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TECHNICAL SPECIFICATION
FOR
INERT GAS EXTINGUISHING SYSTEM

PROJECT : 1 x 660 MW SAGARDIGHI THERMAL POWER EXTENSION PROJECT (PHASE-III, UNIT#-5)

CUSTOMER : THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD. (WBPDCL)

CONSULTANT : DEVELOPMENT CONSULTANTS PRIVATE LIMITED, KOLKATA

Revisions :

Prepared by:

Checked by:

Approved By:

Date

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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.		<p>1. INTENT OF SPECIFICATION:</p> <p>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 Sagardighi 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 SAGARDIGHI THERMAL POWER EXTENSION PROJECT (PHASE-III, UNIT#-5) at Manigram (Village), Murshidabad (Dist.), West Bengal.</p> <p>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.</p> <p>2. SPECIAL NOTES TO BIDDERS</p> <p>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.</p> <p>2.2. All materials supplied under this contract shall be new and unused.</p> <p>2.3. All equipment/items as applicable, shall be UL/FM/VDs/LPCB approved.</p> <p>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.</p> <p>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.</p>		
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- 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.
- 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


Owner	The West Bengal Power Development Corpn. Ltd. (WBPDCL)
Project	1 x 660 MW SAGARDIGHI THERMAL POWER EXTENSION PROJECT (PHASE-III, UNIT#-5)
Location	Manigram (Village), Murshidabad (Dist.), West Bengal
Nearest Railway station	Manigram (on Bandel-Barhawara branch line)
Nearest Airport	Kolkata
Nearest Seaport	Haldia

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 dimension of the cylinder room is (9.8m x 7.5m) for inert gas extinguishing system which 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

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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.		<ul style="list-style-type: none"> ➤ 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 <p>ii. Requirements of the following local statutory authorities (as applicable) shall be taken into account for compliance:</p> <ol style="list-style-type: none"> 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. <p>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.</p> <p>iv. All addenda including the latest addenda to all the above codes and standards (latest editions) shall be followed by the bidder.</p> <p>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.</p> <p>Note:</p>		
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<p style="text-align: center;">Bidder to follow all other applicable statutory rules and regulations of India during manufacturing, procurement & transportation of the IGES components.</p> <p>6. BIDDER'S SCOPE OF WORK</p> <p>6.1. Inert Gas Extinguishing System shall be provided for following areas as listed below:-</p> <ul style="list-style-type: none"> - Central Control room (CCR) and Shift Incharge & Record Room - Computer Room, Conference Room and Operator Cabin - Central Equipment Rooms (CER) Part-1 - Central Equipment Rooms (CER) Part-2 <p>6.2. IGES system should include the following minimum items:</p> <ul style="list-style-type: none"> a) One (01) Inert Gas Release Panel. b) 1 lot of Inert Gas Cylinders required for the system along with same no. of spare 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 m)Mandatory spares 				
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- 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 a 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.
- 3C x 2.5sq.mm Fire Survival cable shall be used for Inert Gas Extinguishing System. Cables shall be as per annexure attached (Annexure-14) 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.
- Surface preparation and painting of pipes, fittings and structural material shall be as defined in Annexure-15.

6.3. Special tools and tackles:

- 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:

Sl. No.	Description	Quantity
1.	Multimeter	1 no.
2.	Hand drilling machine with complete	1 set



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	set drill bit	
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.

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.

6.4. Mandatory Spares for IGES:

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.

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Sl. No.	Description	Quantity
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1.	Manifold Check Valve	2 Nos.
2.	Set of Nozzles	1 Set of each type and size
3.	3-way Solenoid Valve	2 Nos.
4.	Pressure Regulator	2 Nos.
5.	Relief Valve	2 Nos.
6.	Pneumatic Valve (for gas release from master Cylinder)	1 No.
7.	Discharge & Pre-discharge Indicator	2 Sets
8.	Hose	2Sets. for each Size
9.	Pressure/Limit Switch	2(two)no. of each type & model/range used in the system
10.	Pressure Gauge	10% of total nos. used in the system or minimum 1(one) no. whichever is more for each type and range.

6.5. Approvals & Permissions:


Following minimum approvals shall be arranged and necessary documents in support of the same to be furnished by vendor during detailed engineering:


- PESO approval for inert gas cylinder and its valve
- PESO permission for refilling of inert gas cylinders
- Test certificates like material test certificates and hydro test certificates for inert gas cylinder and its valve
- Any other certification / permission required for successful handing over system to customer and subsequent refilling of inert gas cylinders of the inert gas extinguishing.


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 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.


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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.		<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>h) Suitable selector switches shall be provided for "Main/Standby" cylinder bank supply selection.</p> <p>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.</p> <p>j) Following are the minimum signals required through potential free contacts of gas release panel:</p> <ul style="list-style-type: none"> • Pre-Discharge (one each for each zone) • Gas Discharged (one each for each zone) <p>Any other signals for which potential free contacts are required shall be finalized during detailed engineering.</p> <p>7.2. Inert Gas Cylinders:</p> <p>a) 2 sets of inert gas cylinder (one working + one standby) banks for each of the IGES shall be provided in a separate Clean Agent Room and securely installed with a provision for convenient individual servicing.</p> <p>b) The design pressure for storage cylinders shall be suitable for the maximum pressure developed at 550C and shall be designed to meet the requirements in NFPA-2001.</p> <p>c) All cylinders shall bear the marking as detailed out in NFPA - 2001 and shall be duly listed by UL / FM / VDS / LPCB in addition to approval by CHIEF CONTROLLER OF EXPLOSIVES – INDIA (PESO).</p>		
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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.		<p>d) The storage cylinders shall have accessories such as contact gauges/pressure gauges/switches, liquid level indicators (if applicable), refilling connections, relief devices (if applicable) etc. A reliable means of indication shall be provided to determine the pressure in cylinders.</p> <p>e) All the contact gauges/pressure gauges/switches, manifold connections etc. shall be easily removable for servicing/maintenance without any loss of gas.</p> <p>f) Automatic means such as check valves shall be provided to prevent gas loss, if the system is operated, when any containers are removed for maintenance.</p> <p>g) The storage containers shall not be charged to a fill density or super pressurization level different from the manufacturer's listing.</p> <p>h) All the inert gas agent cylinders shall have a permanent nameplate or permanent marking to indicate details as mentioned in Cl. 4.1.4.2 of NFPA – 2001.</p> <p>7.3. Pipes, Fittings & other Operating devices:</p> <p>a) Piping shall be of noncombustible material. The selection of the pipe shall be as per NFPA-2001.</p> <p>b) Pipe joints other than threaded, welded, brazed, flared, compression, or flanged type shall be listed or approved.</p> <p>c) The fittings shall withstand a minimum rated working pressure as mentioned in NFPA-2001. The selection of the fittings shall also be inline with requirements of NFPA-2001.</p> <p>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.</p> <p>7.4. Valves:</p> <p>a) All valves shall be listed or approved for the intended use.</p> <p>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.</p> <p>c) Special corrosion-resistant materials or coatings shall be used in severely corrosive atmospheres.</p> <p>d) Where directional valves are used for multihazard protection, the directional valves shall be listed or approved for use with the installed suppression system.</p>		
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<p style="text-align: center;">COPYRIGHT AND CONFIDENTIAL</p> <p style="text-align: center;">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.</p> <p>c) The operation of the warning devices shall continue after agent discharge until positive action has been taken to acknowledge the alarm.</p> <p>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.</p> <p>e) Warning and instruction signs shall be provided at the entrances to and inside the protected areas.</p> <p>f) The safety sign format and color and the letter style of the signal words shall be in accordance with ANSI Z535.</p> <p>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.</p> <p>7.7. Operating Devices:</p> <p>a) Operating devices shall include agent-releasing devices or valves, discharge controls, and shutdown equipment necessary for successful performance of the system.</p> <p>b) Operation shall be by listed mechanical, electrical, or pneumatic means. An adequate and reliable source of energy shall be used.</p> <p>c) All devices shall be designed for the service they will encounter and shall not readily be rendered inoperative or susceptible to accidental operation. Devices normally shall be designed to function properly from –20°F to 130°F (–29°C to 54°C) or marked to indicate temperature limitations.</p> <p>d) All devices shall be located, installed, or suitably protected so that they are not subject to mechanical, chemical, or other damage that would render them inoperative.</p> <p>e) A means of manual release of the system shall be provided. Manual release shall be accomplished by a mechanical manual release or by an electrical manual release when the control equipment monitors the battery voltage level of the standby battery supply and provides a low-battery signal. The release shall cause simultaneous operation of automatically operated valves controlling agent release and distribution.</p>				
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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.		<p>f) A discharge pressure switch shall be required where mechanical system actuation is possible.</p> <p>g) The discharge pressure switch shall provide an alarm initiating signal to the releasing panel.</p> <p>h) The normal manual control(s) for actuation shall be located for easy accessibility at all times, including at the time of a fire.</p> <p>i) The manual control(s) shall be of distinct appearance and clearly recognizable for the purpose intended.</p> <p>j) Operation of any manual control shall cause the complete system to operate as designed.</p> <p>k) Manual controls shall not require a pull of more than 40 lb (178 N) nor a movement of more than 14 in. (356 mm) to secure operation. At least one manual control for activation shall be located not more than 4 ft (1.2 m) above the floor.</p> <p>l) Where gas pressure from the system or pilot containers is used as a means for releasing the remaining containers, the supply and discharge rate shall be designed for releasing all the remaining containers.</p> <p>m) All devices for shutting down supplementary equipment shall be considered integral parts of the system and shall function with the system operation.</p> <p>n) All manual operating devices shall be identified as to the hazard they protect.</p> <p>7.8. Pressure Relief Vents:</p> <p>a) Pressure relief vent area, or equivalent leakage area, shall be calculated and provided for the protected enclosure to prevent development, during system discharge, of a pressure difference across the enclosure boundaries that exceeds a specified enclosure pressure limit.</p> <p>7.9. First Fill of Consumable:</p> <p>a) All the first fill consumables like gas etc. and replacements, if any, are in bidder scope till successful handing over of plant to BHEL after successful completion of erection and commissioning and /or site performance test.</p> <p>b) Price of these items shall be construed to be included in the main package price. No separate price for the same shall be offered.</p>		
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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.		<p>i. Refilling of Inert Gas Cylinders after Dump test</p> <p>7.10. Erection & Commissioning Spares</p> <p>a) All commissioning spares as required during erection and commissioning of the Inert Gas Extinguishing system is included in bidder’s scope.</p> <p>b) 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.</p> <p>c) Bidder shall also ensure supply of all erection & commissioning spares along with main equipment as per his experience, for replacement of damaged or unserviceable ones during the execution of the project by bidder at site, to avoid delay in the project schedule.</p> <p>d) Price of all the above items shall be construed to be included in the main package price. No separate price for the same shall be offered.</p> <p>8. BIDDER’S SCOPE OF SERVICES</p> <p>8.1. Supervision of erection & commissioning</p> <p>a) The performance test of the system shall be carried out by releasing the agent gas in a selected area and design parameters shall be measured. All equipments, refilling of gas after test, instruments etc shall be provided by the bidder for the same.</p> <p>b) Supervision of erection, commissioning & performance testing at site for the supplied system shall be included in bidder’s scope of service.</p> <p>c) Bidder to note that the supervision charges for erection & commissioning shall consists of the following:</p> <ul style="list-style-type: none"> • 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. <p>d) Per diem charges shall be applicable from the day bidder’s person reaches site, up to the day he leaves the site.</p> <p>e) All payments towards supervision of E&C shall be made only after BHEL-site supervision.</p>		
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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.		<p>f) 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.</p> <p>g) Bidder to quote supervision of erection and commissioning activities strictly as per BHEL’s price format (Annexure-1).</p> <p>h) Engineering of cables, cable routing and cable scheduling within Inert Gas extinguishing system.</p> <p>i) Engineering of cables, cable routing and cable scheduling between Gas release panel and Fire Alarm Panel.</p> <p>9. DESIGN OF IGES SYSTEM</p> <p>9.1. General</p> <p>a) Complete design and all the system components/equipment or major system components (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.</p> <p>b) The IGES shall be a total flooding centralized system with directional valves and have 100% standby cylinders.</p> <p>c) 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.</p> <p>d) 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:</p> <ul style="list-style-type: none"> • The beam and ribs which criss-cross the ceiling • Path of AC ducts • Cabling in false flooring • Light fitting, detectors etc. <p>e) System design, specifications, working plans, flow calculations etc. shall be prepared in line with NFPA-2001 or as specified by listing authorities and shall be approved by Owner.</p> <p>f) IGES system shall be interconnected with FDA system of the plant.</p>		
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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.		<p>9.2. Design Concentration, Quantity & Discharge Time</p> <ul style="list-style-type: none"> a) Minimum design concentration of INERT gas fire extinguishing system shall be as per NFPA-2001. However higher concentration may be used, if it is specified by the agent manufacturer/system supplier (OEM) for the area protected. b) Bidder shall design the system to meet the minimum requirements of Clean Agent System as per NFPA-2001 and having design concentration as specified at 70 Deg. F (21 Deg. C) for the single largest risk zone to be protected. c) The complete volume of the rooms including the above false ceiling and below false flooring shall be considered for estimation of quantity of gas and containers. d) When determining the gas quantity, the minor leakage losses through window and door opening have been considered however it is necessary that all the opening should be minimised in order to retain concentration of Inergen agent for 10 minutes after discharge to prevent reflash/reignition for effective extinguishment. e) Further volume of re-circulating type air conditioning system & its duct work (at least upto the automatic fire dampers of the ducts) shall be considered as a part of the total volume so that the design concentration is achieved throughout the hazard area. Further gas quantity will be adjusted for ambient pressure & temperature conditions. f) To provide primary supply of gas & its cylinders, along with 100% (one hundred percent) standby/reserve gas quantity and cylinders for single largest hazard being protected (as per NFPA 2001). g) The discharge time period shall be such that 95% of the minimum design concentration for flame extinguishment based on 35% safety factor is achieved within 120 seconds. The flow calculations shall establish this criterion. h) The quality of gas shall conform to relevant design standard such as NFPA-2001 or as specified by listing authorities. 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. <p>9.3. System Flow Calculation</p> <ul style="list-style-type: none"> 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. 		
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<p style="writing-mode: vertical-rl; transform: rotate(180deg);"> 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. </p> <p> b) Approval certificate of software from UL/FM/Vds/LPCB etc. shall be submitted along with the offer. </p> <p> 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. </p> <p> 9.4. Clean Agent Quantity </p> <p> 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. </p> <p> 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. </p> <p> 9.5. The principle of operation shall be as follows </p> <p> 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 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. </p> <p> 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 </p>				
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		Ref. Doc	9.7. Clean Agent Gas & Its Grouping/Distribution	


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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.		<p>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.</p> <p>b) Suitable combination of cylinders shall be made to cater to all the risk areas individually.</p> <p>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.</p> <p>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.</p> <p>9.8. Gas properties and its discharge characteristics</p> <p>a) Physical properties of Inert gas agent shall be as per NFPA-2001 latest edition.</p> <p>b) The agent container pressure shall be as recommended in NFPA 2001.</p> <p>c) The agent discharge shall be substantially completed in a nominal 120 sec.</p> <p>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.</p> <p>e) The min. O₂ concentration shall be as per NFPA-2001</p> <p>10. INSPECTION, TESTING, APPROVAL & COMMISSIONING</p> <p>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.</p> <p>10.2. Inspection at Vendor works – by BHEL + VENDOR + END USER as per approved QAP.</p> <p>10.3. Site Acceptance Test at site - by BHEL + VENDOR + END USER as per approved procedure</p> <p>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</p>		
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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.		<p>11.4. Paint or ink for marking shall not contain any harmful metal or metal salts which can cause corrosive attack either ordinarily or in service. Special items/smaller items shall have attached corrosion resistant tag providing salient features.</p> <p>11.5. The equipment shall be transported to site by the vendor in fully assembled condition. However, in case some components are liable to be damaged during transit, the same shall be dismantled and supplied separately, to be reassembled at site the vendor. Assembly of the item supplied loose at site and repairing of any item damaged during transport shall be in the vendor’s scope. The vendor shall send each consignment to site with a detailed packing list.</p> <p>11.6. All the equipment shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by ship/rail or trailer. The equipment shall be wrapped in polythene sheets before being placed in crates/cases to prevent damage to the finish. Crates/cases shall have skid bottom for handling.</p> <p>11.7. Special notations such as 'Fragile', 'This side up', 'Center of gravity', 'Weight', 'Owner's particulars', 'PO Nos.' etc. shall be clearly marked on the package together with other details as per purchaser order.</p> <p>11.8. The equipment/items may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains/high ambient temperature, unless otherwise agreed.</p> <p>11.9. All items shall be dry, clean and free from moisture, dirt and loose foreign material of all kinds.</p> <p>11.10. All items shall be protected from rust, corrosion, and mechanical damage during transportation and handling.</p> <p>11.11. 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.</p> <p>11.12. All electrical, instrumentation etc., shall be properly packed to prevent damage during transport, storage, handling at site.</p> <p>11.13. 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 dessicants.</p>		
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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.		<p>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.</p> <p>11.15. Mandatory Spare parts shall be packaged separately and clearly marked as 'Mandatory Spares'.</p> <p>11.16. Commissioning spares, Tools & tackles to be packed separately & suitably tagged.</p> <p>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</p> <p>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.</p> <p>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.</p> <p>11.20. Loose vendor items sent to sites shall be quantified/numbered/tagged and not merely mentioned as ONE lot of loose items.</p> <p>12. DOCUMENTATION</p> <p>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.</p> <ul style="list-style-type: none"> 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 <p>12.2. Documentation after P.O. Placement</p> <ul style="list-style-type: none"> 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) 		
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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.		<p>b) All vendor documents of Inert Gas Extinguishing System and its sub-items shall be submitted to End user for approval during order execution. Any comment furnished by End user / BHEL shall be taken care by vendor during ordering execution.</p> <p>c) Further BHEL will provide comments on vendor submitted document within 14 working days for revision & resubmission. Vendor shall follow up with BHEL for non-receipt of comments/approvals.</p> <p>d) Revised drawings / Documents shall be submitted by Bidder in 07 days of receipt of comments / observations from BHEL. BHEL shall revert within 14 days on receipt of these revised documents / drawings from vendor for approvals.</p> <p>e) All the approvals required for manufacturing shall be completed with 3 months from P.O to meet the P.O delivery schedule. Accordingly vendor shall ensure the submission of approval category documents (which are required for manufacturing) and obtain their approvals.</p> <p>f) Vendor shall obtain final approvals on all technical + quality aspect documents before inspection dates.</p> <p>g) 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.</p> <p>12.3. 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).</p> <p>a) Complete O&M manual.</p> <p>b) Approved Engg documents, As-Shipped documents, As-Built documents</p> <p>c) Guarantee and all test certificates for review and acceptance by BHEL and / or BHEL’s Customer</p> <p>d) 6 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).</p> <p>e) Following may be noted wrt the drawing submission schedule:</p> <table border="1" data-bbox="365 1759 1399 1906"> <thead> <tr> <th>SL NO.</th> <th>DESCRIPTION</th> <th>NUMBER OF COPIES TO BE SUBMITTED</th> <th>WHEN TO SUBMIT</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Initial drawings / documents under approval</td> <td>2</td> <td>As per approved Master document</td> </tr> </tbody> </table>			SL NO.	DESCRIPTION	NUMBER OF COPIES TO BE SUBMITTED	WHEN TO SUBMIT	1.	Initial drawings / documents under approval	2	As per approved Master document
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<p>12.4. Input drawings</p> <p>a) List of inputs as envisaged by purchaser is attached in annexure-8.</p> <p>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.</p> <p>c) List of major inputs required for engineering of the system shall be prepared during kick off meeting or 15 days after the award of contract. It is bidder's responsibility to list out all the major inputs required for engineering. The required base</p>																																				
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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.		<p>drawings/documents shall be furnished to the Bidder within one week of receipt of such requisition from Bidder.</p> <p>d) Drawings attached with this specification are preliminary in nature & are not exhaustive. These drawings may get revised and /or new drawings will be furnished to bidder during detail engineering.</p> <p>12.5. Review meetings & kick off meeting</p> <p>a) As and when required, the bidder will be called upon to attend design co-ordination meeting / review meeting with the end customer/BHEL during the period of the Contract. The Contractor shall attend such meetings at his own cost at venues decided by BHEL.</p> <p>b) A kick off meeting shall be held at Purchaser's office, preferably within 2 weeks of order.</p> <p>c) An agenda shall be prepared for this meeting and would include the following points related to technical aspects.</p> <ul style="list-style-type: none"> • Any clarifications required by the Bidder on purchaser's order. • Bidder Data Index & Schedule. • Bidder Data Review/approval modalities. • Sub-Bidder lists proposed by Bidder. • Utility requirements. • List of input drawings required from BHEL • Preliminary General Arrangement & layout drawings <p>13. PRICE BID FORMAT</p> <p>13.1. Price bid format is enclosed as Annexure-1, bidder to furnish the offer in line with the same.</p> <p>13.2. Inert Gas Extinguishing System as envisaged in this bid document shall be quoted by the bidder on Lump sum Turnkeybasis.</p> <p>13.3. All the items included in the price bid format shall be quoted as per tender specification and pre-bid clarifications, if any. Responsibility of ensuring correctness & completeness of scope of supply as per specification requirement solely lies with bidder.</p> <p>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.</p>		
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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.		<p>13.5. Bidder to quote only base rates for all the items, Applicable taxes and duties shall be indicated separately.</p> <p>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.</p> <p>13.7. Bidder shall confirm to the unpriced bid as part of their offer.</p> <p>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.</p> <p>14. SUB VENDOR LIST</p> <p>14.1. Makes of Inert Gas Extinguishing System shall be as per Sl. No. 1 of Annexure-12. However, if vendor proposes any other make the same shall be acceptable subject to customer’s approval only.</p> <p>14.2. All the equipment shall be sourced from recommended Bidders as specified Annexure-12.</p> <p>14.3. Further the supplied model shall be under regular manufacturing range and have Proven Track Record (PTR). (items should have been supplied as part of inert gas extinguishing system which have been commissioned as on technical bid opening date).</p> <p>14.4. 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. However, the items should have been supplied as part of inert gas extinguishing system which have been commissioned as on technical bid opening date. 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 :</p> <p>a) ISO certificate of Sub-vendors</p> <p>b) Proven track record & references for makes and models supplied earlier.</p> <p>Note:</p>		
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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

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.	Specification for Surface Preparation & Painting	Annexure – 15
16.	Specification for Domestic Packing	Annexure – 16p

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<p style="text-align: center;">COPYRIGHT AND CONFIDENTIAL</p> <p>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.</p>	<p><u>NOTE:</u></p> <p>Bidder to note that the above annexures are preliminary in nature .These annexures may get revised and /or new annexures will be furnished to bidder. Bidder to however note that they will not be eligible to raise any extra charges on account of this.</p>			
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	00	23/08/2022	Original Issue	--	--	P C Sekhar	
	Ref.						