



BHARAT HEAVY ELECTRICAL LIMITED

Enquiry No. : _____

UNIT'S ADDRESS: HPEP RC PURAM, HYDERABAD

Due Date : _____

UNIT'S PHONE NOS:

Supplier Qtn. No.: _____

CONTACT PERSON'S NAME/DESIGN./PHONE : BATTHINI MADHAN MOHAN

Date : _____

NO./E-MAIL (FROM PURCHASE DEPT.) bmmohan@bhel.in 0402318 2498

SPECIFICATION CUM COMPLIANCE CERTIFICATE FOR DUST FREE ENCLOSURE AT GT Fr-9FA ASSEMBLY AREA

NOTE:-

1. Vendor must submit complete information against clause no. 3.0 The offer meeting this clause would only be processed.
2. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.
3. The offer and all documents enclosed with offer should be in English language only.
4. Vendor to visit the proposed location of DFE before submitting the bid, with prior intimation to the BHEL contact person mentioned above.

ADDRESS OF THE SUPPLIER :	ADDRESS OF THE INDIAN AGENTS :
TELEPHONE NOS.:	TELEPHONE NOS.:
FAX NOS.:	FAX NOS.:
E-MAIL ADDRESS :	E-MAIL ADDRESS :

SCOPE: SUPPLY, ERECTION & COMMISSIONING OF DUST FREE ENCLOSURE WITH SPECIFICATION AS BELOW

Sl. NO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFY	OFFERED	DEVIATIONS	REMARKS
1.0	PURPOSE				
1.0.1	Purpose: Design, construction, testing and commissioning of " Dust free enclosure" DFE at Bharat Heavy Electricals Limited (BHEL), HPEP Hyderabad,Telangana . This is required for assembly of a Product that has many components and parts with small crevices which are not accessible for cleaning as the assembly progresses. The purpose of establishing a Dust free enclosure is to maintain utmost cleanliness of components, sub assemblies by storing them in DFE and also, by carrying out assembly in a dust free enclosure. The assembly shall be performed in a DFE, to avoid contamination and ingress of extraneous particles into internal cavities of the job.	Vendor to confirm			
1.0.2	More accurately, the required clean room must have a controlled level of contamination that is specified by less than 100,000 number of particles per cubic feet (ISO class of 8 (Clean Room Classification shall be ISO Class-8 as per ISO 14644 for Clean Room. This corresponds to Class 100,000 as per US Fed Stds.209E) under closed condition - at rest	Vendor to confirm			
1.0.3	The DFE shall have 12 m length and 8.0 m width. Height of DFE shall be 7.5 m. (Refer enclosed sketch no.(BHEL-HYD-HEF-001, Rev 00.)	Vendor to confirm			
1.0.4	Temperature to be controlled inside the Clean Room is 22+/-2 oC.	Vendor to confirm			
1.0.5	Relative Humidity to be controlled inside the Clean Room is 55+/- 5%.	Vendor to confirm			
1.0.6	Air Filtration Level: 99.97% efficient High Efficiency Particulate Air (HEPA)	Vendor to confirm			
1.0.7	Applicable Standards for Testing: IES-RP-CC 00612	Vendor to confirm			
1.0.8	Air Flow Velocity: Ranging from 80 to 90 fpm ± 20% at outlet of HEPA Filters to catch 0.3 µm particles.	Vendor to confirm			
1.0.9	Air Movement: Vertical unidirectional airflow on work table and mixed airflow inside the rest of the area in Cleanroom.	Vendor to confirm			
1.0.10	Air-Change : 15-48 air changes per hour	Vendor to confirm			

2.0	FACILITIES AND EQUIPMENT REQUIRED				
2.0.1	Openable roof for removal and reinsertion of the Product	vendor to specify			
2.0.2	Wall Panelling with provisions for mounting of Lights, HVAC Ducts, Power supply & air lines	vendor to specify			
2.0.3	Epoxy flooring	vendor to specify			
2.0.4	Clean room Doors	vendor to specify			
2.0.5	Air shower arrangement for personnel entry	vendor to specify			
2.0.6	HEPA Filter	vendor to specify			
2.0.7	HVAC System	vendor to specify			
2.0.8	Air Ducting between Clean Room and HVAC Plant	vendor to specify			
2.0.9	Thermal insulation	vendor to specify			
2.0.10	MS Support Structure	vendor to specify			
2.0.11	Supply Air and Return Air Grille	vendor to specify			
2.0.12	Lighting & Electricals	vendor to specify			
2.0.13	Clean Room Accessories	vendor to specify			
2.0.14	Spares.	vendor to specify			
3.0	SCOPE OF WORK				
3.0.1	The Scope of Work shall include design / engineering, supply erection, TAB (Testing, Adjusting, & Balancing) and commissioning of all the above mentioned facilities which are further deliberated in the subsequent points. For carrying out TAB, all the required Calibrated Instruments, accessories, consumables and service personnel shall be in the scope of the Bidder. All the testing equipments shall be calibrated in a NABL accredited Lab. The supplier shall provide the valid certificates along with testing equipments.	vendor to confirm			
3.0.2	The Scope of Work shall also include all materials, labour, equipment, appliances and incidental work, whether specifically mentioned or not, but are necessary and customary to make complete installation. It shall include all fittings, accessories, hardware, foundation bolt and arrangement, terminal plugs, cable glands, junction boxes etc for proper and efficient working of equipment	vendor to confirm			
3.0.3	The Supplier shall carry out and complete in every respect all the work under this tender in conformity with tender documents specifications.	vendor to confirm			
3.0.4	All the items of the work shall be executed strictly to fulfil the requirements laid down under Basis of Design and Design Objectives and testing specified as per Sl.no. 1.0 and ISO-14644 Standard	vendor to confirm			
4.00	DETAILS OF FACILITIES				
4.1	Roof (completely openable)				
4.1.1	Roof (Ceiling) shall be constructed at a distance of at 7500 mm (clear space) from the ground level.	vendor to confirm			
4.1.3	Openable Roof of size 12m x 8m - using retractable Awings / CANOPY / or by duly supported tarpoulin sheet - complete manually operable.The roof shall be made such that, once it is totally closed, there should not be any leakages from outside, to reduce the efficiency of the clean room (DFE). Pl refer drawing for location of openable roof	vendor to confirm			
4.1.5	Provision shall be made to mount HEPA filters, light fittings and other accessories on the Wall Panels, which are mentioned subsequently in this specification. All mountings including grills etc should be flush with the clean room side surface of the panel i.e. no projection or depression.	vendor to confirm			
4.2	Wall panels				
4.2.1	Wall panels are to be erected inside the Clean room sandwiching to the inner surface of the walls at all sides	vendor to confirm			
4.2.2	Factory fabricated - self-Supported double skin sandwich panel of 50 mm (minimum) thick with 2" Heavy Duty Aluminium profiles as frame work for the panels and connecting profiles and floor track and with PUF infill of 38 Kg/m3 (minimum) density injected between the outer and inner surface of the panels.	vendor to confirm			
4.2.3	Minimum section thickness of Precoated Galvanized Sheet Aluminium shall be 0.8 mm	vendor to confirm			
4.2.4	Outer Skins at both sides shall be of clean room quality powder coated / Precoat Galvanized Iron sheets of 0.8 mm (minimum) thickness	vendor to confirm			

4.2.5	Transparent RTV Silicon Sealant shall be provided for a complete seal of ceiling system.	vendor to confirm			
4.2.6	Provision shall be made to mount grills, ducts, HEPA filters, Various measurement systems, Power supply – terminal boxes, Air supply lines, Ethernet connection terminals, Various measurement systems, safety system and other accessories mountable on the wall, which are mentioned subsequently in this specification. All mountings including grills etc should be flushed with the clean room side surface of the panel ie no projection or depression	vendor to confirm			
4.2.7	View Panel at wall panel: A View panel of 1000mm height and 1000 mm long - Double -glazed panel with both sides flush double toughened glass 5mm thick and inside SS frame with SS cover plate and breather holes with silica gel as desiccant shall be provided at the wall panel of the clean room. Sufficient size hermetically sealed glass glazing is required to be flushed to the wall for either side viewing panels. Location shall be intimated after the placement of P.O.	vendor to confirm			
4.2.8	Extruded Anodized Aluminium Coving at corners at Inside & outside Clean Rooms: Inside and Outside Surface must have Coving type Corners of Extruded Anodized Aluminium, i.e., Coving for wall to floor, wall to wall and wall to ceiling joints. This gives Clean-Room inside with no sharp edges to retain dust Particles and outer aesthetic look. All coving is flush to the wall. All corners are rounded to avoid dirt and particle build-up.	vendor to confirm			
4.3	EPOXY FLOORING				
4.3.1	The entire Cleanroom floor must have 3+1.5 mm thick Screed + self-levelling epoxy coating.	vendor to Specify			
4.4	CLEAN ROOM DOORS				
4.4.1	Supply and installation of clean room doors made out of 1.2mm thk PCGI sheet for door frames and 0.8mm thcik shutter of 46mm depth duly filled with honeycomb as infill material having following accessories i.e. SS ball Bering butt hinges, SS 304 kick plate, Mottise dead lock, SS D type handle, Door closer Standard arm (TS68), standard vision glass having double glazed panel having black hitching all around the pheriphery and automatic door bottom seal.	VENDOR TO FURNISH DETAILS			
4.4.2	The accessories shall be from Dorma / Dorset / Equivalent				
4.4.3	Pl refer to the drawing (BHEL-HYD-HEF-001, Rev 00) enclosed for location of double door and single door	VENDOR TO FURNISH DETAILS			
4.4.4	Double doors Size 1500 x 2100 mm height= 1 numbers				
4.4.5	Single door of size 1000 x 2100 mm height- 1 number				
4.4.6	For safety & Security, Opening of the Outside door of the Cabin shall be shall be activated through a 'Biometric' Access system. Refer Cl. 4.5.9 for further details.				
4.5	Air shower for arrangement for personnel entry Cabin with Biometric entry system				
4.5.1	Whenever people are entering into the Clean room, they shall be thoroughly washed in Air shower for few minutes. This should be done in a closed room, called "Personnel entry Air-Shower Cabin". Once the environment is free from dust particles, the people will be allowed inside the clean room. Air showers blow off and remove much of the contamination preventing it from entering into the clean room.				
4.5.2	These Air Showers shall be a complete pre-fabricated enclosure containing the following compartments:. i)Garment Storage Area, ii)Dress Change Area, and iii)Personnel Air Shower Area In the Dress change room, people have to wear protective clothes & caps. There shall be a storage system for storing the "fresh protective clothes and caps" and "Collection bins" for collecting the used items at the time of exit. Entrance of this compartment only will be exposed to outside atmosphere. Exit of this compartment will be the entry for "Personnel Entry Cabin".	VENDOR TO SUBMIT			
4.5.3	Area available for the construction of "Personnel Entry Air Shower Cabin" is less than 3000mm (L) x 3000mm (W). However, size of the cabin shall be restricted to the requirements.	VENDOR TO NOTE			
4.5.4	Personnel Air shower area should able to accommodate a maximum of two persons at a time	vendor to confirm			

4.5.5	The personnel air shower cabin with dress change cabin shall be attached to the above clean room in the indicated space by meeting the following requirements: The Air shower system shall be Integral location (clean room wall and Air shower system) shall be hermetically sealed. Air shower system shall inject High velocity HEPA filtered air to dislodge the particles that are clinging to the garments The positive pressure inside various areas shall be as follows: 1 Change room : (+) Positive pressure. 2 Air shower : (++) Positive pressure 3 Clean room : (+++) Positive pressure.	vendor to confirm			
4.5.6	The air shower system shall be a high velocity, low pressure type, providing a normal entrance to and exit from a contamination controlled area. Air fluid velocity and the air pressure shall be comfortable to the persons passing through the Air shower system.	vendor to confirm			
4.5.7	The system shall be suitably designed and it shall not harm or injure the persons passing through the air shower system. The system shall be suitably designed such that the shower will operate for few minutes after the persons entered in the shower area and closed the door. Clean room side door shall open only after the stoppage of air shower and evacuation of dusty air from the shower area.	vendor to confirm			
4.5.8	•Material of Construction- Inner surface of Air Shower: Powder coated outside and SS 304 Inside •Heavy-duty doors with 3/16"(5mm) safety tempered glass glazing. •Top loaded High Efficiency Particulate Air (HEPA) UL 900 Filter, 99.97% efficient @ 0.3 micron in an anodized aluminum frame, •Versatile and ergonomic design •High Efficiency direct drive 230V- 3-Phase motor blowers. Motors/Blowers are standard type acceptable to BHEL. •Adjustable air nozzles on walls and ceiling shall be white plastic construction sized and spaced to provide an average of 25 – 35 m/s air flow at the face of the nozzle. •Fluorescent lighting mounted in the interior ceiling with prismatic refractive lens cover. •Anodized aluminum entry and exit doors with push/pull hardware, hydraulic door closures and acrylic, polycarbonate or safety glass inserts. •Three speed switch features low, medium, and high settings; standard. •Solid-state speed control available. •Direct drive, high pressure radial vane blower •Snap-in prefilter allows for easy replacement and maintenance. •Programmable Logic Controller (PLC) shall be used to control the sequence of operation of the Air Shower. •Emergency Off button (EMO) shall be located inside and outside of the Air Shower in a conspicuous location. •Activating the EMO switch shall cause the cycle to immediately end, and release all interlocks & Lights shall remain on. •Door sensors shall be 24 volt DC magnetic reed switches. Door interlocks shall be 24 volt, located in the door jamb. •All locks shall automatically release upon loss of power or when the (EMO) button is pressed. •The entire material air lock and Air shower floor area must have 4mm thick self-levelling epoxy coating. All the side wall to floor intersection shall be properly sealed with RTV Silicon Sealants. •View panels shall be provided at the front entrance door and Clean room side door. They should be of Double -glazed panel with both sides flush double toughened glass 5mm thick - inside SS frame with SS cover plate and breather holes with silica gel as desiccant Size of view panels :300x 300mm	vendor to confirm			
4.5.9	<u>Access Control system with Biometric recognition:</u> Supply, Design, Erection & Commissioning of standalone Biometric Access flushed with the outside Clean room wall panel near personnel entry point. It must be user friendly full graphical LCD display but locked with password, tactile alpha numeric keypad, built in data encryption for secure data transfer across the network by LAN & browser based software with easy to use graphical interfaces and context help, quick biometric registration & authentication, access control system along with PLC control magnetic door-opening. This shall be at main entry point. There shall be provision for 50 people/ cards. Add-on facility for up to 70 cards at a later period to be provided. Biometric entry – recognition shall be by comparing the impressions of index finger of right or left hand or the thumb of right hand.	Bidder to Confirm & provide details of the system being offered.			
4.6	<u>HEPA Filter :</u>				
4.6.1	HEPA filters for “Air Filtration Level of 99.97% efficient High Efficiency Particulate Air (HEPA) Filters” to catch 0.3 µm particles (Applicable Standards for Testing: IES-RP-CC 00612) shall be provided to have the desired ISO class 8 condition at REST inside the DFE				

4.7	HVAC System :				
4.7.1	•Design, Supply, Installation, Testing and commissioning of capacity of 1 X 11 TR (tentative) to cater the requirements of clean room. •Hyderabad environment shall be considered for deciding the HVAC system. Eligible Bidder shall have to supply AC System of Bluestar/ Voltas/ Carrier/ makes which shall be acceptable to BHEL The air distribution system has to be designed for the specified clean room standard class limits	Vendor to specify			
4.8	Air Distribution System and AHU:				
4.8.1	The air distribution system has to be designed for the specified clean room standard class limits	Vendor to specify			
4.8.2	Flow type :Mixed air flow type	Vendor to specify			
4.8.3	Average air flow velocity: Preferably 2-5 fpm +/- 20%	Vendor to specify			
4.8.4	Design Input Parameter	Vendor to specify			
4.8.5	Total Area 12000 mm X 8000 mm	Vendor to specify			
4.8.6	Required Fresh air changes per hour - 2-4	Vendor to specify			
4.8.7	The recommended minimum amount of positive pressurisation gradient to be maintained is around 0.75 to 1.50 mm of water column for the installation of HVAC system	Vendor to confirm			
4.8.8	Type of flow (Horizontal / vertical)	Vendor to specify			
4.8.9	Mounting ; Floor mounting				
4.8.10	Capacity to suit the clean room requirement	Vendor to specify			
4.8.11	Quantity	Vendor to specify			
4.8.12	Type of Casing; Double Skin Air Handling Units shall be comprise of SS double skin casing	vendor to confrn			
4.8.13	<u>Construction details</u> ;Inner skin and outer skin shall be 22G percolated GI) with 43±2 mm thick PUF insulation with Aluminium extruded frame work having Thermal break profile. complete with Centrifugal DIDW backward curved / Plug Type fan and fan section, motor.	vendor to confrn			
4.8.14	Pre Filter section ; The Air handling units should be provided with pre-filters to remove contamination and these filters shall be arranged to suit the AHU configuration in frame. The pre-filters should be mounted directly on AHU for easy removal	vendor to confrn			
4.8.15	Maximum face velocity across prefilters;All the filters and coil shall be designed for maximum 2.5 mps face velocity. Fan Outlet velocity shall be restricted to a maximum of 9.2 mps.	vendor to confrn			
4.8.16	Cooling Coil Section; Multiple row cooling coil (Capacity & row to be specified by the bidder)	vendor to confrn			
4.8.17	Filter Section ;With EU-5, EU-4 and H 13 filter with AHU dampers made out of extruded Aluminium for SA/ RA/ FA/ EA requirement.	vendor to confrn			
4.8.18	<u>Note</u> : AHUs shall be suitable for installation to outdoor weather exposed conditions.				

	4.9	<u>Air Ducting between Clean Room and HVAC Plant</u>				
	4.9.1	Supply Air Duct from HAVC system shall be suitable for part and full load operation of the clean room.	vendor to specify			
	4.9.2	All air duct shall be housed/routed in the space (2 meter) provided around the clean room. Supply and Low Level Return Air Extracts via stainless steel Air Duct to HVAC system shall be integrated into the Wall/ Floor Panels without affecting the wall thickness or the line of the wall Effective 5µm Pre-Filter flushed with stainless steel Grill opening inside the Cleanroom with maintenance accessibility are required. The opening size and location shall be indicated in the form of drawing needed for opening in the clean room wall construction	vendor to specify			
	4.9.3	All ducts, flanges and fasteners shall be of Powder coated GI sheets with RTV Sealant and 3 mm thick food grade quality Neoprene rubber Gasket strips. Thickness of sheets w.r.t length of ducts as follows: Up to 750mm long = 0.63 mm (24G). 751mm to 1500mm long = 0.80mm (22G). 1501mm to 2250mm long = 1.00mm (20G) 2251mm and above long = 1.25mm (18G)	vendor to specify			
	4.10	<u>THERMAL INSULATION</u>				
	4.10.1	Nitrile Rubber / XLPE (Class O) thermal insulation of ducts with aluminum foil. The Joints shall be sealed using factory supplied tape 75mm wide all around joints.	vendor to confirm			
	4.11	<u>MS SUPPORT STRUCTURES</u>				
	4.11.1	Supply, fabrication & installation of MS supports structure with one coat of red oxide paint over & above two coats of anti-corrosive paint of approved color. The rate quotes shall include necessary anchor fastners, grouting bolts, clamps, etc for Mounting of the structure for Panelling, ceiling and ducting	vendor to confirm			
	4.12	<u>SUPPLY AIR & RETURN AIR GRILLE</u>				
	4.12.1	Supply, fabrication & installation of MS supports structure with one coat of red oxide paint over & above two coats of anti-corrosive paint of approved color. The rate quotes shall include necessary anchor fastners, grouting bolts, clamps, etc for Mounting of the structure for Panelling, ceiling and ducting	vendor to confirm			
	4.13	<u>LIGHTING & ELECTRICALS:</u>				
	4.13.1	Electrical supply: 415V (+/- 10%), 50HZ (+/-3%), 3 Phase AC (3 wire) power supply and an Earthing point will be provided by BHEL at a single point near the Clean Room, as per layout recommended by Bidder	vendor to confirm			
	4.13.2	LED light fixtures of of Suitable size fitted to the wall on both sides for maintaining a lux level of 400 inside the room for operating condition including wiring and switch socket position at the entry door	vendor to confirm			
	4.13.3	Light levels to be within 400 to 500 lux at work level ht. of 1 m. inside cleanroom. Lights should be serviceable from false ceiling side outside the Cleanroom / EOT crane top. Make: Crompton Greaves, GE or reputed makes that are acceptable to BHEL. Each lamp shall be controlled individually through a MCB inside a double door Distribution board.	vendor to confirm			
	4.13.4	The light units shall be purpose designed to meet Cleanroom standards and integral with the ceiling void. 200W Induction lamps and fittings rated for 50,000 working hours (continuous) shall be used	vendor to confirm			
	4.13.5	Bidder should ensure the proper earthing for all the installations and panel boards.	vendor to confirm			
	4.13.6	Supply and installation of electrical items including lighting, switches etc for Ante-room, Utility room, service areas (ducting area), above the ceiling panel & around the building will be in bidder scope. All the electrical modular switches power receptacles plugs and socket points shall be flushed along the wall panels. Makes shall be of Siemens, Legrand, GE or any other reputed make which shall be acceptable to BHEL. The contractor shall submit all the material planned for electrical work along with Electrical Drawing	vendor to confirm			

4.13.7	<u>Control panel</u> :The power and control panel shall be pre-assembled, factory wired & cushion mounted on the unit for utmost reliability & long life. It shall have separate compartments for electrical power control and AHU control.It shall have necessary power & control wiring to operate the AHUs, ACs, DFE Lighting and Air Shower and other equipment supplied by vender etc., as per the scope of equipment covered by HVAC part. Panel shall be pre-assembled, factory-wired & cushion-mounted on the unit for utmost reliability & long life. Detailed technical specification shall be provided by the Bidder. Panels shall be given from CPRI tested reputed Bidders. The power panel shall contain the following components: 1. Reduced inrush current starter and moulded case circuit breaker of Siemens/ L & T make for each compressor-motor, 2. Factory wired with terminal block power connection, 3. Primary and secondary fused control power transformer, 4. 3-position (on-off-pump down) selector switch of AE/ ABB/ Siemens make, 5. 4-stage solid state temperature controller of Honeywell, Eurotherm or other makes acceptable to BHEL, 6. Single Phasing Preventer of Minilec, ABB or L&T make, 7. Interlock contactors & OLP of Siemens/L&T/ABB make for protection of all the motors, 8. Voltmeter & Ammeter of AE/ABB/Siemens/L&T make.	vendor to confirm			
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4.14	<u>CLEAN ROOM ACCESSORIES:</u>				
4.14.1	The Bidder has to install & commission the following mentioned measurement systems and other accessories for the effective and safe working of the personnel and equipment.	vendor to confirm			
4.14.2	10 No. of Washable Walk over- Sticky mats of good quality are to be supplied to use at the entrances of personnel air shower and material air shower cabins. Size shall be : 36” x 45”	vendor to confirm			
4.14.3	Cleanroom compatible Shoe Rack: One number of clean room (smoothly finished Stainless steel make with proper covering arrangement) shoe rack for storing and preserving 60 pairs of shoes.	vendor to specify			
4.14.4	<u>Clean room Garments Cabinet & Garments:</u>				
4.14.4	Garment Cabinet Powder coated construction with provision for 25 garments and racks for keeping the extra garments. Stainless steel hangers and number labels also required.	vendor to specify			
4.14.4.1	25 sets of Clean room Garments along with Head cover and hand gloves: Limited lining non-static proprietary fabric, Attractive styles in two shades - white and light blue, Tailored to exceed prevailing clean room norms. Short coat & trouser PVC sole with zip & nylon tie laces overshoes -ankle hold shoes /Boots 25pairs (of standard size 7 number.18 qty, 8 number 4 qty, 9 number 2 qty and 10 number1). Fabric to be check type with 99% nylon, 1% carbon fibers. 23no. for men & 2 no for women.	vendor to specify			
5.0	<u>Spares:</u> 1)Bidder to include initial /Mandatory spares for one year of Trouble free operation in the offer. 2) Bidder to indicate list of O & M spares with qty and price of each item	vendor to specify			
6.0	<u>Erection, Commissioning & Acceptance Criteria:</u>				
6.0.1	Erection of the total system including installation of DFE complete, electrical control & power cabling, earthing of the system is in scope of the supplier . The bidder has to transport all the materials to the site	vendor to confirm			
6.0.2	All tools & tackles, handling equipment including consumables, welding m/c, gas cutting setup, laboratory equipment, measuring instruments etc. required for erection are to be brought by the supplier on returnable basis	vendor to confirm			
6.0.3	All foundation materials such as foundation bolts, levelling pads etc. required for erection are to be brought by the supplier. All equipment and accessories being supplied are to be tested for their individual Erection and commissioning as per the test charts and shall be recorded. After completion of E&C of each system, the system will be tested to meet their functional and safety requirements and shall be recorded.	vendor to confirm			
7.0	<u>On-site validation and Testing of the complete Clean room System (with the roof closed and clean room at rest condition):</u> After completion of E&C of all equipment and accessories, validation test shall be conducted as described below: Testing & Validation as per ISO 14644 (Velocity, Particulate count, Temp, Humidity, filter, integrity tests to be carried out at the site by Vendor/ Bider) Witness by BHEL. A comprehensive on-site validation and certification for clean room installation is in the scope. These includes leak detection, clean room level measurement and certification, air flow pattern analysis, dead zone identification and elimination and comprehensive documentation with regard to maintenance & validation procedure. Bidder has do the following validation & testing of the installed clean -room twice, initially during final commissioning of the above clean room project & second with in the last month before handing over the project to BHEL on completion of guarantee period: Cleanliness levels as per ISO 14644 Air Quality Monitoring Particle size Efficiencies and quantity count Air Velocity Measurement & Air-flow Quantity Measurement Temperature control range tests	vendor to confirm			

8.0	<u>Performance test :</u> After the completion of validation test, The entire plant - all equipment and accessories shall run continuously for three days – 16 hours per day without any break. If any stoppage occurs, the test will be re started again for three days from that time onwards. Bidder must include the total cost for Erection, commissioning, validation test & performance test and all other sundry expenses towards E&C as lump sum cost in their 'price-bid' as cost of Erection & Commissioning Charges.	vendor to confirm			
9.0	<u>Warranty & Performance guarantee:</u> The supplier shall Warranty/guarantee for the successful operation of all the equipments and accessories for a period of 24 months from the date of successful completion of performance test at BHEL works. Equipment /Sub-assemblies /components found defective due to deficiency in design, material or workmanship shall be replaced by new ones or to be rectified at free of cost and such replacements / rectifications shall carry the successful operation for the further period of 24 months from the date of replacements / rectifications	vendor to confirm			
10.0	<u>Maintenance:</u> A well-conceived, properly administered maintenance program is to be provided by bidder for an efficient clean facility. The effectiveness of this maintenance program can be measured by regular testing of the facility. The aim of the testing program is to monitor facility performance to identify significant changes in efficiency. Such changes can be addressed before they become a major problem resulting in decreased product quality or unplanned facility downtime. The bidder has to give detail written instruction in four set to operate & maintain the brought -out equipment & the system as a whole	vendor to confirm			
11.0	<u>AMC:</u> Bidder must quote Annual Maintenance Contract rate for the complete clean room project with HVAC system - comprehensive with material, giving affidavit for further 3 years of AMC. Detailed scope of work shall be specified by the Bidder. This shall be optional.	vendor to confirm			
12.0	<u>Training:</u> During commissioning, the bidder shall demonstrate & train minimum of 5 BHEL personal in reference to daily operation & regular Maintenance of the complete system. Bidder has to give special extensive training on microprocessor repair, handling of electrical equipment & maintenance. For any of the equipment, if training is to be organised at the OEM / Suppliers' work, the bidder is to arrange for it for a minimum of two persons each for maintenance and operation. Bidder is to give the details of training and should quote for the training charges separately in the commercial bid. Transportation, boarding and lodging charges will be borne by BHEL.	vendor to confirm			
13.0	<u>Documentation:</u>				
13.0.1	<u>Documents to be submitted along with the Technical offer :</u> Following mentioned documents are to be submitted along with the technical offer otherwise the Offer will be rejected.				
13.0.2	Air shower for arrangement for personnel entry Cabin with Biometric entry system (Refer 4.5) ☐ Construction details with details with materials for all items such as walls, doors, locks etc being used ☐ General layout showing all arrangement including exhaust line with major dimensions ☐ Qty, type, make, specification and catalogues of HEPA filters ☐ Details of Air nozzles, air flow parameters, air quality details ☐ Qty, type, make, specification and catalogues of motors and blowers ☐ Details of lighting arrangement, interlock systems etc. ☐ Details of Biometric system	vendor to specify			
13.0.3	Epoxy Flooring (Refer Epoxy Flooring (Refer 4.3): ☐ Composition details of epoxy materials	vendor to specify			

13.0.4	HEPA Filter (Refer 4.6) Number of HEPA filter along pre-filters needed for achieving the cleanliness given in the specification shall be indicated with size and quantity along with life period. This detail is essential parameter for the evaluation ☐ Make, Model, Type, Qty, specifications, catalogues of HEPA filter with terminal boxes being used and percentage of coverage at sides ☐ Make, Model, Type, Qty, specifications, catalogues of HEPA filter with terminal boxes being used and percentage of coverage at top ☐ Life and period of replacement/maintenance of HEPA filter	vendor to specify			
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13.0.5	HVAC system: (Refer 4.7 & 4.8)				
13.0.6	☐ Design & heat load calculation which should include thermal design & flow design), QAP etc for the TR capacity of the system. ☐ Details of schematic arrangement with 'Stand by' equipment ☐ Make, model, type, specification, catalogue, mounting details, Qty of the various equipments , Air conditioners, Air Handling Units, automatic controls, flow switches etc.	vendor to specify			
13.0.7	Lighting & Electricals (Refer 4.13) ☐ Complete bill of materials with details like make, quantity for all the electrical items such as florescent lamps, fittings, fixture, terminal boxes, switches, adapters / receptacles, Current carrying conductors and cables,Power Receptacles with Modular Switches for FFUs, Plug & Sockets, feedback systems, sensors, limit switches, proximity switches, pressure switches, and temperature controllers, Control Transformers	vendor to specify			
13.0.8	Clean room Garments Cabinet & Garments (Refer 4.14.4): GA drawing with bill of materials, details, specification / catalogue.	vendor to specify			
13.0.10	General lay-out drawing of the overall Clean room with all its major equipment / accessories in position, major / critical dimensions in line with the specification & in line with the space available in the BHEL layout drg. and with bill of materials	vendor to specify			
	Electrical Circuit with Bill of Materials giving specification and make of components used.	vendor to specify			
	Quality plan / test charts, list of validation tests with acceptable values etc.	vendor to specify			
	Schedule for document submission, Supply, Erection & Commissioning of various equipment / accessories, Validation test & performance trial from the date of release of LOI / PO.	vendor to specify			
	Performance certificate in the format as mentioned	vendor to specify			
	Reference list of customers where similar cleanroom have been executed as mentioned in PQC	vendor to specify			
	Complete list of Spares as mentioned in 5.0	vendor to specify			
13.0.11	<u>Documents to be submitted after the receipt of PO / LOI :</u> * Within one month after the receipt of PO / LOI or before the start of manufacturing / procurement – whichever is earlier, the Bidder has to submit the detailed documents – complete in all respects for the items mentioned vide 13.0.2 to 13.0.8 to BHEL for approval.	vendor to confirm			
13.0.12	* Detailed layout, foundation details of equipment to be erected, openings required etc in the clean room building, Service building and control room, in line with the BHEL layout drg.	vendor to confirm			
13.0.13	* Electrical Circuit with Bill of Materials giving specification and make of components used.	vendor to confirm			
13.0.14	Note: Approval by BHEL will not have any binding on the part of BHEL towards the sufficiency of the materials / items / equipment etc or their functionality to meet the specification requirements. Supplier is completely responsible for successful installation and commissioning of all the equipments as per specification.	vendor to confirm			
13.0.15	<u>Documents to be submitted along with the equipments / Sub assemblies / Instruments:</u>				
	* Inspection reports / Test charts, catalogues of various equipment, accessories and bought-out items.	vendor to confirm			
	As built drawings and inspection reports of the sub-assemblies being supplied as single unit	vendor to confirm			
13.0.16	<u>Documents to be submitted during performance testing:</u>				
	Three sets of hard copies and 1 soft copy in CD of the following mentioned documents are to be submitted to BHEL during performance testing of the system.	vendor to confirm			
	As built drawing of the entire plant- equipment and accessories super imposed on the building with BOM.	vendor to confirm			
	As built drawings of the various Constructions with BOM	vendor to confirm			
	As built drawings of the various subsystems with BOM	vendor to confirm			
	As built drawings of the electrical circuits & networking	vendor to confirm			
13.0.17	O&M manuals, catalogues, test reports / calibration certificates, commissioning reports etc for all equipment and accessories being supplied.	vendor to confirm			
13.0.18	Detailed write up of construction details with bill of materials, construction details, design parameters, etc of complete package.	vendor to confirm			