An ISO 9001 Company

Bharat Heavy Electricals Limited
(High Pressure Boiler Plant)
Tiruchirappalli – 620014, TAMIL NADU, INDIA
CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

ENQUIRY **NOTICE INVITING TENDER**	Phone: +91 431 257 76 53 Fax : +91 431 252 00 31 Email : skaruna@bheltry.co.in Web : www.bhel.com

TWO PART BID Tender to be submitted in two Parts	**Enquiry Number:** **2731300014**	**Enquiry Date:** **28.11.2013**	**Due date for submission of quotation:** **06.01.2014**

You are requested to quote the Enquiry number date and due date in all your correspondence. This is only a request for quotation and not an order.

Please note that under any circumstances both delayed offer and late offers will not be considered. Hence vendors are requested to ensure that the offer is reaching physically our office before 14.00 hrs on the Date of tender opening.

Item	Description	Quantity	Delivery Required
10	**Establishment of Clean Room which includes Design, Construction, Testing, & Commissioning of Dust Free CLEAN-ROOM of ISO Class- 8 with the scope of work as detailed in the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)**	**01 No.**	**6 Months from the date of Purchase Order.**

The above items as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com **or** http://tenders.gov.in**).**

Important points to be taken care during submission of offer:-

1. **The Entire Clean Room System will be divided into few sub-groups following the technical clarifications or during the freezing of Scope of Supply and the payment shall be made against completion of supplies and commissioning of each group (all items under sub-groups)**
2. **Each group is having several sub-items which may require a quantity tolerance (as specified). The quantity required at the time of execution over and above the actual specified quantity but within the maximum tolerance limit will be as added as separate sub-item through an amendment to purchase order.**
3. **However, payment for such items will be made for 80% of the supply value and the balance 20% supply including the Erection & Commissioning value will be made after commissioning and prove-out of the clean room and submission of 10% PBG.**
4. **Checklist No. IND 05 and Annexure-II (Details of Company Performance) as applicable to the vendor to be filled in and enclosed along with the offer failing which, their offer will not be considered for evaluation.**
5. **EMD for this Tender will be Rs. 2,00,000/-**

All updates, amendments, corrigenda, etc., (if any), for each tender will be posted only on the above websites from time to time, as and when required, until each tender is opened. There will be no publication of such updates, amendments, corrigenda, etc., through newspapers or any other media.

BHEL's General guidelines / instructions (refer MM / CE / GENL / 001 - EMD) including bank guarantee formats and list of consortium banks, commercial terms check-list can be downloaded from BHEL web site http://www.bhel.com or from the Government tender website http://tenders.gov.in (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference "2731300014".

Tenders should reach us before 14:00 hours on the due date Tenders will be opened at 14:30 hours on the due date Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present	Yours faithfully, For **BHARAT HEAVY ELECTRICALS LIMITED** C. SARANYA Engineer Capital Equipment / MM BHEL, Tiruchirappalli - 620 014. Sr. Manager/Capital Equipment/MM

An ISO 9001 Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)
Tiruchirappalli – 620014, TAMIL NADU, INDIA
CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

ENQUIRY **NOTICE INVITING TENDER**	Phone: +91 431 257 76 53 Fax : +91 431 252 00 31 Email : skaruna@bheltry.co.in Web : www.bhel.com

TWO PART BID Tender to be submitted in two Parts	**Enquiry Number:** **2731300014**	**Enquiry Date:** **28.11.2013**	**Due date for submission of quotation:** **06.01.2014**

You are requested to quote the Enquiry number date and due date in all your correspondence. This is only a request for quotation and not an order.

Please note that under any circumstances both delayed offer and late offers will not be considered. Hence vendors are requested to ensure that the offer is reaching physically our office before 14.00 hrs on the Date of tender opening.

Item	Description	Quantity	Delivery Required
10	**Establishment of Clean Room which includes Design, Construction, Testing, & Commissioning of Dust Free CLEAN-ROOM of ISO Class- 8 with the scope of work as detailed in the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)**	**01 No.**	**6 Months from the date of Purchase Order.**

The above items as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com **or** http://tenders.gov.in**).**

Important points to be taken care during submission of offer:-

1. **The Entire Clean Room System will be divided into few sub-groups following the technical clarifications or during the freezing of Scope of Supply and the payment shall be made against completion of supplies and commissioning of each group (all items under sub-groups)**
2. **Each group is having several sub-items which may require a quantity tolerance (as specified). The quantity required at the time of execution over and above the actual specified quantity but within the maximum tolerance limit will be as added as separate sub-item through an amendment to purchase order.**
3. **However, payment for such items will be made for 80% of the supply value and the balance 20% supply including the Erection & Commissioning value will be made after commissioning and prove-out of the clean room and submission of 10% PBG.**
4. **Checklist No. IND 05 and Annexure-II (Details of Company Performance) as applicable to the vendor to be filled in and enclosed along with the offer failing which, their offer will not be considered for evaluation.**
5. **EMD for this Tender will be Rs. 2,00,000/-**

All updates, amendments, corrigenda, etc., (if any), for each tender will be posted only on the above websites from time to time, as and when required, until each tender is opened. There will be no publication of such updates, amendments, corrigenda, etc., through newspapers or any other media.

BHEL's General guidelines / instructions (refer MM / CE / GENL / 001 - EMD) including bank guarantee formats and list of consortium banks, commercial terms check-list can be downloaded from BHEL web site http://www.bhel.com or from the Government tender website http://tenders.gov.in (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference "2731300014".

Tenders should reach us before 14:00 hours on the due date Tenders will be opened at 14:30 hours on the due date Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present	Yours faithfully, For **BHARAT HEAVY ELECTRICALS LIMITED** Sr. Manager/Capital Equipment/MM

PART A (Qualifying Criteria)

SECTION – I : QUALIFYING CRITERIA

The BIDDER has to compulsorily meet the following requirements to get qualified for considering the technical offer:

Sl.No.	REQUIREMENTS	BIDDER's RESPONSE
1	Only those Bidders, who have supplied and commissioned **two** number of Clean-Rooms of 75% of specified size or higher size and class with Air-Conditioning system of **30 TR** or higher rating for Industrial application in the past five years and such plant is presently working satisfactorily for more than one year (from the date of tender opening) should quote.	
	The Bidder should submit following information where similar plants h*ave* been supplied for qualification of their offer.	
1.1	Name and postal address of the customers or company where similar plants are installed.	
1.2	Name and designation of the contact person of the customer.	
1.3	Phone, FAX no and email address of the contact person of the customer.	
1.4	Month and Year of commissioning of the Plant.	
1.5	Application for which the Plant is supplied	
1.6	Along with the Technical offer, the Bidder should submit **one** Performance certificate from the customer for the satisfactory performance of the Plant supplied to them. For obtaining the Performance certificate, a suggestive format is provided in **SECTION – IV.**	
1.7	BHEL reserves the right to verify the information provided by Bidder. In case the information provided by Bidder is found to be false/ incorrect, the offer shall be rejected.	
1.8	The bidder has to obtain necessary permission for the visit of BHEL representatives to the referred plant / plants for assessment. Travelling, boarding and lodging charges for BHEL personnel will be borne by BHEL.	
2.0	**DELIVERY** - The bidder shall quote the best possible delivery. However the delivery shall not exceed 6 months. The delivery period shall be reckoned from date of purchase order to despatch from the Bidder works.	

PART A (Qualifying Criteria)

SECTION – I I

The BIDDER / BIDDER is requested to provide the following information:

Sl.No.	REQUIREMENTS	BIDDER's RESPONSE
3.0	The BIDDER/BIDDER to furnish Reference List of Customers, with full address, details of contact person, where such plants have been established in the past.	
4.0	Details on SERVICE-AFTER-SALES Set-Up in India including the Address of Agents / Service Centers in South India.	
5.0	Any Additional Data to supplement the capability of the BIDDER for the subject equipment.	

SECTION – III

The BIDDER to note:

Sl.No.	REQUIREMENTS	BIDDER's RESPONSE
6.0	The BIDDER / BIDDER shall submit the offer in TWO PARTS. 1. Technical Offer [with PART A & PART B] & commercial offer 2. Price Bid.	
7.0	The Technical Offer shall contain a comparative statement of Technical **Specifications demanded by BHEL** and **Offer Details submitted by the Bidder**, against each clause. A just 'CONFIRMED' or 'COMPLIED' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement may lead to disqualification of the Technical Offer.	
8.0	The Technical Offer shall be supported by product Catalogues & Data Sheets and also technical details of Bought-Out-Items with copies of Product Catalogue to the extent possible.	
9.0	The Commercial Offer (given with the Technical Offer) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation.	

PART A (Qualifying Criteria)

SECTION – IV

The performance certificate should be produced **on Customer's Letter Head.**

PERFORMANCE CERTIFICATE

1. Supplier of the "Dust free / Clean Room"		
2. Make & Model of the HVAC system		
3. Month & Year of Commissioning		
4. Application for which the "Dust free / Clean Room" is used		
5	a) Area of the "Dust free / Clean Room" b) Dust level maintained during operation c) Temperature range maintained d) Humidity level controlled e) No. of air changes per hour	
6. Performance of the plant		Satisfactory **/** Good **/** Average **/** Not Satisfactory
7. Any Other remark		
Date:		Signature & Seal of the Authority Issuing the Performance Certificate

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
1.0	**Purpose:** Design, construction, testing and commissioning of " Dust free clean room environment of ISO class -8 " with HVAC (Heating Ventilation & Air Conditioning) facility at Bharat Heavy Electricals Limited (BHEL), Tiruchirapalli, Tamilnadu for fabrication of Noble metal equipment and part fabrication, that has a low level of environmental pollutants such as dust, airborne aerosol particles and chemical/Argon vapours. It is to be noted that, during Welding, the joint location and neighbouring surfaces are to be protected with Argon Gas as Shielding. Huge volume of shielding Argon Gas is involved in TIG welding. As argon gas is heavier than air, it will move towards the floor, and to be evacuated progressively. Welding fumes will move upwards. Details of **Clean Room Building, Service & Control Room building** being provided by BHEL are specified in the **Annexure-I.** **Clean Room Size: 16.0 m (W) x 20.0 m (B) x 10.0 m (H) –Refer SK.No. : ATP/D/CR/001 Rev.01** and **SK.No. : ATP/D/CR/002 Rev.01** **Design Objectives shall to provide clean environment for TIG (Tungsten Inert Gas) welding facility having class of cleanliness and related details given below:** ***Better than class 10,000 (ISO Class-7) as built** ***Better than class 10,000 (ISO Class-7) at testing condition** ***Better than class 1,00,000 (ISO Class-8) at dynamic condition (in operation).** *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**) *Temperature to be controlled inside the Clean Room is **20+/-2 ºC.** *Relative Humidity to be controlled inside the Clean Room is **55+/- 5%.**	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	{Outside Ambient Design Conditions [summer/monsoon/winter (Dry bulb temp.) (Wet bulb temp.)]: Trichy or nearby area ambient condition is to be considered for Heat Load Calculations. Values /parameters shall be indicated by the vendor in the design calculation sheet}. *Oxygen level to be maintained inside the Clean Room shall be above **19.5%** by volume (to limit the excess percentage of Argon level in the clean room). * Argon Gas Extraction: **35 m^3** in a shift of 8 hours with total 3 Shifts to be operated in a day *Positive pressure inside the Clean Room is **+1.5 mm** of Water Column (WC). *Light illumination intensity to be maintained at the working level (between 1.0 M and 2.5 M level from the ground) is **400 Lux**. *Maximum Heat Load generated inside the clean room : **30 kW (equipment load only).** Heat load of Lights & other accessories being provided by the bidder in the clean room and men shall be **added.** *Maximum no. of Persons occupying: **25 persons at a time** *Air Filtration Level: **99.97%** efficient High Efficiency Particulate Air (HEPA) Filters to catch 0.3 µm particles. Applicable Standards for Testing: **IES-RP-CC 00612** *Air Cleanliness: ISO Class 7 (ISO 14644) At Rest Condition. *Air Flow Velocity: Ranging from **5 to 10 fpm ± 20% at outlet of HEPA**. *Air Movement: Vertical unidirectional airflow on work table and mixed airflow inside the rest of the area in Cleanroom. *Air Flow Velocity: Ranging from **2 to 5 fpm ± 20%** *Air-Change : **15-48** air changes per hour *Ceiling HEPA filter coverage : **30% - 40%**	

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
2.0	**Scope of Work :** To meet the purpose mentioned above vide point No.1.0, facilities / equipment required are broadly subdivided under the following headings: 1. Roof Panelling with provisions for mounting of Lights, Air filters and HVAC Ducts 2. Wall Panelling with provisions for mounting of Lights, HVAC Ducts, Power supply & air lines 3. Modular type Welding booths (dismantling type) 4. Epoxy Flooring 5. Air shower arrangement along with Air Lock Cabin for Material entry 6. Air shower for arrangement for personnel entry Cabin with Biometric entry system 7. Emergency Door 8. HEPA filters with Terminal Boxes 9. HVAC System 10. Air Ducting between Clean Room and HVAC Plant 11. Compressed air supply system 12. Argon Evacuation system 13. Lighting & Electricals 14. Clean Room Accessories 15. Spares. 16. Four numbers of cubicles along with Split Air conditioners The Scope of Work shall include design / engineering, supplying, 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. 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	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	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. The Supplier shall carry out and complete in every respect all the work under this tender in conformity with tender documents specifications. 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. All the works shall be carried out on a "turnkey" basis with single point responsibility. THE ORDER HAS TO BE MADE ON TURNKEY BASIS, THE REQUIRED BILL OF MATERIALS (BOM) SHALL HAVE IN-BUILT TOLERANCES W.R.T THE QUANTITIES AND ARE TO BE ABSORBED BY THE VENDOR AFTER THE FINAL FROZEN SCOPE OF SUPPLY IS ARRIVED. * THE VENDORS SHALL SUBMIT THE PRICE BID ACCORDINGLY. * SUBSEQUENT TO THE TECHNICAL CLARIFICATIONS & ARRIVING AT THE FINAL SCOPE OF SUPPLY, THEY SHALL SUBMIT THE PRICE IMPACT, IF ANY. * NO FURTHER CHANGES IN THE SCOPE/PRICE SHALL BE ENTERTAINED. The designer (Bidder) has to clearly bring out various items which are not included in the scope of work finalised by them.	
2.1.0	**Roof (Ceiling) Panelling with provisions for mounting of Lights, HEPA Filters, HVAC Ducts etc.**	
2.1.1	Refer **Annexure-I**, **SK.No. : ATP/D/CR/001 Rev.01** Sh 1 of 2 & 2 of 2 and **SK.No. : ATP/D/CR/002 Rev.01** for the details, overall layout and cross section of the Clean room building.	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
2.1.2	Roof (Ceiling) Panel shall be constructed at a distance of at **10000 mm** from the ground level. **1500mm** clear space is provided above planned roof panel and space shall be used for providing the walkable type platform at appropriate location for servicing of HEPA filters, light fixtures and other instruments / accessories. Bottom level of the Roof beams from the floor level is 11500mm. Height of the beam from the inner surface of ceiling is **800 mm**.	Bidder to confirm
2.1.3	**Construction details of Ceiling panels:** * Factory fabricated - self-Supported **double skin** sandwich panel of **80 mm** (minimum) thick with 2" Heavy Duty T-Grid profiles and with PUF infill of **38 Kg/m^3** (minimum) density injected between the outer and inner surface of the panels. * Minimum section thickness of Aluminium shall be 1.0 mm * Outer Skins at both sides shall be of clean room quality powder coated aluminium sheets of o.8 mm (minimum) thickness. * Thickness of powder coating shall be minimum of 150µm. There should not be any variation in colour. * White satin finish inside for a high-tech appearance of the ceiling from inside of the clean room * Preferable size of 1200mm X 3000mm Walk-on-panels will be perfect solution for fully supporting mezzanine to be used as technical floor. * Transparent RTV Silicon Sealant shall be provided for a complete seal of ceiling system. * Grid is to be arranged in a 2' X 4' pattern to accept standard filters and light fixtures. * Gasket are to be provided for a complete seal of ceiling system	Bidder to confirm
2.1.4	Provision shall be made to mount HEPA filters, light fittings and other accessories mountable on the ceiling, which are mentioned subsequently in this specification. All mountings including grills etc should be flush with the clean room side surface of the panel ie no projection or depression.	Bidder to confirm
2.1.5	Connector and suspension hardware shall be of high quality powder coated steel and must include a series of intersection connectors and turnbuckles for suspending the T-Grid System from steel structure frame-work, preferable method of suspension with all-thread rod should serve as a compression strut attached to the turnbuckles and splay wires attached to eye bolts secured to the Intersection Connectors. All other mild steel items used inside the clean room are to be powder coated.	Bidder to confirm

2.2.0	**Wall Panelling with provisions for mounting of HVAC Ducts, Power supply terminal boxes, compressed air lines etc.**	
2.2.1	Wall panels are to be erected inside the Clean room **sandwiching** to the inner surface of the walls at all sides	Bidder to confirm
2.2.2	**Construction details of Wall panels:** * Factory fabricated - self-Supported **double skin** sandwich panel of **80 mm** (minimum) thick with 2" Heavy Duty T-Grid profiles and with PUF infill of **38 Kg/m^3** (minimum) density injected between the outer and inner surface of the panels. * Minimum section thickness of Aluminium shall be 1.0 mm * Outer Skins at both sides shall be of clean room quality powder coated aluminium sheets of o.8 mm (minimum) thickness. * Thickness of powder coating shall be minimum of 150µm. There should not be any variation in colour. * White satin finish inside for a high-tech appearance of the walls from inside of the clean room * Preferable size : 1200mm X 5000 mm * Transparent RTV Silicon Sealant shall be provided for a complete seal of ceiling system. * Gasket are to be provided for a complete seal of ceiling system	Bidder to confirm
2.2.3	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.	Bidder to confirm
2.2.4	**View Panel at wall panel:** A View panel of 300mm height and 1200 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.	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
2.2.5	The wall panels must be easy to assemble & dismantle i.e.., the wall erection & disassembling can be done in a clean environment without the risk of contamination neighbouring areas; no dust must be generated during the assembling & dissembling operations & no wet materials must be used.	Bidder to confirm
2.2.6	The utility services lines will be outside the Cleanroom & Inputs will be Punctured through the Walls & all Ports will be made available inside the wall.	Bidder to confirm
2.2.7	The clean room is divided into number of partitions (refer 2.3.0) using panels. Mounting provision of the panels with the wall panel to be worked out.	Bidder to note.
2.2.8	All attachments such as Power supply terminal boxes, inlet / outlet ducts etc including the partition wall shall supporting posts on the wall panels should be flush with the surface of the wall panels. No projection / cavity shall be permitted to avoid the settling of dust.	Bidder to confirm
2.2.9	Panels shall be provided at the wall openings provided for manual entry , material entry and viewing window.	Bidder to confirm
2.2.10	**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.	Bidder to confirm
2.3.0	**Modular type Welding Booths:**	
2.3.1	As specified in **Cl 1.0,** basic building will be made available to the Bidder. Bidder has to construct 10 No. of welding Booths as per the dimensions given in **SK.No. : ATP/D/CR/003 Rev.01**	Bidder to confirm
2.3.2	Partition panels shall be constructed as specified below. Refer **SK.No. : ATP/D/CR/004 Rev.01 Sh 1 of 2 and Sh 2 of 2** for general construction arrangement. * Total height of each partition panel shall be **4000** mm and each shall be divided into 3 sections * From Floor level to 1000 mm height – Clean room quality opaque material * Between 1000 mm height and 2500 mm height – Clean room compatible **5.38 laminated safety glass.** * Remaining Height shall be with Clean room quality opaque material * All joints between the panels shall be filled with RTV Silicon Sealants. * The partition support post shall be powder coated Aluminium / steel structure and shall be bolted	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	to the ground. * Access to the cabin shall be provided with Double opening door on the partition walls. Sliding door arrangement also may be considered. * Width of each door shall be 750 mm (2 no.) and height shall be 2500mm. * Construction of doors also shall be similar to the partition panels. * Suitable locking arrangements shall be provided to lock the doors of the booth. * All materials & construction shall be to suit the clean room conditions. * Compartments are to be formed by modular partition walls for easy mounting / dismantling so that any of the adjacent booths (including with Booth 10) can be joined to make them bigger in size. No dust must be generated during the assembling & dissembling operations & no wet materials must be used. * Top & Bottom Tracks including the intermediate support system must be of Aluminium-extruded Profiles of different shapes.	
2.4.0	**Epoxy Flooring :**	
2.4.1	As already mentioned in Cl. 1.0, Argon is to be evacuated from the welding booths, for which pipe lines will be laid by BHEL as shown in **SK. No. : ATP/D/CR/003 Rev.01**.	Bidder to confirm
2.4.2	Suitable Stainless Steel sieves over which with Stainless Steel Seal caps shall be provided by the bidder at the exhaust ports in level with the ground. S.S seal caps shall be used for opening / closing of the ports as per requirement and hence shall be provided with suitable sealing arrangement at the seating area and handle for lifting.	Bidder to confirm
2.4.3	The entire Cleanroom floor must have 4mm thick self-levelling epoxy coating. Masonry work for levelling the floor including materials is in the scope of Bidder	Bidder to confirm
2.5.0	**Air shower arrangement along with Air Lock Cabin for Material entry:**	
2.5.1	Whenever materials are to be taken into the Clean room, it shall be thoroughly washed in Air shower for few minutes. This should be done in a closed room, called "Material Air-lock Cabin". Air showers blow off and remove much of this contamination preventing it from entering into the clean room. Once the environment is free from dust particles, the material will be allowed inside the clean room. Air curtain shall be used at the entry to material entry cabin.	Bidder to note

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
2.5.2	**Complete pre-fabricated enclosure (Cabin) with provision of Material Air Lock with air showers & filters** shall be constructed in the indicated space, meeting the following requirements: The cabin shall be divided into two portions using PVC curtain. • First portion shall act as an air lock room. • In the Second portion shall be air shower area. • The Material Air Lock cabin with Air shower system shall be attached to the above clean room. Integrations location (clean room wall and Air shower system) shall be hermetically sealed. • Material admission shall be through double door provided at the entrance of the cabin. • There shall be enclosure with in containment area curtained with suitable arrangement of suitable size in between air lock & air shower area. • The air shower has to be tailor made for material movement area or alternatively HEPA filter is to be provided to clean air bath. • At the entry of material-entry area air-curtain is to be planned. The positive pressure inside various areas shall be as follows: Change room : (+) Positive pressure. Air shower : (++) Positive pressure Clean room : (+++) Positive pressure.	Bidder to confirm
2.5.3	Area available for the construction of "Material Air-lock Lock Cabin" is **7000mm (L) x 4800mm (W). Refer SK. No. : ATP/D/CR/001 Rev.01. However, size of the shower cabin shall be restricted to the requirements.**	Bidder to note
2.5.4	**Maximum size of** Job that should be accommodated inside the Cabin is **3000 x 3000 x 3000 mm** and **Height** of trolley over which the job shall be moved is **750 mm**. Hence Inner height shall not be less than **4000 mm**.	Bidder to note
2.5.5	Size of opening made available at the wall of the Clean room for material entry inlet size is 3500 mm Width X 3750 mm Height. Doors shall be of sliding type. Doors and the sliding arrangements should not have any room for the dust particles to settle.	Bidder to confirm
2.5.6	The air shower system shall be a high velocity, low pressure type, providing a normal entrance to and	Bidder to provide.

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	exit from a contamination controlled area. Bidder to provide Air flow, velocity and pressure.	
2.5.7	The system shall be suitably designed and it shall not the harm or injure the material/components passing through the air shower system.	Bidder to confirm
2.5.8	Double leaf door for material lock cabin shall be provided for effective cleaning of the material pass through the material lock and shower system. Doors arrangements should not have any room for the dust particles to settle.	Bidder to confirm
2.5.9	For safety & Security, Opening of the Outside door of the Cabin shall be shall be activated through a **'Biometric' Access system**. **Refer Cl. 2.6.8 for further details.**	
2.5.10	Clean room side door shall be activated from inside of the clean room. Interlock shall be provided in such a way that opening of this door shall only after the completion of Air shower cycle.	
2.5.11	**Construction detail** • Material of Construction- Inner surface of Material air lock and Air Shower: Stainless Steel SS304 or SS304L. • Heavy-duty SS 304 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 which shall be 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 pre-filter allows for easy replacement and maintenance.	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	• 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 walls 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	
2.5.12	Exhaust air from Air shower shall be let out at atmosphere to outside of the building through ducts.	Bidder to confirm
2.6.0	**Air shower for arrangement for personnel entry Cabin with Biometric entry system:**	
2.6.1	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.	Bidder to note
2.6.2	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	Bidder to Confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	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".	
2.6.3	Area available for the construction of "Personnel Entry Air Shower Cabin" is **7000mm (L) x 2500mm (W). Refer SK. No. : ATP/D/CR/001 Rev.01. However, size of the cabin shall be restricted to the requirements.**	Bidder to Confirm
2.6.4	Personnel Air shower area should able to accommodate a maximum of **three persons at a time**	Bidder to Confirm
2.6.5	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. Integrations location (clean room wall and Air shower system) shall be hermetically sealed. Air sower system shall inject High velocity **HEPA filtered air** to dislodges 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.	Bidder to Confirm
2.6.6	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.	Bidder to Confirm
2.6.7	The system shall be suitably designed and it shall not the 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.	Bidder to Confirm
2.6.8	**Access Control system with Biometric recognition:** 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	**Bidder to Confirm & provide details of the system being offered.**

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	registration & authentication, access control system along with PLC control magnetic door-opening. This shall be at main entry point. There shall be provision for 100 people/ cards. Add-on facility for up to 150 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 thump of right hand.	
2.6.9	Size of opening made available at the wall of the Clean room for Personnel entry is 1000 mm Width X 2000 mm Height. Single leaf / Double leaf for Personal entry and material lock cabin with above specifications Doors shall be of Single leaf hinged or sliding type. Doors arrangements should not have any room for the dust particles to settle.	Bidder to Confirm
2.6.10	• Material of Construction- Inner surface of Air Shower: Stainless Steel SS304 or SS304L. • Heavy-duty SS 304 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 &	Bidder to Confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	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	
2.6.11	Exhaust air from Air shower shall be let out at atmosphere to outside of the building through ducts.	Bidder to confirm
2.7.0	An **Emergency Door** as per the following specification shall be provided at the rear side of the "Clean Room" as shown as **ED** in **SK.No. : ATP/D/CR/001 Rev.01:** • Factory fabricated - self-Supported **double skin** sandwich panel of **150 mm** (minimum) thick with 2" Heavy Duty T-Grid profiles and with PUF infill of **38 Kg/m^3** (minimum) density • Inner & Outer surfaces shall be of **Stainless Steel AISI 304 / 316 of 3.0 mm (min) thickness.** • Minimum section thickness of **Aluminium shall be 2.0 mm** • Heavy-duty – Single Door – made of SS 304 with 3/16"(5mm) safety tempered glass glazing • Size : 1200 mm (W) and 2100mm (H) and Thickness -150 mm (minimum). • Proper puff insulation of density 38 kg/M^3 (minimum) between the surfaces • Shall be manually operated from inside the clean room • Heavy duty locking system • Flush with the inside wall panel and with proper sealing to prevent leakages BHEL will provide opening in the wall as specified in the above sketch. Bidder has to mount the Emergency door in alignment with the opening.	Bidder to confirm
2.8.0	**HEPA Filter with Terminal Box :**	
2.8.1	HEPA filters with Terminal boxes 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-	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	CC 00612) shall be provided at suitable locations in the material air lock cabin, personnel entry cabin and over the ceiling panel of the clean room.	
2.8.2	The entire Clean room is divided into number of compartments as shown in the **SK.No.: ATP: D:CR:003,** and provision shall be made such that partial section of clean room space (compartment wise) shall be kept in clean condition. Ceiling HEPA Filter coverage shall designed with provision for part of clean room shall be maintained ISO class-8 during operation.	Bidder to confirm
2.8.3	Box Type HEPA Filters of 99.97% efficient down to 0.3 µm filtration (top loading type, imported Camfil make) mounted in Stainless Steel Box with Swirl type Stainless Steel Diffuser, probe for DOP testing and Pressure Drop measurement and Low Leakage Aluminium Aero foil Damper.	Bidder to confirm
2.8.4	HEPA Filters are glass fibre media pleated and bonded to an aluminium frame using a non-hardening adhesive and closed cell neoprene gasket with gel seal & room-side filter change.	Bidder to confirm
2.8.5	HEPA Filters shall be of High efficiency, low pressure drop & good loading characteristic meeting the ISO specification.	Bidder to confirm
2.8.6	Ceiling HEPA Filter coverage: 30-40 % (approx).	Bidder to provide
2.8.7	The operation should be without time consuming and counter-productive de-contamination delays. They prevent accidental contamination due to premature or mistaken opening of the pressure sealed doors. Contaminated air returned through a low wall pre-filter for delivery to the HEPA module. Maintenance and filter replacement are simplified and performed primarily from outside to minimize down time during works.	Bidder to confirm
2.8.8	HEPA filter Terminal box with powder coated single skin casing made out of 1.6 mm CRCA sheet suitable for fixing on walk able ceiling panels ' side walls complete with HEPA filters. Filter removal from below the false ceiling only. All bolts & nuts and port shall be of SS. System to be complete with leak free sealing arrangement with neoprene gaskets, frame & food grade sealant, provision for installing DP sensors, DOP charging ports etc., (1.6 mm thick perforated SS grills flush with false ceiling or slab but without perforated SS grill). The casing shall have arrangement for DOP charge & pressure measurement from above/bottom of the false ceiling and with geared type aluminium volume control damper suitable to adjust from the bottom of the filter module. HEPA Filters shall be of nominal size, qty location and capacity shall be clearly indicated in the form drawing along with technical bid.	Bidder to **provide details**

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
2.9.0	**HVAC System :** • **Design, Supply, Installation, Testing and commissioning of capacity of 3 X 60 TR (tentative) – Including a standby unit) Air Cooled Heat Ventilation & Air Conditioning system to cater the requirements of clean room.** • **Tiruchirappali environment shall be considered for deciding the HVAC system.** • **The supplier shall be provided two units for regular operation to meet the design requirement and one Unit of 50% of total design capacity as stand by unit .** • **Out of the three Chillers of the above mentioned three HVAC Units, one shall be with heater for de-humidification purpose.**	Bidder to confirm
2.9.1.0	**Air Distribution System:** The air distribution system has to be designed for the specified clean room standard class limits	Bidder to **specify**
	Flow type: Mixed air flow type	
	Average air flow velocity: Preferably **2-5 fpm +/- 20%**	
	Air changes per hour: Preferably **15- 48**	
2.9.1.1	**Design Input Parameter**	Bidder to confirm
	Total Area: 19770 mm X 15770 mm	
	Height: 10000 mm upto the ceiling panel.	
	Occupancy: 25 No's	
	Equipment Load: 30 kW	
	Additional Load (bidder to add the load of lighting and other accessories in the scope of vendor for installation inside the clean room)	

SL.NO.	BHEL SPECIFICATION / REQUIREMENT		BIDDER'S RESPONSE
	Required Fresh air changes per hour	**15-48**	
	Required Inside design Temperature	20 +/-2 ^{o} C.	
	Inside design RH	55 +/- 5%.	
	Application for which the air conditioning is required.	TIG Welding of Titanium materials. (Load due to heat generation included in the equipment load)	
2.9.1.2	Eligible Bidder shall have to supply AC System of Bluestar/ Voltas/ Carrier/ Samsung/ LG makes or any other reputed make which shall be acceptable to BHEL. The complete work of AC System must be carried out by Bidder on TURNKEY Basis. Complete erection & commissioning of system at BHEL site will be in supplier's scope. All the responsibility of the above work will be in supplier's scope. All the responsibility of the above work will be at single point of Bidder/Supplier.		Bidder to confirm
2.9.1.3	All Items of HVAC work shall be executed strictly to fulfil the requirements laid down under the Basis of Design. The type of Equipment, material specifications, method of installations and testing and type of Controls shall be in accordance with Technical Specifications, the approved Shop drawings and the relevant Indian Standards. Changes, if any needs to be incorporated in the offer of the bidder.		Bidder to confirm
2.9.1.4	Suitable "Stand by" equipment shall be included for uninterrupted operation of the system in the event of failure of any of the unit in the HVAC plant.		Bidder to confirm
2.9.1.5	Bidder have to do complete engineering, design and supply of required items, erection, testing, balancing and commissioning of complete HVAC for the above Clean-Room facility. Detailed engineering, schematic drawing, design basis, (Design & heat load calculation which should include thermal design & flow design), QAP etc. have to be submitted for approval in their Technical Bid.		Bidder to confirm & **submit documents**
2.9.1.6	Air-cooled Chiller with HFC-134A / HFC-410 A/ HFC-404 A refrigerant, suitable refrigerant circuits-multiple Compressors (no. to be indicated), able to unload down to 15% of full load, Semi-hermetic / hermetic rotary screw compressors, Microprocessor based control with user interface, rated and certified in accordance with Euro Vent Standards, Compliant with EC requirements for machinery, electromagnetic and Pressure Equipment Directive or with national legislations.		Bidder to confirm
2.9.1.7	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.		Bidder to confirm

2.9.2.0	**Scope and Detail Technical Specification of Water Chilling Units with Individual Accessories Details:**		
2.9.2.1	Type	**Air cooled Screw chiller**	Bidder to confirm
	Capacity of the Chiller at operating condition	Vendor to specify	
	Refrigerant to be used	Chlorine free refrigerant HFC-134 A/ HFC-410 A/ HFC-404 A	
	Unit observed power	Vendor to specify	
	KW/TR	Vendor to specify	
	Number of Compressors	Multiple (Nos. to be specified)	
	Number of Refrigerant circuit	Vendor to specify	
	Method of starting	Vendor to specify	
	Dimensions (mm)	Vendor to specify	
	Overall weight	Vendor to specify	
2.9.2.2	Mounting Details	This whole unit must be mounted on a strong, rigid galvanized steel chassis and painted with epoxy polyurethane paint- RAL 7035.	Bidder to confirm
2.9.2.3	Installation	It shall be suitable for outdoor installation and designed for maximum corrosion protection with all panels being of heavy gauge galvanized steel construction.	Bidder to confirm
2.9.2.4	As mentioned in 2.9.0, one Chiller must be provided with heater for de-humidifation purpose..		Bidder to confirm
2.9.2.5	Detailed Chiller configuration, dimension, quantity, specification, layout, make, model, schematic electrical wiring diagram, etc. needs to be specified in the Technical-Bid for technical scrutiny.		Bidder to **submit**

2.9.2.6	Supply, Installation, Testing, Proving and Commissioning of Air-Cooled package type multiple-circuit Semi-hermetic / hermetic rotary screw compressor, Chiller with all related microprocessor controls with environmentally sound features including- chlorine free refrigerant HFC-134 A/ HFC-410 A/ HFC-404 A, compact design, step-less, capacity-control and low sound levels. It shall be suitable for outdoor installation and designed for maximum corrosion protection with all panels being of heavy gauge galvanized steel construction.	Bidder to confirm
2.9.2.7	It shall be compact, light-weight design completely factory assembled and tested under load conditions before dispatch and shipped with full operating charge of refrigerant and oil.	Bidder to confirm
2.9.2.8	The Chiller Package includes: accessible, highly durable, energy efficient multiple rotary screw compressors with suction gas cooled semi-hermetic motors with inbuilt internal thermal protector & internal pressure relief valve, matching air-cooled condensers: low sound, aero-acoustic condenser fans, mechanically cleanable flooded liquid cooler, all interconnecting refrigerant piping, fully communicating microprocessor based controls panel containing all necessary operating and safety controls, filter drier, moisture indicator: electronic refrigerant feed controls indicating lights, starter, internal wiring, etc. as described. The crankcase heater must be operated as required by microprocessor DDC Controller. Unit must have more than two compressors for part-load operations & take care of breakdown of any one compressor. The microprocessor should automatically switch on an individual compressor to work at part load to ensure energy efficiency of chilling unit. It should also calculate & ensure equal running time for all compressors.	Bidder to confirm
2.9.2.9	This whole unit must be mounted on shaped, strong, rigid galvanized steel chassis and painted with epoxy polyurethane paint- RAL 7035.	Bidder to confirm
2.9.3.0	**Compressor Details**	
2.9.3.1	The Compressor shall be semi-hermetic / hermetic rotary screw type driven by a two-pole motor. The motor rating shall exceed break-hp by at least 10%. It shall be suitable for reduced inrush current starting. Each compressor shall have a suction check valve, suction filter, suction service valve and discharge check valve.	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT		BIDDER'S RESPONSE
2.9.3.2	**Compressor Details**		
	Type of compressor	Semi-hermetic / hermetic rotary screw type driven by a two-pole motor	Bidder to confirm
	Compressor-Motor	The motor rating shall exceed brake-hp by at least 10%. It shall be suitable for reduced inrush current starting.	Bidder to confirm
	Compressor-Motor assembly	The assembly should be installed on a common base frame with anti-vibration mounts.	Bidder to confirm
	Capacity at operating conditions		Bidder to specify
	BHP /TR at operating conditions		Bidder to specify
	Lubrication system	Lubrication system should be force-fed and should include an integral oil separation system, oil sump and oil filter.	Bidder to confirm
	Temperature Control System	The temperature should be controlled during operation to maintain proper oil temperatures throughout lubrication System. An electric Oil-Heater shall be supplied with each compressor to maintain oil temperature during shutdown period.	Bidder to confirm
	Capacity Control System	The step-less capacity control system should be there to modulate compressor capacity automatically by using an electrically initiated hydraulically actuated slide valve within each compressor housing.	Bidder to confirm
	Accessories	Suction check valve, suction filter, Suction service valve and discharge check valve.	Bidder to confirm
	Overall dimensions & weight		Bidder to specify
	Noise level at 1 meter distance - maximum 90 dB (A)		Bidder to specify
	Vibration level		Bidder to specify
2.9.3.3	**Condenser Details:**		Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT		BIDDER'S RESPONSE
	Type of Condenser	Air-cooled type which uses ambient air to condense the refrigerant.	Bidder to confirm
	Tube coil material	seamless copper tubes	Bidder to confirm
	Tube diameter, thickness and length		Bidder to specify
	Number of tubes		Bidder to specify
	Shell Diameter and length (mm)		Bidder to specify
	Number of Passes		Bidder to specify
	Fouling factor		Bidder to specify
	Condenser coil arrangement	Internally grooved type arranged in staggered rows & is mechanically expanded into hydrophilic super slit aluminium fins having self-spacing collars to give superior heat transfer efficiency. Refrigerant sub-cooling shall be incorporated into the coil. The coil guards should be made of heavy gauge steel which are electro galvanised and epoxy painted	Bidder to confirm
	Air flow rate		Bidder to specify
	Fans	Dynamically and statically balanced helicoids fans, direct drive must be installed. The fam motors shall be Six poles, slow speed type with internal overloads and shall be permanently lubricated. The fan guards should be made of heavy gauge steel which are electro galvanised and epoxy painted	
	Number of fans		Bidder to specify
	Class of protection	IP-54	Bidder to confirm
2.9.3.4	**Cooler Details:**		
	Construction	A direct expansion valve should be provided to efficiently monitor expansion of refrigerant gas in liquid Chiller of shell and tube type. The shell of the cooler must be rolled from tested quality steel plate. A no. of baffles must be provided on the shell side for zig-zag flow of secondary fluid (water) for better efficient heat transfer. Internally grooved high quality seamless copper tubes, individually	Bidder to confirm

		replaceable & are expanded into the tube-sheets for leak-proof joints must be used. The hydraulic water circuit with suction & discharge pipe outlet from the cooler must be interlocked with anti-freeze thermostat. The chiller with pipes within the package unit must be insulated with 50 mm thick expandable PUF/ Nitrile foam.	
	Evaporator	The flooded evaporator shall have a built-in distributer for feeding refrigerant evenly under the tube bundle to produce a uniform boiling action and baffle plates shall ensure vapour separation.	Bidder to confirm
	Oil-recovery system	The flooded evaporator shall be fitted with oil-recovery system. The oil-recovery system shall ensure that the cooler is operating at peak efficiency at all times and provides optimal energy efficiency during extended periods of part-loads.	Bidder to confirm
	Water Heads	The water heads shall be of carbon steel and designed for easy removal for mechanical tube-cleaning and/ or tube removal. They shall be designed for multiple pass arrangement for optimum water velocity through tubes for efficient heat transfer and lower pressure drop.	Bidder to confirm
	Tube material & sizing	The tubes shall be at least 16mm outside diameter seamless copper tubes plain from outside and integrally fine finned from inside. The fin spacing shall be at least 748 fins/mtr. The tubes shall be roller expanded into tube sheets made of high grade carbon steel plates. The tubes shall be removable without affecting strength and durability of tube sheets or causing any leakage in adjacent tubes. The tubes shall be adequately supported to prevent tube vibrations.	Bidder to confirm
	Cooler accessories	The cooler shall be complete with standard accessories such as pressure relief valve, purge valve, angle relief valve at liquid refrigerant outlet and drain connections.	Bidder to confirm
	Pressure Testing	The cooler shall be designed for minimum 20 Kg/ cm2 pneumatic pressure on shell side and minimum 10 Kg/cm2 hydraulic pressure on tube side.	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT		BIDDER'S RESPONSE
2.9.3.5	**Refrigerant Piping Details**		
	Material of Refrigerant pipe lines	Hard copper tubes	Bidder to confirm
	Refrigeration accessories	Hand-shutoff valves with charging port, hygroscopic liquid sight glass, solenoid valve, flash economiser and modulating refrigerant expansion devices, moisture indicator, filter-drier, etc.	
	Refrigerant control system	The modulating refrigerant control system shall optimise efficiency by restricting the flow of refrigerant vapour in condenser from entering the vapour at reduced load, by directly modulating a motorized refrigerant valve in the liquid line entering the evaporator. In addition, the refrigerant control system shall measure the level of liquid refrigerant in the flooded evaporator and restrict refrigerant flow entering the evaporator upon a rise in the level protecting the compressor from slugging liquid refrigerant.	Bidder to confirm
	Piping design pressure	The refrigerant piping shall be designed for minimum 20kg/ cm^2 Nitrogen pressure.	Bidder to confirm
	cooler and suction line	The cooler and suction line shall be factory insulated with adequate thickness of foam rubber or equivalent insulating material to prevent condensation. The entire suction line and liquid line between the expansion valve and cooler shall be insulated with flexible closed shell insulation.	Bidder to confirm
	The refrigerant vapour from flash economiser shall be fed back into an intermediate compressor stage, thereby reducing the enthalpy of refrigerant, increasing the net refrigeration effect of the evaporator and maximizing energy efficiency.		Bidder to confirm
	Suitable **leak detectors** shall be installed at appropriate locations.		Bidder to confirm
2.9.4.0	**Power and Control Panel**		Bidder to confirm
2.9.4.1	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 refrigeration control. The control centre of the package chillier must be complete from the stand-point of major operating & safety controls in double door constructed control panel as per IP-65.		Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
2.9.4.2	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. The control panel shall include the following components: 1. High and low pressure cut-offs, 2. Oil safety switch of Danfoss make, 3. Suction, discharge and oil pressure gauges of Fiebig make, 4. Oil safety control, 5. Antifreeze protection, 6. Indicating lights to locate cause of shutdown, 7. Interlocks for inherent motor protection, 8. Marked terminal strip and interconnecting control wiring. For Electrical connections, glands & lugs should be used and all wires should be provided with numbering ferrules as per prior approved control wiring drawings by BHEL. The control panel should be microprocessor based provided with all operating and safety controls. The same shall be preassembled, Wired and mounted on the unit. All the gauges mounted on the panel shall be clearly visible. The microcontroller to have following features viz. 1. Memory Backup 2. Digital control of temperature 3. Auto restart 4. Built in time delay for compressors 5. Single phasing/phase reversal /overload/short circuit protection.	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	6.Temperature setting control to decimal 0.1C 7. Operation in manual & auto mode. 8. Fault Failures Display. The above features are only indicative Protection against the following to be compulsorily provided: a) Loss of refrigerant charge b) Reverse rotation c) Low chilled water temperature d) Current imbalance e) Compressor thermal overload f) Automatic compressor unloading in case of excessive air temperature g) High Pressure i) Electrical over load j) Loss of phase/ Phase reversal k) Fan motors should protected by individual circuit breaker	
2.9.4.3	Vertical inline pumps for chilled water as a complete package along with motors and other accessories, with mechanical seal. Pump shall have following MOC. Bidder to include 2 no. of pumps with common discharge and suction. Impeller : Stainless Steel/ Bronze Shaft : Stainless Steel Casing : Cast Iron Duty parameters shall be suitable to meet the duty condition and should be designed by Bidder. Layout detail shall be provided.	Bidder to confirm
2.9.4.4	Main Electrical Control panels with necessary power & control wiring to operate the chiller, AHUs, Pumps, 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. It should be compatible with BMS if installed in future. Detailed technical specification shall be provided by the Bidder. Panels shall be given from CPRI tested reputed Bidders.	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT		BIDDER'S RESPONSE
2.9.5.0	**Air-Handling Units (AHU)**		
	Type of flow (Horizontal / vertical)	Vendor to specify	Bidder to confirm
	Mounting	Floor mounting	
	Capacity to suit the clean room requirement	Vendor to specify	
	Quantity	Vendor to specify	
	Type of Casing	Double Skin Air Handling Units shall be comprise of SS double skin casing	
	Construction details	Inner skin shall be SS and outer skin shall be 22G percolated GI) with 43±2 mm thick PUF insulation with Aluminium extruded frame work having Terminal break profile. complete with Centrifugal DIDW backward curved / Plug Type fan and fan section, motor with variable frequency drive,	
	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	
	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.	Bidder to confirm
	Cooling Coil Section	Multiple row cooling coil (Capacity & row to be specified by the bidder)	Bidder to confirm
	Filter Section	With EU-4, EU-7 and EU-8 filter with AHU dampers made out of extruded Aluminium for SA/ RA/ FA/ EA requirement.	Bidder to confirm
	Note: AHUs shall be suitable for insulation to outdoor weather exposed conditions. The necessary canopy arrangement to be included by Bidder.		Bidder to confirm

2.9.6.0	**Automatic Controls** Three Way modulating (motorised) control valves with proportional thermostat for chilled water flow control in AHU CHW coil suitable to operate at 0-10 V AC or 0-20 **m Amps.**	Bidder to confirm
2.9.7.0	**Flow Switches:** Flow Switch shall be vane operated type. The motion of the vane shall actuate switch by the action of magnet, which controls the switch.	Bidder to confirm
2.10.0	**Air Ducting between Clean Room and HVAC Plant**	
2.10.1	Supply Air Duct from HAVC system shall be suitable for part and full load operation of the clean room.	Bidder to confirm
2.10.2	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	Bidder to **provide**
2.10.3	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)	Bidder to confirm
2.10.4	**Duct dampers:** Opposed blade Aero foil construction of extruded Aluminium. For supply air and return air-duct branches (to be provided with extended shaft for motorised operation)	Bidder to confirm
2.10.5	Suitable thick blade of **Fire Dampers** suitable for 19 min fire rating with feasible link and limit switch to be installed in supply and return air duct of AHU.	Bidder to confirm
2.10.6	**Return Air riser Grill** (operable push fit type) in Clean area made out of Stainless Steel perforated plate complete (with 10 micron filter) with fixing frame, gasket etc.	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
2.10.7	**Thermal Insulation for duct work:** The insulation for duct work shall be of foil faced closed cell XLPE material (Trocellen / Thermaflex make) in sheet form with thermal conductivity not exceeding 0.035 W/mK at an average Temperature of 40 deg.C shall be with 20mm thick for Supply Air Duct & 10mm thick for Return Air duct. The insulated area shall be covered with anodized aluminium foil.	Bidder to confirm
2.10.8	Any minor rework on the wall for accommodating the duct opening is in the scope of Bidder. The tentative wall openings shall be properly finished by the bidder while erecting the ducts.	Bidder to confirm
2.10.9	All the duct support columns, frames and other structure shall be provided with coat of Epoxy paint after primer coat.	
2.11.0	**Compressed air supply system:** Compressed air is being required for driving pneumatic tools to dress the weld edges, weld beads, removal of defects etc occasionally. **BHEL will provide filtered compressed air supply at 60 to 70 psi (4.1 to 4.8 bar) at a single point,** outside the clean room, indicated by the bidder.	Bidder to confirm
2.11.1	Compressed air lines and tapping points with valves are to be provided for each welding booth. Approximately 10 no. of compressed air tapping point shall be provided.	Bidder to confirm
2.11.2	All lines, ball valves and connectors shall be of materials shall be made stainless steel. Compressed air line shall be laid outside the concrete building and properly drawn inside the clean room. Ball valve size shall be ½ inch. Compressed Air line size shall be 1/2inch.	Bidder to confirm
2.12.0	**Argon Evacution system:** Please refer Cl. 2.4.1, Pipe lines are being laid for removal of argon gas from each of the welding booth. Out let of pipe from each booth is to be connected to three independent extraction (vacuum) pumps. Refer **SK.No. ATP:D:CR:002 Rev. 01.** Volume of Argon to be handled will be 35 m^3 in a shift of 8 hours No. of operating shift – 3 Evacuation pump capacity (tentative value)- Evacuation pipe line size: 6 inch Bidder scope. Evacuation pump shall be properly connected to line provided by BHEL with suitable dampers and connecting chutes (Bidder material) Installation of Evacuation pump and associated controls and along with switch terminal box Exhaust line ducting above the ground level (with out affecting other ducting and other lines) and terminating out at level of 7 meter height.	Bidder to **provide details** and confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
2.12.1	As the welding operation may not be carried out at all the booths simultaneously, it shall be able to perform the evacuation of argon from any of the booth / booths as and when required. This will avoid unnecessary removal of clean and cool air from inside the building.	Bidder to confirm
2.12.2	Provision shall be provided to operate the pump / pumps from the welding cabins	Bidder to confirm
2.12.3	Bidder is to submit the complete details such as materials, make of bought out items, specification, layout drawing etc of the proposed "Argon extraction system".	Bidder to **submit**
2.13.0	**Lighting & Electricals:**	
2.13.1	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. All cables, connections, circuit breakers etc. required for connecting BHEL's power supply in the Clean Room shall be in the scope of Bidder. No neutral will be provided. 220V & 24 V for control circuit are to be provided by step-down transformers of required capacity, which will be in the scope of the supplier. Supply and installation of electrical items including cabling inside clean room and cabins will in Bidder's scope. Detailed electrical wiring diagram shall be submitted for BHEL approval before start of work.	Bidder to confirm
2.13.2	All electrical and electronic panels should be provided with T5 fluorescent lamps for sufficient illumination and power receptacles of 220Volts, 5/15 Amp AC. All adapters /receptacles should have compatibility with Indian equivalents.	Bidder to confirm
2.13.3	Cables shall be routed through totally enclosed cable trays. There shall not be cable trenches. The cable trays should have smooth surfaces without any dirt/ water traps and without any loose parts.	Bidder to confirm
2.13.4	All Current carrying conductors and cables should be of copper. Makes: RPG, Delton, Reliance, Fort Gloster, ACC, CCI, NICCO, Radiant, Toshniwal, Universal, Elkay, Havells, Siechem, RR, Finolex.	Bidder to confirm
2.13.5	All electrical & electronic control cabinets & panels should be vermin and dust proof. All Electric enclosures shall have IP 54 protection	Bidder to confirm
2.13.6	All indication lamps should be provided with LED Indication Lamp.	Bidder to confirm
2.13.7	All components/devices/terminals are to be incorporated with numbered ferrules.	Bidder to confirm
2.13.8	All feedback systems, sensors, limit switches, proximity switches, pressure switches, and temperature controllers should be for heavy duty application and wired up with flexible PVC insulated screened	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	cables running in conduits and converging to common terminal block. Terminal blocks shall be of reputed make acceptable to BHEL. Make: Siemens, L&T, P&F, Omron, Schneider, Telemechanique, Baumer, Balluf, ASM, BCH, Heidenhain, C&S, Honeywell.	
2.13.9	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 . 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.	Bidder to **provide details**
2.13.10	Bidder should ensure the proper earthing for all the installations and panel boards.	Bidder to confirm
2.13.11	Electrical Power Receptacles with Modular Switches for FFUs and Plug & Sockets Points 220 V AC/ 5-15 A 50 Hz single phase, 415 V AC, 15/30 A, 50 Hz three phase electric Supply must be flushed with SS304 Outer-covering including Wiring must be incorporated inside the Wall Panels. Electrical points as required for Welding machines, Clean Room Accessories are also need to be incorporated. 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	
2.13.12	Each Welding Booth shall be provided with the following: Two nos of 63A / 415 V / 3Ph plug, socket and MCB Two nos of 5/15A / 220 V / Single Ph switch and sockets Two No. of 24V / 5A plug, socket and MCB (for hand lamps)	Bidder to confirm
2.13.13	All electrical motors and equipments must be accessible for maintenance. All the electrical components must be laid in proper fashion with neatly dressed control wiring having ferules & properly soldered lugs/terminal inside control panel.	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
2.13.14	All electrical equipment such as motors, fans, Split AC units etc shall be energy efficient as per BEE norms. Star ratings for AC units and EFF-1 for Electric motors as per IEC. Make of motors: Siemens, ABB, Mitshubishi, SEW, CG or reputed makes acceptable to BHEL.	
2.13.15	Total connected load in **KW** for all equipment & accessories	**Bidder to specify**
2.14.0	**Clean Room Accessories:** 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.	Bidder to confirm
2.14.1.0	**Two sets of Calibrated Portable Particle Counter:**	
2.14.1.1	**They shall be suitable for_Simultaneous measurements of Particle concentration, relative humidity, temperature, air-velocity and room pressure** in a single instrument.	Bidder to confirm
2.14.1.2	* With easy to Read, large1/4 VGA colour LED screen, with a memory to store 3000 data's (minimum) with stamp 4 locations, data from up to 4 environmental sensors. * All data can be quickly and reliably downloaded to a computer through RS-232 or USB Drive, Ethernet or can be printed to its built -in thermal printer. * Sensitivity : 0.3 µm * Flow Rate: 1.0 CFM (2.83LPM) * Channel Thresholds (6) : 0.3-25.0 µm / Channel Thresholds (6) : 0.3-10.0 µm * Solid State Laser Diode Sensor	Bidder to confirm
2.14.1.3	Accessories : Battery Pack (conditioned), Zero count Filter, T/RH sensor, Air Velocity sensor, pressure sensor, Operation manual, Tripod stand, 1/2" dia. 3m length tubing, SS Carrying Case, Power Cord, Iso-kinetic sample Probe, Printer paper (3 Rolls), Spare Fuse.	Bidder to confirm
2.14.1.4	Built in Flow Sensors enables highly accurate measurement of particle concentration (0.1CFM ± 10%). The pump must have the automatic shut-off feature if the air-flow is not maintained at 1 CFM.	Bidder to confirm
2.14.1.5	Perfect to use in hard to reach areas behind benches and equipment.	Bidder to confirm
2.14.1.6	Frequency of calibration of the above instrument shall be indicated.	Bidder to confirm
2.14.1.7	Efficient Data Storage and logging capability (3000 data can be stored internally).	Bidder to confirm
2.14.1.8	Calibration certificate from NABL accredited shall be provided for all the measuring instruments	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	involved in the above clean room	
2.14.1.9	Compact and Light weight	Bidder to confirm
2.14.1.10	Rechargeable Internal Battery- NiMH Battery with internal charger expected operation 4-7 hrs.	Bidder to confirm
2.14.1.11	Can be controlled and operated through Web Browser vis Ethernet connectivity without use of any other Software.	Bidder to confirm
2.14.1.12	Counting Efficiency : To Meet ISO 13323-2 Standards	Bidder to confirm
2.14.1.13	Zero Count: Must Meet JIS Standards.	Bidder to confirm
2.14.1.14	Single/ Repeat/ Continuous/ Calculation/ Remote	Bidder to confirm
2.14.1.15	1/4 VGA colour LCD screen.	Bidder to confirm
2.14.1.16	Counts beyond Max. Concentration. Drop-off laser power, Out of regulated flow rate (+/-10%), Low Battery	Bidder to confirm
2.14.1.17	Interface: RS-232C or USB (selectable on Menu Page)	Bidder to confirm
2.14.2.0	**TWO No. of Hand held Oxygen measurement Units with data logger:** Hand held "Oxygen level measurement unit" to measurer the oxygen level percentage in all the welding booths and measured values shall be recorded and then all data can be quickly and reliably downloaded to a computer through RS-232 or USB Drive, Ethernet. Alarm indication shall be provided when the oxygen level goes below 19.5% by volume. Details to be submitted.	Bidder to confirm and provide details
2.14.3.0	**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"	Bidder to confirm and provide details
2.14.4.0	**Two Numbers of Shoe Scrubber:** Bidder has to supply and commission 2 numbers of Shoe Scrubber of reputed make at the dress change cabin. Spares for two years of trouble free maintenance and operation are also to be supplied.	Bidder to confirm and provide details
2.14.5.0	**Two Numbers of high quality Shoe Cover Wrapping Machine:** Bidder has to supply and commission 2 numbers of Shoe Cover Wrapping machine of reputed make at the dress change cabin along with **15,000** numbers of shoe covers.	Bidder to confirm and provide details
2.14.6.0	**Digital Clock:**	Bidder to confirm and

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	One number of GPS-based digital clocks is to be fitted inside the cleanroom flushed with the wall. The specification of the clock shall be as below: * Synchronization : GPS satellite synchronized time * Colour : Red coloured LED with high brightness * Digit Size : 12 inches (minimum) * No of Digits : 4 in HH:MM format with blinking colon * Display format : 12 hours (with option to display in 24 hours format, selection should be made via selector switch) * Mounting : Wall mounting * Power supply : 230 V AC * Dimensions : 3 ft long X 1.5 ft wide; bidder to mention the thickness and gross weight * Housing : IP65 * Operating temperature : 20 to 25 deg C * Suitable line filter to be provided for interface protection * Master unit which receives atomic time from GPS satellite and re-transmits it to clocks to be mounted in suitable location for 24 x 365 operation without any hindrance. * Supply and installation of power cables, signal cables are under the bidder's scope. All cables to be neatly enclosed in casing/capping pies or conduit pipes to maintain the aesthetic look. * Clock must be accessible for maintenance. * One year replacement warranty for the GPS clock and its accessories to be provided.	provide details
2.14.7.0	**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.	Bidder to confirm and provide details
2.14.8.0	**Industrial Vacuum Cleaner:** One No. of Industrial Vacuum Cleaner of 20 litre container capacity. the maximum vacuum power is 3700 mm WC and the unit shall be complete with cyclone primary filter and cellulose cartridge type secondary filter. This unit will be needed remove the heavier particle from the welding booth.	Bidder to confirm and provide details
2.14.9.0	**Uninterrupted Power supply (UPS) and emergency lighting:** UPS powered CFL lights, to maintain an average illumination level of 65 lux, shall be provided at suitable locations inside the clean room, Material air lock cabin, Personnel entry cabin, Dress change room, Control Room and Supervisor cabin. System Monitors & emergency equipment also shall be	Bidder to confirm & **provide details**

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	powered through this UPS. UPS capacity shall be for a minimum of 1500 VA and 2 hour backup power supply to the connected equipment. Cabling and necessary electrical accessories will be in bidder's scope. UPS supply unit comprising of one sine wave single phase inverter and required number of VRLA batteries as specified below, Actual Power Rating: Bidder to specify Input voltage: 24/36/48V Output voltage: 230V single phase, 50 Hz Overvoltage regulation: plus or minus 1% from no load to full load Overload with standability: 150% for 10 sec and 125% for 60 sec THD: less than 5% Efficiency at full load: more than 90% No load current: less than 2% Metering and Display: LCD front Battery connection through MCB IP code: IP20 Battery: 150Ah maintenance free VRLA batteries. Nominal Voltage: 12V No. of batteries: Bidder to specify Warranty: Two years Make of Battery- Exide, Amaraja, Amco only.	
2.14.10.0	**<u>Clean room Garments Cabinet & Garments:</u>** **Garment Cabinet** with HEPA, motor blower assembly in SS304 construction with provision for 60 garments and racks for keeping the extra garments. Stainless steel hangers and number labels also required. The whole unit to be on mounted on casters, front type with lockable arrangement. **60 sets** of Clean room **Garments** along with **Head cover**: 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 30 pairs. Fabric to be check type with 99%nylon, 1%carbon fibers. 50 no. for men & 10 no for women.	Bidder to **provide details**

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
2.14.11.0	**Washing Machine for washing Garments:** 1 No. of 7 kg Front loading, Fully automatic, warm wash facility, with all standard accessories; Make: Siemens, Bosch or other brands acceptable to BHEL for washing the clean room garments.	Bidder to **provide details**
2.14.12.0	**Argon Cylinders Carry Case:** 12 numbers of Argon Cylinders carrying case, capable of holding **six** argon cylinders at a time, made up of stainless steel material, fitted with caster wheels for floor movement and hooks for lifting by crane. Bidder is to submit the drawing along with the offer.	Bidder to confirm and **provide detail**
2.15.0	**Four number of Cubicles along with Split air conditioning units**	
2.15.1	Four numbers of Cubicles are to be constructed in the locations (6,7,8 & 9) shown in **SK.No. ATP:D:CR:001 Rev.01.** Dimensions of each cubicle are: **Cubicle No. / Length / Width / Height .** **06 / 6500 mm / 5500 mm / 4000 mm** **07 / 6500 mm / 5500 mm / 4000 mm** **08 / 6500 mm / 5500 mm / 4000 mm** **09 / 6500 mm / 5500 mm / 4000 mm**	Bidder to confirm and **provide detail**
2.15.2	General construction requirement is detailed in the sketch **SK.No. ATP:D:CR:004 Rev.01 Sh 1of 2 and Sh 2 of 2.** * Total height of each partition panel shall be **4000** mm and each shall be divided into 3 sections for which materials selection shall be as given below: * From Floor level to 1000 mm height – Insulated opaque sheet. * Between 1000 mm height and 2500 mm height – Clean room compatible -Transparent PVC material. * Remaining Height shall be with Insulated opaque sheet. * All joints between the panels shall be filled with RTV Silicon Sealants. * The partition support post shall be epoxy paint coated steel material and shall be bolted to the ground using anchoring M16 anchoring bolts. (refer the drawing for the foundation detail). * Access to the cabin shall be provided with Sliding door arrangement on the partition walls. * Width of **each** door shall be 750 mm (2 no.) and height shall be 2500mm. (exact location of	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	doors will be provided after the placement of PO). * Construction of doors also shall be similar to the partition panels. * Suitable locking arrangements shall be provided to lock the doors of the booth. * Top & Bottom Tracks including the intermediate support system must be of Aluminium-extruded Profiles of different shapes. * All the cabins shall be closed at the top with MS structure. For general construction details, refer Sk.No. ATP:D:CR:005 Rev 01. * For loading and unloading of components, it should be able to open the top covers of all the cubicles by lifting using crane. Suitable lifting hooks and locating pins shall be provided. * It should be easy to lift and put back and seating shall be ensured to prevent leakage of air.	
2.15.3	**Swing door** - 2 no. shall be provided for **Cubicle No. 8** and **Sliding doors** shall be provided for **Cubicle No. 7, 9 and 10.** Locations and dimensions of door openings will be provided after the release of P.O.	Bidder to confirm
2.15.4	The entire floor of **Cubicle No. 8** must have **4mm thick self-levelling epoxy coating**. Properties of epoxy shall be the same as in the floor of clean room.	Bidder to confirm
2.15.5	All the four cabins shall be air conditioned Using Split Air conditioners as specified below: * Bluestar ,Samsung, hitchi make which shall be acceptable to BHEL * Each Cubicle shall be provided with two number of each 1.5 Ton Capacity with minimum 2 star rated - Split Air Conditioner. * Minimum 35 meter of copper tube for each unit for the cabins 8 & 9 is required.	Bidder to confirm
2.16.0	**Spares:** Bidder has to provide detailed item wise Un-priced list of spares for each and every equipment such as motors, blowers, compressors filters, HVAC equipments, control instruments, all clean room accessories etc. being supplied for this entire package for two years of trouble free Operation and Maintenance.	Bidder to confirm and **provide detail**
3.0	**General:**	

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
3.1	**MS Structural Frame-work with I-Channel and MS Plates for supporting the Cleanroom Facility**: Supply, Fabrication and installation of primary structure Frame work with I-Beams, MS plates, Channels, Angles as per approved drawings and specifications for AHU Ducting, piping etc. The Structural design shall be as per IS standard & rigid enough to carry required load. Galvanized Steel Roof Decking acts as the building diaphragm for the clean room ceiling system in addition to supporting the HVAC Equipment like AHU, FFU, Ducting, Filters, etc.. & fire fighting piping.	Bidder to confirm
3.2	Detailed Bill of material including weight for MS Structural shall be furnished by bidder in the 'Technical bid' offer for technical scrutiny	Bidder to **provide details**
3.3	Service areas shall be provided with sufficient numbers of non-clean room lights-FTL 28W T5 at various places with complete wiring and switches.	Bidder to confirm
3.4	Provision for Network Cabling for intranet at 2 different locations in Clean-room hall at centre of longer wall. The cable will be inserted from false-roof top where there will be All LAN line cables are to be provided in the wall panel itself.	Bidder to confirm
3.5	**Pipes and Fittings:** MS "C" Class piping for Chilled water Circulation duel insulated with 40mm cross-linked Polyethylene insulation (Trocellen/ Thermoflex make) finally cladded with 26G Aluminium cladding. GI Butterfly Valve GI Balancing Valve GI Check Valve Y Strainer with SS basket and permanent magnet. SS Ball Valve Pipe and Valves sizing to be done by Bidder with maximum friction drop to be 8 /100 feet of pipe length. GI "B" Class Piping for Drain water duly insulated with 10mm cross-linked Polyethylene insulation (Trocellen / Thermoflex make) finally cladded with 26 G Aluminium cladding. Valves with insulation (as specified for Drain Pipe) : 1 No. Ball Valve and 1 No. "U" trap (to check any air leakage inside AHU from Drain pipe) to be provided for each AHU.	Bidder to confirm
3.6	Joints between the various wall panels are to be sealed flush with clear silicon sealant. This shall provide a totally airtight room, which prevents ingress or egress of particles and contamination	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
3.7	Entry of the chute shall be provided with grill plate and dummy cover. Material of chute, grill and dummy cover shall be made of stainless steel.	Bidder to confirm
3.8	**Civil work:** Regarding the plant room, foundations for m/cs, pumps etc. necessary opening / enlargement on walls etc. shall also be in bidder's scope. For this all preliminary drawings and details will be approved by BHEL during execution stage.	Bidder to confirm
3.9	**Water supply:** Water supply will be provided at one point only – as per the choice of the bidder.	Bidder to confirm
	ENVIRONMENTAL PERFORMANCE OF THE SYSTEM: The complete system or any of its part should confirm to following factors related to environment: 1 Maximum noise level shall not exceed 90 dB(A) at normal load condition,1 meter away from the equipment. 2 There shall not be any emissions from the equipment. 3 If any safety / environmental protection enclosure is required it should be built in the equipment by the Bidder.	Bidder to confirm
4.0	**Pre-Despatch Inspection:** The complete package chiller with microprocessor control is to be factory assembled, wired and proved of rated performance, which will be witnessed by BHEL representatives at their works before dispatch. Before despatch, testing of Major equipment / accessories / sub-assemblies at suppliers' works, are to be witnessed by BHEL representatives. BHEL is to be informed well in advance for PDI. Transportation, boarding & lodging charges of the BHEL personnel will be borne by BHEL. Complete documents such as manuals, drawings, O&M manuals etc related to the equipment are to be presented at the time of Pre-despatch inspection.	Bidder to confirm
5.0	**Erection, Commissioning & Acceptance Criteria:**	
6.1	Erection of the total system including installation of new plant, fabrication & erection of chilled water pump, pipelines, storage tank& its insulation, electrical control& power cabling, earthing of the system	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	is in scope of the supplier on **TURNKEY BASIS.** The bidder has to transport all the materials at the site.	
6.2	All tools & tackles, handling equipment including mobile cranes, 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.	Bidder to confirm
6.3	All foundation materials such as foundation bolts, levelling pads etc. required for erection are to be brought by the supplier.	
6.4	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.	Bidder to confirm
6.5	After completion of E&C of each system, the system will be tested to meet their functional and safety requirements and shall be recorded.	Bidder to confirm
6.0	**<u>On-site validation and Testing of the complete Clean room System:</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 3rd party. A comprehensive on-site validation and certification service 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 Airborne Particulate contamination Monitoring Air Velocity Measurement & Air-flow Quantity Measurement Temperature control range tests Humidity control range tests On-site HEPA filter leak test (By cold DOP)	Bidder to confirm

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	Filter pressure drop measurements Air flow pattern and strength (by titanium chloride aerosol Test) Light level checks at 1m working height in clean room Room pressurization Oxygen level measurement, etc. During a typical certification test, the bidder will identify areas of concern and make the user aware of them. Adjustments will be made as necessary to bring the room into compliance with BHEL specification and /or other pertinent standards. Recommendations and the cost estimates for procedures necessary to bring the facility into compliance will also need to be offered. Upon completion of the test procedure, a certificate of performance and supporting test report has to be submitted to BHEL.	
7.0	**Performance test :** After the completion of validation test, The entire plant - all equipment and accessories shall **run continuously for six days – 24 hours per day** without any break. If any stoppage occurs, the test will be re started again for six 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.	Bidder to confirm
8.0	**Warranty & Performance guarantee:** The supplier shall Warranty/guarantee for the successful operation of all the equipments and accessories for a period of 12 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 12 months from the date of replacements / rectifications.	Bidder to confirm
10.0	**Maintenance:** 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	Bidder to **provide details**

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	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	
11.0	**Revalidation:** Bidder has to give **optional** cost of re-validation after the completion of guarantee period and indicate the duration of the validation test. This cost will be considered for further 3 yrs. of operation of the cleanroom.	Bidder to **provide details**
12.0	**AMC:** 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**.	Bidder to **provide details**
13.0	**Training:** 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.	Bidder to confirm
14.0	**Documentation:**	
14,1.10	**Documents to be submitted along with the Technical offer :** Follwing mentioned documents are to be submitted along with the technical offer otherwise the **Offer will be rejected**.	
14.1.1	**Ceiling panel (Refer 2.1.0):** * Size of the panel * Construction details including cross sections, Interconnection details, interlocking of panels, hanging & mounting arrangements etc with materials & major dimensions	Bidder to **submit**

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	* Percentage of HAVC fluid planned to be admit from roof * General Layout showing various openings for HEPA filters, light fittings and other accessories as mentioned in 2.1.4.etc with major dimensions.	
14.1.2	**Wall panel (Refer 2.2.0):** * Size of the panel * Construction details including cross sections, Interconnection details, interlocking of panels, mounting arrangements of ducts, riser grills, terminal boxes etc with materials & major dimensions * Construction detail of view panel (ref. 2.2.4) * General layout showing all openings for various fixtures and accessories with major dimensions. * Compressed air line layout system * Electrical cable layout with supply point * Method of number of Air change * Details of Coving * Mounting arrangement of partition panels, etc. * General layout showing locations of Filters, duct openings, HEPA filters, Various measurement systems, Power supply – terminal boxes, Air supply lines, Ethernet connection terminals, Various measurement systems, safety system etc as mentioned in 2.2.3 * Details of coving at different intersections with materials and dimensions (Ref 2.2.10)	Bidder to **submit**
14.1.3	**Modular type welding Booths:** * Over all layout of Welding booths inside the clean room to suit the space available after wall panelling, Construction details with drawings, details & make of laminated glass, interconnection & grouting details, Bill of materials etc.	Bidder to **submit**
14.1.4	**Epoxy Flooring (Refer 2.4.0):** * Composition details of epoxy materials * Sketches for Sieves & seal caps of argon exhaust ports.	
14.1.5	**Air shower arrangement along with Air Lock Cabin for Material entry (Refer 2.5.0)** * Construction details with details with materials for all items such as walls, doors, locks etc being used	Bidder to **submit**

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	* General layout showing all arrangement including exhaust line with major dimensions * Qty, type, make, specification and catalogues of HEPA filters * Qty, type, make, specification and catalogues of Air curtain * 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.	
14.1.6	**Air shower for arrangement for personnel entry Cabin with Biometric entry system (Refer 2.6.0)** * 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 Biometric system * Details of lighting arrangement, interlock systems etc.	Bidder to **submit**
14.1.7	**Emergency Door (Refer 2.7.0)** * General layout with drawing & bill of materials * Constructional details	Bidder to **submit**

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
14.1.8	**HEPA Filter with Terminal Box (Refer 2.8.0)** 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	Bidder to **submit**
14.1.9	**HVAC system: (Refer 2.9.0)** * 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 such as Chiller units, Chiller Unit with heater, Compressors, Condensers, Air Handling Units, automatic controls, flow switches etc.	Bidder to **submit**
14.1.10	**Air Ducting between Clean Room and HVAC Plant (Refer 2.10.0)** * General layout showing complete routing & locations of HVAC fluid inlet / out let in the clean room * Construction & interconnection details of ducts * Percentage of HVAC fluid admitted from side walls * Percentage of HVAC fluid admitted from ceiling panel * Specification of thermal insulation & outside cladding sheet.	
14.1.11	**Compressed air supply system (Refer 2.11.0)** * General layout with Bill of materials and quantity.	Bidder to **submit**
14.1.12	**Argon Evacution system (Refer 2.12.0)**	Bidder to **submit**

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	* Motor capacity, Make, Specification & Catalogue * Outlet ducting arrangement	
14.1.13	**Lighting & Electricals (Refer 2.13.0)** * 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 etc	Bidder to **submit**
14.1.14	**Calibrated Portable Particle Counter (Refer 2.14.1.0)** * Make (reputed makes which shall be acceptable to BHEL),model, type, specification, catalogue, mounting details of sensors & general layout of arrangement	Bidder to **submit**
14.1.15	**Hand held Oxygen measurement Unit with data logger: (Refer 2.14.2.0)** Make (reputed makes which shall be acceptable to BHEL),model, type, specification & catalogue	Bidder to **submit**
14.1.16	**Washable Walk over- Sticky mats (Refer 2.14.3.0):** Details like make, material, specification etc.	Bidder to **submit**
14.1.17	**Shoe Scrubber: (Refer 2.14.4.0):** Make (reputed makes which shall be acceptable to BHEL),model, type, specification & catalogue	Bidder to **submit**
14.1.18	**Shoe Cover Wrapping Machine (Refer 2.14.5.0):** Make (reputed makes which shall be acceptable to BHEL),model, type, specification & catalogue	Bidder to **submit**
14.1.19	**Digital Clock: (Refer 2.14.6.0):** Make (reputed makes which shall be acceptable to BHEL),model, type, specification & catalogue	Bidder to **submit**
14.1.20	**Cleanroom compatible Shoe Rack (Refer 2.14.7.0):** GA drawing with bill of materials, details, specification / catalogue.	Bidder to **submit**
14.1.21	**Industrial Vacuum Cleaner (Refer 2.14.8.0):** Make (reputed makes which shall be acceptable to BHEL),model, type, specification & catalogue	Bidder to **submit**
14.1.22	**Uninterrupted Power supply (UPS) and emergency lighting (Refer 2.14.9.0):** Make (reputed makes which shall be acceptable to BHEL),model, type, specification, catalogue, connected equipment details, total connected load etc.	Bidder to **submit**

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
14.1.23	**Clean room Garments Cabinet & Garments (Refer 2.14.10.0):** GA drawing with bill of materials, details, specification / catalogue.	Bidder to **submit**
14.1.24	**Washing Machine for washing Garments: (Refer 2.14.11.0):** Make (reputed makes which shall be acceptable to BHEL),model, type, specification & catalogue	Bidder to **submit**
14.1.25	**Argon Cylinders Carry Case: (Refer 2.14.12.0):** Drawing with bill of materials & dimensions	Bidder to **submit**
14.1.26	**Four number of Cubicles along with Split air conditioning units (Refer 2.15.0):** GA drawing with bill of materials, Details & dimensions of cabins, specification / catalogue of AC Units, construction details of doors, specification of epoxy flooring etc.	Bidder to **submit**
14.1.27	**General lay-out drawing of the overall Clean room, Service building & Control 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	Bidder to **submit**
14.1.28	Electrical Circuit with Bill of Materials giving specification and make of components used.	Bidder to **submit**
14.1.29	Quality plan / test charts, list of validation tests with acceptable values etc.	Bidder to **submit**
14.1.30	Schedule for document submission, Supply, Erection & Commissioning of various equipment / accessories, Validation test & performance trial from the date of release of LOI / PO.	Bidder to **submit**
14.1.31	Performance certificate in the format as mentioned in Section IV of Part-A.	Bidder to **submit**
14.1.32	Reference list of customers where similar cleanroom have been executed as mentioned in PART A.	Bidder to **submit**
14.1.33	Complete list of Spares as mentioned in **2.16.0**	
14.2.0	**Documents to be submitted after the receipt of PO / LOI :** * 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 14.1.1 to 14.1.29** to BHEL for approval. * 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. * Hydraulic / Pneumatic Circuit with Bill of Materials giving specification and make of components used.	Bidder to **confirm**

SL.NO.	BHEL SPECIFICATION / REQUIREMENT	BIDDER'S RESPONSE
	* Lubrication / Coolant Circuit with Bill of Materials giving specification and make of components used. * Electrical Circuit with Bill of Materials giving specification and make of components used. **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.	
14.3.0	**Documents to be submitted along with the equipments / Sub assemblies / Instruments:** * Inspection reports / Test charts, catalogues of various equipment, accessories and bought-out items. * As built drawings and inspection reports of the sub-assemblies being supplied as single unit	
14.4.0	**Documents to be submitted during performance testing:**	
17.0	**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.	Bidder to **confirm**
17.1	As built drawing of the entire plant- equipment and accessories super imposed on the building with BOM.	
17.2	As built drawings of the various Constructions with BOM	
17.3	As built drawings of the various subsystems with BOM	
17.4	As built drawings of the hydraulic circuits	
17.5	As built drawings of the electrical circuits & networking	
17.6	Reports of the validation tests	
17.7	**O&M manuals, catalogues, test reports / calibration certificates, commissioning reports etc for** all equipment and accessories being supplied.	
17.8	Detailed write up of construction details with bill of materials, construction details, design parameters, etc of complete package.	

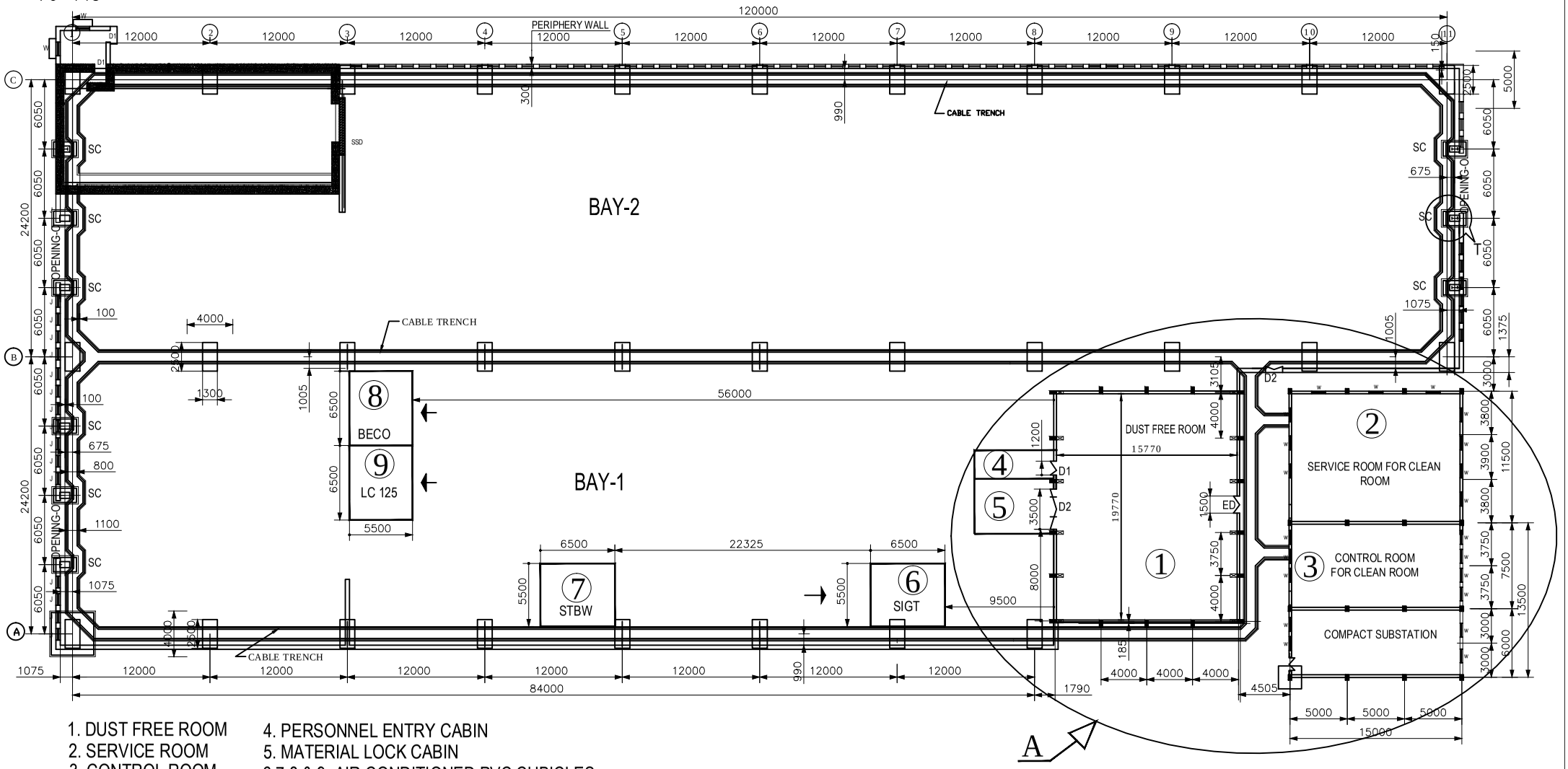
List of Annexures :

1. **Annexure I** **–** Basic Building details.
2. **Annexure II** **-** Preferred makes of various bought-out items (in addition to the make specified in individual clause)
3. **SK.No. ATP:D:CR:001** **- Sh1 of 1 & Sh 2 of 2 –** General layout of shop
4. **SK.No. ATP:D:CR:002** **–** General layout of shop
5. **SK.No. ATP:D:CR:003** **-** Clean Room welding Booth wall details
6. **SK.No. ATP:D:CR:004** **- Sh1 of 1 & Sh 2 of 2 -** Clean Room welding Booth wall details
7. **Sk.No. ATP:D:CR:005** - For Top Closure of AC Cubicles (6,7,8,&9)

BHEL

70–143

ADVANCED TECHNOLOGY PRODUCTS



1. DUST FREE ROOM
2. SERVICE ROOM
3. CONTROL ROOM
4. PERSONNEL ENTRY CABIN
5. MATERIAL LOCK CABIN
6,7,8 & 9 AIR CONDITIONED PVC CUBICLES

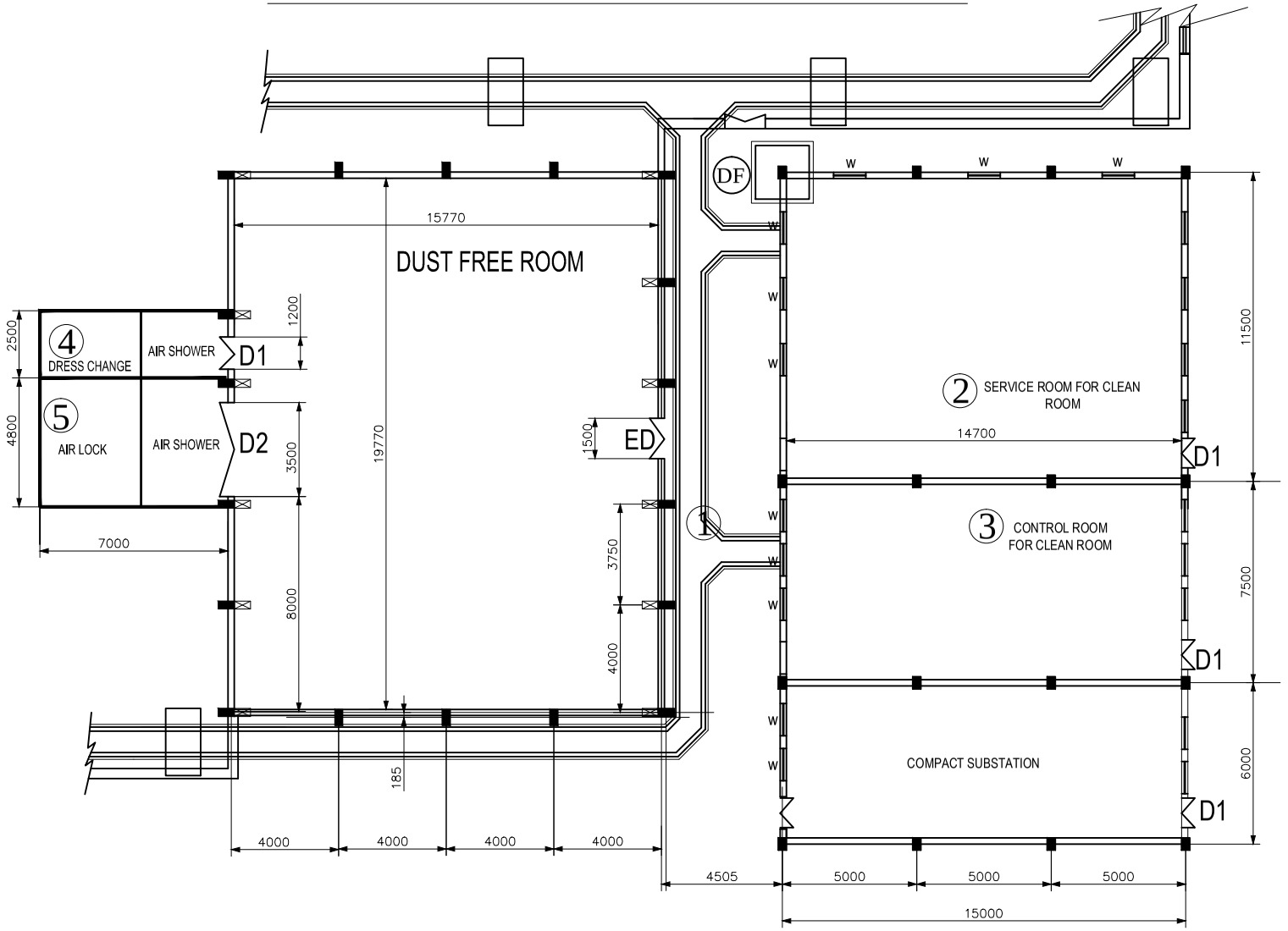
GENERAL LAYOUT (PLAN) OF SHOP

SK: No.	REV
ATP:D:CR:001	01
	SH 1 OF 2

BHEL

70–143

ADVANCED TECHNOLOGY PRODUCTS



DETAIL-A

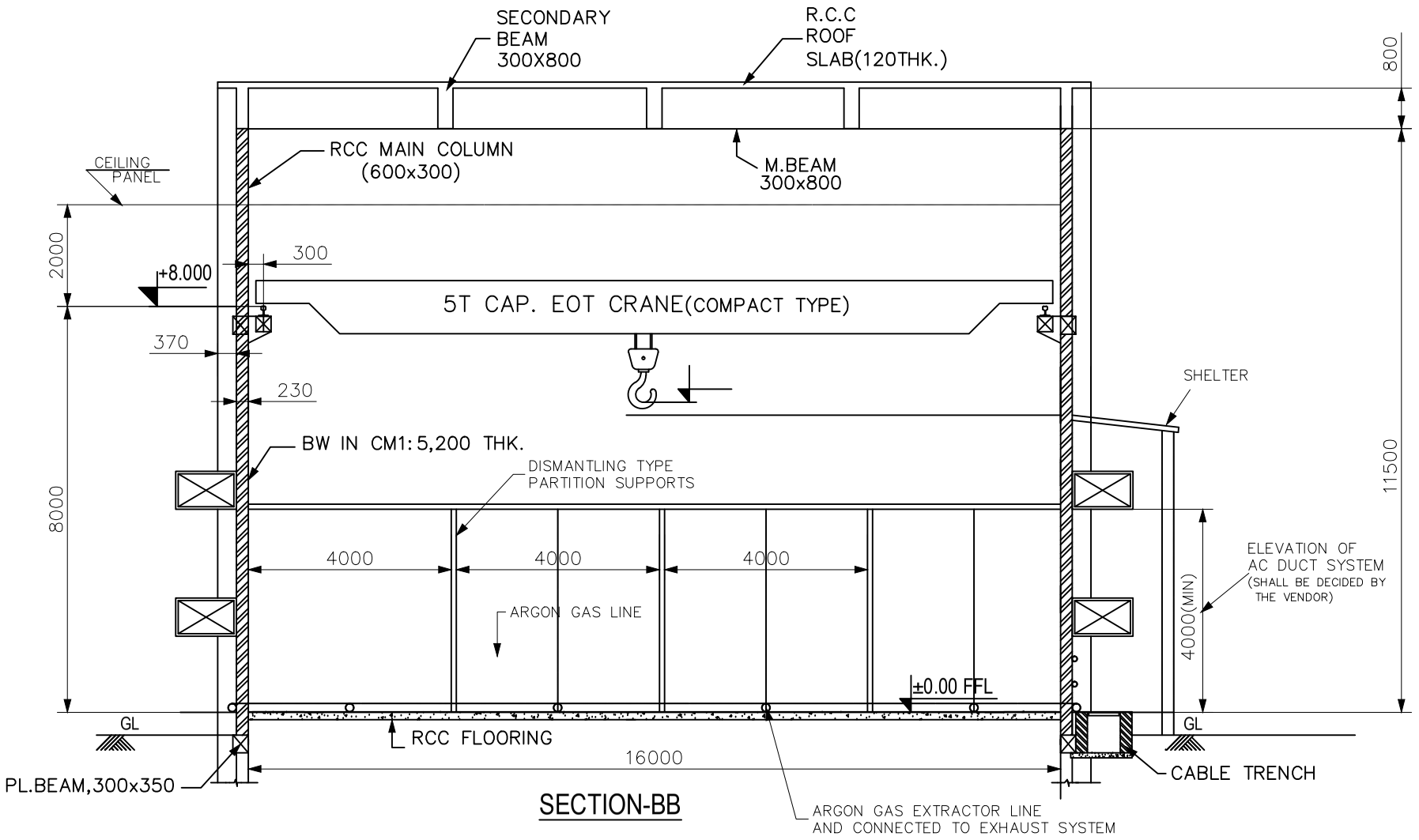
SK: No. ATP:D:CR:001

REV 01

SH 2 OF 2

70–143

ADVANCED TECHNOLOGY PRODUCTS

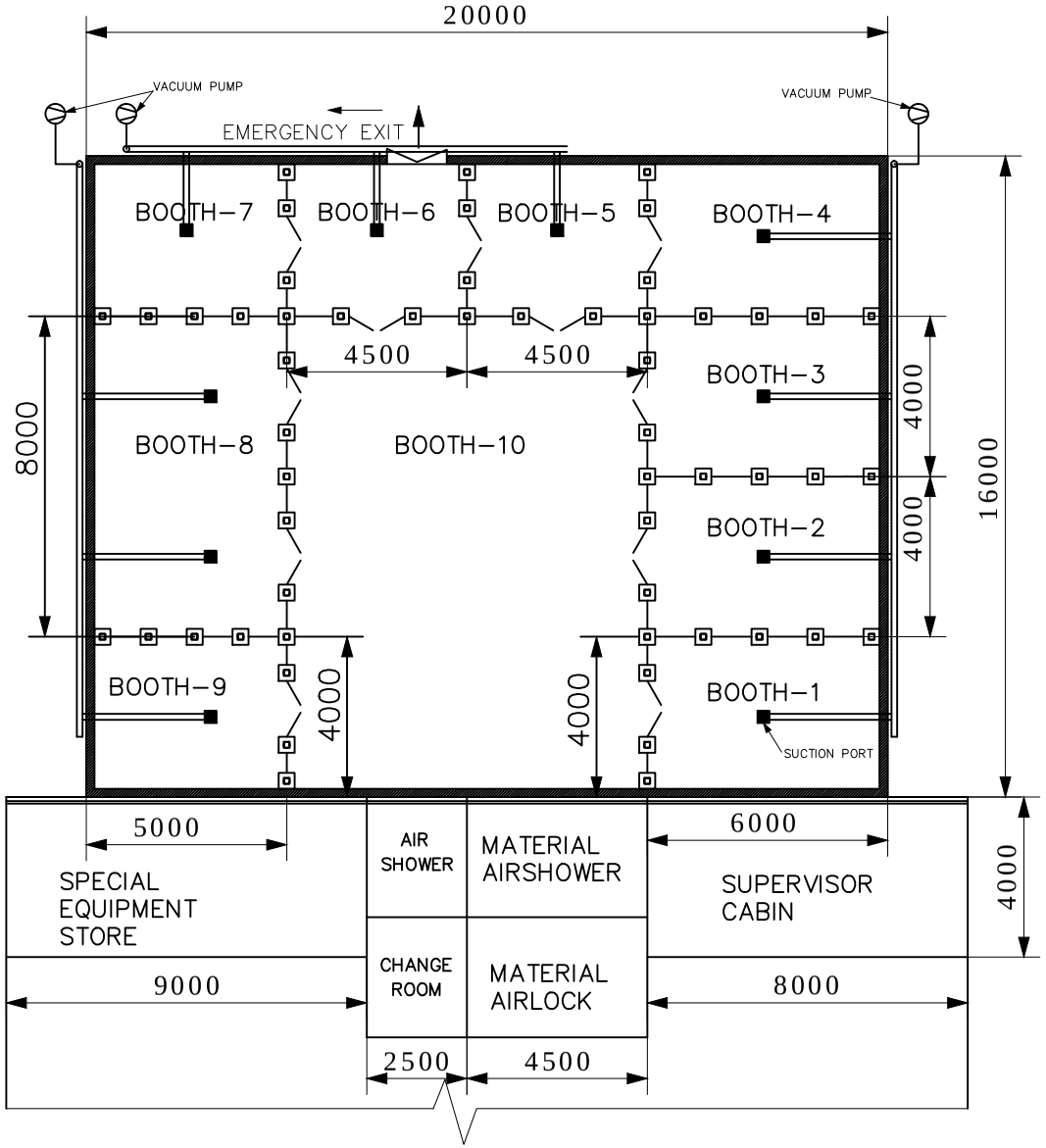


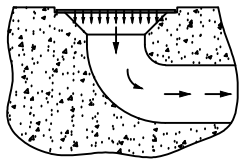
SECTION-BB

SK.No.	REV
ATP:D:CR:002	01

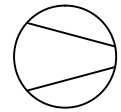
70–143

ADVANCED TECHNOLOGY PRODUCTS





SUCTION PORT



VACUUM PUMP - 3 No.

NOTES: –

1. ALL DOORS SHOWN SHALL BE SLIDING TYPE ARRANGEMENT.

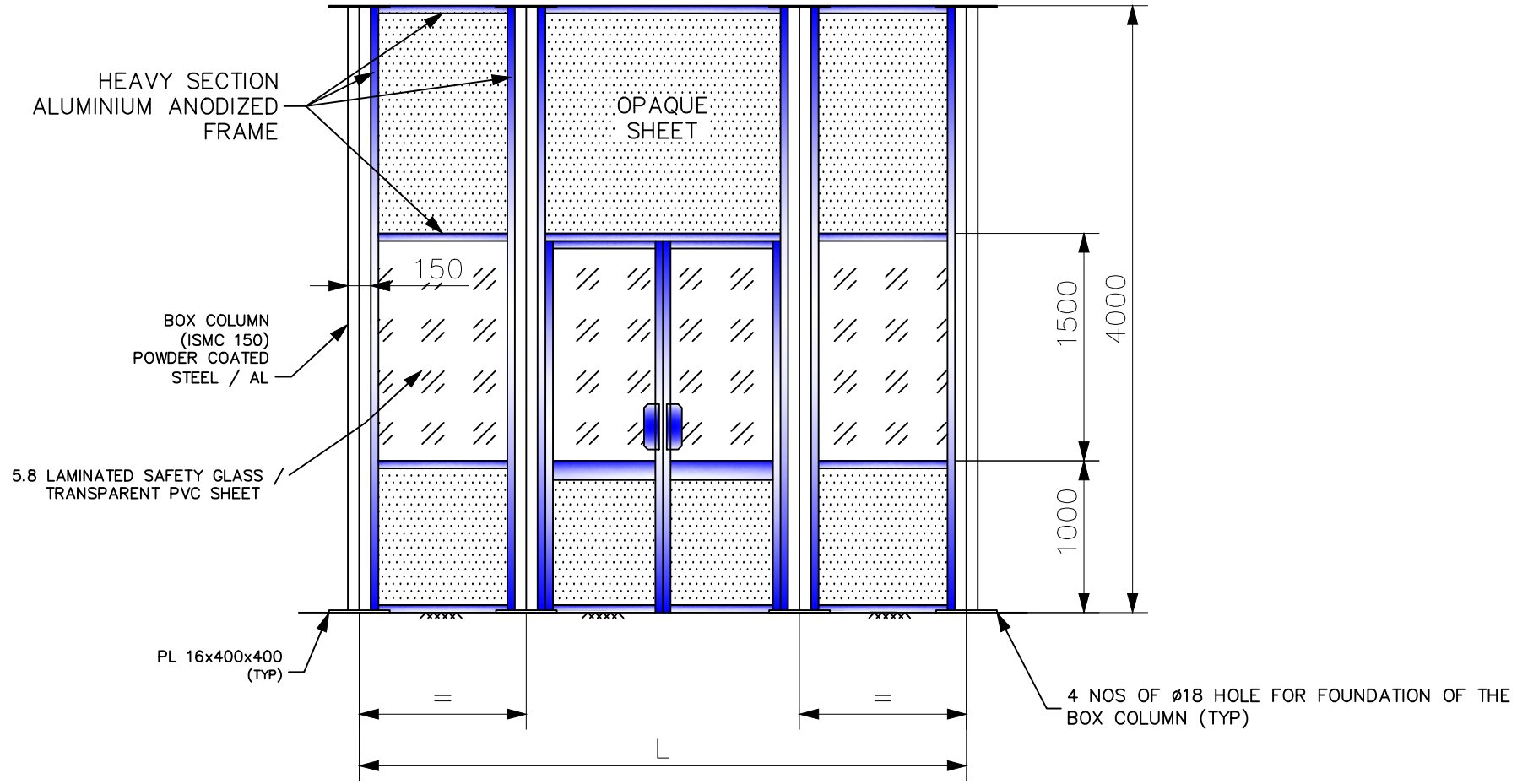
CLEAN ROOM WELDING BOOTH WALL DETAIL

SH 1 OF 1

SK.No.	REV
ATP:D:CR:003	01

70–143

WELDING BOOTH / AC CUBICLE - PARTITION PANEL DETAIL



ELEVATION

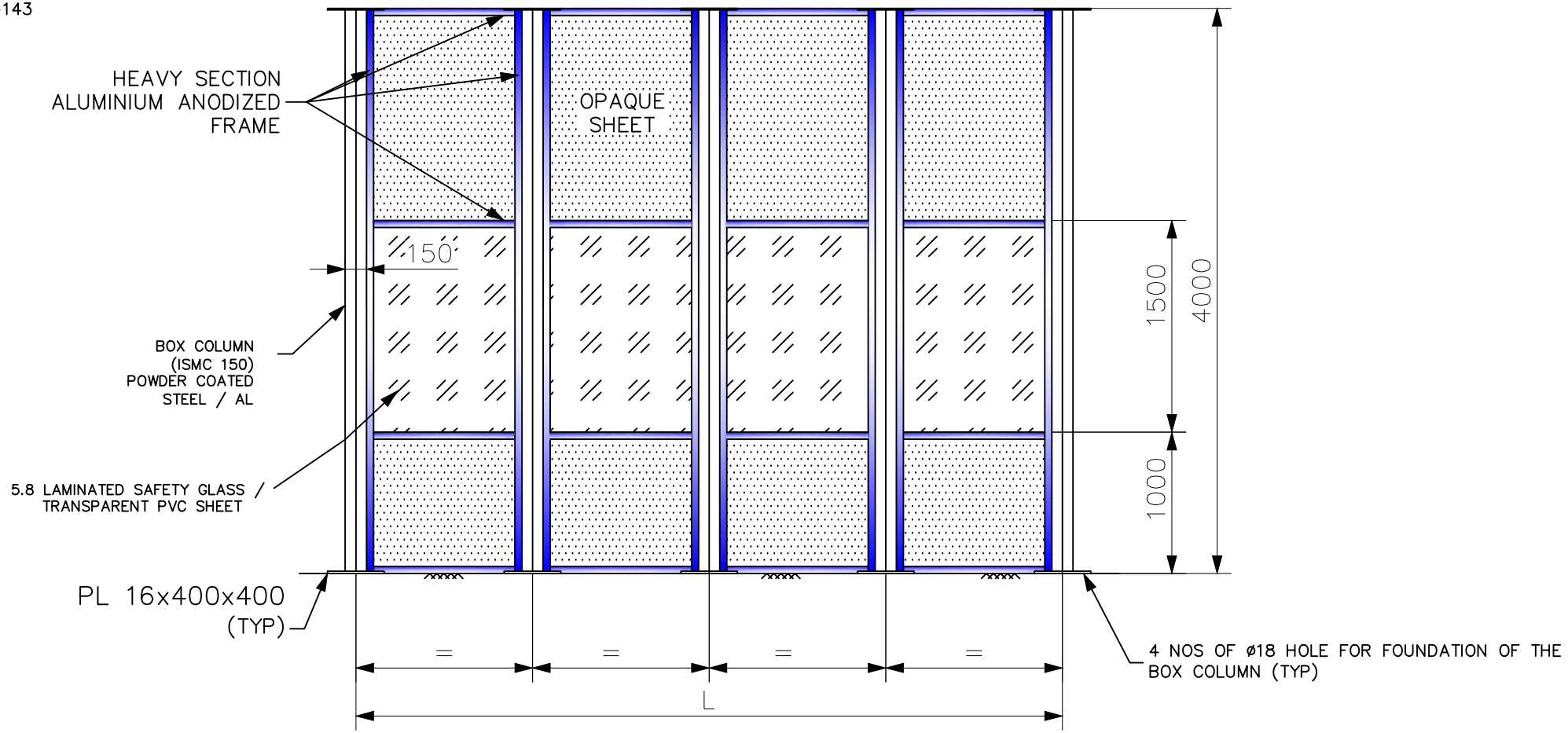
NOTES: –

1. ENTIRE LENGTH OF BOX CHANNEL SHALL BE WELDED AND SMOOTHLY GROUND.
2. THE ALUMINIUM FRAME SHALL BE PROPERLY ATTACHED TO THE METALLIC BOX COLUMN.
3. ALL JOINTS TO BE FILLED WITH RTV SILICONE SEALANT.
4. M16 FOUNDATION BOLT GROUTING IS IN THE BIDDER'S SCOPE.
5. THIS SKETCH IS ONLY SCHEMATIC. BIDDER HAS TO DETAIL OUT ALL REQUIREMENTS AS PER SPECIFICATION.

SK.No.	REV
ATP:MD:CR:004	01

70–143

WELDING BOOTH / AC CUBICLE - PARTITION SIDE PANEL DETAIL



SIDE ELEVATION

NOTES: –

1. ENTIRE LENGTH OF BOX CHANNEL SHALL BE WELDED AND SMOOTHLY GROUND.
2. THE ALUMINIUM FRAME SHALL BE PROPERLY ATTACHED TO THE METALLIC BOX COLUMN.
3. ALL JOINTS TO BE FILLED WITH RTV SILICONE SEALANT.
4. M16 FOUNDATION BOLT GROUTING IS IN THE BIDDER'S SCOPE.
5. THIS SKETCH IS ONLY SCHEMATIC. BIDDER HAS TO DETAIL OUT ALL REQUIREMENTS AS PER SPECIFICATION.

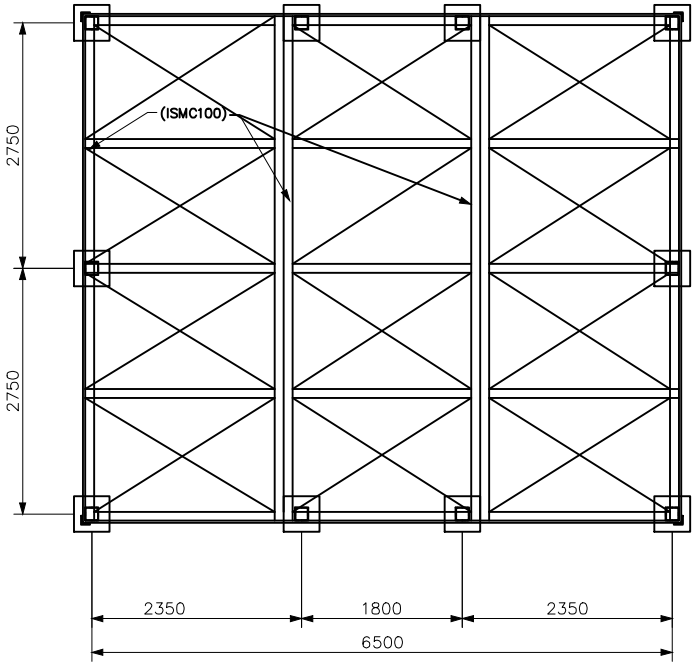
SK.No.	REV
ATP:MD:CR:004	01

70–143

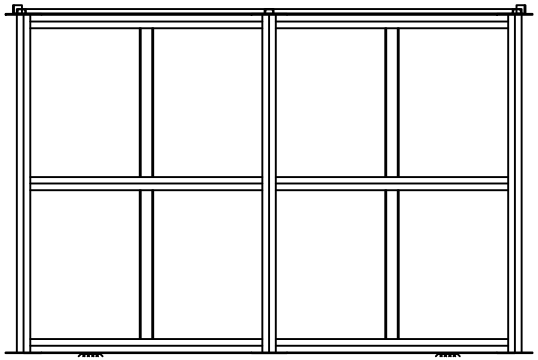
AIR CONDITIONED CUBICLES (6,7,8 & 9) TOP COVER

NOTES: –

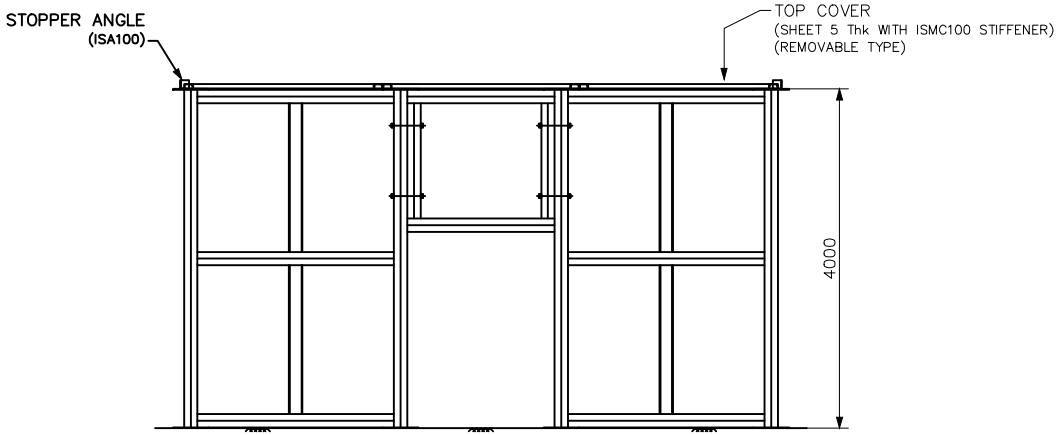
1. TOP SECTION OF THE CABIN SHALL BE MADE AS DISMANTABLE TYPE (3 Nos AS SHOWN). MATERIAL OF CONSTRUCTION IS STRUCTURAL STEEL. TOP COVER SHALL BE PROPERLY HOUSED WITH LOCATING ARRANGEMENT.
2. ENTIRE LENGTH OF BOX CHANNEL SHALL BE WELDED AND SMOOTHLY GROUND.
3. 2 COATS OF EPOXY PAINTING SHALL BE DONE ON CARBON STEEL STRUCTURAL MATERIAL.
4. INNER SURFACE OF CABIN SHALL BE COVERED WITH TRANSPARENT SHEET AND SHALL BE SUPPORTED USING STRONG ANODIZED ALUMINIUM FRAME.
5. THIS SKETCH IS ONLY SCHEMATIC. BIDDER HAS TO DETAIL OUT ALL REQUIREMENTS AS PER SPECIFICATION.



TOP VIEW



SIDE VIEW



ELEVATION

SK.No.	REV
ATP:MD:CR:005	01

Advanced Technology Products	ATP:CR:SPEC:001/00
SCOPE for Design, Construction, Testing, & Commissioning of CLEAN-ROOM of ISO Class- 8 (as per ISO-14644 Standard)	

ANNEXURE I

	Basic Building being provided by BHEL:
1.	Clean Room Building is a complete concrete building, being constructed to have a clear inside dimensions as mentioned below: **Length: 19770 mm, Width : 15770 mm and Height : 11100 mm**. **(Refer SK.No. : ATP/D/CR/001 Rev.01 and Refer SK.No. : ATP/D/CR/002 Rev.01).**
2.	All columns and beams shall be flush at inside of the building except the Crane rail support gussets and beams.
3.	Interior of the Clean Room will be divided into 11 compartments as shown in **SK.No. : ATP/D/CR/003 Rev.01** of which 10 compartments will be converted into welding Booths. During welding in these booths, Argon gas will be used as "Shielding Gas". As it is heavier than air, this gas will move towards the floor. As the accumulation of this gas is a concern for the safety of the human beings, it is to be evacuated. Hence Pipe lines will be provided from each booth as shown in the above mentioned sketch.
4.	For each compartment, openings shall be provided at the walls for Inlet and Outlet ducts of HVAC system. Drawings shall be submitted by the Bidder with size and locations of HVAC ducts - inlet and outlet points.
5.	Opening shall be provided for Material entry shall be 3500mm (width) x 4000 mm (height) and for Personnel entry shall be 1500mm (width) x 2100 mm (height).
6.	All cable trenches and other trenches shall be provided outside the building.
7.	**Service Building & Control Room:** As shown in **SK.No. : ATP/D/CR/001 Rev.01**, a concrete building of **15000 mm Width and 5000 mm height,** divided into two compartments as "Service Building of length 11500 mm and "Control Room of length 7500 mm will be provided by BHEL. This rooms are to be utilised for the purpose of Air change and to accommodate all HVAC & allied equipment, control panels, controls and monitoring of various measurement and safety systems etc.
8.	**Chiller Area** is an open area, which will be provided adjacent to the Clean room. Bidder to specify the area required.
9.	Bidder has to submit the layout, foundation details of equipment to be erected, openings required etc, with in month after placement of PO.
10.	**EOT Crane inside the Clean Room:** It may please be noted that one no. of 5 Ton EOT crane is installed inside the building head room. Supply, E&C is in the scope of BHEL.