and corrosion protective tapes of minimum thickness of 4 mm (in two layers) of coal tar type as per AWWA C 203 / IS :15337.

b) Over-ground pipes normally empty but periodically charged with water, foam system applications & compressed air shall be galvanized as per IS : 4736.These pipes shall be provided with one coat of primer and three coats of chlorinated rubber paint.

3.00.00	Size	As per final design and engineering by Bidder and approved by Owner. However Bidder shall consider velocity of fluid in the pipeline & other criteria as indicated elsewhere for selection of pipe size.			
4.00.00	Construction	←---------- ERW ----------→			
		(i)	(ii)	(iii)	(iv)
5.00.00	Joints	Butt-welded for size 65 mm NB & higher as per ANSI B 16.9 and socket welded for sizes up to 50 m NB as per ANSI B16.11		Screwed flange as required for dismantling purposes for sizes 65 mm NB & above as per ANSI B 16.5 and screwed socket for sizes 50 mm NB & below. Welding on GI 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 the 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.	
6.00.00	Fittings				
	Ratings/Wall thickness	Minimum thickness to match with that of pipe for pipe size 65 mm NB and above. For pipe size above 150 mm NB, minimum thickness shall be 6 mm. For pipe size 50 mm NB & below rating shall be 3000 lbs or wall thickness matching with that of corresponding pipe.			
	Material	The material shall conform to ASTM A234 Gr. WPB or ASTM A 105 or equivalent.			

Note :

1) All fittings and flanges for galvanized pipes shall be galvanized.

2) Unless otherwise specified, all elbows/bends shall be long radius type.

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

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

5) Working and test pressure of piping & fittings shall be as per IS or relevant international standards.

B. VALVES

I. Gate, Globe & Check Valve

1. Basic Design Code

a)	Gate Valve	:	i)	IS-14846 for sizes 65 mm NB to 300 mm NB
			ii)	IS-2906 for sizes 350mm NB and above
b)	Globe Valve	:	BS EN-13789	
c)	Check Valve	:	BS-1868	

2. Construction : Cast body and bonnet/cover.

3. Material of Construction for Gate and Globe Valve

a)	Body and bonnet Material for Gate and Globe valve cover		IS-210 Gr. FG 260.
b)	Trim/disc.	:	IS-210 Gr. FG 260.
c)	Stem	:	Stainless steel to AISI-410 13% Cr. St.

4. Material of Construction of Check Valve shall be as given below:

a)	Body, Bonnet & Cover	:	ASTM-A-216 Gr. WCB
b)	Trim/Disc	:	13% Cr. Steel as per ASTM-A-182 Gr. F6 Heat treated and Hardened, min. Hardness-250 HB.
c)	Back seat & Hinge Pin	:	13% Cr. Steel as per ASTM-A-182 Gr. F6.

Note: Gate, globe and check valve of size 50 mm NB & below shall be of forged CS body as per API 602(Gate valve), BS 1868(Check valve) and BS 1873(Globe valve). These valves shall have socket welded ends. Valves will be provided with locking arrangements.

II. Deluge Valve

1.	Type		:	Differential pressure type with diaphragm & clapper assemblies.
2.	Code/Standard		:	As applicable.
3.	Material of construction			
	a)	Body	:	CI conforming to IS-210 Gr. FG-260
	b)	Valve internal	:	Brass/bronze

4. Water motor alarm gong shall be provided for hydraulically operated Deluge valve. For solenoid operated deluge valve, same is not required.

C. **HYDRANT VALVE (OUT DOOR)/LANDING VALVE (INTERNAL HYDRANT VALVE) / HYDRANT VALVE FOR FIRST AID FIRE PROTECTION SYSTEM**

1.	Type		:	Female oblique type with the outlets angled towards ground.
2.	Code/Standard		:	IS-5290 Type-A
3.	Material of Construction			
	a)	Body	:	SS-304
	b)	Stop valve	:	SS-304
	c)	Spindle	:	SS-304
	d)	Seat	:	SS-304

D. **WATER MONITORS**

1.	Type		:	Fixed type
2.	Code/Standard		:	IS: 8442
3.	Flow		:	2500-2700 litre/min at 7 Kg/Sq.cm
4.	Rotation of body			
	a)	Horizontal	:	360°
	b)	Vertical	:	+ 105°- 20°
5.	Throw of monitors			
		Horizontal	:	55 - 60 M
		Vertical	:	25 - 30 M

6.	Material of construction			
	a)	Base flange	:	M.S. conforming to IS: 6392
	b)	Reducer	:	M.S. conforming to IS: 1239 Part-II
	c)	Water nozzle	:	SS304

E. **FIRE HOSE FOR INTERNAL AND OUTDOOR HYDRANTS**

1.	Type	:	Impregnated woven jacketed
2.	Code/Standard	:	IS-636 Type II
3.	Wt. (gm/M)	:	Not more than 250
4.	Coil diameter	:	Not more than 44 Cm. (for 30 M long)

F. **FIRE HOSE FOR FIRST AID FIRE PROTECTION SYSTEM**

1.	Manufacturer	:	As per approved make
2.	Type	:	Corrugated external surface, reinforced rubber hose pipe.
3.	Code/Standard	:	IS-884

G. **BRANCH PIPES AND NOZZLES**

1.	Manufacturer		:	As per approved make
2.	Type		:	Triple purpose, solid jet and Fog type
3.	Code/Specification		:	IS-2871 for branch pipe and IS- 952 for Fog Nozzles.
4.	Material of construction			
	a)	Branch pipe	:	SS AISI-304 & Construction as per IS-2871
	b)	Nozzle	:	SS-304
	c)	Diffuser	:	SS-304 & Construction as per IS-2871
	d)	Fog Nozzle	:	SS-304 & Construction as per IS-952.

H. **HOSE BOXES/CABINET (INDOOR)**

1.	Manufacturer	:	As per approved make.
2.	Material of construction	:	MS 16 SWG & 3 mm thick glass panel in

				front door with lock & two keys.
	3.	Size	:	To accommodate a pair of hoses one branch pipe, nozzles, spanner etc.
	4.	Mounting	:	Wall/Column/Pedestal mounted

I. **HOSE BOXES/CABINET (FIRST-AID FIRE PROTECTION)**

	1.	Manufacturer	:	As per approved make.
	2.	Material of construction	:	MS 16 SWG & 3 mm thick glass panel in front door with lock & two keys.
	3.	Size	:	To accommodate One (1) no. of hose with end fittings, one branch pipe, nozzles, spanner etc.
	4.	Mounting	:	Wall/Column/ Pedestal mounted

J. **STRAINERS**

	1.	Type	:	Simplex basket type
	2.	Material of construction		
		a) Body	:	MS fabricated IS:2062 tested quality
		b) Internal	:	SS (AISI 316), 30 mesh suitably reinforced

K. **SPRAY NOZZLES FOR HVW AND MVW SPRAY SYSTEM**

	1.	Manufacturer	:	As per approved make
	2.	Type	:	Open head type / open nozzle solid cone
	3.	Discharge angle	:	60^{o} - 150^{o}
	4.	K - factor	:	Bidder to indicate
	5.	Flow rate	:	Bidder to indicate
	6.	Material of construction		
		a) Body	:	SS-304
		b) Insert	:	SS-304

ANNEXURE-VI

DATA SHEET FOR HOSE HOUSE

1.00.00	Service	:	To accommodate the hoses for outdoor hydrants with nozzles, branch pipes, spanner etc.
2.00.00	Location	:	Outdoor, to be strategically located in the entire plant area.
3.00.00	Number	:	As per TAC/LPA requirement

ANNEXURE-VII

DATA SHEET FOR DELUGE VALVE SHED

1.00.00	Service	:	To accommodate deluge valves of transformers rating more than 10 MVA, deluge Valves of coal conveyor and cable galleries etc. fire protection system.
2.00.00	Location	:	Outdoor. Bidder to select the suitable locations based on piping layout.
3.00.00	Number	:	Bidder to indicate

ANNEXURE-VIII

DATA SHEET FOR DETECTORS

A. MULTI CRITERIA SMOKE DETECTORS

1.00	Manufacturer	:	As per approved make
2.00	Type	:	Combination of Photo electric sensing and heat sensing, intelligent Analogue Addressable.
3.00	Code/Specification	:	NFPA-72E/BS-5839/IS
4.00	Sensitivity	:	Preset at factory/Adjustable at site (as per UL-268).
5.00	Temperature range	:	1.6 Deg.C to + 60 Deg.C
6.00	Humidity range	:	15% to 90% RH
7.00	Air velocity	:	0 to 300 ± 25 feet/minute
8.00	Plug in type detector to be provided	:	Yes
9.00	No. of terminals on detector on mounting base	:	Bidder to indicate
10.00	Area covered by single detector	:	Bidder to indicate
11.00	Operating voltage	:	24 volt D.C.
12.00	Inbuilt indicating lamp to indicate operation of the detector provided	:	Yes [Separate response indicators mounted on false ceiling to be provided for smoke detectors mounted above false ceiling]
13.00	Material of detector body	:	Metallic/Plastic
14.00	Detector is approved by UL/FOC/FM/TAC/LPA	:	Yes
15.00	Detector Base	:	Mounting box (if applicable) Double Compression gland.
16.00	Coverage area	:	Considering maximum spacing as per

IS: 2189

B. **HEAT DETECTORS**

1.00.00	Manufacturer	:	As per approved make
2.00.00	Type	:	Fixed temperature cum rate of rise type, intelligent Addressable Analog
3.00.00	Sensitivity	:	Preset at factory/Adjustable at site
4.00.00	Operating temperature range	:	54°C. to 60°C.
5.00.00	Humidity range	:	5% to 90% RH
6.00.00	Detector automatically resets after actuation	:	Yes
7.00.00	Area covered by single detector	:	Bidder to indicate
8.00.00	Operating voltage	:	24V DC
9.00.00	Type of contacts	:	Silver
10.00.00	Principle of operation	:	As per Specification
11.00.00	Detector approved by FOC/FM/UL/TAC/LPA	:	Yes
12.00.00	Detector Base	:	Mounting box (if applicable) Double Compression gland.
13.00.00	Coverage area	:	50 Sq.m per detector (Max.) / Maximum spacing as per IS-2189
14.00.00	Special cable	:	To be provided

C. **QUARTZOID BULB DETECTORS**

1.00.00	Manufacturer	:	As per approved make
2.00.00	Type	:	Frangible bulb type
3.00.00	Operating temperature	:	79°C
4.00.00	Material of Construction		
	a) Frame	:	Bronze (ASTM B 145) Class-5A

			Leaded gun metal, Chrome plated
	b) Bulb	:	Glass filled with heat sensitivity liquid (coloured)
	c) Deflector	:	Brass
	d) Cap	:	Copper
	e) Seal	:	Teflon/Rubber
5.00.00	Working pressure	:	3.5 Kg/Sq. cm (g) minimum
6.00.00	Detector approved by TAC/LPA/FOC/UL/FAS/NFPA	:	Yes

D. **LINEAR HEAT SENSING CABLE**

1.00.00	Manufacturer	:	As per approved make	
2.00.00	Type	:	Non-electrically operated Fibre Optical type linear heat sensing cable. It shall be totally immuned to EMI/RFI	
3.00.00	Operating voltage	:	24 Volt D.C.	
4.00.00	Ambient temperature	:	-20^{o} C to 70 ^{o}C	
5.00.00	Operating temperature	:	Programmable type, with combination of fixed temperature and Rate of Rise in temperature.	
6.00.00	Cable Optical Parameter	:	62.5/125 µm graded index, Multimode Fiber	
7.00.00	Cable Jacket	:	Steel Type (for conveyor)	Thermoplastic (for cable tray)
	i) Nominal Cable Diameter	:	3.2mm	4 mm
	ii) Maximum weight	:	33 kg/km	23 kg/km
	iii) Minimum Bending Radius	:	75 mm	63 mm
8.00.00	Typical Performance	:		
	i) Sampling Resolution	:	1.0 meter	
	ii) Measurement Time	:	10 sec for 4 kms	
	iii) Measurement Range	:	-20^{o} C to 150^{o}C	

9.00.00	Detector/Control Unit Condition	:	LED for Power ON/Fault/Alarm It shall have freely programmable Relay Contact, minimum 16 nos.
10.00.00	Enclosure for Detector Unit	:	Weather tight and gasketed, IP-54 or better
11.00.00	All accessories such as fittings, fastenings, sleeves, straps, staples, clips (mounting) rings, test terminals, Junction Box etc. as may be required for interconnection of linear heat detector cables as well as interconnection to Control and Power Cable	:	Yes
12.00.00	Linear Heat Detector approved by FOC/FM/UL/ TAC/LPA/NFPA/VDS/LPCB	:	Yes
13.00.00	Interface	:	PC Interface via Ethernet/Mod-bus output etc.
14.00.00	Fire Detection	:	Unit should be able to detect abnormal/hot spot within 1 mtrs. Span. Further it shall be able to measure both side of the FO LHS cable in the event of wire break. So as to ensure continued fire protection over the entire length.

E. **INFRARED DETECTORS**

1.00.00	Manufacturer	:	As per approved make.
2.00.00	Type	:	Infrared Spark/Ember detectors, (Solar Blind) Intelligent analogue addressable with inbuilt air purging unit.
3.00.00	Operating Voltage	:	24V DC
4.00.00	Ambient Temperature	:	8°C to 45°C
5.00.00	Temperature Range	:	- 40°C to 60°C
6.00.00	Nominal Response Time	:	75 m.Sec. (Max.)
7.00.00	Sensitivity	:	1.0- 5.0 Microwatt shall be Field Adjustable
8.00.00	Dimensions	:	As per manufacturer's standard.

9.00.00	Enclosure	:	Dust and Water proof.
10.00.00	Mounting	:	To be mounted in protective sheet metal housing above conveyor.
11.00.00	Quiescent Current	:	10 mA/As per manufacturer standard.
12.00.00	Alarm Current	:	20 mA/As per manufacturer standard.
13.00.00	Acceptance Angle	:	120°/As per manufacturer standard
14.00.00	Spectral Response	:	0.8 to 2.0 Micron/As per manufacturer standard.
15.00.00	Half Power Cone Vision	:	90°/As per manufacturer standard.
16.00.00	All accessories such as air purging facilities for cleaning lens, protective housing mounting hinge & latch, J. Box Glands etc. as required.	:	Yes
17.00.00	Detector shall be solar blind	:	Yes

F. **INFRARED FLAME DETECTORS**

1.00.00	Manufacturer	:	As per approved make
2.00.00	Type	:	Dual wavelength Infrared flame detectors.
3.00.00	Application	:	Boiler Burner Fronts and Turbine Oil Tanks
4.00.00	Operating voltage	:	24V DC
5.00.00	Ambient temperature	:	8°C to 45°C
6.00.00	Temperature range	:	-40°C to 60°C
7.00.00	Response time	:	Flame - 20 Sec.
8.00.00	Sensitivity	:	One (1) foot diameter flame at 35 foot distance.
9.00.00	Field at view	:	90 Degrees
10.00.00	Quiescent current	:	7.5 mA/As per manufacturer's standard.
11.00.00	Alarm current	:	25 mA/As per manufacturer's standard
12.00.00	Stability	:	Bidder to indicate

13.00.00	Dimensions	:	As per manufacturer's standard
14.00.00	Mounting	:	Bidder to indicate in the offer itself.
15.00.00	Enclosure	:	Dust and weather proof
16.00.00	All accessories such as air purging facilities for cleaning lens, protective housing, bracket etc. as required	:	Yes

G. **GAS SENSING FIRE DETECTORS**

1.00.00	Manufacturer	:	As per approved make
2.00.00	Type	:	Gas sensing fire detectors working on air sampling
3.00.00	Application	:	All control rooms and control equipment room
4.00.00	Operating voltage	:	24V DC
5.00.00	Ambient temperature	:	8°C. to 45°C.
6.00.00	Relative Humidity	:	0.95%, non condensing
7.00.00	Sensitivity	:	0.006 to .06% obscuration per foot
8.00.00	Maximum Transport time	:	120 seconds
9.00.00	Detector Current	:	300 mA
10.00.00	Dimensions	:	Bidder to indicate
11.00.00	Mounting	:	Bidder to indicate in the offer itself
12.00.00	Enclosure	:	Dust and weather proof
13.00.00	All accessories as required	:	Yes

ANNEXURE-IX

Technical Specifications for Nitrogen Gas Injection System for Oil Filled Transformer

1. **Operation Controls**

The system is to be provided with automatic control for fire protection and fire extinction, beside automatic control remote electrical push button control on control box and local manual control in the fire-extinguishing cubicle is provided.

2. **System Activating Signals**

Transformer isolation through master trip relay or circuit breaker (HV & LV in series). Besides, two electrical signals to be provided in series, for activating the system as under:

i) For prevention :
Differential relay
Buchholz Relay paralleled with pressure relief valve or RPRR.

ii) For Extinction :
Fire Detector
Buchholz Relay paralleled with pressure relief valve or RPRR.

3. **System Equipment**

A. Fire extinguishing cubicle (FEC) to be placed on plinth at about minimum 5 meter away from the transformer, shall consist of:

i) Nitrogen cylinder with regulator and falling pressure electrical contact manometer.

ii) Oil drainpipe with mechanical quick drain valve.

iii) Electro mechanical control equipments for oil drain and predetermined regulated nitrogen release.

iv) Pressure monitoring switch for back up protection for nitrogen release.

B. Control box with activating, monitoring devices and line faults indicators (to be placed in the control room).

C. Pre-stressed non-return valve (PNRV) to be fitted in the conservator pipe line, between conservator and buchholz relay operating mechanically on transformer oil flow rate with electrical signal for monitoring.

D. Fire detectors to be fixed on transformer tank top cover for sensing fire.

E. Signal box to be fixed on transformer sidewall for terminating cable connections from fire detectors and PNRV.

4. **Other Requirements for System Installation**

A. Oil drain and nitrogen openings with gate valve on transformer tank, flanges with dummy piece in conservator pipe and fire detector brackets on transformer top cover.

B. Spare potential free contacts for system activating signals i.e. Differential relay, Buchholz relay, PRV/ RPRR, Transformer isolation.

C. Pipe connections between transformer to fire extinguishing cubicle and fire extinguishing cubicle to oil pit.

D. Cabling on transformer top cover. All fire detector to be connected in parallel and inter cabling between signal box to control box and control box to FEC.

E. Plinth for FEC, Oil pit with capacity as 10% of total oil quantity of transformer.

5. **Technical Details**

Fire Extinction Period
On Commencement of Nitrogen injection: Maximum 30 seconds
On system activation up to post cooling: Maximum 3 minutes

Fire Detectors heat sensing temperature: 141 ° C

Heat Sensing Area: 800 mm radius

Pre-stressed non-return valve setting for operation: Minimum 60 litre per minute.

6. **Power Source**

Control Box: 220V DC

Fire Extinguishing cubicle: 240V AC, 40W

7. **Cabling**

Fire survival cables 4 C x 1.5 mm ² for connection of fire detectors in parallel.

Fire survival cable 12 C x 1.5 mm ² for connection between transformer signal box/ marshalling box to control box and control box to FEC.

Fire survival cable 4 C x 1.5 mm ² for connection between control box to DC supply source and FEC to AC supply source, signal box/ marshalling box to pre-stressed non-return valve connection on transformer.

SCOPE OF SUPPLY & INSTALLATION ACTIVITIES FOR NITROGEN INJECTION FIRE PROTECTION SYSTEM FOR TRANSFORMER

A. System Equipments

1. Fire extinguishing cubicle with base frame and containing oil drain assembly, nitrogen cylinder, electro mechanical control unit for oil drain and nitrogen release, pressure monitoring switch for back up protection for release of nitrogen, detectors necessary for monitoring system, flanges with gate/ butterfly valves on top panel for connecting pipe connections from transformer, panel lighting etc.

2. Control box for monitoring system operation, automatic control and remote operation, with alarms, indication light switches, push buttons, audio signals, line fault detection suitable for tripping and signaling on 220V DC supply.

3. Pre-Stressed non-return valve (PNRV) working mechanically on transformer oil flow rate, with proximity switch for remote alarm indication and with visual position indicator.

4. Required no. of fire detectors rated for 141°C for heat sensing each fitted with two number cable glands.

5. Signal box for terminating cable connections from PNRV and fire detectors.

B. Other Material Requirements

1. FRLS cable 4 C x 1.5 mm² for fire detector connections.

2. Fire survival cables 12 C x 1.5 mm² for connections between transformer - control box.

3. Fire survival cables 4 C x 1.5 mm² for signals from relay panels to control box, panel lighting, PNRV connections on transformer etc.

4. Pipe connections between transformer and FEC, ERW class 'C' pipes with bends, flanges, other fittings and gate/ butterfly valves as required.

5. Pipe connections with fittings for connection between FEC – oil pit.

6. Mandatory Spares: 1 No. spare N_2 cylinder for each sub station 3 No. Heat Sensors for each system 1 set Hose pipes with fittings.

C. Installation of System

1. Civil Work

i) Plinth for fire extinguishing cubicle.

2. Pipe Connections between Transformer, FEC and Oil Pit

i) Oil drainpipe connections between outlet valve provided on the transformer tank and the flanges provided on FEC top panel.

ii) Drainpipe connections between oil drainpipe bottom (in FEC) to the oil pit.

iii) Nitrogen injection pipe connections between inlet openings on transformer tank and flange provided on FEC top panel.

3. **Cabling**

i) Connecting all fire detectors in parallel and terminating in signal box, using fire survival cables 4 C x 1.5 mm ² cable.

ii) Connecting PNRV to signal box, using Fire survival cables 4C x 1.5 mm ²

iii) Connections to FEC for 230V AC single-phase panel light supply, using fire survival cables 4C x 1.5 mm ²

iv) Connections from relay panel to control box using fire survival cables 4Cx1.5mm ²

v) Connections from DC source to control box directly or through DC-DC connector, using fire survival cables 4C x 1.5 mm ²

vi) Connections between signal box to control box and between control box to FEC using fire survival cables 12 C x 1.5 mm ²

D. Pre-Commissioning Tests

Pre-Commissioning tests shall be carried out jointly by system manufacturer and the purchaser or his representative prior to commissioning the system.

Note: This system shall be provided in addition to the Spray System for the transformers

ANNEXURE-X

FIRE TENDER

1.00.00 GENERAL INFORMATION

1.01.00 The Fire Tender to be supplied under this section shall be used for general protection against fire for this unit of the power plant.

1.02.00 The quantity of Fire Tender shall be two (2) numbers. The Fire tenders shall be located in the fire station of this unit of the plant.

2.00.00 BASIC FEATURES

Fire Tender shall have following basic features in line with NFPA - 414 and IS - 950, to combat the emergency situation for fire fighting in the plant. Fire Tender shall be equipped with following basic equipment.

2.01.00 Chasis

The fire tender will be mounted on a vehicle and shall have an all wheel drive for good mobility over cross country conditions.

The gross vehicle weight (GVW) rating of the chassis to be used shall exceed actual gross weight of fully loaded vehicle by at least 500 Kg.

2.02.00 Engine

The vehicle shall be diesel driven and able to develop sufficient power to achieve the required rate of acceleration of 64 Km/h in 55 second and a maximum speed of 72 Km/h, when fully laden. The accleration time shall be achieved on ambient temperature varying from 0 to 50°C and at elevation upto 600 m without engine preheating.

The engine shall be equipped with a governor which shall be set at not more than maximum permissible rev/min recommended for the engine at no load.

Each engine shall be equipped with a complete and separate starting system of 24 V type. An alternator and rectifier capable of delivering a minimum of 30 A at 24 V shall be provided.

2.03.00 Power Take Off

When the pump is powered by the vehicle engine, it should be driven through a suitable mechanical power take off (PTO). The PTO should be so designed that it transmits the full requirements of power for driving the pump. The power transmission should be uninterrupted even though the transmission gear may be shifted or the clutch released or the transmission is placed in any of its speed ranges. When a power take off pump drive is used, there shall be sufficient engine power both to operate the pump at the required rate

of discharge estimated at 134 KW (180 hp) and to propel the vehicle while creeping.

2.04.00 Vehicle Drive

The drive shall provide that transmission of power from the engine fly-wheel to the wheels of vehicle with such multiplication of torque that the vehicle is capable of traveling at specified acceleration and speed.

The suspension system shall be designed to allow the vehicle loaded or unloaded, to travel at high speeds over load surfaces or over rough unimproved terrain.

Fuel tank shall be of not less than 200 litre capacity. It shall be of rugged construction securely located and easy floor maintenance.

The vehicle shall be equipped with sufficient capacity compressor; with reservoir to ensure supply of dry air for brakes and pneumatic controls.

2.05.00 Water Tank

A water tank of 4500 litres (min.) capacity shall be mounted on the chasis in a manner keeping in view the proper load distribution on the axles. It shall be fabricated out of mild steel sheet of thickness not les than 5 mm at base and notless than 3 mm for the remaining portion, it shall be treated with corrosion resisting compound. Epoxy treatment should be given to inside of the tank. four lifting eyes shall be provided on the shell of the tank to enable the tank to be lifted off the vehicle for repairs/replacement as necessary.

The tank shall be fitted with manhole cum filling orifice of 450 mm dia. on top of the tank fitted with removable strainer.

2.06.00 Hose Reel

One first aid hose reel shall be provided and mounted so as to be accessible for use from left side of the appliance.

2.07.00 Pump

The pump shall preferably be made of any suitable alloy, compatible with aqueous film forming foam and protein foam compound, with stainless steel shaft suitable for use with brackish water. The pump shall be capable of delivering not less than 1800 l/min of water at a pressure not less than 8.5Kg/f (cm2), when operated from a suction lift of 1.5ml. the pump shall be of single stage/double stage and closed impeller type where the impeller is hydraulically balanced to reduce any thrust.

2.08.00 Primer

The primer shall be capable of a suction lift of 7 m in not more than 30 secs. using 100 mm suction hose.

2.09.00 Foam Equipment

A foam compound tank of 500 litter (minimum) capacity shall be mounted on the chassis, in addition to the water tank and as a separate distinct unit which can be removed separately for replacement.

The foam tank shall have its top dished with funneling arrangement provided to enable easy filling from 20 litre drum. The manhole for the tank shall be used for foam filling which shall have a stainless steel strainer. Means shall be provided for automatic vending of foam compound tank when the foam is being produced or the tank is being filled.

Automatic proportioning arrangements shall be provided where the present induction ratio of foam compound/water solution and flow of water are automatically varied merely by opening and closing monitor/handling. A foam monitor shall be mounted on the roof of the cab in such a manner that it can be manually operated by crew.

All parts of appliances shall be of good workmanship and shall have streamlined finish.

The appliance shall be painted “Fire Red” on the outside with the Fire Service insignia painted in gold and black.

2.10.00 Following accessories also to be provided :

a) One electrically operated siren 24 volts, to be mounted externally.

b) Fog Lamps Two. These shall be low mounted in front of the appliance.

c) Reversing light, one - It shall be suitably situated to assist reversing.

d) Wind screen Wiper Electrically operated of approved design.

e) VHF Radio Telephone set Bracket. A self contained VHF transmitting/ receiving set for communication.

f) All tools required for normal maintenance shall be supplied.

g) Users Hand Book and part identification manual.

h) Aluminium ladder shall be provided in the fire tender.

3.00.00 SCHEDULE OF EQUIPMENT TO BE CARRIED WITH THE FIRE TENDER

SL. NO.	ITEM	QUANTITY
1.	Armoured suction hose 100 mm dia complete with round thread coupling 2.5 m long (see IS : 3549 - 1983 and IS : 902 - 1974)	4 length
2.	Suction strainer for above (see IS : 907 - 1984)	1 No.
3.	Basket strainer for item 2 (see IS : 3582 - 1984)	1 No.
4.	Suction wrenches (see IS : 4643 - 1984)	1 pair
5.	Hose. 63 mm and 30 mm long with instantaneous couplings (see Type II of IS : 636 - 1979 and IS : 903 - 1984)	4 length
6.	Hose bandages (see IS : 5612 (Part-2) - 1977)	12 No.
7.	Hose clamps (see IS : 5612 (Part-1) - 1977)	6 No.
8.	Dual propose jet and diffuser nozzle with instantaneous connection (see IS : 28713582 - 1983)	2 No.
9.	Branch pipe (see IS : 903 - 1984)	2 No.
10.	Nozzles of sizes (see IS : 903 - 1984)	
	a) 12 mm	1 No.
	b) 19 mm	1 No.
11.	Nozzle spanner (see IS : 903 - 1984)	2 No.
12.	Dividing breechings (see IS : 5131 - 1986)	1 No.
13.	Dual head stand pipes (see IS : 5714 - 1981)	1 No.
14.	Hydrant valve key and bar (see IS : 910 - 1980)	1 No.
15.	9 kg. capacity suitable for fighting metal fires in charged condition with applicator (see IS : 11833 - 1986)	2 No.
16.	Self contained portable emergency lights working on rechargeable batteries	2 No.
17.	Insulated plier with rubber gloves pair tested to 20000 Volts (see IS : 3650 - 1981)	2 No.
18.	Copper bolt (see IS : 5200 - 1969)	1 No.

SL. NO.	ITEM	QUANTITY
19.	Hacksaw 300 mm adjustable with 5 spare blades each (see IS : 5169 - 1969)	2 No.
20.	Sledge hammer 5 kg. (see IS : 841 - 1983)	1 No.
21.	Hooks (see IS : 927 - 1981)	1 No.
22.	Crow bar (see IS : 704 - 1984)	1 No.
23.	Axe, drift and rescue (see IS : 273 - 1983)	1 No.
24.	Axe. Felling (see IS : 703 - 1966)	1 No.
25.	Fireman's axe with belt firemen and pauches firemen (see IS : 926 - 1970)	5 No.
26.	Quick release knife (see IS : 5486 - 1985)	5 No.
27.	Longline, hemp/ manila 50 mm circumference, 30 m long (see IS : 1084 - 1983)	Length
28.	Shortline, hemp/ manila 50 mm circumference, 15 m long (see IS : 1084 - 1983)	Length
29.	Lifting and pulling machine, 3 tonnes (see IS : 5604 - 1984)	1 No.
30.	Hook grab	1 No.
31.	First Aid Box	1 No.
32.	Blanker smothering	1 No.
33.	VHF radio telephone set	2 No.
34.	Motorized barrel transfer pump	1 Set
35.	Hydraulic rescue tools	1 Set
36.	Compressed air positive pressure type breathing apparatus, 30 minutes working duration (see IS : 10245 (Part-2) - 1982)	1 No.
37.	Fire proximity suits complete with head wear, hand wear and foot wear	2 No.

Following is the consolidated mandatory spares list. FDA system mandatory spares pertaining to the project are mentioned in the BOQ. However, bidders are advised to review this document thoroughly with respect to FDA system and are requested to include mandatory spares that are not covered in the Mandatory BOQ list of items, and quote accordingly.
Deviation on mandatory spares are not acceptable and post bid additions (for FDA panels and components and their hardware materials) due to this document will not give any price and delivery implications.

Sl. No.	Equipment/Package Name	Quantity	Remarks
3.1.6	Engine - starter Motor	1No.	
3.1.7	Injector	2 Nos.	
3.1.8	Piston rings & liner set	2Sets	
3.2	Fire Water Pump		
3.2.1	Set of Impellers	1Set	
3.2.2	Set of shafts	1Set	
3.2.3	Casing wear rings	1Set	
3.2.4	Impeller wear rings	1Set	
3.2.5	Shaft sleeves	1Set	
3.2.6	Shaft coupling	1Set	
3.2.7	Shaft nuts and keys	1Set	
3.2.8	Bearings Various types as applicable	1Set	
3.3	Valves		
3.3.1	Complete Hydrants Valves	10% of each type and size of total population or minimum 1(one) No. whichever is higher	
3.3.2	Set of Seat & Rubber Ring of Hydrants Valves	5% of each type and size of total population or minimum 1(one) No. whichever is higher	
3.3.2	Deluge valve Assembly complete with water Monitor and Triming Drain	10% of each type and size of total population or minimum 1(one) No. whichever is higher	
3.3.3	Isolating Valves	2Nos. for each type, Class and size	
3.4	Spray Nozzle	10% for each type/model and each spray system of total population	
3.5	Branch pipe with Nozzle	10% for each type of total population	
3.6	Fire Hose with SS Fittings Complete Assembly	10% for each type of total population	
3.7	Manual call points	5% for each type of total population	
3.8	Frangible bulb holders with accessories	10% for each type of total population	
3.9	Detectors (Analog Addressable Type)		
3.9.1	Quartzoid Bulb	10% for each type of total population	
3.9.2	Multicriteria Type Smoke Detectors	10% for each type of total population	
3.9.3	Photo-electric Type Smoke Detectors	10% for each type of total population	
3.9.4	Heat Detector	10% for each type of total population	
3.9.5	Infra-red Amber Detector	10% for each type of total population	
3.9.6	Infra-red Flame Detector	10% for each type of total population	
3.9.7	Air Sampling Detector	10% for each type of total population	
3.9.8	Linear Heat Sensing Cable	10% of total length used in the system	
3.10	Field mounted Optical/Electronic Items/Accessories for Linear Heat Sensing Cable	2Nos. each type	
3.11	Fire Alarm & Detection Panel Items		
3.11.1	Power Supply Module	2Nos. for each type and rating	
3.11.2	CPU Card/Main Control Board	2Nos. for each type	
3.11.3	Network Interface Items	2Nos. for each type	
3.11.4	Zone Control Card/Module	2Nos. for each type	
3.11.5	Audio Control Modules	2Nos. for each type	
3.11.6	Input/Output Control Modules	2Nos. for each type	
3.11.7	Any Other Electronic Cards/Modules used in theSystem	2Nos. for each type	
3.11.8	Battery	2Nos. for each type and rating	
3.12	Electrical		
3.12.1	Electrical Spares as applicable as per the Electrical List	Item & Quantity same as indicated in Electrical list 'B'	
3.12.2	UPS Spares as applicable as per the Electrical List	Item & Quantity same as indicated in Electrical list 'B'	
3.13	C&I Items		
3.13.1	Field Instruments & Others as applicable as per the C&I List	Item & Quantity same as indicated in C&I list 'C'	
3.14	MI (Mineral Insulated)Cable		

Sl. No.	Equipment/Package Name	Quantity	Remarks
3.14.1	MI Cable	500Mtrs of each type, size & rating of Cables	
3.14.2	Accessories for MI Cable	Each Items 5Nos.	
4	**TG Hall EOT Cranes**		
4.1	Long Travel Unit		
4.1.1	Set of Bearings of Axle	1Set for each type & capacity of EOT	
4.1.2	Set of Gearbox bearings with sleeves	1Set for each type & capacity of EOT	
4.1.3	Long Travel end shaft bearings	1Set for each type & capacity of EOT	
4.1.4	Seals for Travel Gear box	1Set for each type & capacity of EOT	
4.1.5	Long Travel Brake shoes lining with Rivets	2Sets for each type & capacity of EOT	
4.1.6	Motor	1No. for each type & capacity of EOT	
4.2	Cross Travel Unit		
4.2.1	Axle Bearings	1Set for each type & capacity of EOT	
4.2.2	Set of Gearbox bearings with sleeves	1Set for each type & capacity of EOT	
4.2.3	Set of seals for Gearbox	1Set for each type & capacity of EOT	
4.2.4	Cross travel end shaft bearing	1Set for each type & capacity of EOT	
4.2.5	Cross travel brake shoes lining	2Sets for each type & capacity of EOT	
4.2.6	Motor	1No. for each type & capacity of EOT	
4.3	Main Hoist		
4.3.1	Main Hoist Pulley Bearings	1Set for each type & capacity of EOT	
4.3.2	Set of Bearings for Gear box	1Set for each type & capacity of EOT	
4.3.3	Set of seals for Gearbox	1Set for each type & capacity of EOT	
4.3.4	Aux. Hoist Gearbox Bearings	1Set for each type & capacity of EOT	
4.3.5	Aux. Hoist Gearbox Seals	1Set for each type & capacity of EOT	
4.3.6	Main & Aux. Hoist Brake Shoes	2Sets for each type & capacity of EOT	
4.3.7	Main & Aux. Hoist Brake Springs	2Sets for each type & capacity of EOT	
4.3.8	Main & Aux. Hoist Brake shoe liners	4Sets for each type & capacity of EOT	
4.3.9	Motor for Main Hoist & Auxiliary Hoist	1No. for each type & capacity of EOT	
4.4	Electrical : Control Panels/motors		
4.4.1	Fixed + moving + spring contactors	2 sets of each type for each control panel	
4.4.2	Other Electrical Spares as applicable as per the Electrical List	Item & Quantity same as indicated in Electrical list 'B'	
4.4.3	Control Module	2 Nos. each type & rating	
4.4.4	Thyristor Stack	2 Nos. each type & rating	
4.4.5	Speed Setting module	2 Nos. each type	
VI	**Condensate Polishing Plant**		
1	**Spares for Horizontal Centrifugal Pumps**		
1.1	Shaft	1 No.	
1.2	Shaft Sleeve	2 Nos.	
1.3	Impeller	1 No.	
1.4	Impeller locking nut and bolt	4 Nos.	
1.5	Impeller wear ring	4 Nos.	
1.6	Casing wear ring	4 Nos.	
1.7	Oil Seal	4 Nos.	
1.8	Oil Deflector	3 Nos.	
1.9	Oil Ring	3 Nos.	
1.10	Gland Packing	4	
1.11	Lantern Ring	3 Nos.	
1.12	Mech Seal Assembly	1 No.	

			tightness between kick plate and finished floor
		f)	Lifting hook / Eye bolt
		g)	Drawing pocket
		h)	Door switch, lamps, thermostat, heaters and industrial grade cooling fans,, illumination fixures
12.	Name Plate	:	Both at front and back surface of the panel
13.	Fixing of name plate	:	Stainless steel pan head screws
14.	Name plate material	:	Laminated phenolic (3 layers)
15.	Lettering	:	Black with white engraved
16.	Mounting of terminal blocks	:	Vertical angle support bracket tack welded on sheet steel plate, screwed on internal wall of enclosure

2.05.00 FURNITURE

All the furnitures in the Central / Local control Room (s), Engineers' rooms, Instrument laboratory , SWAS Room & any other rooms with C&I equipments located in different plant buildings under Bidder's scope shall be included in Bidder's scope of supply. Bidder shall provide following industrial grade furniture items as a minimum from reputed manufacturers/suppliers meeting International Standards. The furniture shall be modular and latest with ease of operational features. The furniture shall be modern, aesthetically designed, modular, flexible, space saving and future safe.

2.05.01 WORK STATION FURNITURE

Modular work station furniture, suitable for mounting servers & historians, programmer stations, PC based systems, printers (A4/A3 color laserjet) etc. shall be provided.

2.05.02 PC RACK

PC Racks shall be provided to mount CPUs of workstations/PCs of OWS/LVS etc. in control room. For each PC / workstation / monitor at least one chair shall be included.

2.05.03 CHAIRS

Industry standard revolving chairs with wheels and with provision for adjustment of height (hydraulically/gas lift) shall be provided for the operators, unit-in-charge & other personnel in control room area. These shall be designed for sitting for long duration such that these are comfortable for the back.

2.05.04 TABLES

Industry standard computer tables shall be provided & shall be as approved by Owner during detailed Engineering. Glass top teak wood horse shoe shaped table with vertical file mounting arrangement (two layers to house approx. 40 Nos of files and lockable drawers at both ends) for Engineering Room shall be provided.

2.05.05 ALMIRAHS

Steel Almirahs shall be provided for keeping documents in the documentation room. Glass doors for each rack shall be provided such that the documents are visible from outside. Size of the rack shall be sufficient to easily fit technical manuals. The exact details shall be approved by Owner during detailed Engineering.

2.05.06 KEYPAD

One keypad per unit shall be provided for the storing of keys of relevant areas of the unit in the control room.

2.05.07 LOCKERS

Suitable lockers shall be provided in the room adjacent to the control room for storing of personal articles of control room personnel. Also, lockers of bigger size shall be provided in documentation Room for storing of personal documents. Details shall be finalized and approved by Employer during detailed engineering.

3.00.00 LVS PANEL

3.01.00 An arc shaped Large Video Screen (LVS) panel shall be supplied for mounting large video screens in number of tiers in various Control rooms as specified elsewhere in this specification.

Biddr shall provide and fix ACP cladding around the LVS screen including covering the LVS back side and LVS stand. The cladding will be from floor finish to 600 mm above LVS screen like a self-standing partition with necessary openings for system requirement. ACP paneling shall be with 304 grade & approx. 0.5 mm mirror finish SS strip.

3.02.00 The profile, dimensions and the general arrangement shall be finalized & approved by Owner during detailed engineering. Recommendations, if any, for the control room lighting in order to ensure continuous proper viewing of the LVS screen by the operator & shift incharge (without any fatigue) shall be

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. APPLICABLE CODES & STANDARDS

4.1 The design engineering and testing of the item shall be as per IS 60950, IS 13252, IEC 60950 and any other relevant & applicable international codes/standards.

5 TECHNICAL SPECIFICATIONs

5.1 SMPS with batteries shall be shall be supplied in fully wired condition. BHEL terminal point shall be 230V AC ± 10% incomer (cable size: 3C x 6 sq.mm) and 24V DC outgoing feeders. 24V DC outgoing cables shall be provided by BHEL (cable size: 2C x 2.5 sq.mm). Suitable cable terminations shall be provided by bidder in their SMPS.

5.2 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.

5.3 Bidder shall supply all the erection material required for installation/mounting of SMPS.

5.4 Batteries shall be 2 x 12V SMF type. Back up time shall be for 30 min. at full load condition.

5.5 The Power Supply 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.

5.6 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. Accordingly, each 24 V DC output shall be designed for 6A.

5.7 Each power supply module shall have provision to take two tap offs from incomer to extend incoming power supply to other two power supply modules as shown below.

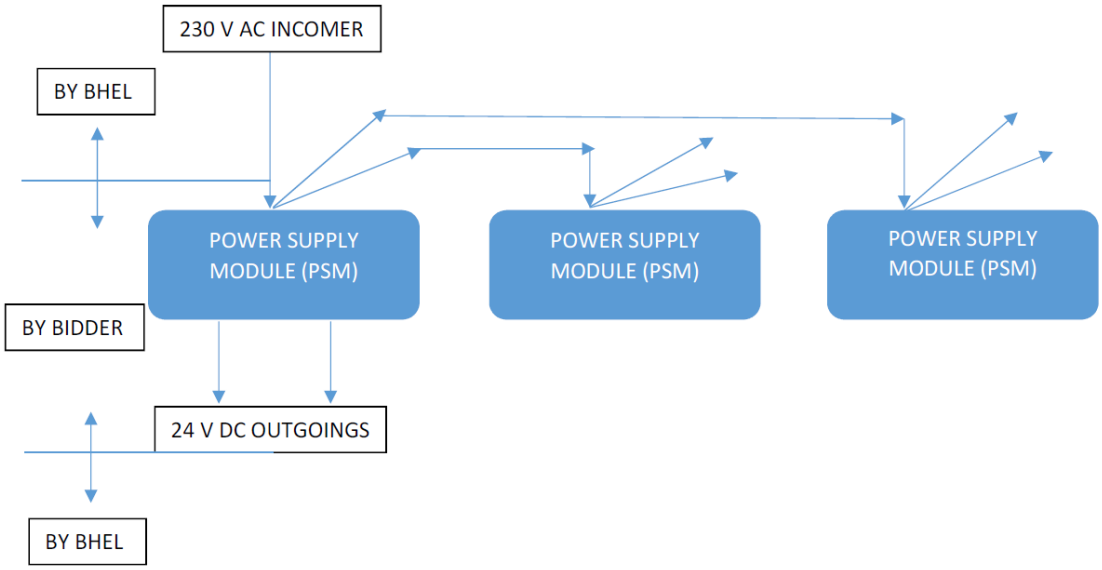
5.8 Incomer and tap off cables shall be 2C x 4 sq.mm. CU. These cables are in BHEL scope of supply. However, necessary cable lugs & glands for termination shall be in bidder scope.

5.9 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.

5.10 Output of SMPS shall be field/site adjustable in the range of 24 V DC + 10% to 24V DC - (minus) 0% as per end user requirement.

5.11 Irrespective of AC input variation (230V AC ± 10%); output of SMPS shall be constant i.e. in the range of 24 V DC + 10% to 24V DC - (minus) 0%.

5.12 Brief scope demarcation is indicated below:-



6 BILL OF QUANTITY

BOQ shall be supplies as per specification. IP certificates shall be submitted by bidder along with data sheets.

7 INSPECTION & TESTING

7.1 Inspection & testing of the item shall be as per IS 60950, IS 13252, IEC 60950 and any other relevant & applicable international codes/standards.

RECORD OF REVISIONS

Rev. No.	Date	Revision Details	Revised By	Approved By
00	22.05.2021	Original issue	--	P Chandra Sekhar

Ref. Doc.

SPECIFICATION FOR CABLE TRAY

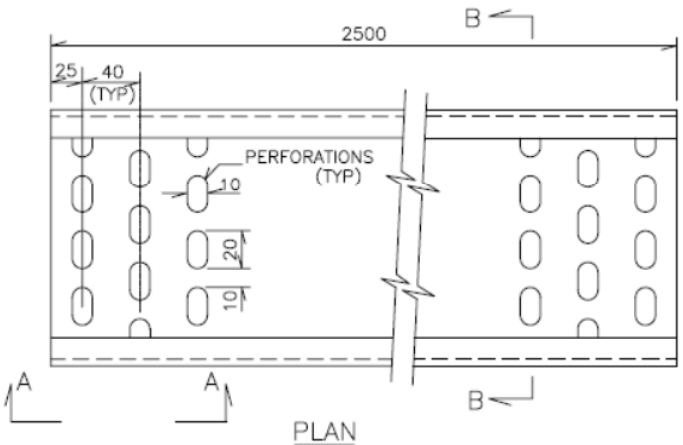
- Applicable Standards
  - IS-1079: For hot rolled carbon steel sheets and strips specifications.
  - IS-2629: For practice of hot dip galvanising & adhesion test
  - IS-1363: For heat bolts, screws and nuts.
  - IS-1367: For threaded steel fasteners.
  - IS-5986: For hot rolled steel plates, sheets, strips and flats for flanging & forming operation.

- Constructional Requirements
  - The cable trays and accessories such as coupler plates shall have rigid welded constructions and shall be fabricated out of minimum 2mm thick hot rolled sheet steel.
  - Hot dip galvanizing shall be done after fabrication as per relevant Indian standards. The amount of galvanizing shall be min. 610 g/m2.
  - All hardware and fittings like bolts, nuts, washers etc. shall be hard chrome or Cadmium plated or Zinc passivated.
  - Straight run for perforated cable tray shall include 2 sets of coupler plates along with accessories like nut, bolts and washers

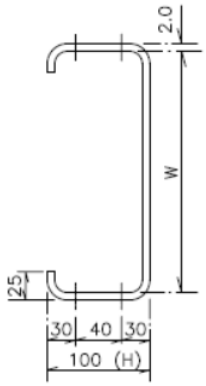
- Inspections & Tests

  - Test for thickness of Galvanized coating by Elcometer.
  - Test for mass of Galvanized coating by stripping test.
  - Test for determination of uniformity of Galvanized coating.

TYPICAL ARRANGEMENT FOR PERFORATED TYPE STRAIGHT RUN CABLE TRAY ALONG WITH ACCESSORIES & COUPLER PLATES

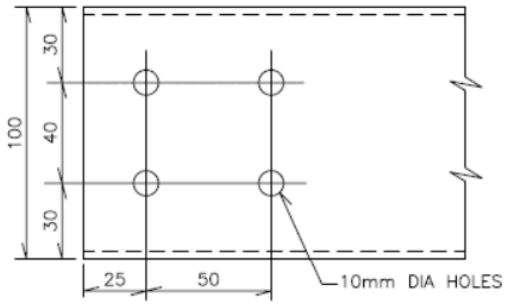


PLAN

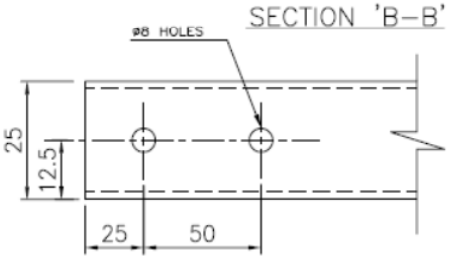


H=100mm for 450/600/750mm width Tray
H=75mm for 150/300mm width Tray
H=25mm for 50mm width Tray

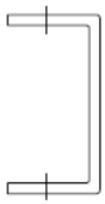
SECTION 'B–B'



SECTION 'A–A'

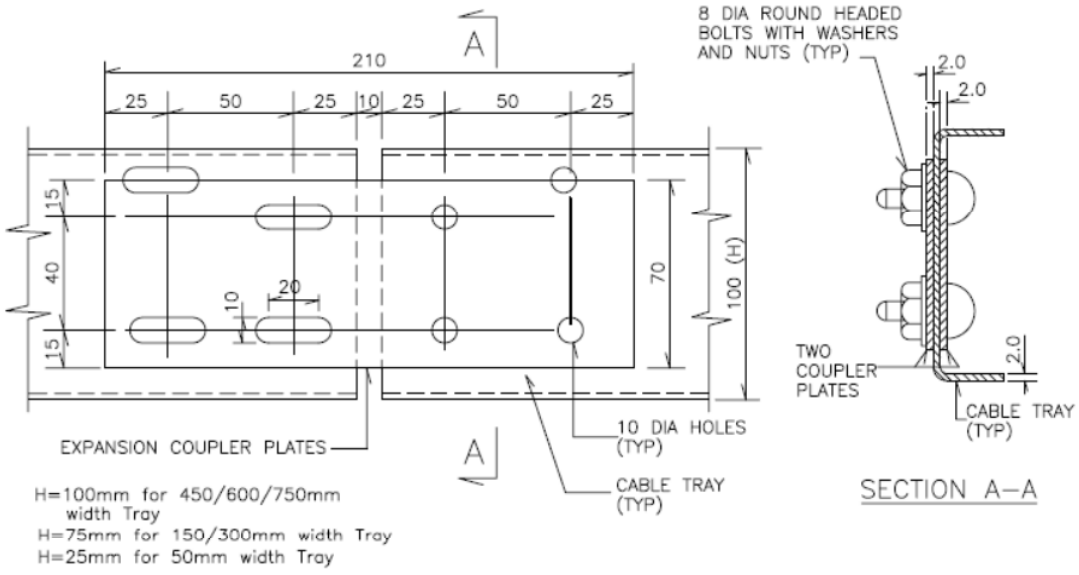


SECTION 'A–A' FOR 50mm TRAY

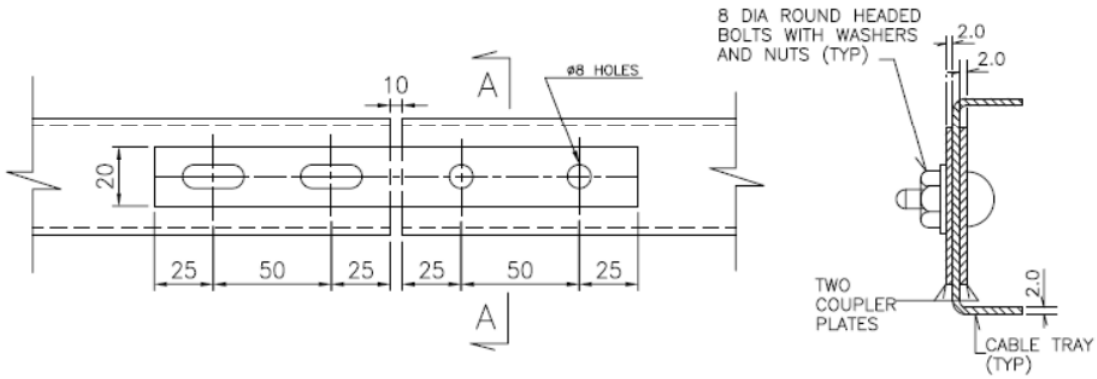


SECTION 'B–B' FOR 50mm TRAY

TYPICAL ARRANGEMENT FOR COUPLER PLATE SET ALONG WITH ACCESSORIES FOR PERFORATED TYPE CABLE TRAYS



TYPICAL ARRANGEMENT FOR COUPLER PLATE SET ALONG WITH ACCESSORIES FOR 50mm PERFORATED TYPE CABLE TRAYS



NOTES

CENTRAL CONTROL ROOM
UNIT-1 & 2

CENTRAL CONTROL ROOM

S.No.	DESCRIPTION	QTY./UNIT	COMMON	LOCATION(UNIT # 1 & 2)	DIMENSION(WxDxH)	SCOPE	REMARKS
1.	LARGE VIDEO SCREEN (67")	05	03		1625x1000x2419	BHEL-EDN	
2.	CONTROL DESK (W1-1 TO W1-8)	08	--	B/W ROW B & C. B/W COLMN 11a & 15.	REFER EDN DRG NO. EN-DG-1175-145-4006	BHEL-EDN	
	CONTROL DESK (W2-1 TO W2-8)	08	--				
	CONTROL DESK (WC-1 to 3) CHP/AHP/FOPH/RW/CLW/CPU/CAS/CWP	--	03				
	CONTROL DESK (WC-4) PT PLANT	--	01				
	CONTROL DESK (WC-5) DM PLANT	--	01				
	CONTROL DESK (WC-6) H2 GENERATION	--	01				
	CONTROL DESK (WC-7) HVAC	--	01				
	CONTROL DESK (WC-8) FIRE WATER PUMPs	--	01				
3.	UNIT CONTROL PANEL	01	--		1448X1000X2355	BHEL-EDN	
4.	ELECTRICAL CONTROL PANEL	01	--		3128X1000X2355	BHEL-EDN	
5.	INERT GAS PANEL	--	01		650x400x1500	BHEL-PESD	SHIFTED TO CYLINDER ROOM @0.0M
6.	MAIN FIRE ALARM PANEL	01	--		600x600x1200	BHEL-PESD	
7.	MAIN FIRE ALARM PC & PRINTER 1 NO. PLACED IN SHIFT INCHAREGE & 1 NO. PLACED IN COMP ROOM-2	01	--		1000x1050x750	BHEL-PESD	
8.	SHIFT IN-CHARGE PC	01	--		1000x1050x750	BHEL-EDN	PLACED IN SHIFT INCHARGE ROOM
9.	RIVER WATER INTAKE PC	--	01		1000x1050x750	BHEL-EDN	PLACED IN SHIFT INCHARGE ROOM
10.	CCTV MONITOR	01	--		750x750x750	BHEL-EDN	
16.	WIRELESS BASE STATION	01	--		300x250x150	BHEL-EDN	PLACED ON DESK

COMPUTER ROOM

S.No.	DESCRIPTION	QTY./UNIT	COMMON	LOCATION UNIT#1	LOCATION UNIT#2	DIMENSION(WxDxH)	SCOPE	REMARKS
13.	NETWORK ATTACHED STORAGE (NAS)	01	01	B/W ROW C & D. B/W COLMN 11a & 12.	B/W ROW C & D. B/W COLMN 14 & 15.	1000x900x1900	BHEL-PEM	PLACED IN RACK-1
14.	BACK-UP STATION	03	--				BHEL-PEM	PLACED IN RACK-1
15.	ALARM STATION	04	--			1000x900x1900	BHEL-PEM	PLACED IN RACK-2
17.	SOE PC	01	--			1000x1050x750	BHEL-EDN	BASED ON EDN INPUT
21.	ENGINEERING ACTIVITY SERVER (EAS)	01	--			1000x1050x750	BHEL-EDN	
22.	ENGINEERING ACTIVITY CLIENT (EAC)	01	--			1000x1050x750	BHEL-EDN	
23.	INFO SERVER	02	02			1000x1050x750	BHEL-EDN	
24.	OPERATOR WORK STATION (OFFSITE)	--	07			1000x1050x750	BHEL-EDN	
25.	OPC PC	--	02			1000x1050x750	BHEL-EDN	
26.	PEFORMANCE CALCULATION PC	01	--			1000x1050x750	BHEL-EDN	
27.	MIS SERVER STATION	03 02	--			1000x1050x750	BHEL-EDN	
28.	MIS CLIENT STATION	02	--			1000x1050x750	BHEL-EDN	
29.	PADO OWS	02	--			1000x1050x750	BHEL-EDN	
30.	PADO OPTIMIZATION SERVER	01	--			1000x1050x750	BHEL-EDN	
31.	PADO I/F PC1	01	--			1000x1050x750	BHEL-EDN	
32.	SAS GATEWAY PC	--	01			1000x1050x750	BHEL-TBG	
33.	VMS SERVER PC	01	--			1000x1050x750	BHEL-EDN	
34.	VMS CLIENT PC	01	--			1000x1050x750	BHEL-EDN	
35.	HV DATA CONCENTRATOR (OEWS+OWS)	02	01			1000x1050x750	BHEL-BPL	
36.	LV DATA CONCENTRATOR (OEWS+OWS)	02	01			1000x1050x750	BHEL-EPD	
37.	EWS FOR GRP RELAYS	01	--			1000x1050x750	BHEL-BPL	DELETED (PART OF PNL)
38.	LASERJET PRINTER (A3, COLOR)	03	--			900x600x740	BHEL-EDN	
39.	PADO PRINTER	01	01			900x600x740	BHEL-EDN	
41.	VMS LASERJET PRINTER (A3 SIZE)	01	--			900x600x740	BHEL-EDN	
42.	HV DATA CONCENTRATOR PRNTR (COLOR LASER)	01	--			900x600x740	BHEL-BPL	
43.	LV DATA CONCENTRATOR PRNTR (COLOR LASER)	01	--			900x600x740	BHEL-EPD	
44.	PRINTER FOR GRP RELAYS	01	--			900x600x740	BHEL-BPL	DELETED
45.	LASERJET PRINTER (A4, COLOR)	03	09			900x600x740	BHEL-EDN	ADDED IN REV. 01
46.	TSS A&D SERVER PC	01	--			1000x1050x750	BHEL-EDN	
47.	TSS A&D CLIENT PC	01	--			1000x1050x750	BHEL-EDN	
48.	TSS A&D PRINTER (A3 SIZE)	01	--			900x600x740	BHEL-EDN	
49.	3D SCANNER CBLMS PC	01	--			1000x1050x750	BHEL-EDN	
50.	3D SCANNER CBLMS (A4 SIZE)	01	--			900x600x740	BHEL-EDN	
50a.	ASLD PC	01	--			1000x1050x750	BHEL-TRY	
50b.	CONTROL VALVE PC	01	--			1000x1050x750	BHEL-PEM	CV VENDOR
50c-h.	CHP/AHP/CPU/FOPH/CAS/AAQMS PCs	06	--			1000x1050x750	BHEL-EDN	

CONTROL EQUIPMENT ROOM

S.No.	DESCRIPTION	QTY./UNIT	COMMON	LOCATION OF PNL UNIT#1	LOCATION OF PNL UNIT#2	DIMENSION(WxDxH)	SCOPE	REMARKS
51.	SG C&I PANEL	33	--	B/W ROW F' & G' and G' & H'. B/W COLMN 12 & 13.	B/W ROW E' & F' and F' & G'. B/W COLMN 13 & 14.	750x800x2117	BHEL-EDN	
52.	BOP C&I PANEL	73	07 (STG-1,KEPT IN UNIT 1) 02 (CMN FOR ALL 5 UNIT, KEPT IN UNIT 2)	B/W ROW D & E' and E' & F'. B/W COLMN 12 & 13.	B/W ROW D & E' and E' & F'. B/W COLMN 13 & 14.	750x800x2117	BHEL-EDN	
53.	TG C&I PANEL	24	--	B/W ROW D & E'. B/W COLMN 11a & 12.	B/W ROW D & E'. B/W COLMN 14 & 15.	750x800x2117	BHEL-EDN	
54.	GRP	01	--	B/W ROW C & D. B/W COLMN 12 & 13.	B/W ROW C & D. B/W COLMN 14 & 15.	5500x1000x2229	BHEL-BPL	
55.	STRP	--	--	--	--	--		PART OF SAS
56.	BUS TRANSFER PANEL	02	--	B/W ROW C & D. B/W COLMN 12 & 13.	B/W ROW C & D. B/W COLMN 14 & 15.	800x800x2355	BHEL-BPL	
57.	DAVR	01	--	B/W ROW C & D. B/W COLMN 12 & 13.	B/W ROW C & D. B/W COLMN 14 & 15.	4804x800x2295	BHEL-EDN	
58.	DATA CONCENTRATOR-LV	--	02	B/W ROW C & D. B/W COLMN 12 & 13.	--	800x800x2315	BHEL-EPD	
59.	DATA CONCENTRATOR-MV WITH GPS CLOCK	--	03	B/W ROW C & D. B/W COLMN 12 & 13.	--	800x800x2315	BHEL-BPL	
60.	TRANSDUCER & AVT	05+01*	--	B/W ROW D & E'. B/W COLMN 12 & 13.	B/W ROW D & E'. B/W COLMN 13 & 14.	750x800x2117	BHEL-EDN	AS PER INPUT RECEIVED FROM BHEL-EDN 1 NO. OF ADDITIONAL RELAY PANEL (i.e CXA05) HAS BEEN ADDED ONLY FOR UNIT#1.
61.	SCR PANEL	06	--	B/W ROW D & E'. B/W COLMN 11a & 12.	B/W ROW D & E'. B/W COLMN 14 & 15.	750x800x2117	BHEL-EDN	
62.	GRAVIMETRIC FEEDER PANEL	08	--	B/W ROW F' & G'. B/W COLMN 12 & 13.	B/W ROW 'F' & G'. B/W COLMN 13 & 14.	1200x600x2415	BHEL-TRY	
63.	NETWORK PANELs	03	06	B/W ROW C & D. B/W COLMN 12 & 13.	B/W ROW C & D. B/W COLMN 14 & 15.	750x800x2117	BHEL-EDN	
64.	ELE. INTERFACE SYS (EIS)/EMS PANEL	01	--	B/W ROW C & D. B/W COLMN 12 & 13.	B/W ROW C & D. B/W COLMN 14 & 15.	750x800x2117	BHEL-EDN	AS PER INPUT RECEIVED FROM BHEL-EDN WORKSTATION WILL BE MOUNTED INSIDE THE EIS/EMS PANEL.
	ENERGY MGMT SYS (EMS) WORKSTATION	02						
65.	ACDB (FOR MAIN UPS)	02	--	B/W ROW C & D. B/W COLMN 12 & 13.	B/W ROW C & D. B/W COLMN 14 & 15.	2400x1000x2215	BHEL-EDN	
66.	ACDB (FOR COMMON UPS)	02	--	B/W ROW C & D. B/W COLMN 12 & 13.	B/W ROW C & D. B/W COLMN 14 & 15.	1000x1000x2215	BHEL-EDN	
67.	VMS	05	--	B/W ROW D & E'. B/W COLMN 11a & 12.	B/W ROW D & E'. B/W COLMN 14 & 15.	750x800x2415	BHEL-EDN	
69.	GPS/MASTER CLOCK	--	01	B/W ROW C & D. B/W COLMN 12 & 13.	B/W ROW C & D. B/W COLMN 14 & 15.	800x800x2415	BHEL-EDN	AS PER INPUT RECEIVED FROM BHEL-EDN 1 NO. PANEL OF GPS MASTER CLOCK SYSTEM KEPT IN UNIT-1 IS COMMON FOR ALL 5 UNITS.
70.	HART MANAGEMENT SYSTEM	02	--	B/W ROW D & E'. B/W COLMN 11a & 12.	B/W ROW D & E'. B/W COLMN 14 & 15.	800x800x2415	BHEL-EDN	
71.	SAS GATEWAY PANEL	--	01	B/W ROW C & D. B/W COLMN 12 & 13.	B/W ROW C & D. B/W COLMN 14 & 15.	800x800x2295	BHEL-TBG/BPL	
72.	RTCC PANEL	02	--	B/W ROW C & D. B/W COLMN 12 & 13.	B/W ROW C & D. B/W COLMN 14 & 15.	660X600X2345	BHEL-JHS	
74.	ASLD SYS	01	--	B/W ROW F' & G'. B/W COLMN 12 & 13.	B/W ROW 'F' & G'. B/W COLMN 13 & 14.	800x800x2315	BHEL-TRY	
75.	GEN. END WNDG. VIB. MONITORING CAB	01	--	B/W ROW C & D. B/W COLMN 12 & 13.	B/W ROW C & D. B/W COLMN 13 & 14.	800x600x2200	BHEL-HWR	
76.	ALCS	01	--	B/W ROW F' & G'. B/W COLMN 12 & 13.	B/W ROW 'F' & G'. B/W COLMN 13 & 14.	750x800x2117	BHEL-EDN	
77.	CCTV PANEL	01	--	B/W ROW F' & G'. B/W COLMN 12 & 13.	B/W ROW 'F' & G'. B/W COLMN 13 & 14.	550x200x400	BHEL-TRY	
78.	CCTV SYSYTEM-MULTIPLEXER	01	--	B/W ROW F' & G'. B/W COLMN 12 & 13.	B/W ROW 'F' & G'. B/W COLMN 13 & 14.	500x500x900	BHEL-TRY	
79.	CCTV REMOTE RETRACT CONTROL UNIT	01	--	B/W ROW F' & G'. B/W COLMN 12 & 13.	B/W ROW 'F' & G'. B/W COLMN 13 & 14.	600x300x500	BHEL-TRY	
80.	CCTV SYSTEM FOR UNIT CAMERAs	--	01 (KEPT IN UNIT-1)	B/W ROW F' & G'. B/W COLMN 12 & 13.	--	800x1000x2000	BHEL-EDN	
81.	PA SYSTEM	--	01 (KEPT IN UNIT-2)	B/W ROW F' & G'. B/W COLMN 13 & 14.	--	800x1000x2000	BHEL-EDN	
82.	VFD PNL FOR DYNAM CLASSIFIER (MILL A-H)	08	--	B/W ROW G' & H'. B/W COLMN 12 & 13.	B/W ROW G' & H'. B/W COLMN 12 & 13.	(800+300+400) x600x2100	BHEL-HYD	
83.	CCTV SYSTEM FOR CPA CAMERAs	--	01 (KEPT IN UNIT-1)	B/W ROW F' & G'. B/W COLMN 12 & 13.	B/W ROW 'F' & G'. B/W COLMN 13 & 14.	800x1000x2000	BHEL-EDN	
S	SPARE SPACE							

REFERENCE DRAWING:

1. TG HALL EQUIPMENT LAYOUT PLAN AT OPERATING FLOOR — DRG, NO. PE-DG-417-100-M005
2. FUNCTION GROUPING DOCUMENT — EN-DG-1276-145-5001
3. CONFIGURATION DRAWING — DRG. NO. EN-DG-1276-145-4001
4. HMI BILL OF MATERIAL — EN-DG-1276-145-4002
5. LVS SYSTEM WRITEUP for METSO DNA HMI SYSTEM — DRG. NO. EN-DG-1276-145-4009
6. PADO PROPOSED CONFIGURATION — AS PER EMAIL RECEIVED EDN.

NOTES:-

1. ALL PANEL DIMENSIONS ARE IN mm
2. (symbol) - BRICK WALL WITH CLADDING
3. (symbol) - AL. FRAMED PARTIAL GLAZED
4. ◄ - FRONT
5. WALLS/PARTITIONS SHALL BE BUILT AFTER THE ERECTION OF THE PANELS.
6. FALSE CEILING HEIGHT SHALL BE 3.5 MTR.
7. SD* - SLIDING DOOR
8. S SPARE SPACE
9. ===== - 50 mm EXPENSION GAP

REV.	DATE	ALTD	CHD	APPD	DESCRIPTION
06	12.08.21	RINKY	KKM/SSB	DP	1. THIS DOCUMENT IS GENERALLY REVISED AS PER PEM-CIVIL OBSERVATIONs AND LATEST INPUT RECIEVED FROM BHEL-EDN.
05	02.07.21	RINKY -sd-	KKM/SSB -sd-	DP -sd-	1. REVISED IN LINE WITH THE CUSTOMER COMMENTs RECEIVED VIDE LTR REF. NO. TCE.11005A-IC-VDT-519 DTD 16.06.21.
04	03.06.21	RINKY -sd-	KKM/SSB -sd-	DP -sd-	1. REVISED IN LINE WITH THE CUSTOMER COMMENTs RECEIVED VIDE LTR REF. NO. TCE.11005A-IC-VDT-504 DTD 10.05.21. 2. THERE IS NO CHANGE IN THE DOCUMENT. REVISION NO. IS UPDATED TO SUBMIT THE DOCUMENT.
03	08.04.21	RINKY -sd-	RKR -sd-	DP -sd-	1. REVISED IN LINE WITH THE CUSTOMER COMMENTs RECEIVED VIDE LTR REF. NO. TCE.11005A-IC-VDT-472 DTD 24.02.21.
02	29.01.21	RINKY -sd-	RKR -sd-	DP -sd-	1. REVISED IN LINE WITH VARIOUS DISCUSSION AND CORRESPONDENCEs WITH TSGENCO/TCE (LATEST CORRESPONDENCE DTD 22.07.2020). 2. REVISED IN LINE WITH MOM WITH TSGENCO/TCE DTD 14.12.2020. 3. REVISED IN LINE WITH LATEST INPUTs RECEIVED FROM OTHER BHEL UNITs.
01	26.06.20	RINKY -sd-	RKR -sd-	DP -sd-	1. REVISED IN LINE WITH DISCUSSION AND VARIOUS CORRESPONDENCE WITH TSGENCO/TCE.

CUSTOMER: TELANGANA STATE POWER GENERATION CORPORATION LTD
TELANGANA STATE, INDIA
5 x 800 MW YADADRI TPS, NALGONDA

CONSULTANT: TATA CONSULTING ENGINEERS LIMITED
BANGALORE, INDIA

JOB NO. 417
STATUS CONTRACT
DISTRIBUTION

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
I	DRN	GA	-sd-	22.01.2018
	DESN	GA	-sd-	22.01.2018
	CHD	RKR/SSB	-sd-	22.01.2018
	APPD	SSB/DP	-sd-	22.01.2018

TITLE: CCR/CER/COMPUTER/UPS ROOM LAYOUT (AT EL 17.0M)

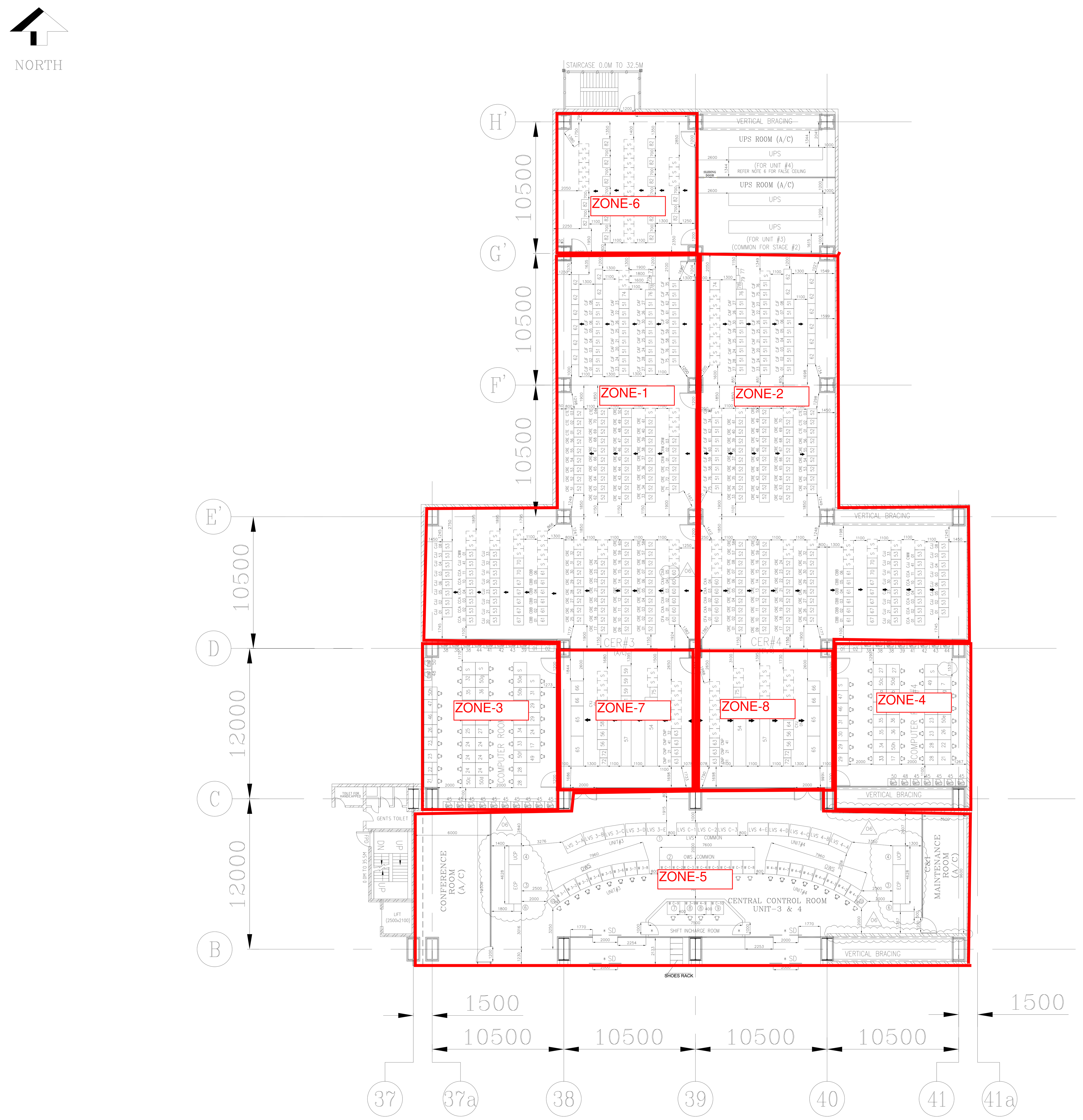
DEPT. SIGN SCALE NTS

DRAWING NO. PE-DG-417-145-I401

SHEET 1 OF 3 REV. 06

SIZE-A1

DRAWING No. PE-DG-417-145-I401



CENTRAL CONTROL ROOM
UNIT-3 & 4

CENTRAL CONTROL ROOM

S.No.	DESCRIPTION	QTY./UNIT	COMMON	LOCATION (UNIT # 3 & 4)	DIMENSION(WxDxH)	SCOPE	REMARKS
1.	LARGE VIDEO SCREEN (67")	05	03		1625x1000x2419	BHEL-EDN	
2.	CONTROL DESK (W3-1 TO W3-8)	08	--	B/W ROW B & C . B/W COLMN 37a & 41.	REFER EDN DRG NO. EN-DG-1175-145-4006	BHEL-EDN	
	CONTROL DESK (W4-1 TO W4-8)	08	--				
	CONTROL DESK (WC-1 to 3) CHP/AHP/FOPH/RW/CLW/CPU/CAS/CWP	--	03				
	CONTROL DESK (WC-4) PT PLANT	--	01				
	CONTROL DESK (WC-5) DM PLANT	--	01				
	CONTROL DESK (WC-6) H2 GENERATION	--	01				
	CONTROL DESK (WC-7) HVAC	--	01				
	CONTROL DESK (WC-8) FIRE WATER PUMPs	--	01				
3.	UNIT CONTROL PANEL	01	--		1448X1000X2355	BHEL-EDN	
4.	ELECTRICAL CONTROL PANEL	01	--		3128X1000X2355	BHEL-EDN	
~~5.~~	~~INERT GAS PANEL~~	~~--~~	~~01~~		650x400x1500	BHEL-PESD	SHIFTED TO CYLINDER ROOM @0.0M
6.	MAIN FIRE ALARM PANEL	01	--		600x600x1200	BHEL-PESD	
7.	MAIN FIRE ALARM PC & PRINTER 1 NO. PLACED IN SHIFT INCHAREGE & 1 NO. PLACED IN COMP ROOM-4	01	--		1000x1050x750	BHEL-PESD	
8.	SHIFT IN-CHARGE PC	01	--		1000x1050x750	BHEL-EDN	PLACED IN SHIFT INCHARGE ROOM
9.	RIVER WATER INTAKE PC	--	01		1000x1050x750	BHEL-EDN	PLACED IN SHIFT INCHARGE ROOM
10.	CCTV MONITOR	01	--		750x750x750	BHEL-EDN	
16.	WIRELESS BASE STATION	01	--		300x250x150	BHEL-EDN	PLACED ON DESK

COMPUTER ROOM

S.No.	DESCRIPTION	QTY./UNIT	COMMON	LOCATION UNIT#3	LOCATION UNIT#4	DIMENSION(WxDxH)	SCOPE	REMARKS
13.	NETWORK ATTACHED STORAGE (NAS)	01	-- 01	B/W ROW C & D . B/W COLMN 37a & 38.	B/W ROW C & D . B/W COLMN 40 & 41.	1000x900x1900	BHEL-PEM	PLACED IN RACK-1
14.	BACK-UP STATION	03	--				BHEL-PEM	PLACED IN RACK-1
15.	ALARM STATION	04				1000x900x1900	BHEL-PEM	PLACED IN RACK-2
17.	SOE PC	01	--			1500x750x735	BHEL-EDN	BASED ON EDN INPUT
21.	ENGINEERING ACTIVITY SERVER (EAS)	01	--			1500x750x735	BHEL-EDN	
22.	ENGINEERING ACTIVITY CLIENT (EAC)	01	--			1500x750x735	BHEL-EDN	
23.	INFO SERVER	02 01	--			1500x750x735	BHEL-EDN	
24.	OPERATOR WORK STATION (OFFSITE)	--	07 01			1500x750x735	BHEL-EDN	
25.	OPC PC	--	--			1500x750x735	BHEL-EDN	
26.	PEFORMANCE CALCULATION PC	01	--			1500x750x735	BHEL-EDN	
27.	MIS SERVER STATION	03 02	--			1500x750x735	BHEL-EDN	
28.	MIS CLIENT STATION	02 01	--			1500x750x735	BHEL-EDN	
29.	PADO OWS	02	--			1500x750x735	BHEL-EDN	
30.	PADO OPTIMIZATION SERVER	01 01	--			1500x750x735	BHEL-EDN	
31.	PADO I/F PC1	01	--			1500x750x735	BHEL-EDN	
32.	SAS GATEWAY PC	--	01			1500x750x735	BHEL-TBG	
33.	VMS SERVER PC	01	--			1500x750x735	BHEL-EDN	
34.	VMS CLIENT PC	01	--			1500x750x735	BHEL-EDN	
35.	HV DATA CONCENTRATOR (OEWS+OWS)	02	01			1500x750x735	BHEL-BPL	
36.	LV DATA CONCENTRATOR (OEWS+OWS)	02	01			1500x750x735	BHEL-EPD	
~~37.~~	~~EWS FOR GRP RELAYS~~	~~01~~				~~1500x750x735~~	~~BHEL-BPL~~	DELETED (PART OF PNL)
38.	LASERJET PRINTER (A3, COLOR)	03 01	--			900x600x740	BHEL-EDN	
39.	PADO PRINTER	01	01			900x600x740	BHEL-EDN	
41.	VMS LASERJET PRINTER (A3 SIZE)	01	--			900x600x740	BHEL-EDN	
42.	HV DATA CONCENTRATOR PRNTR (COLOR LASER)	01	--			900x600x740	BHEL-BPL	
43.	LV DATA CONCENTRATOR PRNTR (COLOR LASER)	01	--			900x600x740	BHEL-EPD	
44.	PRINTER FOR GRP RELAYS	01	--			900x600x740	BHEL-BPL	
45.	LASERJET PRINTER (A4, COLOR)	03	09			900x600x740	BHEL-EDN	ADDED IN REV. 01
46.	TSS A&D SERVER PC	01	--			1000x1050x750	BHEL-EDN	
47.	TSS A&D CLIENT PC	01	--			1000x1050x750	BHEL-EDN	
48.	TSS A&D PRINTER (A3 SIZE)	01	--			900x600x740	BHEL-EDN	
49.	3D SCANNER CBLMS PC	01	--			1000x1050x750	BHEL-EDN	
50.	3D SCANNER CBLMS (A4 SIZE)	01	--			900x600x740	BHEL-EDN	
50a.	ASLD PC	01	--			1000x1050x750	BHEL-TRY	
50b.	CONTROL VALVE PC	01	--			1000x1050x750	BHEL-PEM	CV VENDOR
50c-h.	CHP/AHP/CPU/FOPH/CAS/AAQMS PCs	06	--			1000x1050x750	BHEL-EDN	

CONTROL EQUIPMENT ROOM

S.No.	DESCRIPTION	QTY./UNIT	COMMON	LOCATION OF PNL UNIT#3	LOCATION OF PNL UNIT#4	DIMENSION(WxDxH)	SCOPE	REMARKS
51.	SG C&I PANEL	33	--	B/W ROW F' & G' and G' & H'. B/W COLMN 38 & 39.	B/W ROW E' & F' and F' & G'. B/W COLMN 39 & 40.	750x800x2117	BHEL-EDN	
52.	BOP C&I PANEL	73	07 (STG-2,KEPT IN UNIT 3)	B/W ROW D & E' and E' & F'. B/W COLMN 38 & 39.	B/W ROW D & E' and E' & F'. B/W COLMN 39 & 40.	750x800x2117	BHEL-EDN	
53.	TG C&I PANEL	24	--	B/W ROW D & E' . B/W COLMN 37a & 38.	B/W ROW D & E' . B/W COLMN 40 & 41.	750x800x2117	BHEL-EDN	
54.	GRP	01	--	B/W ROW C & D . B/W COLMN 38 & 39.	B/W ROW C & D . B/W COLMN 40 & 41.	5500x1000x2229	BHEL-BPL	
55.	STRP	--	--	--	--	--		PART OF SAS
56.	BUS TRANSFER PANEL	02	--	B/W ROW C & D . B/W COLMN 38 & 39.	B/W ROW C & D . B/W COLMN 40 & 41.	800x800x2355	BHEL-BPL	
57.	DAVR	01	--	B/W ROW C & D . B/W COLMN 38 & 39.	B/W ROW C & D . B/W COLMN 40 & 41.	4804x800x2295	BHEL-EDN	
58.	DATA CONCENTRATOR-LV	--	02	B/W ROW C & D . B/W COLMN 38 & 39.	--	800x800x2315	BHEL-EPD	
59.	DATA CONCENTRATOR-MV WITH GPS CLOCK	--	03	B/W ROW C & D . B/W COLMN 38 & 39.	--	800x800x2315	BHEL-BPL	
60.	TRANSDUCER & AVT	05+01*	--	B/W ROW D & E' . B/W COLMN 38 & 39.	B/W ROW D & E' . B/W COLMN 39 & 40.	750x800x2117	BHEL-EDN	AS PER INPUT RECEIVED FROM BHEL-EDN 1 NO. OF ADDITIONAL RELAY PANEL (i.e CXA05) HAS BEEN ADDED ONLY FOR UNIT#3.
61.	SCR PANEL	06	--	B/W ROW D & E' . B/W COLMN 11a & 12.	B/W ROW D & E' . B/W COLMN 40 & 41.	750x800x2117	BHEL-EDN	
62.	GRAVIMETRIC FEEDER PANEL	08	--	B/W ROW 'G' & H'. B/W COLMN 38 & 39.	B/W ROW 'F' & G'. B/W COLMN 39 & 40.	1200x600x2415	BHEL-TRY	
63.	NETWORK PANELs	03	01	B/W ROW C & D . B/W COLMN 38 & 39.	B/W ROW C & D . B/W COLMN 40 & 41.	750x800x2117	BHEL-EDN	
64.	ELE. INTERFACE SYS (EIS)/EMS PANEL	01	--	B/W ROW C & D . B/W COLMN 38 & 39.	B/W ROW C & D . B/W COLMN 40 & 41.	750x800x2117	BHEL-EDN	AS PER INPUT RECEIVED FROM BHEL-EDN WORKSTATION WILL BE MOUNTED INSIDE THE EIS/EMS PANEL.
	ENERGY MGMT SYS (EMS) WORKSTATION	02						
65.	ACDB (FOR MAIN UPS)	02	--	B/W ROW C & D . B/W COLMN 38 & 39.	B/W ROW C & D . B/W COLMN 40 & 41.	2400x1000x2215	BHEL-EDN	
66.	ACDB (FOR COMMON UPS)	02	--	B/W ROW C & D . B/W COLMN 38 & 39.	B/W ROW C & D . B/W COLMN 40 & 41.	1000x1000x2215	BHEL-EDN	
67.	VMS	05	--	B/W ROW D & E' . B/W COLMN 11a & 12.	B/W ROW D & E' . B/W COLMN 40 & 41.	750x800x2415	BHEL-EDN	
69.	GPS/MASTER CLOCK	--	--	B/W ROW C & D . B/W COLMN 38 & 39.	B/W ROW C & D . B/W COLMN 40 & 41.	800x800x2415	BHEL-EDN	AS PER INPUT RECEIVED FROM BHEL-EDN 1 NO. PANEL OF GPS MASTER CLOCK SYSTEM KEPT IN UNIT-1 IS COMMON FOR ALL 5 UNITS.
70.	HART MANAGEMENT SYSTEM	02	--	B/W ROW D & E' . B/W COLMN 37a & 38.	B/W ROW D & E' . B/W COLMN 40 & 41.	800x800x2415	BHEL-EDN	
71.	SAS PANEL	--	01	B/W ROW C & D . B/W COLMN 38 & 39.	B/W ROW C & D . B/W COLMN 40 & 41.	800x800x2415	BHEL-TBG	
72.	RTCC PANEL	02	--	B/W ROW C & D . B/W COLMN 38 & 39.	B/W ROW C & D . B/W COLMN 40 & 41.	660X600X2345	BHEL-JHS	
74.	BHELSONIC TUBE LEAK DETECTION SYS	01	--	B/W ROW F' & G'. B/W COLMN 38 & 39.	B/W ROW 'F' & G'. B/W COLMN 39 & 40.	800x800x2315	BHEL-TRY	
75.	GEN. END WNDG. VIB. MONITORING CAB	01	--	B/W ROW C & D . B/W COLMN 38 & 39.	B/W ROW C & D . B/W COLMN 39 & 40.	800x600x2200	BHEL-HWR	
76.	ALCS	01	--	B/W ROW F' & G'. B/W COLMN 38 & 39.	B/W ROW 'F' & G'. B/W COLMN 39 & 40.	750x800x2117	BHEL-EDN	
77.	CCTV PANEL	01	--	B/W ROW F' & G'. B/W COLMN 38 & 39.	B/W ROW 'F' & G'. B/W COLMN 39 & 40.	550x200x400	BHEL-TRY	
78.	CCTV SYSYTEM-MULTIPLEXER	01	--	B/W ROW F' & G'. B/W COLMN 38 & 39.	B/W ROW 'F' & G'. B/W COLMN 39 & 40.	500x500x900	BHEL-TRY	
79.	CCTV REMOTE RETRACT CONTROL UNIT	01	--	B/W ROW F' & G'. B/W COLMN 38 & 39.	B/W ROW 'F' & G'. B/W COLMN 39 & 40.	600x300x500	BHEL-TRY	
80.	CCTV SYSTEM FOR UNIT CAMERAs	--	--	--	--	--	--	
81.	PA SYSTEM	--	--	--	--	--	--	
82.	VFD PNL FOR DYNAM CLASSIFIER (MILL A-H)	08	--	B/W ROW G' & H'. B/W COLMN 38 & 39.	B/W ROW G' & H'. B/W COLMN 38 & 39.	(800+300+400) x600x2100	BHEL-HYD	
83.	CCTV SYSTEM FOR CPA CAMERAs	--	--	--	--	--	--	
S	SPARE SPACE							

REFERENCE DRAWING:

1. TG HALL EQUIPMENT LAYOUT PLAN AT OPERATING FLOOR — DRG, NO. PE-DG-417-100-M005
2. FUNCTION GROUPING DOCUMENT — EN-DG-1276-145-5001
3. CONFIGURATION DRAWING — DRG. NO. EN-DG-1276-145-4001
4. HMI BILL OF MATERIAL — EN-DG-1276-145-4002
5. LVS SYSTEM WRITEUP for METSO DNA HMI SYSTEM — DRG. NO. EN-DG-1276-145-4009
6. PADO PROPOSED CONFIGURATION — AS PER EMAIL RECEIVED EDN.

NOTES:-

1. ALL PANEL DIMENSIONS ARE IN mm
2. — BRICK WALL WITH CLADDING
3. — AL. FRAMED PARTIAL GLAZED
4. ◄ — FRONT
5. WALLS/PARTITIONS SHALL BE BUILT AFTER THE ERECTION OF THE PANELS.
6. FALSE CEILING HEIGHT SHALL BE 3.5 MTR.
7. SD* — SLIDING DOOR
8. [S] SPARE SPACE
9. ===== — 50 mm EXPENSION GAP

REV.	DATE	ALTD	CHD	APPD	DESCRIPTION
06	12.08.21	RINKY	KKM/SSB	DP	1. THIS DOCUMENT IS GENERALLY REVISED AS PER PEM-CIVIL OBSERVATIONs AND LATEST INPUT RECIEVED FROM BHEL-EDN.
05	02.07.21	RINKY	KKM/SSB	DP	1. REVISED IN LINE WITH THE CUSTOMER COMMENTs RECEIVED VIDE LTR REF. NO. TCE.11005A-IC-VDT-519 DTD 16.06.21.
04	03.06.21	RINKY	KKM/SSB	DP	1. REVISED IN LINE WITH THE CUSTOMER COMMENTs RECEIVED VIDE LTR REF. NO. TCE.11005A-IC-VDT-504 DTD 10.05.21. 2. THERE IS NO CHANGE IN THE DOCUMENT. REVISION NO. IS UPDATED TO SUBMIT THE DOCUMENT.
03	08.04.21	RINKY	RKR	DP	1. REVISED IN LINE WITH THE CUSTOMER COMMENTs RECEIVED VIDE LTR REF. NO. TCE.11005A-IC-VDT-472 DTD 24.02.21.
02	29.01.21	RINKY	RKR	DP	1. REVISED IN LINE WITH VARIOUS DISCUSSION AND CORRESPONDENCEs WITH TSGENCO/TCE (LATEST CORRESPONDENCE DTD 22.07.2020). 2. REVISED IN LINE WITH MOM WITH TSGENCO/TCE DTD 14.12.2020. 3. REVISED IN LINE WITH LATEST INPUTs RECEIVED FROM OTHER BHEL UNITs.
01	26.06.20	RINKY	RKR	DP	1. REVISED IN LINE WITH DISCUSSION AND VARIOUS CORRESPONDENCE WITH TSGENCO/TCE.

CUSTOMER: TELANGANA STATE POWER GENERATION CORPORATION LTD
TELANGANA STATE, INDIA
5 x 800 MW YADADRI TPS, NALGONDA

CONSULTANT: TATA CONSULTING ENGINEERS LIMITED
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JOB NO. 417
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BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
I	DRN	GA	-sd-	22.01.2018
	DESN	GA	-sd-	22.01.2018
	CHD	RKR/SSB	-sd-	22.01.2018
	APPD	SSB/DP	-sd-	22.01.2018

TITLE: CCR/CER/COMPUTER/UPS ROOM LAYOUT (AT EL 17.0M)

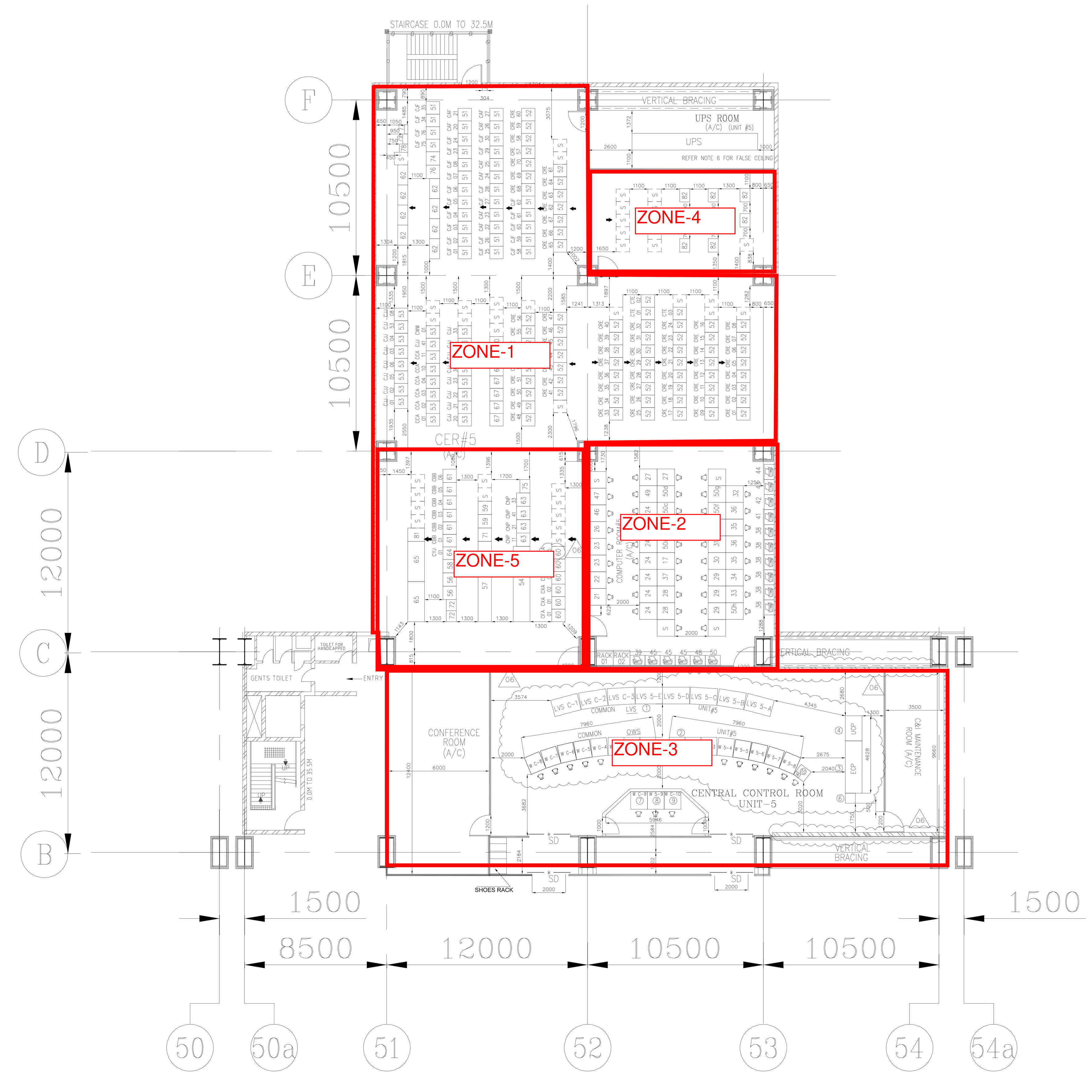
DEPT. SCALE NTS
SIGN

DRAWING NO. PE-DG-417-145-I401
SHEET 2 OF 3 REV. 06

SIZE-A1

DRAWING No. PE-DG-417-145-1401

NORTH



CENTRAL CONTROL ROOM
UNIT-5

CENTRAL CONTROL ROOM

S.No.	DESCRIPTION	QTY./UNIT	COMMON	LOCATION (UNIT # 5)	DIMENSION(WxDxH)	SCOPE	REMARKS
1.	LARGE VIDEO SCREEN (67")	05	03		1625x1000x2419	BHEL-EDN	
2.	CONTROL DESK (W5-1 TO W5-8)	08	--		REFER EDN DRG NO. EN-DG-1175-145-4006	BHEL-EDN	
	CONTROL DESK (WC-1 to 3) CHP/AHP/FOPH/RW/CLW/CPU/CAS/CWP	--	03				
	CONTROL DESK (WC-4) PT PLANT	--	01				
	CONTROL DESK (WC-5) DM PLANT	--	01				
	CONTROL DESK (WC-6) H2 GENERATION	--	01				
	CONTROL DESK (WC-7) HVAC	--	01	B/W ROW B & C. B/W COLMN 51 & 54.			
	CONTROL DESK (WC-8) FIRE WATER PUMPs	--	01				
3.	UNIT CONTROL PANEL	01	--		1448X1000X2355	BHEL-EDN	
4.	ELECTRICAL CONTROL PANEL	01	--		3128X1000X2355	BHEL-EDN	
5.	INERT GAS PANEL	--	01		650x400x1500	BHEL-PESD	SHIFTED TO CYLINDER ROOM @0.0M
6.	MAIN FIRE ALARM PANEL	01	--		600x600x1200 01	BHEL-PESD	
7.	MAIN FIRE ALARM PC & PRINTER	01	--		1000x1050x750	BHEL-PESD	PLACED IN SHIFT INCHARGE ROOM
8.	SHIFT IN-CHARGE PC	01	--		1000x1050x750	BHEL-EDN	PLACED IN SHIFT INCHARGE ROOM
9.	RIVER WATER INTAKE PC	--	01		1000x1050x750	BHEL-EDN	PLACED IN SHIFT INCHARGE ROOM
10.	CCTV MONITOR	01	--		750x750x750	BHEL-EDN	
16.	WIRELESS BASE STATION	01	--		300x250x150	BHEL-EDN	PLACED ON DESK

COMPUTER ROOM

S.No.	DESCRIPTION	QTY./UNIT	COMMON	LOCATION UNIT#5	DIMENSION(WxDxH)	SCOPE	REMARKS
13.	NETWORK ATTACHED STORAGE (NAS)	01	-- 01		1000x900x1900	BHEL-PEM	PLACED IN RACK-1
14.	BACK-UP STATION	03	--			BHEL-PEM	PLACED IN RACK-1
15.	ALARM STATION	04			1000x900x1900	BHEL-PEM	PLACED IN RACK-2
17.	SOE PC	01	--		1500x750x735	BHEL-EDN	BASED ON EDN INPUT
21.	ENGINEERING ACTIVITY SERVER (EAS)	01	--		1500x750x735	BHEL-EDN	
22.	ENGINEERING ACTIVITY CLIENT (EAC)	01	--		1500x750x735	BHEL-EDN	
23.	INFO SERVER	02 01	--		1500x750x735	BHEL-EDN	
24.	OPERATOR WORK STATION (OFFSITE)	--	07 01		1500x750x735	BHEL-EDN	
25.	OPC PC	--	--		1500x750x735	BHEL-EDN	
26.	PEFORMANCE CALCULATION PC	01	--		1500x750x735	BHEL-EDN	
27.	MIS SERVER STATION	03 02	--		1500x750x735	BHEL-EDN	
28.	MIS CLIENT STATION	02 01	--		1500x750x735	BHEL-EDN	
29.	PADO OWS	02	--	B/W ROW C & D. B/W COLMN 52 & 53.	1500x750x735	BHEL-EDN	
30.	PADO OPTIMIZATION SERVER	01 01	--		1500x750x735	BHEL-EDN	
31.	PADO I/F PC1	01	--		1500x750x735	BHEL-EDN	
32.	SAS GATEWAY PC	--	01		1500x750x735	BHEL-TBG	
33.	VMS SERVER PC	01	--		1500x750x735	BHEL-EDN	
34.	VMS CLIENT PC	01	--		1500x750x735	BHEL-EDN	
35.	HV DATA CONCENTRATOR (OEWS+OWS)	02	--		1500x750x735	BHEL-BPL	
36.	LV DATA CONCENTRATOR (OEWS+OWS)	02	--		1500x750x735	BHEL-EPD	
37.	EWS FOR GRP RELAYS	01			1500x750x735	BHEL-BPL	DELETED (PART OF PNL)
38.	LASERJET PRINTER (A3, COLOR)	03 01	--		900x600x740	BHEL-EDN	
39.	PADO PRINTER	01	01		900x600x740	BHEL-EDN	
41.	VMS LASERJET PRINTER (A3 SIZE)	01	--		900x600x740	BHEL-EDN	
42.	HV DATA CONCENTRATOR PRNTR (COLOR LASER)	01	--		900x600x740	BHEL-BPL	
43.	LV DATA CONCENTRATOR PRNTR (COLOR LASER)	01	--		900x600x740	BHEL-EPD	
44.	PRINTER FOR GRP RELAYS	01	--		900x600x740	BHEL-BPL	
45.	LASERJET PRINTER (A4, COLOR)	03	09		900x600x740	BHEL-EDN	ADDED IN REV. 01
46.	TSS A&D SERVER PC	01	--		1000x1050x750	BHEL-EDN	
47.	TSS A&D CLIENT PC	01	--		1000x1050x750	BHEL-EDN	
48.	TSS A&D PRINTER (A3 SIZE)	01	--		900x600x740	BHEL-EDN	
49.	3D SCANNER CBLMS PC	01	--		1000x1050x750	BHEL-EDN	
50.	3D SCANNER CBLMS (A4 SIZE)	01	--		900x600x740	BHEL-EDN	
50a.	ASLD PC	01	--		1000x1050x750	BHEL-TRY	
50b.	CONTROL VALVE PC	01	--		1000x1050x750	BHEL-PEM	CV VENDOR
50c-h.	CHP/AHP/CPU/FOPH/CAS/AAQMS PCs	06			1000x1050x750	BHEL-EDN	

CONTROL EQUIPMENT ROOM

S.No.	DESCRIPTION	QTY./UNIT	COMMON	LOCATION OF PNL UNIT#5	DIMENSION(WxDxH)	SCOPE	REMARKS
51.	SG C&I PANEL	33	--	B/W ROW E & F. B/W COLMN 51 & 53.	750x800x2117	BHEL-EDN	
52.	BOP C&I PANEL	73 01	--	B/W ROW D & E and E & F. B/W COLMN 51 & 52.	750x800x2117	BHEL-EDN	
53.	TG C&I PANEL	24	--	B/W ROW D & E. B/W COLMN 51 & 52.	750x800x2117	BHEL-EDN	
54.	GRP	01	--	B/W ROW C & D. B/W COLMN 51 & 52.	5500x1000x2229	BHEL-BPL	
55.	STRP	--	--	--	--		PART OF SAS
56.	BUS TRANSFER PANEL	02	--	B/W ROW C & D. B/W COLMN 51 & 52.	800x800x2355	BHEL-BPL	
57.	DAVR	01	--	B/W ROW C & D. B/W COLMN 51 & 52.	4804x800x2295	BHEL-EDN	
58.	DATA CONCENTRATOR-LV	--	01	B/W ROW C & D. B/W COLMN 51 & 52.	800x800x2315	BHEL-EPD	
59.	DATA CONCENTRATOR-MV WITH GPS CLOCK 05	--	02	B/W ROW C & D. B/W COLMN 51 & 52.	800x800x2315	BHEL-BPL	
60.	TRANSDUCER & AVT 06	05+01*	--	B/W ROW C & D. B/W COLMN 51 & 52.	750x800x2117	BHEL-EDN	AS PER INPUT RECEIVED FROM BHEL-EDN 1 NO. OF ADDITIONAL RELAY PANEL (i.e CXA05) HAS BEEN ADDED FOR UNIT#5. 06
61.	SCR PANEL	06	--	B/W ROW C & D. B/W COLMN 51 & 52.	750x800x2117	BHEL-EDN	
62.	GRAVIMETRIC FEEDER PANEL	08	--	B/W ROW E & F. B/W COLMN 51 & 52.	1200x600x2415	BHEL-TRY	
63.	NETWORK PANELs	03	01	B/W ROW C & D. B/W COLMN 51 & 52.	750x800x2117	BHEL-EDN	
64.	ELE. INTERFACE SYS (EIS)/EMS PANEL	01	--	B/W ROW C & D. B/W COLMN 51 & 52.	750x800x2117	BHEL-EDN	AS PER INPUT RECEIVED FROM BHEL-EDN WORKSTATION WILL BE MOUNTED INSIDE THE EIS/EMS PANEL. 03
	ENERGY MGMT SYS (EMS) WORKSTATION	02					
65.	ACDB (FOR MAIN UPS)	02	--	B/W ROW C & D. B/W COLMN 51 & 52.	2400x1000x2215	BHEL-EDN	
66.	ACDB (FOR COMMON UPS)	--	--	--	--	--	
67.	VMS	05	--	B/W ROW D & E. B/W COLMN 51 & 52.	750x800x2415	BHEL-EDN	
69.	GPS/MASTER CLOCK	--	-- 03	B/W ROW C & D. B/W COLMN 51 & 52.	800x800x2415	BHEL-EDN	AS PER INPUT RECEIVED FROM BHEL-EDN 1 NO. PANEL OF GPS MASTER CLOCK SYSTEM KEPT IN UNIT-1 IS COMMON FOR ALL 5 UNITS. 03
70.	HART MANAGEMENT SYSTEM	02	--	B/W ROW D & E. B/W COLMN 51 & 52.	800x800x2415	BHEL-EDN	
71.	SAS PANEL	--	01	--	800x800x2415	BHEL-TBG	
72.	RTCC PANEL	02	--	B/W ROW C & D. B/W COLMN 51 & 52.	660X600X2345	BHEL-JHS	
74.	BHELSONIC TUBE LEAK DETECTION SYS	01	--	B/W ROW E & F. B/W COLMN 51 & 52.	800x800x2315	BHEL-TRY	
75.	GEN. END WNDG. VIB. MONITORING CAB	01	--	B/W ROW C & D. B/W COLMN 51 & 52.	800x600x2200	BHEL-HWR	
76.	ALCS	01	--	B/W ROW E & F. B/W COLMN 51 & 52.	750x800x2117	BHEL-EDN	
77.	CCTV PANEL	01	--	B/W ROW E & F. B/W COLMN 51 & 52.	550x200x400	BHEL-TRY	
78.	CCTV SYSYTEM-MULTIPLEXER	01	--	B/W ROW E & F. B/W COLMN 51 & 52.	500x500x900	BHEL-TRY	
79.	CCTV REMOTE RETRACT CONTROL UNIT	01	--	B/W ROW E & F. B/W COLMN 51 & 52.	600x300x500	BHEL-TRY	
80.	CCTV SYSTEM FOR UNIT CAMERAs	--	--	--	--	--	
81.	PA SYSTEM	01	--	B/W ROW C & D. B/W COLMN 51 & 52.	800x1000x2000	BHEL-EDN	
82.	VFD PNL FOR DYNAM CLASSIFIER (MILL A-H)	08	--	B/W ROW E & F. B/W COLMN 52 & 53.	(800+300+400) x600x2100	BHEL-HYD	
83.	CCTV SYSTEM FOR CPA CAMERAs	--	--	--	--	--	
S	SPARE SPACE						

REFERENCE DRAWING:

1. TG HALL EQUIPMENT LAYOUT PLAN AT OPERATING FLOOR — DRG, NO. PE-DG-417-100-M005
2. FUNCTION GROUPING DOCUMENT — EN-DG-1276-145-5001
3. CONFIGURATION DRAWING — DRG. NO. EN-DG-1276-145-4001
4. HMI BILL OF MATERIAL — EN-DG-1276-145-4002
5. LVS SYSTEM WRITEUP for METSO DNA HMI SYSTEM — DRG. NO. EN-DG-1276-145-4009
6. PADO PROPOSED CONFIGURATION — AS PER EMAIL RECEIVED EDN.

NOTES:-

1. ALL PANEL DIMENSIONS ARE IN mm
2. – BRICK WALL WITH CLADDING
3. – AL. FRAMED PARTIAL GLAZED
4. ◄ – FRONT
5. WALLS/PARTITIONS SHALL BE BUILT AFTER THE ERECTION OF THE PANELS.
6. FALSE CEILING HEIGHT SHALL BE 3.5 MTR.
7. SD* – SLIDING DOOR
8. [S] SPARE SPACE

REV.	DATE	ALTD	CHD	APPD	DESCRIPTION
06	12.08.21	RINKY	KKM/SSB	DP	1. THIS DOCUMENT IS GENERALLY REVISED AS PER PEM-CIVIL OBSERVATIONs AND LATEST INPUT RECIEVED FROM BHEL-EDN.
05	02.07.21	RINKY -sd-	KKM/SSB -sd-	DP -sd-	1. REVISED IN LINE WITH THE CUSTOMER COMMENTs RECEIVED VIDE LTR REF. NO. TCE.11005A-IC-VDT-519 DTD 16.06.21.
04	03.06.21	RINKY -sd-	KKM/SSB -sd-	DP -sd-	1. REVISED IN LINE WITH THE CUSTOMER COMMENTs RECEIVED VIDE LTR REF. NO. TCE.11005A-IC-VDT-504 DTD 10.05.21. 2. THERE IS NO CHANGE IN THE DOCUMENT. REVISION NO. IS UPDATED TO SUBMIT THE DOCUMENT.
03	08.04.21	RINKY -sd-	RKR -sd-	DP -sd-	1. REVISED IN LINE WITH THE CUSTOMER COMMENTs RECEIVED VIDE LTR REF. NO. TCE.11005A-IC-VDT-472 DTD 24.02.21.
02	29.01.21	RINKY -sd-	RKR -sd-	DP -sd-	1. REVISED IN LINE WITH VARIOUS DISCUSSION AND CORRESPONDENCEs WITH TSGENCO/TCE (LATEST CORRESPONDENCE DTD 22.07.2020). 2. REVISED IN LINE WITH MOM WITH TSGENCO/TCE DTD 14.12.2020. 3. REVISED IN LINE WITH LATEST INPUTs RECEIVED FROM OTHER BHEL UNITs.
01	07.07.20	RINKY -sd-	RKR -sd-	DP -sd-	1. REVISED IN LINE WITH DISCUSSION AND VARIOUS CORRESPONDENCE WITH TSGENCO/TCE.

CUSTOMER: TELANGANA STATE POWER GENERATION CORPORATION LTD
TELANGANA STATE, INDIA
5 x 800 MW YADADRI TPS, NALGONDA

CONSULTANT: TATA CONSULTING ENGINEERS LIMITED
BANGALORE, INDIA

JOB NO. 417
STATUS CONTRACT
DISTRIBUTION

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
I	DRN	GA	-sd-	22.01.2018
	DESN	GA	-sd-	22.01.2018
	CHD	RKR/SSB	-sd-	22.01.2018
	APPD	SSB/DP	-sd-	22.01.2018

TITLE: CCR/CER/COMPUTER/UPS ROOM LAYOUT (AT EL 17.0M)

DEPT. SCALE NTS
SIGN

DRAWING NO. PE-DG-417-145-I401
SHEET 3 OF 3 REV. 06

SIZE-A1

5 x 800 MW YADADRI
LIST FIRE ALARM PANELS

Date: 28.08.2021

Sl. No.	Locations	Type of Panel	Remarks
1	CCR 1&2	FAP	
2	CCR 3&4	FAP	
3	CCR 5	FAP	
4	Switchyard Control Room	FAP	
5	CHP Control Room-3	FAP	
6	AHP Control Room-2	FAP	
7	AHP Control Room-3	FAP	
8	Service Building-1	FAP	
9	Service Building-2	FAP	
10	Admin Building	FAP	
11	Fire Station	FAP	
12	DM Plant Control Room	FAP	
13	PT Plant Control Room	RP	
14	CW Pump House Control Room-1	FAP	
15	CW Pump House Control Room-2	RP	
16	CW Chlorination Building-1	RP	
17	CW Chlorination Building-2	RP	
18	STP Control Room	RP	
19	ETP Control Room	RP	
20	FGD Control Room-1	RP	
21	FGD Control Room-2	FAP	
22	Fire Water Pump House	RP	
23	Stores	RP	
24	ESP Control Room-1	RP	
25	ESP Control Room-2	FAP	
26	ESP Control Room-3	FAP	
27	ESP Control Room-4	RP	
28	ESP Control Room-5	RP	
29	Ash Water Recovery Pump House	FAP	This shall be a stand alone panel. This panel shall be interfaced with local DCS.
30	CHP Control Room-4	FAP	
31	CHP Control Room-2	FAP	

BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING & SYSTEMS DIVISION

PROJECT: -Project Name

,

ANNEXURE-E

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

	Master Document Schedule	Annexure-H of PY56397
	Project:5 x800MW Yadadri	

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-H of PY56397
	Project:5 x800MW Yadadri	

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-H of PY56397
	Project:5 x800MW Yadadri	

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-H of PY56397
	Project:5 x800MW Yadadri	

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								

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	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
2.0	**INPROCESS INSPECTION**												
3.0	**FINAL INSPECTION & TESTING**												
4.0	**PRESERVATION & PACKING**												

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL /BHEL's TPIA(BHEL NOMINATED INSPECTION AGENCY) 2 FOR VENDOR/SUB VENDOR & 3 BHEL's CUSTOMER 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

BHARAT HEAVY ELECTRICALS LIMITED
RAMACHANDRAPURAM:: HYDERABAD – 502032
PROJECT ENGINEERING & SYSTEMS DIVISION
QUALITY & BUSINESS EXCELLANCE DEPARTMENT

Format for inspection call

Ref: BHEL/PESD/QA/11 **Dt: 28.07.2020**

Due to unavailability of all BHEL/Customer, approved documents TPIAs visits are being wasted .To avoid this it is mandatory that vendor should arrange all the approved reference documents and then only raise the inspection call in portal. Vendor has to fill the below details and upload this documents in portal while raising the inspection call.

Sr.No	Approved Documents	Approved Documents date
	Approved QAP No with revision	
	Approved Drawing No with revision	
	Approved Data Sheet No with revision	
	Purchase specification	
	Purchase Order/BBU	

Note: While raising inspection call vendor has to take care of below points.

1. **Purchasing Unit:** Purchasing Unit should be PE & SD.
2. **Joint Inspection:** Joint inspection means that BHEL and BHEL client both are jointly attending the inspection.
3. **CQ Center:** CQ center is a TPIA nearest region,suppose inspection is in Mumbai than CQ center will be either of TUV Mumbai or BVI Mumbai.

Vendor Signature

PROJECT ENGINEERING & SYSTEMS DIVISION
RC PURAM, HYDERABAD.
QUALITY & BUSINESS EXELLENCE

INSPECTION / TC REVIEW FORMAT

1	Vendor's Name:		5	Applicable BHEL Spec No:	
2	Project:		6	Approved Drawing No:	
3	PO No:		7	Approved Data Sheet No:	
4	Item Description:		8	Approved QAP No:	

OFFER LIST

S.No	BBU/ PO Sr. No.	Item Description	Total Qty as per PO/BBU	Qty. already accepted	Qty offered for TC review	Cumulative Qty	Balance Qty
A							
B							
C							
D							

TC REVIEW REQUISITION

BBU / PO Sr. No.	QAP Clause No.	Format of Record	Certificate No. & Date	Page No.	REMARKS
A. Item Description:					
B. Item Description:					
C. Item Description:					
D. Item Description:					
E. Item Description:					

SUPPLIER / VENDOR SIGNATURE WITH SEAL	BHEL/ BHEL's TPIA SIGNATURE WITH SEAL
Dt:	Dt:

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM	REV NO: 00 / DATE:
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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
	Incoming Material like fabricated items, PCBs, Lamps, Push buttons, Fire detectors, temp detectors, UV, IR, Ionisation Type,MCP, Annunciators, battery, battery charger, exit signs, zener battries, short circuit/fault/isolator etc..	Visual, Dimensional , physical, operational checks, matching of detectors with given specification, statutory body certification, make of item	MAJOR	PHYSICAL& CHEMICAL PROPERTIES	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	
	PCBs,	Burn-in Test of PCBs for 96 hrs at 50 deg C	MAJOR	PHYSICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	
2.0	**INPROCESS INSPECTION**												

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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	APPROVED BY	APPROVED BY
BHEL QA SIGNATURE & STAMP	BHEL QA SIGNATURE & STAMP	CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
	ASSEMBLY	WIRING,EARTHING	MAJOR	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	
	GENERAL ARRANGEMENT	COMPONENT MOUNTING	MAJOR	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	
3.0	**FINAL INSPECTION & TESTING**												
	Conventional fire Alarm system	Visual check, including GA, Layout, Tag Plates, paint shade, panel gasketing, identification and location of component, mimic layout, check of specification of all types of detectors w.r.t data sheet ect..	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		
		BOM/Make of component	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Quality of lacquering and inter changeability of PCBs	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Verification of cable termination arrangement	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Operation check of scheme, mimic lamps by simulating fire, cable fault condition w.r.t different types of detectors	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Check of detector operation wrt to loop impedence	CRITICAL	ELECTRICAL	ONE	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Operation check of schemes , mimic lamps, wrt to different type of release and inhibit switch thro iutput relays	CRITICAL	ELECTRICAL	ONE	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Simulation of all alarms	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Auto and manual release operation	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:	
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM	REV NO: 00	DATE:
			PAGE 5 OF 11	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Fail safe operation	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Verification of battery type and capacity	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Operation check on break glass assembly	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Operation check on applicable accessories, lamps, siren, switches, beacons etc..	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Provision of cable glands and earthing	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		

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	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM	REV NO: 00	DATE:
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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
	Computer aided Fire alarm system consisting of Central Fire alarm panel , MFAP and Repeat panel (Final Inspection)	Visual check, including GA, Layout, Tag Plates, paint shade, panel gasketing, identification and location of component, mimic layout, check of specification of all types of detectors w.r.t data sheet ect..	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		BOM/Make of component	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:	
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM	REV NO: 00	DATE:
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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Verification of cable termination arrangement	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Operation check of scheme, mimic lamps by simulating fire, cable fault condition w.r.t different types of detectors	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Check of detector operation wrt to loop impedence	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		

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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Operation check of schemes , mimic lamps, wrt to different type of release and inhibit switch thro iutput relays	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Simulation of all alarms	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Auto and manual release operation	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Fail safe operation	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:	
PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM		REV NO: 00	DATE:
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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Redundancy check	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		
		Verification of battery type and capacity	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		
		Operation check on applicable accessories, lamps, siren, switches, beacons etc.	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		
		Operation check on break glass assembly	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
	Fire alarm system & accessories	Certificate of statutory approval authority like CCOE/PESO /DGFASLI as applicable	CRITICAL	VISUAL	ONE	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2		1	
		Valid BIS license as applicable	CRITICAL	VISUAL	ONE	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2		1	
		Certificate of statutory testing authority like FM, UL, BASEEFA, CMRI etc for MFAP , detectors and other accessories		VISUAL	ONE	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2		1	
4.0	**PRESERVATION & PACKING**												

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

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	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM	REV NO: 00	DATE:
			PAGE 11 OF 11	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
	PACKING	FINISH	MAJOR	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

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1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
	Incoming Material like fabricated items, PCBs, Lamps, Push buttons, Fire detectors, temp detectors, UV, IR, Ionisation Type,MCP, Annunciators, battery, battery charger, exit signs, zener battries, short circuit/fault/isolator etc..	Visual, Dimensional , physical, operational checks, matching of detectors with given specification, statutory body certification, make of item	MAJOR	PHYSICAL& CHEMICAL PROPERTIES	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	
	PCBs,	Burn-in Test of PCBs for 96 hrs at 50 deg C	MAJOR	PHYSICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	
2.0	**INPROCESS INSPECTION**												

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	ASSEMBLY	WIRING,EARTHING	MAJOR	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	
	GENERAL ARRANGEMENT	COMPONENT MOUNTING	MAJOR	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	
3.0	**FINAL INSPECTION & TESTING**												
	Conventional fire Alarm system	Visual check, including GA, Layout, Tag Plates, paint shade, panel gasketing, identification and location of component, mimic layout, check of specification of all types of detectors w.r.t data sheet ect..	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		
		BOM/Make of component	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		

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		Quality of lacquering and inter changeability of PCBs	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Verification of cable termination arrangement	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Operation check of scheme, mimic lamps by simulating fire, cable fault condition w.r.t different types of detectors	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Check of detector operation wrt to loop impedence	CRITICAL	ELECTRICAL	ONE	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Operation check of schemes , mimic lamps, wrt to different type of release and inhibit switch thro iutput relays	CRITICAL	ELECTRICAL	ONE	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Simulation of all alarms	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Auto and manual release operation	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:	
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM	REV NO: 00	DATE:
			PAGE 5 OF 11	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Fail safe operation	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Verification of battery type and capacity	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Operation check on break glass assembly	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Operation check on applicable accessories, lamps, siren, switches, beacons etc..	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Provision of cable glands and earthing	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:	
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM	REV NO: 00	DATE:
			PAGE 6 OF 11	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
	Computer aided Fire alarm system consisting of Central Fire alarm panel , MFAP and Repeat panel (Final Inspection)	Visual check, including GA, Layout, Tag Plates, paint shade, panel gasketing, identification and location of component, mimic layout, check of specification of all types of detectors w.r.t data sheet ect..	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		BOM/Make of component	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:	
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM	REV NO: 00	DATE:
			PAGE 7 OF 11	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Verification of cable termination arrangement	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Operation check of scheme, mimic lamps by simulating fire, cable fault condition w.r.t different types of detectors	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Check of detector operation wrt to loop impedence	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Operation check of schemes , mimic lamps, wrt to different type of release and inhibit switch thro iutput relays	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Simulation of all alarms	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Auto and manual release operation	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Fail safe operation	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:	
PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM		REV NO: 00	DATE:
			PAGE 9 OF 11	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Redundancy check	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		
		Verification of battery type and capacity	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		
		Operation check on applicable accessories, lamps, siren, switches, beacons etc.	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		
		Operation check on break glass assembly	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
	Fire alarm system & accessories	Certificate of statutory approval authority like CCOE/PESO /DGFASLI as applicable	CRITICAL	VISUAL	ONE	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2		1	
		Valid BIS license as applicable	CRITICAL	VISUAL	ONE	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2		1	
		Certificate of statutory testing authority like FM, UL, BASEEFA, CMRI etc for MFAP , detectors and other accessories		VISUAL	ONE	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2		1	
4.0	**PRESERVATION & PACKING**												

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:	
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM	REV NO: 00	DATE:
			PAGE 11 OF 11	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
	PACKING	FINISH	MAJOR	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

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) Inprocess 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 drg references etc should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practise 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 (4 Tick) against each characteristic where vendor proposes to submit test certificate/report etc OR as required as per BHEL Spec.
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 Drgs.

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/ peeloff test etc.
f) Check for correctness for all components mounted as per General arrangement Drg, 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 (fitup, 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, Preece 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) Packing and Preservation.

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	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
2.0	**INPROCESS INSPECTION**												
3.0	**FINAL INSPECTION & TESTING**												
4.0	**PRESERVATION & PACKING**												

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL /BHEL's TPIA(BHEL NOMINATED INSPECTION AGENCY) 2 FOR VENDOR/SUB VENDOR & 3 BHEL's CUSTOMER 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

BHARAT HEAVY ELECTRICALS LIMITED
RAMACHANDRAPURAM:: HYDERABAD – 502032
PROJECT ENGINEERING & SYSTEMS DIVISION
QUALITY & BUSINESS EXCELLANCE DEPARTMENT

Format for inspection call

Ref: BHEL/PESD/QA/11 **Dt: 28.07.2020**

Due to unavailability of all BHEL/Customer, approved documents TPIAs visits are being wasted .To avoid this it is mandatory that vendor should arrange all the approved reference documents and then only raise the inspection call in portal. Vendor has to fill the below details and upload this documents in portal while raising the inspection call.

Sr.No	Approved Documents	Approved Documents date
	Approved QAP No with revision	
	Approved Drawing No with revision	
	Approved Data Sheet No with revision	
	Purchase specification	
	Purchase Order/BBU	

Note: While raising inspection call vendor has to take care of below points.

1. **Purchasing Unit:** Purchasing Unit should be PE & SD.
2. **Joint Inspection:** Joint inspection means that BHEL and BHEL client both are jointly attending the inspection.
3. **CQ Center:** CQ center is a TPIA nearest region,suppose inspection is in Mumbai than CQ center will be either of TUV Mumbai or BVI Mumbai.

Vendor Signature

PROJECT ENGINEERING & SYSTEMS DIVISION
RC PURAM, HYDERABAD.
QUALITY & BUSINESS EXELLENCE

INSPECTION / TC REVIEW FORMAT

1	Vendor's Name:		5	Applicable BHEL Spec No:	
2	Project:		6	Approved Drawing No:	
3	PO No:		7	Approved Data Sheet No:	
4	Item Description:		8	Approved QAP No:	

OFFER LIST

S.No	BBU/ PO Sr. No.	Item Description	Total Qty as per PO/BBU	Qty. already accepted	Qty offered for TC review	Cumulative Qty	Balance Qty
A							
B							
C							
D							

TC REVIEW REQUISITION

BBU / PO Sr. No.	QAP Clause No.	Format of Record	Certificate No. & Date	Page No.	REMARKS
A. Item Description:					
B. Item Description:					
C. Item Description:					
D. Item Description:					
E. Item Description:					

SUPPLIER / VENDOR SIGNATURE WITH SEAL	BHEL/ BHEL's TPIA SIGNATURE WITH SEAL
Dt:	Dt:

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM	REV NO: 00 / DATE:
			PAGE 1 OF 11

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
	Incoming Material like fabricated items, PCBs, Lamps, Push buttons, Fire detectors, temp detectors, UV, IR, Ionisation Type,MCP, Annunciators, battery, battery charger, exit signs, zener battries, short circuit/fault/isolator etc..	Visual, Dimensional , physical, operational checks, matching of detectors with given specification, statutory body certification, make of item	MAJOR	PHYSICAL& CHEMICAL PROPERTIES	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	
	PCBs,	Burn-in Test of PCBs for 96 hrs at 50 deg C	MAJOR	PHYSICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	
2.0	**INPROCESS INSPECTION**												

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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	APPROVED BY	APPROVED BY
BHEL QA SIGNATURE & STAMP	BHEL QA SIGNATURE & STAMP	CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
	ASSEMBLY	WIRING,EARTHING	MAJOR	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	
	GENERAL ARRANGEMENT	COMPONENT MOUNTING	MAJOR	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	
3.0	**FINAL INSPECTION & TESTING**												
	Conventional fire Alarm system	Visual check, including GA, Layout, Tag Plates, paint shade, panel gasketing, identification and location of component, mimic layout, check of specification of all types of detectors w.r.t data sheet ect..	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		
		BOM/Make of component	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Quality of lacquering and inter changeability of PCBs	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Verification of cable termination arrangement	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Operation check of scheme, mimic lamps by simulating fire, cable fault condition w.r.t different types of detectors	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Check of detector operation wrt to loop impedence	CRITICAL	ELECTRICAL	ONE	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Operation check of schemes , mimic lamps, wrt to different type of release and inhibit switch thro iutput relays	CRITICAL	ELECTRICAL	ONE	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Simulation of all alarms	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Auto and manual release operation	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:	
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM	REV NO: 00	DATE:
			PAGE 5 OF 11	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Fail safe operation	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Verification of battery type and capacity	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Operation check on break glass assembly	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Operation check on applicable accessories, lamps, siren, switches, beacons etc..	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		
		Provision of cable glands and earthing	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET	BHEL SPECIFICATION/DATA SHEET	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:	
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM	REV NO: 00	DATE:
			PAGE 6 OF 11	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
	Computer aided Fire alarm system consisting of Central Fire alarm panel , MFAP and Repeat panel (Final Inspection)	Visual check, including GA, Layout, Tag Plates, paint shade, panel gasketing, identification and location of component, mimic layout, check of specification of all types of detectors w.r.t data sheet ect..	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		BOM/Make of component	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:	
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM	REV NO: 00	DATE:
			PAGE 7 OF 11	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Verification of cable termination arrangement	CRITICAL	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Operation check of scheme, mimic lamps by simulating fire, cable fault condition w.r.t different types of detectors	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Check of detector operation wrt to loop impedence	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Operation check of schemes , mimic lamps, wrt to different type of release and inhibit switch thro iutput relays	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Simulation of all alarms	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Auto and manual release operation	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		
		Fail safe operation	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	BHEL SPECIFICATION/DATA SHEET/APPRD DRG.	TEST CERTIFICATE	√	2	1		

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:	
PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM		REV NO: 00	DATE:
			PAGE 9 OF 11	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Redundancy check	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		
		Verification of battery type and capacity	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		
		Operation check on applicable accessories, lamps, siren, switches, beacons etc.	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		
		Operation check on break glass assembly	CRITICAL	ELECTRICAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
	Fire alarm system & accessories	Certificate of statutory approval authority like CCOE/PESO /DGFASLI as applicable	CRITICAL	VISUAL	ONE	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2		1	
		Valid BIS license as applicable	CRITICAL	VISUAL	ONE	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2		1	
		Certificate of statutory testing authority like FM, UL, BASEEFA, CMRI etc for MFAP , detectors and other accessories		VISUAL	ONE	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE	√	2		1	
4.0	**PRESERVATION & PACKING**												

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 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 BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

	TYPICAL MANUFACTURING QUALITY PLAN		MQP. NO.:	
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032	PRODUCT: AUTOMATIC AND MANUAL FIRE ALARM SYSTEM	REV NO: 00	DATE:
			PAGE 11 OF 11	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
	PACKING	FINISH	MAJOR	VISUAL	100%	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	BHEL SPECIFICATION/DATA SHEET/APPR D DRG.	TEST CERTIFICATE/LOG BOOK	√	2		1	

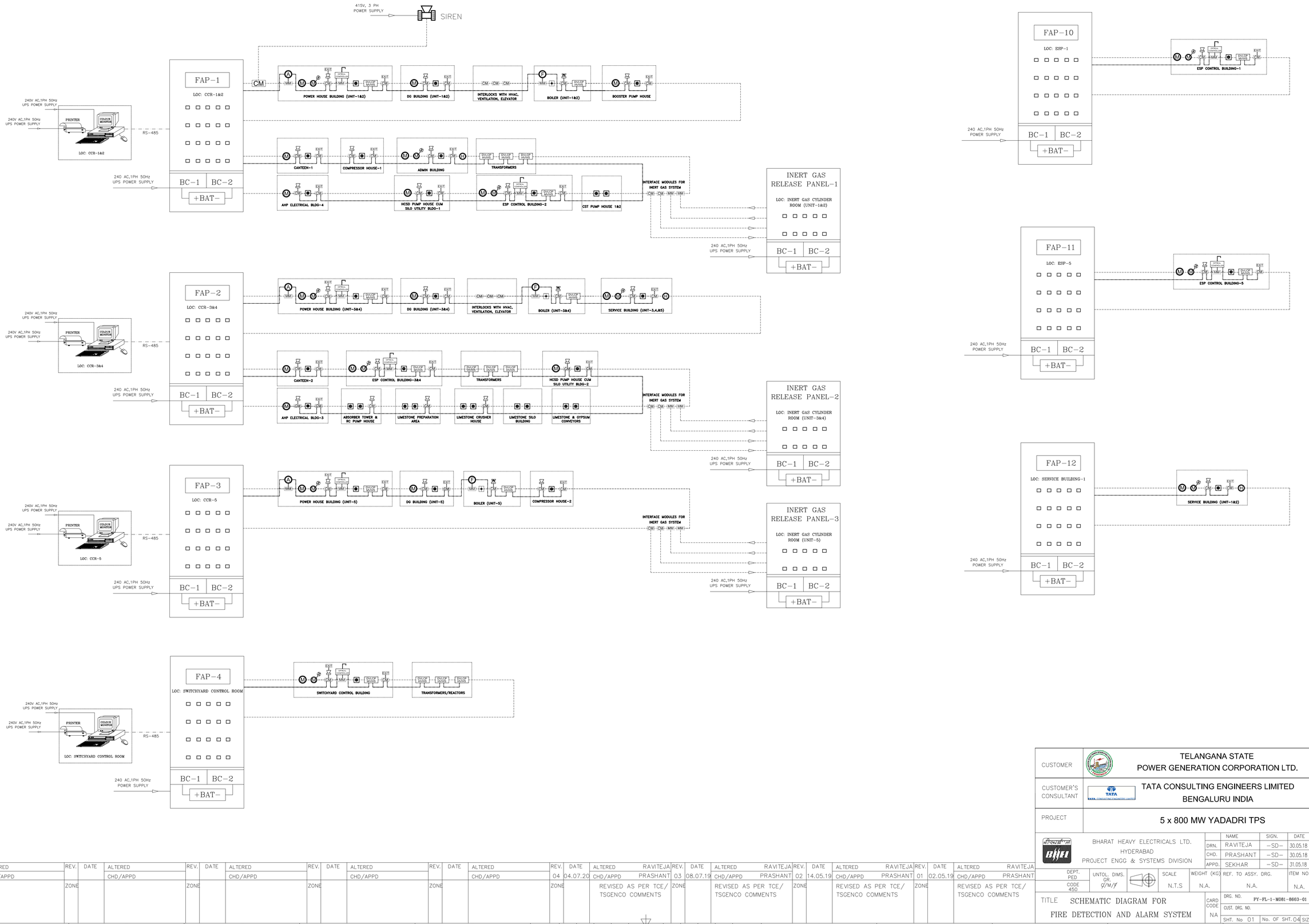
LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST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

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. PY-FL-1-M081-8663-01

SH. 01 OF 04



THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

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

ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD	04	04.07.20	CHD/APPD RAVITEJA PRASHANT	03	08.07.19	CHD/APPD RAVITEJA PRASHANT	02	14.05.19	CHD/APPD RAVITEJA PRASHANT	01	02.05.19	CHD/APPD RAVITEJA PRASHANT
	ZONE			ZONE			ZONE			ZONE			ZONE		REVISED AS PER TCE/ TSGENCO COMMENTS	ZONE		REVISED AS PER TCE/ TSGENCO COMMENTS	ZONE		REVISED AS PER TCE/ TSGENCO COMMENTS	ZONE		REVISED AS PER TCE/ TSGENCO COMMENTS

CUSTOMER	TELANGANA STATE POWER GENERATION CORPORATION LTD.
CUSTOMER'S CONSULTANT	TATA CONSULTING ENGINEERS LIMITED BENGALURU INDIA
PROJECT	5 x 800 MW YADADRI TPS

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD PROJECT ENGG & SYSTEMS DIVISION

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	RAVITEJA	-SD-	30.05.18	N.A.
CHD.	PRASHANT	-SD-	30.05.18	
APPD.	SEKHAR	-SD-	31.05.18	

DEPT. PED	UNTOL. DIMS. GR.		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.

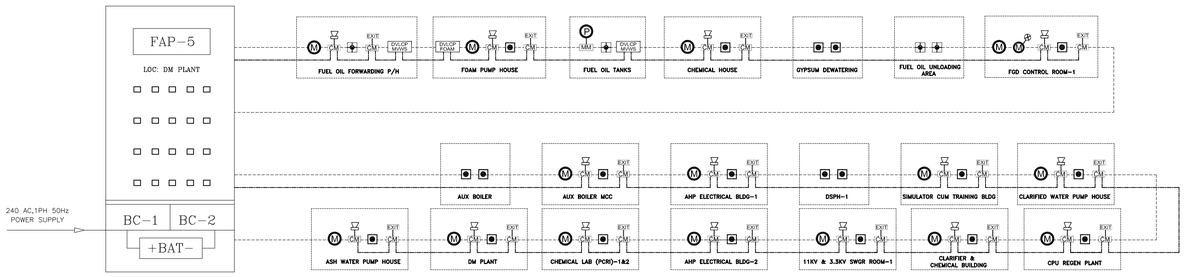
TITLE SCHEMATIC DIAGRAM FOR FIRE DETECTION AND ALARM SYSTEM

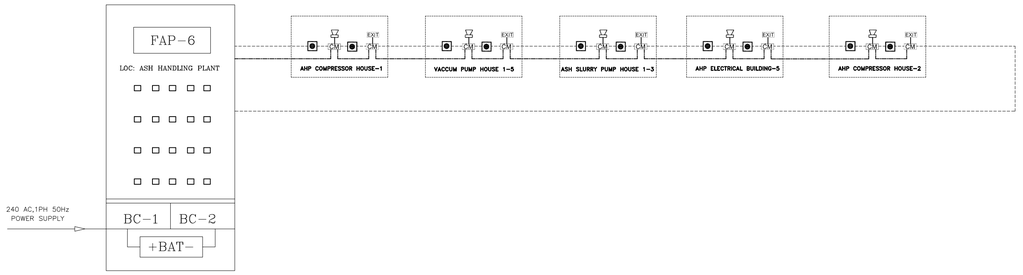
CARD CODE NA

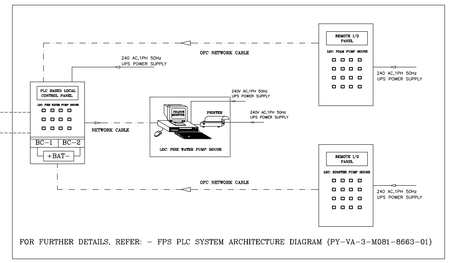
DRG. NO. PY-FL-1-M081-8663-01 REV.

CUST. DRG. NO. 04

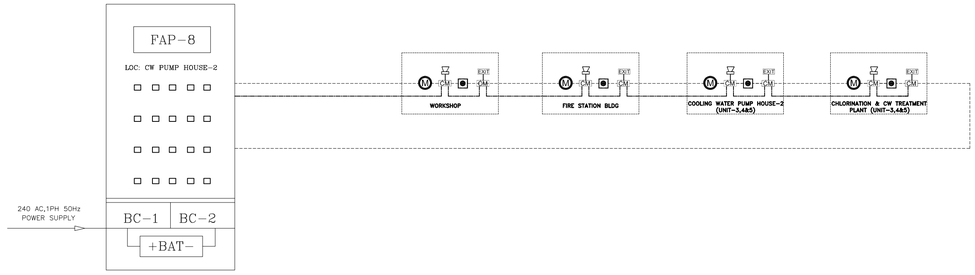
SHT. No 01 No. OF SHT. 04 SIZE - A1

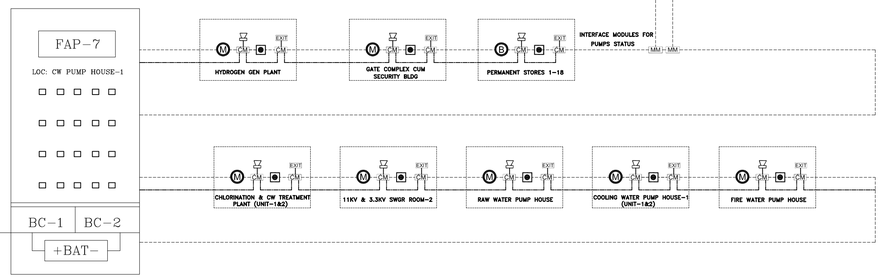


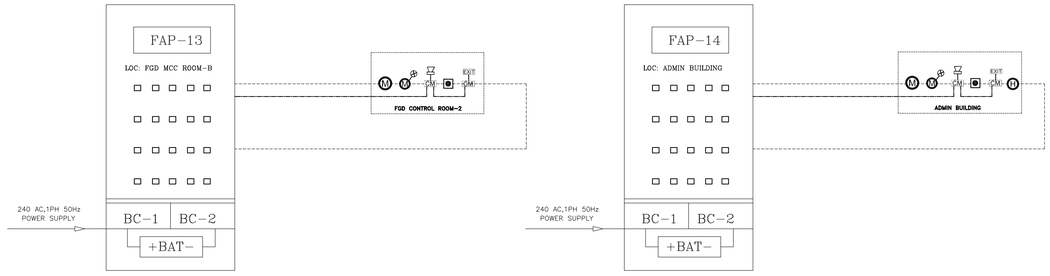


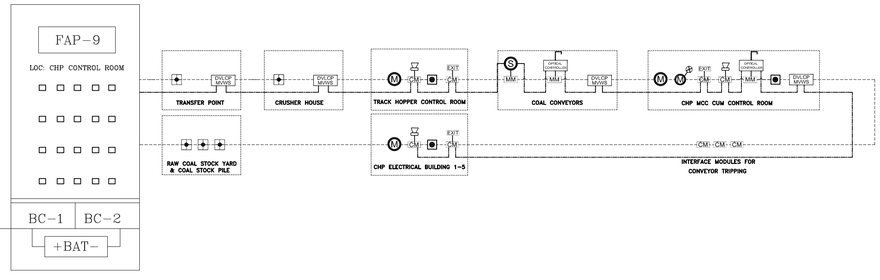


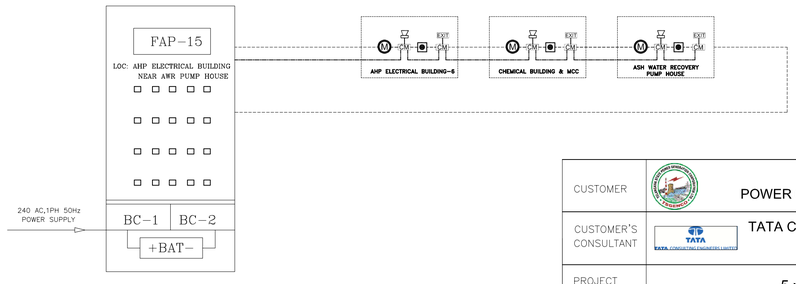
FOR FURTHER DETAILS, REFER: - FPS PLC SYSTEM ARCHITECTURE DIAGRAM (PY-VA-3-M081-8663-01)











ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD	04	04.07.20	CHD/APPD PRASHANT	03	08.07.19	CHD/APPD PRASHANT	02	14.05.19	CHD/APPD PRASHANT	01	02.05.19	CHD/APPD PRASHANT
	ZONE			ZONE			ZONE			ZONE			ZONE		REVISED AS PER TCE/ TSGENCO COMMENTS	ZONE		REVISED AS PER TCE/ TSGENCO COMMENTS	ZONE		REVISED AS PER TCE/ TSGENCO COMMENTS	ZONE		REVISED AS PER TCE/ TSGENCO COMMENTS

CUSTOMER	TELANGANA STATE POWER GENERATION CORPORATION LTD.				
CUSTOMER'S CONSULTANT	TATA CONSULTING ENGINEERS LIMITED BENGALURU INDIA				
PROJECT	5 x 800 MW YADADRI TPS				
BHARAT HEAVY ELECTRICALS LTD. HYDERABAD PROJECT ENGG & SYSTEMS DIVISION		NAME	SIGN.	DATE	NO.OF VAR.
	DRN.	RAVITEJA	-SD-	30.05.18	
	CHD.	PRASHANT	-SD-	30.05.18	N.A.
	APPD.	SEKHAR	-SD-	31.05.18	

DEPT. PED	UNTOL. DIMS. CR.		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.

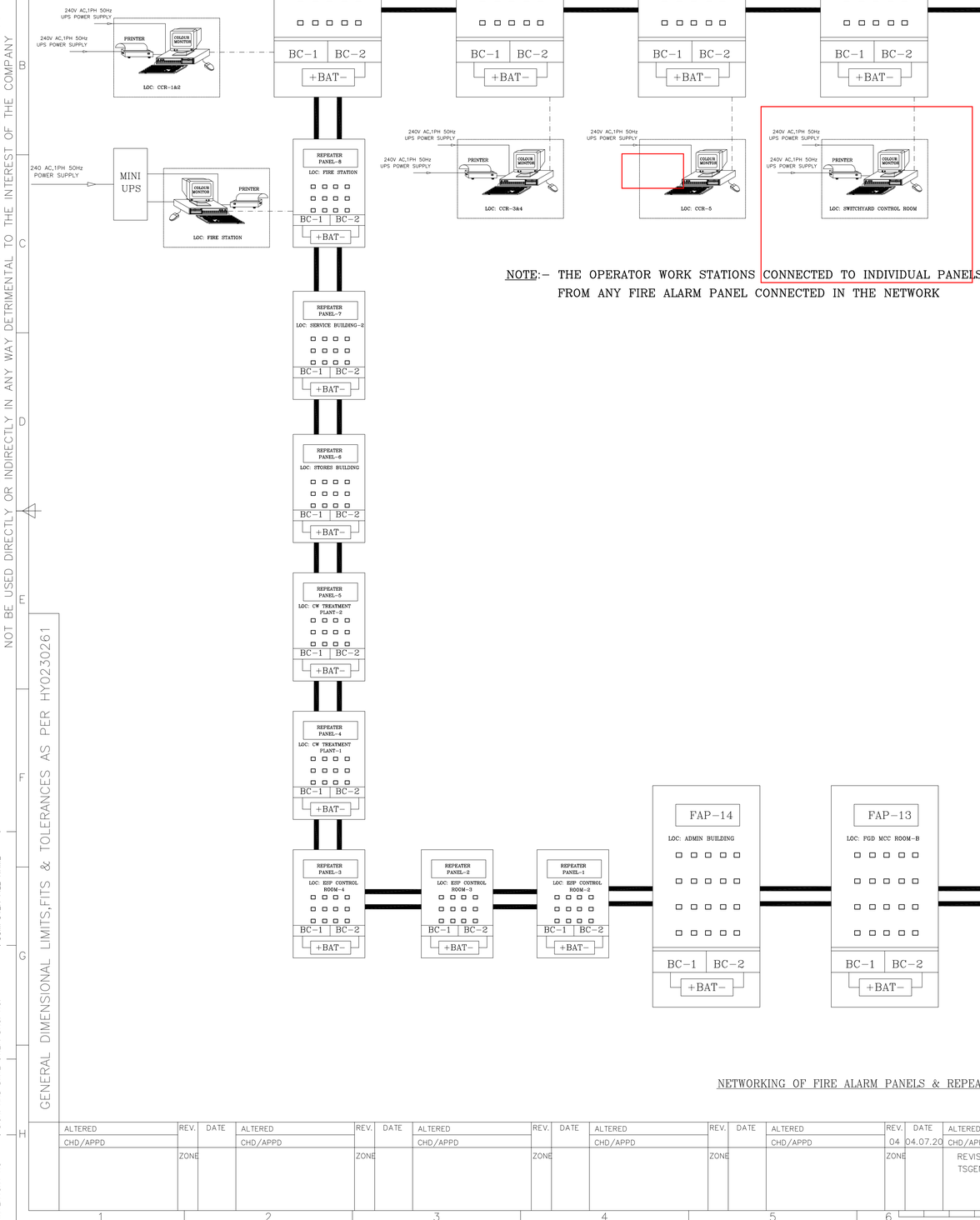
TITLE	CARD CODE	DRG. NO.	REV.
SCHEMATIC DIAGRAM FOR FIRE DETECTION AND ALARM SYSTEM	NA	PY-FL-1-M081-8663-01	
		CUST. DRG. NO.	04
		SHT. No 02	No. OF SHT. 04 SIZE - A1

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

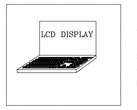
DRG. NO. PY-PL-1-M081-8663-01

SH. 03 OF 04

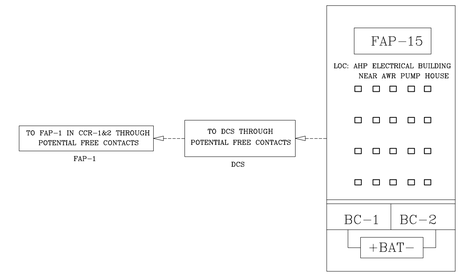


NOTE:- THE OPERATOR WORK STATIONS CONNECTED TO INDIVIDUAL PANELS CAN ACCESS THE INFORMATION FROM ANY FIRE ALARM PANEL CONNECTED IN THE NETWORK

NETWORKING OF FIRE ALARM PANELS & REPEATER PANELS



ONE INDUSTRIAL GRADE LAPTOP SHALL BE PROVIDED WITH FOLLOWING SPECIFICATION:-
A) 15" SCREEN
B) MINIMUM I7 PROCESSOR OR EQUIVALENT.
C) ONE 16 GB RAM.
D) ONE 2 TB HARD DISK.



ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE
CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD				04	04.07.20	CHD/APPD PRASHANT	03	08.07.19	CHD/APPD PRASHANT	02	14.05.19	CHD/APPD PRASHANT	01	02.05.19
ZONE			ZONE			ZONE			ZONE			ZONE			REVISED AS PER TCE/ TSGENCO COMMENTS	ZONE		REVISED AS PER TCE/ TSGENCO COMMENTS	ZONE		REVISED AS PER TCE/ TSGENCO COMMENTS	ZONE		REVISED AS PER TCE/ TSGENCO COMMENTS

CUSTOMER	TELANGANA STATE POWER GENERATION CORPORATION LTD.				
PROJECT	TATA CONSULTING ENGINEERS LIMITED BENGALURU INDIA				
CONSULTANT	5 x 800 MW YADADRI TPS				
BHARAT HEAVY ELECTRICALS LTD. HYDERABAD PROJECT ENGG & SYSTEMS DIVISION		NAME	SIGN.	DATE	NO.OF VAR.
	DRN.	RAVITEJA	-SD-	30.05.18	
	CHD.	PRASHAR	-SD-	30.05.18	N.A.
	APPD.	SEKHAR	-SD-	31.05.18	
DEPT. PED / CODE 450	UNTOL. DIMS. GR. g/M/f	SCALE N.T.S	WEIGHT (KG) N.A.	REF. TO ASSY. DRG. N.A.	ITEM NO. N.A. / NO.OF ITEMS N.A.
TITLE SCHEMATIC DIAGRAM FOR FIRE DETECTION AND ALARM SYSTEM		CARD CODE NA	DRG. NO. PY-FL-1-M081-8663-01	CUST. DRG. NO. 04	REV.
			SHT. No 03	No. OF SHT. 04	SIZE - A1

NOTES:–

1. ALL FIRE ALARM PANELS AND REPEATER PANELS SHALL BE WALL MOUNTED TYPE.
2. EACH FIRE ALARM PANEL/REPEATER PANEL SHALL BE PROVIDED WITH 24 V D.C BATTERY BACKUP, COMPRISING OF 2x100% CHARGERS AND 2x100% SMF LEAD ACID BATTERIES.
3. FIRE ALARM PANELS AND REPEATER PANELS SHALL HAVE A BATTERY BACK UP FOR 48 HRS NORMAL OPERATION AND 30 MIN. OF ALARM CONDITION.
4. ALL DETECTORS SHALL BE LOOPED AS PER IS: 2189.
5. DELUGE VALVES ARE INTERFACED WITH THE FIRE ALARM SYSTEM THROUGH CONTROL MODULE (CM).
6. FOR AUDIO VISUAL ALARMS HOOTERS AND BACK LIT EXIT SIGN BOARDS ARE PROVIDED RESPECTIVELY.
7. HOOTERS ALONG WITH CONTROL MODULE (CM) SHOWN IN THE SCHEME ARE INDICATIVE ONLY. IN CASE OF LOOP POWERED HOOTERS, CONTROL MODULES ARE NOT REQUIRED. IN CASE OF CONVENTIONAL HOOTERS CUM STROBE, THEY ARE INTERFACED WITH FIRE ALARM PANEL THROUGH CONTROL MODULE (CM).
8. 10% OF EACH LOOP CAPACITY SHALL BE LEFT FREE IN EACH OF THE LOOP FOR FUTURE ADDITION.
9. SIREN SHALL HAVE CAPACITY TO COVER 10 KM RANGE AND SHALL BE MOTOR OPERATED WITH THREE PHASE DESIGN.
10. FIRE ALARM CABLES AS PER OEM RECOMMENDATION SHALL BE USED FOR LOOPING & POWERING OF DEVICES SHALL BE HRPVC TYPE–C STRANDED ANNEALED PLAIN COPPER FRLS ST–2.
11. 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.
12. THE NUMBER OF LOOPS AND DEVICES/DETECTORS ARE INDICATIVE ONLY. ACTUAL DETAILS SHALL BE FURNISHED DURING DETAIL ENGINEERING
13. AS PER CL. NO. 8.8.1 OF IS 3034 (FIRE SAFETY OF INDUSTRIAL BUILDINGS – ELECTRICAL GENERATING & DISTRIBUTION STATIONS), HVWS SHALL BE PROVIDED FOR ALL TRANSFORMERS OF RATING GREATER THAN 10 MVA OR OIL CAPACITY MORE THAT 2000 LITERS.
14. FAULT ISOLATORS SHALL BE PROVIDED AS PER IS 2189.
15. SPACING OF DETECTORS AND MANUAL CALL POINTS SHALL BE AS PER IS 2189.
16. PUMPS AND COMPRESSOR AREAS ARE PROVIDED WITH MANUAL CALL POINTS AND PORTABLE FIRE EXTINGUISHERS. NO DETECTORS ARE PROVIDED IN THESE AREAS. HOWEVER, DETECTORS SHALL BE PROVIDED FOR CORRESPONDING MCC ROOMS, CONTROL ROOMS AND BATTERY ROOMS IF ANY.
17. THE FOLLOWING SIGNALS SHALL BE TAKEN FROM INERT GAS PANEL TO FIRE DETECTION & ALARM SYSTEM THROUGH POTENTIAL FREE CONTACTS/MODULES:–
    (a) PRE ALARM
    (b) GAS DISCHARGE SIGNAL
18. OPERATOR WORKSTATION LOCATED IN CONTROL ROOM & FIRE WATER PUMP HOUSE SHALL BE OF THE FOLLOWING CONFIGURATION:–
    (a) 24" MONITOR
    (b) MINIMUM I7 PROCESSOR OR EQUIVALENT
    (c) ONE 4 GB RAM
    (d) ONE 500 GB HARD DISK
    (e) UPS FOR PC & PRINTER WITH 60 MIN. BACKUP
    (f) COLOUR LASER PRINTER (A4/A3 SIZE), QWERTY KEYBOARD AND OPTICAL MOUSE
19. BACK LIT EXIT SIGN BOARDS SHALL BE PROVIDED IN ALL BUILDINGS AT FLOOR EXITS.
20. THE FOLLOWING SIGNALS SHALL BE TAKEN FROM MAIN FIRE ALARM PANEL TO DCS:–
    (a) SYSTEM HEALTHY
    (b) SYSTEM FAULT
    (c) FIRE SIGNAL
21. COMMUNICATION BETWEEN PANELS SHALL BE THROUGH REDUNDANT OPTICAL FIBER NETWORK.
22. IN COAL CONVEYORS OPTICAL LHS CABLE SHALL BE LAID IN ZIG ZAG FASHION FOR BOTH FORWARD AND RETURN BELT. FOR CABLE GALLERIES LHS CABLE SHALL BE LAID IN STRAIGHT LINES IN THE CENTER OF CABLE TRAY.
23. EACH COAL CONVEYOR SHALL BE PROVIDED WITH 3 INFRARED EMBER DETECTORS.
24. ALL FIRE ALARM PANELS & REPEATER PANELS SHALL BE CONNECTED BY A DEDICATED FAULT TOLERANT LOCAL AREA NETWORK (LAN) THROUGH REDUNDANT FIBER OPTIC COMMUNICATION CABLE.
25. CABLES SHALL BE STRANDED COOPER CONDUCTOR, PVC INSULATED, PVC SHEATHED, ARMOURED AND OUTER SHEATH OF FRLS PVC COMPOUND . THE FOLLOWING CABLES ARE USED IN THE SYSTEM:–
    (a) LOOP CABLE – 2Cx1.5 SQMM
    (b) POWER CABLE – 2Cx2.5 SQMM

REFERENCE DRAWINGS:–

1. PLOT PLAN – PE–DG–417–100–M001
2. DESIGN MEMORANDUM FOR FIRE PROTECTION SYSTEM – PY–SZ–4–M081–8315–01
3. CCR/CER/COMPUTER/UPS ROOM LAYOUT AT EL.17.0 M – PE–DG–417–145–I401

LEGEND:–

SL NO	SYMBOL	DESCRIPTION
1	————	POWER CABLE
2	- - - - - - - -	LOOP CABLE
3	▬▬▬	NETWORK CABLE (OPTICAL FIBER)
4	⌐	OPTICAL LHS CABLE
5		HOOTER
6	CM	CONTROL MODULE
7	MM	MONITOR MODULE
8	EXIT	BACKLIT TYPE EXIT SIGN BOARD
9		BEAM DETECTOR
10	A	ASPIRATION DETECTOR
11		MULTISENSOR DETECTOR WITH RESPONSE INDICATOR (ABOVE FALSE CEILING & BELOW FALSE FLOORING)
12	M	MULTISENSOR DETECTOR
13	P	PROBE TYPE HEAT DETECTOR
14	S	EMBER DETECTOR (SOLAR BLIND)
15	H	HEAT DETECTOR
16	F	FLAME DETECTOR
17	BC–1,2	BATTERY CHARGER
18	+BAT–	SMF LEAD ACID BATTERIES
19	DVLCP	DELUGE VALVE LOCAL CONTROL PANEL
20		SIREN
21	FAP	FIRE ALARM PANEL
22	RP	REPEATER PANEL
23		MANUAL CALL POINT (INDOOR)
24	OPTICAL CONTROLLER	OPTICAL LHS CONTROLLER
25		MANUAL CALL POINT (OUTDOOR)
26		MANUAL CALL POINT (FLAMEPROOF)

Sl. No.	Area	Type of Detection	Type of Protection
1.	All transformers of rating greater than or equal to 10 MVA and/or oil capacity more than 2000 liters.	Quartzoid Bulb Detectors	HVWS System
2.	Central control room, Computer Room and Control Equipment room in TG building	Air Sampling Detectors and Manual Call Points	Inert gas System
3.	All Aux. control room viz; CHP Control Room, AHP Control Room and ESP Control Room etc.	Multi-sensor Detectors and Manual Call Points	Portable Fire Extinguishers
4.	HFO & LDO Tanks	Rate Of Rise Detectors (Probe Type) & Flameproof Manual Call Point	Foam System and MVWS System
5.	Battery rooms and Pantry	Heat Detectors and Manual Call Points	Portable Fire Extinguishers
6.	Cable Spreading Areas / Cable Galleries / Cable Vaults of main plant building, CHP Control Room, AHP Control Room, ESP Control Room	Optical Linear Heat Sensing Cable, Multi Sensor Smoke Detectors and Manual Call Points	MVWS System
7.	Coal Conveyors, Transfer Points and Bunker Bay Conveyors	Solar Blind Infra-Red detectors with inbuilt air purging unit, Optical Linear Heat Sensing Cable and Outdoor Manual Call Point	MVWS System
8.	Lube Oil Piping, Generator Seal Oil System, Lube oil system for turbine driven boiler feed pumps	Quartzoid Bulb Detectors (QBD) and Flameproof Manual Call Point	HVWS System
9.	All buildings/floors listed in plot plan (including false flooring & false ceiling)	Multi Sensor Detectors and Manual Call Points	Portable Fire Extinguishers
10.	Outdoor Areas	Outdoor Manual Call Points	-
11.	Turbine Oil Tanks and Boiler Burner Front	Quartzoid Bulb Detector (QBD)	HVWS System
12.	Switchgear Room and Control Room of Pump Houses and Compressor House	Multi Sensor Detectors and Manual Call Points	Portable Fire Extinguishers
13.	Pump Houses and Compressor House	Manual Call Points	Portable Fire Extinguishers

Sl. No.	Description	Type	Approval
1	Power/Control/Network Cable	HRPVC Type-C Stranded Annealed Plain Copper FRLS ST-2	-
2	LHS Cable	Fiber Optic	UL / FM / Vds
3	Hooter	-	UL / FM / Vds
4	Control Module	as per manufacturer standard	UL / FM / Vds
5	Monitor Module	as per manufacturer standard	UL / FM / Vds
6	Exit Sign Board	Back Lit	-
7	Manual Call Point	Break Glass/Pull Type	UL / FM / Vds
8	Aspiration Detector	-	UL / FM / Vds
9	Multisensor Detector	-	UL / FM / Vds
10	Rate of Rise Detector	Probe	UL / FM / Vds
11	Ember Detector (Infrared)	Solar blind with in built air purging	CE Certified
12	Flame Detector	Dual wavelength Infrared	CE Certified
13	Battery	SMF	-
14	Isolator Module	In Built / Separate device as per manufacturer standard	UL / FM / Vds
15	Siren	Horizontal double mounting (3 Phase Design)	-

ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE
CHD/APPD	ZONE		CHD/APPD	ZONE		CHD/APPD	ZONE		CHD/APPD	ZONE		CHD/APPD	04 ZONE	04.07.20	CHD/APPD RAVITEJA PRASHANT REVISED AS PER TCE/ TSGENCO COMMENTS	03 ZONE	08.07.19	CHD/APPD RAVITEJA PRASHANT REVISED AS PER TCE/ TSGENCO COMMENTS	02 ZONE	14.05.19	CHD/APPD RAVITEJA PRASHANT REVISED AS PER TCE/ TSGENCO COMMENTS	01 ZONE	02.05.19	CHD/APPD RAVITEJA PRASHANT REVISED AS PER TCE/ TSGENCO COMMENTS

CUSTOMER	TELANGANA STATE POWER GENERATION CORPORATION LTD.
PROJECT	TATA CONSULTING ENGINEERS LIMITED BENGALURU INDIA
CONSULTANT	5 x 800 MW YADADRI TPS

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD
PROJECT ENGG & SYSTEMS DIVISION

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	RAVITEJA	–SD–	30.05.18	N.A.
CHD.	PRASHANT	–SD–	30.05.18	
APPD.	SEKHAR	–SD–	31.05.18	

DEPT.	UNTOL. DIMS.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PED	GR.						
CODE 450	±/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-FL-1-M081-8663-01 REV.

CUST. DRG. NO. 04

SHT. No 04 No. OF SHT. 04 SIZE – A1