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TECHNICAL SPECIFICATION
FOR
INERT GAS EXTINGUISHING SYSTEM

PROJECT : **1 x 660 MW PANKI THERMAL POWER STATION**
CUSTOMER : **UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM**
LIMITED

		Revisions :	Prepared by:	Checked by:	Approved By:	Date
—	—		-SD-	-SD-	-SD-	24/06/2020
—	—	00	RAVITEJA JETTI	D V PRASHANT	P C SEKHAR	

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COPYRIGHT AND CONFIDENTIAL 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.		1. INTENT OF SPECIFICATION: The intent of this document is to establish the minimum requirement of design, engineering, supply, selection, selection, manufacture, assembly, inspection, shop testing, shop painting, transportation and delivery at Panki site in proper condition and supervision of Erection & Commissioning at site for the Inert Gas Extinguishing System, which forms part of this 1 x 660 MW Panki project at Panki, Uttar Pradesh. The equipment and supply shall conform to high standard of engineering and applicable codes/standards and shall be capable of performing intended operation in a manner acceptable to the Purchaser and end customer 2. SPECIAL NOTES TO BIDDERS 2.1. This specification shall be read in conjunction with all its annexures listed later in this specification. In case of any discrepancy arising between this specification & its annexures, the most stringent of all (as determined by purchaser) shall be followed. Further, if a requirement in this specification or any of the annexures, calls for a decision from the Purchaser, it shall be bidder's sole responsibility to clearly bring out/highlight the same distinctively in his pre-bid queries (Annexure-7), so as to enable purchaser to furnish their decision/clarification. If such issues/requirements are not duly addressed by bidder during the pre-bid stage and if such issues/requirements are observed later during order execution stage, it shall be binding on the bidder to comply with the final decision made by the purchaser subsequently, without any cost, delivery, or any other commercial implications. 2.2. All materials supplied under this contract shall be new and unused. 2.3. All equipment/items as applicable, shall be UL/FM/VDs/LPCB approved. 2.4. Any additional equipment, material, services etc., which are not specifically mentioned in this specification, but required to make the IGES complete in all respects, in accordance with the intent of this technical specification, contractual agreement, statutory requirements, relevant/applicable codes/standards, good engineering practices, and for safe and trouble-free operation, shall be deemed to be covered under the scope of this specification. 2.5. All mounting hardware/ accessories/fittings etc. required for the erection of Inert gas Extinguishing System shall be included in the scope of bidder and the same shall be included in the base price even if such items are not explicitly mentioned in this specification. 2.6. The Bidder shall accept full responsibility for the completeness and for the faultless working of all the equipments and the IGES system as a whole.		
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COPYRIGHT AND CONFIDENTIAL 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.	2.7. Bidder offer shall be strictly as per these specification requirements. Unsolicited or Alternate offers from the bidders will not be entertained. 2.8. The design information, specifications and drawings indicate the "Minimum" requirements and are intended to enable Bidders to ascertain the extent of the work involved. Bidders are expected to supplement the information included in this specification as required and submit a comprehensive bid. 3. PROJECT DESCRIPTION <table border="1"> <tr> <td>Project</td> <td>1 x 660 MW Panki Thermal Power Station</td> </tr> <tr> <td>Owner</td> <td>Uttar Pradesh Rajya Vidyut Utpadan Nigam Limited (UPRVUNL)</td> </tr> <tr> <td>Review Consultant</td> <td>NTPC Ltd.</td> </tr> <tr> <td>Consultant</td> <td>Development Consultants Pvt. Ltd., Kolkata</td> </tr> <tr> <td>Location</td> <td>Panki, Kanpur (Dist.), Uttar Pradesh</td> </tr> <tr> <td>Nearest Railway Station</td> <td>Panki – 5 kms</td> </tr> <tr> <td>Nearest Town</td> <td>Kanpur – 16 kms</td> </tr> <tr> <td>Nearest Highway</td> <td>National Highway 25</td> </tr> <tr> <td>Nearest Airport</td> <td>Kanpur – 25 kms Lucknow – 80 kms</td> </tr> </table> 4. GENERAL SYSTEM REQUIREMENT 4.1. For the design of the plant, it is necessary not only to consider the requirements of operation, but also, by suitably planning the layout, the convenience of inspection, cleaning, maintenance and repair. 4.2. In order to achieve the reliability, high efficiency and safe operation of the plant, it is also necessary to consider various precautions to safeguard the operating and maintenance personnel. 4.3. After award of work, before finalizing especially the layout/Zones of system, pipe routes and other services, the bidder shall carry out a site survey to identify the location & details of existing facilities that may interfere with his proposed facilities. He shall suitably modify his layout/levels to prevent dislocation of existing facilities without any commercial implication to the purchaser. 4.4. The dimensions of the cylinder rooms are (10.9m x 7.4m) for inert gas extinguishing system is already finalized and cannot be changed now. Bidder to select the system (as per NFPA-2001 guidelines) to which while meeting the intended requirement as per the specification and shall be properly housed in the inert gas cylinder room. Adequate space			Project	1 x 660 MW Panki Thermal Power Station	Owner	Uttar Pradesh Rajya Vidyut Utpadan Nigam Limited (UPRVUNL)	Review Consultant	NTPC Ltd.	Consultant	Development Consultants Pvt. Ltd., Kolkata	Location	Panki, Kanpur (Dist.), Uttar Pradesh	Nearest Railway Station	Panki – 5 kms	Nearest Town	Kanpur – 16 kms	Nearest Highway	National Highway 25	Nearest Airport	Kanpur – 25 kms Lucknow – 80 kms
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COPYRIGHT AND CONFIDENTIAL 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.		for Operation & Maintenance of cylinder shall also be considered while selecting the inert gas system. 4.5. If during the execution of works it is found that there is interference with other facilities / structures, the Bidder shall revise his design/detailed drawings to clear the interference and shall provide all necessary measures for the safety of structures under construction. No claim in terms of cost or relaxation in time shall be entertained for any redesign, rework and for the safety measures provided. 4.6. Bidder is also required to provide on the job training to Purchaser /End Customer's operation personnel by associating them in all the day to day pre-commissioning, commissioning and maintenance activities and process operations. The cost of all such training shall be deemed to be included in the price quoted by the bidder. Bidder shall not be eligible to raise any extra claim in this regard. 5. APPLICABLE CODES & STANDARDS i. The design, engineering, installation, testing, commissioning of the package shall be as per all relevant & applicable codes/standards, however specifically the following : ➤ NFPA 2001: National Fire Protection (Standard on Clean Agent Fire Extiguishing System) ➤ VDS – Flow calulations of the system ➤ UL/FM/LPCB/VdS approval for IGES equipment such as cylinders, contact gauges, pressure regulators etc. ➤ ASTM A 106 - Piping ➤ ASTM A 105, Grade WPB, ANSIB-16.9 for 65 NB & Above - Butt Weld Fittings ➤ ASTM A-105, ANSI B-16.11 for 50 NB & Below – Socket Weld Weld fittings ➤ ANSI B-16.5, Class 1500 # - Flanges ➤ IS 2932 : Enamel , synthetic , Exterior ➤ IS:1248(Part I)-1983 -Direct acting indicating analogue electrical measuring and their accessories: Part I General requirements(Second revision)		
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COPYRIGHT AND CONFIDENTIAL 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.		➤ IS:1248(Part II)-1983 -Direct acting indicating analogue electrical measuring instruments and their accessories: Part II Ammeters and Voltmeters (Second revision) ➤ IS:6236-1971-Direct recording electrical measuring instrument (Reaffirmed 1987) ➤ IS: 2419-1979 -Dimensions for Panel mounted indicating & recording electrical instruments (first revision) (with Amendment No.1.) ➤ IS:8573-1977 -Digital electronic DC voltmeters and DC electronic analogue-to-digital convertors(with Amendment No.1) (Reaffirmed1991) ➤ ANSI B 16.5 - Pipe flanges and flanged fittings. ➤ SMPV rules , PESO Nagpur (For Storage Cylinders) ➤ Clean Agent Manufacturer’s recommendations ➤ VDE: 0150, protection against corrosion due to stray currents from DC installations. ➤ Statutory Requirements ii. Requirements of the following local statutory authorities (as applicable) shall be taken into account for compliance: a. VDE : 0150, protection against corrosion due to stray currents from DC installations. b. DIN : 30676 c. Requirement of Petroleum & Explosives Safety Organization (PESO), Nagpur, India. iii. Latest edition of applicable codes/Standards/Statutory Regulations referred to in the Bid Document shall correspond to the edition as on the date of issue of bid. iv. All addenda including the latest addenda to all the above codes and standards (latest editions) shall be followed by the bidder. v. All the legal formalities including preparation of documents, furnishing clarifications, information etc. as and when required, for obtaining any of the permissions and approvals related to the IGES will have to be done by the bidder. Note:		
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COPYRIGHT AND CONFIDENTIAL 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.		Bidder to follow all other applicable statutory rules and regulations of India during manufacturing, procurement & transportation of the IGES components. 6. BIDDER'S SCOPE OF WORK Separate Inert Gas Extinguishing System shall be provided for following areas of TG building as mentioned below:- - Control room at El.17.0M - Central Equipment Room (CER) at El.17.0M - C&I Engg Room at El.17.0M - Conference Room at El.17.0M - Programmer Room at El.17.0M - UPS Panel & Charger Room at El.8.5M 6.1. Each IGES system should include the following minimum items: a) One (01) Inert Gas Release Panel. b) 1 lot of Inert Gas Cylinders required for the system along with same no. of standby cylinders. Including solenoid valves, directional valves, pilot manifold etc. and shall be FM/UL/Vds/LPCB approved. c) 1 Lot of Piping & fittings, pressure gauges, nozzles, threadolets, weldolets, socketolets & all other equipment/accessories required for completion of system. d) One lot of Armoured cables including interface cables with Fire Alarm panel and related erection hardware. e) One lot of Inert gas Discharge Warning Signs f) One lot of gas discharge EPB & inhibitor unit g) One lot of Pressure Operated Switches h) One lot of Pressure Relief Vents i) First Fill of consumables j) Erection & Commissioning spares k) One lot of erection hardware l) Special tools & tackles		
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COPYRIGHT AND CONFIDENTIAL 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.		m) Mandatory spares n) Items like Trolleys, etc required for Refilling & Maintenance of Inert Gas cylinders. o) Other items not specified but required to complete the system in all respects. p) Engineering of Inert Gas Extinguishing System NOTE: • The performance test of the system shall be carried out by releasing the agent gas in the smallest zone of the system and design parameters shall be measured. All equipments, refilling of gas after test, instruments etc shall be provided by the bidder for the same. • The offered IGES shall be in designed as per NFPA-2001. • BOQ of inert gas pipes and cables shall be considered by considering welding allowances, cutting allowances etc. In addition to this, as inert gas extinguishing system is site intensive package, a margin of 10% shall be considered over total BOQ and shall be reflected in each layout drawing. • All erection hardware including structural steel, pipe fittings, brackets, U clamps, nuts & bolts, base plates, anchor fastners, cable clamps, conduits, cable ties (considering a margin of at least 10% over the total quantity, as inert gas extinguishing system is site intensive package) etc. that are required for the erection of inert gas extinguishing system (as per the scope of this bid) shall be included in the scope of bidder and the same shall be included in the base price. • Cables shall be as per annexure attached to this specification. • The input drawings are furnished along with the specification. The same may also be used for estimation of cables. Further, for quoting purpose bidder to consider a cable distance of 150 mtrs between Gas Release panel and Fire Alarm panel. 7. PRODUCT DESCRIPTION 7.1. Gas release panel: a) This Panel shall be designed and manufactured keeping in mind the ease of installation. Operating and maintenance of the panel and the associated system accessories. The design shall be totally modular in concept and in the unlikely even of		
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COPYRIGHT AND CONFIDENTIAL 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.		any fault developing in the panel; the system can be brought back on line by simply replacing the faulty PCB module. b) Panel shall be located in inert gas cylinder room. c) The panel shall be provided with automatic Electronic battery charger unit, which will keep the backup batteries fully charged. The panel has various input/output modules. Each indication and control is labeled with easy to understand making it very simple to understand. d) 230V AC, 1 phase, 50Hz shall be provided at one point for Gas release panel. Further distribution if needed shall be in bidder's scope. e) Gas Release Panel shall be provided with battery backup of 24 hours in normal condition and 0.5 hours in alarm condition. The panel shall also have the capability for both trickle and boost charging of the batteries. f) The control panel consists of a lockable front door fitted with a 3 mm thick acrylic sheet, enabling visualizes the various indications and controls within the housing. The unit shall be designed in such a way so as to facilitate servicing. Cable entry shall from Bottom and removable plate shall be provided for cable entry. g) Its use ability to utilize conventional devices any make, MCP and potential free contact shall be read from other panel. It shall be the most flexible and reliable system in the life safety field. Panel shall be capable of monitor each zone cable and DV, Cylinder sol. valve. h) Suitable selector switches shall be provided for "Main/Standby" cylinder bank supply selection. i) Facility for manual release of gas/manual abort of gas release through push buttons shall be provided. along with selection facility of "Auto/Manual" from the panel. j) Following are the minimum signals required through potential free contacts of gas release panel: • Pre-Discharge (one each for each zone) • Gas Discharged (one each for each zone) Any other signals for which potential free contacts are required shall be finalized during detailed engineering. k) To prevent the loss/release of gas automatically or manually during maintenance, the system shall have the facility of “ LOCK OUT”.		
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COPYRIGHT AND CONFIDENTIAL 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.		d) The pressure relieving device (if any) shall be designed for the maximum design pressure of the system and shall conform to the requirements of NFPA-2001 or as specified by listing authorities. e) Material of construction for manifolds shall be as per listed design manual and shall be hydro-tested as per design manual or at 1.5 times the maximum design pressure, whichever is higher. 7.4. Valves: a) All valves shall be listed or approved for the intended use. b) All gaskets, O-rings, sealants, and other valve components shall be constructed of materials that are compatible with the agent. Valves shall be protected against mechanical, chemical, or other damage. c) Special corrosion-resistant materials or coatings shall be used in severely corrosive atmospheres. d) Where directional valves are used for multihazard protection, the directional valves shall be listed or approved for use with the installed suppression system. e) Where directional valves are used for multihazard protection, the control equipment shall be specifically listed for the number, type, and operation of those valves. 7.5. Nozzles: a) Discharge nozzles along with deflector shields shall be listed and quantity & design shall be such that complete quantity of gas is uniformly distributed throughout the hazard volume within the specified discharge time without disturbing the ceilings, lighting fixtures etc. b) Discharge nozzles shall conform to NFPA 2001 and shall be FM/UL/LCPB/Vds approved. c) Discharge nozzles used in the system shall be listed for the use intended for discharge characteristics. d) Listing criteria shall include flow characteristics, area coverage, height limits, and minimum pressures. Discharge orifices and discharge orifice plates and inserts shall be of a material that is corrosion resistant to the agent used and the atmosphere in the intended application. e) Special corrosion-resistant materials or coatings shall be required in severely corrosive atmospheres.		
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COPYRIGHT AND CONFIDENTIAL 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.		f) The selection of nozzle orifice shall be such discharge time period to achieve 95% of the minimum design concentration for flame extinguishment based on 35% safety factor as specified in NFPA-2001 (latest edition) is achieved. Flow calculations shall also establish this criteria. g) Each nozzle shall be permanently marked to identify the manufacturer as well as type and size of orifice. h) Where clogging by external foreign materials is likely, discharge nozzles shall be provided with frangible discs, blowoff caps, or other suitable devices. These devices shall provide an unobstructed opening upon system operation and shall be located so they will not injure personnel. 7.6. Warning Signs: a) Alarms or indicators or both shall be used to indicate the operation of the system, hazards to personnel, or failure of any supervised device. b) Audio and visual pre-discharge alarms shall be provided within the protected area to give positive warning of impending discharge. c) The operation of the warning devices shall continue after agent discharge until positive action has been taken to acknowledge the alarm. d) Alarms indicating failure of supervised devices or equipment shall give prompt and positive indication of any failure and shall be distinctive from alarms indicating operation or hazardous conditions. e) Warning and instruction signs shall be provided at the entrances to and inside the protected areas. f) The safety sign format and color and the letter style of the signal words shall be in accordance with ANSI Z535. g) Abort switches shall be located within the protected area and shall be located near the means of egress for the area. The abort switch shall be of a type that requires constant manual pressure to cause abort. In all cases, the normal manual control and the manual emergency control shall override the abort function. Operation of the abort function shall result in both audible and distinct visual indication of system impairment. The abort switch shall be clearly recognizable for the purpose intended.		
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COPYRIGHT AND CONFIDENTIAL 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.	a) The bidder shall furnish the following special tools required for operation and maintenance of the system supplied, as a part of scope of supply: <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Description</th> <th>Quantity</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Multimeter</td> <td>1 no.</td> </tr> <tr> <td>2.</td> <td>Hand drilling machine with complete set drill bit</td> <td>1 set</td> </tr> <tr> <td>3.</td> <td>Hammer</td> <td>1 no.</td> </tr> <tr> <td>4.</td> <td>Hexaframe</td> <td>1 no.</td> </tr> <tr> <td>5.</td> <td>Instrument Box</td> <td>1 no.</td> </tr> <tr> <td>6.</td> <td>Insulation Pliers</td> <td>1 no.</td> </tr> <tr> <td>7.</td> <td>Nose Pliers</td> <td>1 no.</td> </tr> <tr> <td>8.</td> <td>Screw Driver</td> <td>1 no.</td> </tr> <tr> <td>9.</td> <td>First Aid Box</td> <td>1 no.</td> </tr> </tbody> </table> Any other tools required for repairs and maintenance but not mentioned above shall be supplied by the bidder. b) All special tools and tackles which are necessary or convenient for erection and commissioning of the Inert Gas Extinguishing System shall be supplied at site by bidder. Price of these items shall be construed to be included in the main package price. No separate price for the same shall be offered c) All the special tools and tackles shall be shipped in separate heavily constructed wooden boxes. Notes: • All Tools and tackles required for dismantling, maintenance, adjustment, and calibration of the all the equipments that form part of Inert Gas Extinguishing System shall be supplied. • Bidder shall provide all equipment like trolleys, etc. required for Refilling & Maintenance of Inert Gas cylinders. • Bidder to note that if at a later stage the requirement of any other special tool & tackles is required for the Package, same has to be supplied by bidder without any delivery or commercial implication. Decision of the Purchaser regarding the requirement of any additional tools and tackles will be final and binding on the Purchaser. • All special tools and tackles shall be handed over purchaser, prior to the issuance of the PROVISIONAL ACCEPTANCE CERTIFICATE for the IGES.			Sl. No.	Description	Quantity	1.	Multimeter	1 no.	2.	Hand drilling machine with complete set drill bit	1 set	3.	Hammer	1 no.	4.	Hexaframe	1 no.	5.	Instrument Box	1 no.	6.	Insulation Pliers	1 no.	7.	Nose Pliers	1 no.	8.	Screw Driver	1 no.	9.	First Aid Box	1 no.
	Sl. No.	Description	Quantity																														
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2.	Hand drilling machine with complete set drill bit	1 set																															
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7.	Nose Pliers	1 no.																															
8.	Screw Driver	1 no.																															
9.	First Aid Box	1 no.																															
Ref. Doc	7.12. Mandatory Spares:																																

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COPYRIGHT AND CONFIDENTIAL 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.	The following specified spare parts shall be supplied. The price for each listed special spare part shall be quoted individually in the Price Bid Format, the total price is included in the total contract price. <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Description</th> <th>Quantity</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Nozzles</td> <td>2 Nos. of each size/type</td> </tr> <tr> <td>2.</td> <td>Automatic & Manual release system</td> <td>1 No. of each size/type</td> </tr> <tr> <td>3.</td> <td>Cylinder valve with safety pressure relief device</td> <td>1 No. of each size/type</td> </tr> <tr> <td>4.</td> <td>Gas Cylinder</td> <td>5 Nos. of each size/type</td> </tr> <tr> <td>5.</td> <td>Flexible hoses (if applicable)</td> <td>2 Nos. of each size/type</td> </tr> <tr> <td>6.</td> <td>Solenoid coils</td> <td>2 Nos. of each size/type</td> </tr> </tbody> </table> 8. BIDDER'S SCOPE OF SERVICES 8.1. Supervision of erection & commissioning - The performance test of the system shall be carried out by releasing the agent gas in the smallest zone of the system and design parameters shall be measured. All equipments, refilling of gas after test, instruments etc shall be provided by the bidder for the same. - Supervision of erection, commissioning & performance testing at site for the supplied system shall be included in bidder's scope of service. - Bidder to note that the supervision charges for erection & commissioning shall consists of the following: - Per day supervision charges of an Engineer including all other expenses like boarding, lodging, local travel, insurance etc. - Travel expenses (inclusive of any clearance charges like Visa fee etc, insurance) from / to vendor works to site. - Per diem charges shall be applicable from the day bidder's person reaches site, up to the day he leaves the site. - All payments towards supervision of E&C shall be made only after BHEL-site supervision. - 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 by BHEL.			Sl. No.	Description	Quantity	1.	Nozzles	2 Nos. of each size/type	2.	Automatic & Manual release system	1 No. of each size/type	3.	Cylinder valve with safety pressure relief device	1 No. of each size/type	4.	Gas Cylinder	5 Nos. of each size/type	5.	Flexible hoses (if applicable)	2 Nos. of each size/type	6.	Solenoid coils	2 Nos. of each size/type
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COPYRIGHT AND CONFIDENTIAL 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.		g) Bidder to quote supervision of erection and commissioning activities strictly as per BHEL's price format (Annexure-1). h) Engineering of cables, cable routing and cable scheduling within Inert Gas extinguishing system. i) Engineering of cables, cable routing and cable scheduling between Gas release panel and Fire Alarm Panel. 9. DESIGN OF IGES SYSTEM 9.1. General a) Complete design and all the system components/equipment or major system components like cylinder, cylinder valve assembly, hoses, check valve, actuation controls, restrictor / pressure reducer, directional / selector valve, pressure relief device / safety valve, pressure gauge, pressure switch, nozzle, etc. (as applicable for approving/listing agencies) shall be approved and listed by UL/FM/VdS/LPCB and shall also be approved by TAC/TAC accredited professional (s) before installation. b) The IGES shall be a total flooding centralized system with directional valves and have 100% standby cylinders. c) Operating devices shall be by mechanical, electrical and pneumatic means conforming to NFPA-2001. The power supply to electrical actuators shall be backed up with reliable battery supply. Such batteries shall be charged automatically by battery chargers. a) The system shall be centralized for all the rooms protected, and shall be designed as total flooding for the single largest room volume (ceiling void + room void + floor void) of control room. The areas to be protected by inert gas extinguishing system shall be divided into the zones as mentioned in cl. No. 6.0 above. b) The clean agent piping and nozzles shall have to planned clearing following facilities coming on its route , in the areas where protection is being envisaged: • The beam and ribs which criss-cross the ceiling • Path of AC ducts • Cabling in false flooring • Light fitting, detectors etc. c) Basic design parameters of inert gas extinguishing system like type of inert gas agent, extinguishing / design concentration, safety factor, discharge time, etc. shall be considered in strict accordance with NFPA-2001 (latest edition). Piping design / layout,		
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COPYRIGHT AND CONFIDENTIAL 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.		i) Calculation shall be provided by the designer to prove that the area is not pressurised and extinguishing capability is not affected due to provided ventilation of that area. Pressure vent shall be provided for each protected area as per system requirement. 9.3. System Flow Calculation a) System flow calculation shall be performed using a calculation method listed or approved by the authority having jurisdiction (i.e. UL/FM/Vds/LPCB) and shall be approved by TAC accredited agency. The system design shall be within the manufacturers listed limitations. b) Approval certificate of software from UL/FM/Vds/LPCB etc. shall be submitted along with the offer. c) Bidder shall also provide sufficient safety facilities (like properly designed louvers etc.) in the risk areas to dissipate over pressurisation due to release of Clean Agent and also provide calculation in support of same for each protected area. 9.4. Clean Agent Quantity a) Minimum design concentration of Clean Agent gas shall be as per NFPA-2001 at 70 deg F by volume for clean agent fire extinguishing system based on approved/listed flow calculation method. b) Clean agent concentration requirement shall be computed considering the volume of the hazard as specified. In addition to the concentration requirement as specified, 20% of the gas quantity as computed above, shall be added to compensate for leakages and extinguishing efficiency. The bidder, as per NFPA-2001, shall work out the quantity of clean agent. However, bidder drawing shall quote minimum quantity of agent for volume as given in the scope. 9.5. The principle of operation shall be as follows a) Whenever there is a fire in any of the rooms protected, the same will be detected by the automatic fire detector. It will in turn annunciate a fire signal in the MFAP. The first detection signal will actuate the hooters in the room and warning lights, so as to warn the people to evacuate and prevent people from entering the room. When, at least another automatic fire detector in the room registers a fire condition, the necessary fire dampers in the AC / Ventilation system will get closed (from their respective panel/s based upon confirmed fire signal from the MFAP), the clean agent extinguishing system will get actuated and the time delay for the release starts (normally 10 seconds however shall be based on the recommendation of the bidder). After the time delay elapses, the clean agent is released. The release mechanism operates by opening the electrical actuator of the pilot cylinder, which then in turn		
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COPYRIGHT AND CONFIDENTIAL 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.		open the quick opening valve of the designated slave cylinders, and thus releasing the gas in the manifold. The gas then is carried through piping to the room in fire and released through the nozzles located strategically in the room. The gas is maintained in the room for a specified period of time (about 10 min. however shall be based on the recommendation of the bidder), during which the fire is extinguished. b) In case, it gets known during the time delay period before release, that there is no fire but the alarm is false alarm, the gas release can be aborted by pressing the abort switch. Also, if due to any reason it is found that the gas is not getting released even after the time delay period, a manual release can be initiated by pressing the manual release button. c) The system shall be designed based on the single largest risk area of the control room to be protected. However, the grouping of cylinders shall be made in such a way that discharge takes place corresponding to the volume of the risk under fire. d) The system shall include electrically actuated automatic Clean Agent Fire Extinguishing System complete with filled up Clean Agent cylinders cylinder rack, manifolds, Pressure reducing devices, cylinder valves, pipes, discharge nozzles, bracket support, hangers, and such other fittings as necessary for complete installation of the system, including chipping of existing RCC/brick walls/cutting of steel plates etc. or removal & re-fixing of false ceiling and floor of risk areas, fixing fasteners and other activities required to install the system. e) The system shall also comprise of the different modes of operation, actuation and cancellation facility etc. with necessary local control panel mentioned elsewhere in this specification. f) Operating devices and Local control panels shall be provided for this system. The bidder shall have to offer 100% Clean Agent filled standby cylinders. (i.e. A reserve clean agent filled cylinders with manifold , directional valves and automatic change over to any of the two banks after actuation of main cylinders to be provided in each risk area i.e. 100% reserve). 9.6. System Operation a) System operation shall be possible by the following means: - Automatically due to fire detection in protected area - Operation of manual release push button located adjacent to protected area. - By operating manual lever provided on electrical/manual control head on pilot cylinder - By push button actuation at Clean Agent Control panel , in manual mode		
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COPYRIGHT AND CONFIDENTIAL 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.		b) The clean agent shall be discharged /actuated automatically after an adjustable time delay based on the detection signal received. The delay shall be minimum 30 sec.; however it shall be adjustable from 30 to 120 sec. In the local control panel of clean agent system, there shall be one hooter, which shall operate once the gas is released. During time delay, there shall be a pre-discharge alarm (audio+visual). Hooter shall follow the alarm once the gas is discharged. 9.7. Clean Agent Gas & Its Grouping/Distribution a) The quantity of clean agent gas provided shall be sufficient to protect the single largest risk with 100% standby. The system for every individual risk shall have its own distribution piping, nozzles, alarms and actuation system etc. b) Suitable combination of cylinders shall be made to cater to all the risk areas individually. c) Both primary and standby cylinders shall be permanently connected to distribution piping through manifold and arranged for easy and automatic changeover. Suitable selector switches be provided for "Normal/ Standby" supply selection. d) Since the system is designed for the largest risk and there are several risk areas varying in size in a particular building, the system shall permit the use of required no. of cylinders for any individual risk involved so that the concentration of gas in that risk area does not exceed the NOAEL as per NFPA-2001. 9.8. Gas properties and its discharge characteristics a) Physical properties of Inert gas agent shall be as per NFPA-2001 latest edition. b) The agent container pressure shall be as recommended in NFPA 2001. c) The agent discharge shall be substantially completed in a nominal 120 sec. d) For inert gases the measured discharge time is considered to be the time when the measuring device starts to record reduction of oxygen until the design oxygen reduction level is achieved. e) The min. O₂ concentration shall be as per NFPA-2001 10. INSPECTION, TESTING, APPROVAL & COMMISSIONING 10.1. 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.		
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COPYRIGHT AND CONFIDENTIAL 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.		10.2. Inspection at Vendor works – by BHEL + VENDOR + END USER as per approved QAP. 10.3. Site Acceptance Test at site - by BHEL + VENDOR + END USER as per approved procedure 10.4. Bidder after satisfying that all inspection requirements as per approved Inspection Testing Plan (ITP) and applicable specifications / documents have been taken care by Third Party Inspection Agency (TPIA), shall submit copy of the Inspection Certificate and all Quality control records to Purchaser in requisite copies along with Statutory Certificates if any, such as IBR, CCE etc. duly endorsed by their Quality Control Manager. 10.5. Purchaser and / or End customer reserve the right to carry out surprise checks on all material either at manufacturer's works or at site. In case of any rejection at site, the whole lot will be rejected and bidder shall get the entire lot replaced without any time or delivery implication to the purchaser. 10.6. TPIA shall check the calibration status and traceability of all instruments used by the supplier, for testing. In case, TPIA uses their own instruments for testing purposes, similar certification shall be ensured. 10.7. In case any non-conformity is noticed, 100% of the lot shall be checked by TPIA and all non-conforming material shall be replaced by the bidder. 10.8. Testing a) After installation, the complete system shall be inspected and tested as per relevant clauses of NFPA-2001. Wherever testing is mentioned at a regular frequency in these chapters, the bidder shall carry out initial testing and records shall be presented to Owner for approval of the installation. b) Prior to handing over of the system to Employer, the supplier shall provide operational training to Employer's operating personnel which shall consist of control system operation, trouble procedures, emergency procedures, safety requirements etc. c) The performance test of the system shall be carried out by releasing the agent gas in the smallest zone of the system and design parameters shall be measured. All equipments, refilling of gas after test, instruments etc shall be provided by the bidder for the same. 11. MARKING, PACKING AND DISPATCH 11.1. All items shall be marked (stamped/etched) in accordance with the applicable code/standard/specification. In addition, the item code, if available, shall also be marked.		
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COPYRIGHT AND CONFIDENTIAL 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.		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 dessicants. 11.14. 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. 11.15. Mandatory Spare parts shall be packaged separately and clearly marked as 'Mandatory Spares '. 11.16. Commissioning spares, Tools & tackles to be packed separately & suitably tagged. 11.17. If mandatory spare items are ordered, same shall be sent in pre-decided lots in containers /secure boxes distinctly marked in GREEN color with boldly written "S "mark on each face of the containers /secure boxes 11.18. Loose vendor items sent by vendor to sites shall be quantified/numbered/tagged and not merely mentioned as ONE lot of loose items. 11.19. A packing list covering items having shelf life are to be intimated to site. Also, shelf life items shall be packed separately in BLACK color painted box for easy identification at site. 11.20. Loose vendor items sent to sites shall be quantified/numbered/tagged and not merely mentioned as ONE lot of loose items. 12. DOCUMENTATION 12.1. Vendor shall make the offer in detail, with respect to every item of the Purchaser's specifications. Any offer not conforming to the following requirements shall be summarily rejected. a) Duly filled & Signed copy of Check list b) Deviation list, if any (as per "No deviation format" given in this specification). If there are no deviations, bidders shall submit "Deviation format" by mentioning deviations "Nil". c) Unpriced price schedule (To be submitted compulsorily without fail) d) Bill of materials 12.2. Documentation after P.O. Placement		
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a) List of inputs as envisaged by purchaser is attached in annexure-8.																																				
b) On receipt of order, it shall be solely the bidder's responsibility to spell out the requirement of the base engineering drawings/documents (required by him over and above the data furnished along with this specification) to go ahead with the engineering of the package within a week, and shall not expect the Purchaser to automatically supply the same after order placement. Any ultimate delay arising out of the delay by the successful bidder in putting up such a requisition shall solely be to the bidder's account.																																				
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COPYRIGHT AND CONFIDENTIAL 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.		13.4. Prices quoted by the bidder shall remain firm till the successful handing over of the Fire Protection plant to end customer. Any request for upward revision of price during any intermediate stage before handing over the plant to end customer will be summarily rejected by BHEL. 13.5. Bidder to quote only base rates for all the items, Applicable taxes and duties shall be indicated separately. 13.6. The Priced Bid shall be submitted in Original (without any copy) duly signed and stamped on each page in a separate sealed envelope super scribing “Price Bid –Do not Open” This shall not contain any condition whatsoever failing which the Bids shall be liable to be rejected. In case of any correction, the bidder shall put its signature and its stamp. Eraser fluid will not be allowed for making any correction. 13.7. Bidder shall confirm to the unpriced bid as part of their offer. 13.8. Information like Bill of materials (BOM), Instrument list, datasheets, and typical specifications enclosed by the bidder as a part of their bid, shall be retained for information only and shall not be referred by contractor as contractual agreement. No implication shall be admissible on the basis of these documents during any stage of contract execution. 14. SUB VENDOR LIST 14.1. All the equipment shall be sourced from recommended Bidders only as specified Annexure-12. 14.2. Further the supplied model shall be under regular manufacturing range and have Proven Track Record (PTR). (Bidder / sub-Bidder shall have supplied minimum 2 no. in last 7 years, out of which at least one shall be in satisfactory operation for minimum 8000 hours). 14.3. Bidder to comply with sub-vendor list enclosed with the specification. The sub-vendors for any item that is not appearing in the sub-vendor list (annexure-12) may be proposed for BHEL’s approval. Non-acceptance of any sub-vendor by BHEL / customer shall not have any commercial & delivery implication. While submitting sub-vendors for approval of BHEL, bidder shall furnish following documents : a) ISO certificate of Sub-vendors b) Proven track record & references for makes and models supplied earlier.		
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COPYRIGHT AND CONFIDENTIAL 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.	Note: Bidder to note that all IGES equipment such as cylinders, contact gauges, pressure regulators, Gas release Panel etc. shall be UL/FM/LPCB/VdS approved. Cylinders shall also have PESO , Nagpur approval certificate. 15. DOCUMENTS ALONG WITH BID 15.1. The following documents shall be submitted by bidder and the bidder's offer shall be evaluated on the following: a) Duly filled & Signed copy of Check list b) No Deviation Format c) Unpriced price schedule (To be submitted compulsorily without fail) Note: Evaluation shall be done on No Deviation schedule. Even if no deviations are there, bidder shall submit, signed copy of No deviation format. Technical evaluation of offer shall be done based on no deviation schedule only. Any other document submitted along with the offer shall be retained for information only. 16. LIST OF ANNEXURES <table border="1"> <thead> <tr> <th colspan="3">LIST OF ANNEXURES</th> </tr> <tr> <th>Sl. No</th> <th>Drawings/Documents</th> <th>Drg/Doc no</th> </tr> </thead> <tbody> <tr><td>1.</td><td>Price Bid Format</td><td>Annexure – 1</td></tr> <tr><td>2.</td><td>Master Document List</td><td>Annexure – 2</td></tr> <tr><td>3.</td><td>Standard Manufacturing Quality Plan (for reference)</td><td>Annexure – 3</td></tr> <tr><td>4.</td><td>Guidelines for QA QC plan</td><td>Annexure – 4</td></tr> <tr><td>5.</td><td>Format for Despatch details</td><td>Annexure – 5</td></tr> <tr><td>6.</td><td>Typical BBU for IGES system</td><td>Annexure – 6</td></tr> <tr><td>7.</td><td>Pre Bid Query Format</td><td>Annexure – 7</td></tr> <tr><td>8.</td><td>Input Doc. List</td><td>Annexure – 8</td></tr> <tr><td>9.</td><td>Deviation Format</td><td>Annexure – 9</td></tr> <tr><td>10.</td><td>Tender purpose Drawings</td><td>Annexure – 10</td></tr> <tr><td>11.</td><td>Check List</td><td>Annexure – 11</td></tr> <tr><td>12.</td><td>Sub-Vendor List</td><td>Annexure – 12</td></tr> <tr><td>13.</td><td>Typical BOQ Format</td><td>Annexure – 13</td></tr> <tr><td>14.</td><td>Specification for Cables</td><td>Annexure – 14</td></tr> <tr><td>15.</td><td>Painting Specification</td><td>Annexure – 15</td></tr> </tbody> </table>			LIST OF ANNEXURES			Sl. No	Drawings/Documents	Drg/Doc no	1.	Price Bid Format	Annexure – 1	2.	Master Document List	Annexure – 2	3.	Standard Manufacturing Quality Plan (for reference)	Annexure – 3	4.	Guidelines for QA QC plan	Annexure – 4	5.	Format for Despatch details	Annexure – 5	6.	Typical BBU for IGES system	Annexure – 6	7.	Pre Bid Query Format	Annexure – 7	8.	Input Doc. List	Annexure – 8	9.	Deviation Format	Annexure – 9	10.	Tender purpose Drawings	Annexure – 10	11.	Check List	Annexure – 11	12.	Sub-Vendor List	Annexure – 12	13.	Typical BOQ Format	Annexure – 13	14.	Specification for Cables	Annexure – 14	15.	Painting Specification	Annexure – 15
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		Rev. No.	Date	Revision Details	Prepared By	Checked By	Approved By	
		00	24/06/2020	Original Issue	RTJ	DVPK	PCS	
		Ref.						