



23rd October 2024

To Whom It May Concern

Open Tender for Supply and installation of AHU & Chillers.

This is an RFQ (Request for Quote) for the Supply and installation of AHU & Chillers as part of an open tender for the Centre for Nano Science and Engineering (CeNSE) at IISc, Bangalore.

CeNSE is a multidisciplinary research department at IISc that houses a 14,000 sq. ft. Cleanroom and characterization facility used by 50 faculty members from various disciplines at IISc. CeNSE also runs a program called the Indian Nanoelectronics Users Program (INUP) which has allowed 4200 participants from more than 700 universities and institutes all over India to use the facilities at CeNSE. Consequently, any tool in CeNSE receives significant exposure to the scientific community at IISc and beyond. The vendors are requested to factor in the value of this exposure in their quotes. Details of existing facilities and the INUP program can be gleaned from: <http://nnfc.cense.iisc.ac.in/>
<http://www.mnfc.cense.iisc.ac.in/>
<https://www.inup.cense.iisc.ac.in/>

Procedure

1. Vendors must submit a technical proposal and a commercial proposal in **two separate sealed envelopes**. Only vendors who meet the technical requirements will be considered for the commercial negotiation. **PLEASE MAKE SURE THE SITE VISIT IS DONE BEFORE SUBMITTING THE BID. ONLY BIDS FROM VENDORS WHO HAVE VISITED THE SITE WILL BE ENTERTAINED.**
2. **The deadline for submission of proposals is the 13th of October 2024, 5:30 pm Indian Standard Time.** Proposals should arrive at the Main office, GF-15, Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore 560012, India, by the above deadline.
3. The decision of the purchase committee will be final.
4. The Bidder should belong to either class 1 or class 2 suppliers distinguished by their "local content" as defined by recent edits to GFR. They should mention clearly which class they belong to in the cover letter and should provide all the required supporting documents.
 - a) Class 1 supplier: Goods and services should have local content equal to or more than 50%.
 - b) Class 2 supplier: Goods and services should have local content equal to or more than 20 % and less than 50%.
5. Bidders offering imported products will fall under the category of non-local suppliers. They cannot claim themselves as Class-1 local suppliers/Class-2 local suppliers by claiming services such as transportation, insurance, installation, commissioning, training, and other sales service support like AMC/CMC, etc., as local value addition.



6. Quote should come only from Indian Original Equipment Manufacturer (OEM) or their Indian authorized distributor.
7. The quotations should be on FOR-IISc Bangalore basis in INR only.
8. MSMEs can seek an exemption to some qualification criteria. IISc follows GFR2017 for such details.
9. Bidders offering imported products must submit an authorized letter of OEM with a particular tender name and address.
10. The bidder should have local vendor support for installation.
11. To ensure accurate understanding of the site conditions and measurements, all bidders are required to visit the site. Failure to do so will result in disqualification of the bid.
12. Purchase preference as defined by the recent edits to GFR (within the “margin of purchase preference”) will be given to the Class-1 supplier.
13. The technical proposal should contain a compliance table with 5 columns. The first column must list the technical requirements, in the order that they are given in the technical configuration below. The second column should describe your compliance in a “Yes” or “No” response. If “No” the third column should provide the extent of the deviation (please provide quantitative responses). The fourth column should state the reasons for the deviation, if any. The fourth column should also contain the make and model of the components/parts to be used in the installation.
14. Any additional capabilities or technical details that you would like to bring to the attention of the purchase committee can be listed at the end of the technical table.
15. In the commercial bid, please provide the itemized cost of the different subsystems, along with possible breakups.
16. Provide itemized cost for required spares for 2 years of operation. Please note, the cleanroom is expected to be operational 24x7 and breakdowns should be minimal or nil.
17. As an additional option, provide the cost of an annual maintenance contract (AMC) for 1-year, post-warranty. The AMC must cover 1 scheduled and 1 emergency visit per year. The AMC cost must also include an itemized list of spares that are essential for the scheduled visits.
18. The RFQ must include references to 3 previous installations, preferably in India. Please provide the names and contact addresses of the referees, so that the committee can contact them independently.
19. The offer shall be valid at least 90 Days from the date of opening of the commercial bid.
20. Any questions can be directed to Mr. Gajendra M, Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore 560012, India. (gajendram@iisc.ac.in)

Technical Specifications

SI NO	Specification	Qty.
1	Air Handling Unit (AHU) (15000 CFM)	02 No.
1.1	<p>AHU Casing:</p> <p>1) AHU shall be of modular construction and of draw through type comprising of pre-filter section, fine filter section, cooling coil section and fan section. The framework shall be of extruded Al sections joined by moulded high tensile reinforced plastic and shall be assembled to provide a sturdy, strong and self-supporting framework for various sections. Each section shall be complete with its own independent base and mounted on 14G galvanized sheet steel and aluminum die cast channels. Zinc deposition on the GI sheets shall be minimum 120 gsm.</p> <p>2) AHU shall be of double skin, with 50 mm thick PUF insulation sand-witched panel, 0.8 mm thick percolated GSS outer skin and 0.8 mm thick plain GSS sheet inside. The density of PUF insulation shall be minimum 40 Kg/m³.</p> <p>3) The framework for each section shall be joined together with soft rubber gasket in between to make joints air tight.</p> <p>4) Suitable air tight access doors with Aluminum die cast heavy duty hinges and locks shall be provided for various sections.</p> <p>5) The casing shall incorporate thermal break profile and all other necessary design features to ensure that condensation does not occur during all seasons.</p> <p>6) The AHUs shall be having sound attenuators at the suction and delivery.</p>	
1.2	<p>Circulation Fan:</p> <p>1) Fan Type: Direct driven, Plug type high efficiency centrifugal fan</p> <p>2) Desired noise level should be reduced to 60 dB or less by suitable sound attenuators on supply and return air path.</p> <p>3) Required total static pressure: 150 ± 2 mm WG.</p> <p>4) Fans should have backward curved blades to improve efficiency.</p> <p>5) Fan blades should be made of Aluminium alloy for stability.</p> <p>6) Motor and fan assembly should be floor mounted and to be placed on extruded aluminium sections and on the vibration isolators to reduce amplitude to less than 25-50 microns.</p> <p>7) Motor Requirement: Adequately sized, TEFC Squirrel cage induction motor with VFD drive and suitable for 415V ± 10%, 3 phase, 50 Hz ± 5% AC power supply.</p> <p>8) The motor should be of high Efficiency IE3 class as per IS 12615 – 2011- Non FLP.</p> <p>9) Motor should be compatible for VFD operation.</p> <p>10) Epoxy based coating shall be provided on all the surfaces of ferrous fan housing.</p>	
1.3	<p>Cooling coil:</p> <p>1) Cooling medium requirement: Chilled water at a temperature of 7 ± 1°C</p>	

	<p>2) The velocity across the cooling coils should not exceed 2.25 m/s. accordingly, cooling coil area should be selected.</p> <p>3) Coils should be of seamless copper tubes with Al fins, 8 rows deep, with 12-13 fins/inch, with copper header, flange connection and SS304 enclosure.</p> <p>4) Copper tubes should be 25±5% SWG and hydrostatically tested for 21 kg/cm².</p> <p>5) Cooling coil condensate tray should be of 14±5% SWG SS304 material.</p> <p>6) Vertically stacked Cooling coils should have SS304 drip trays between them and SS pipe drain connection left at the drain tray and finally should be connected to drain point with suitable trap to check ingress of outside air.</p> <p>7) Fouling factor requirement: 0.0002 hr. m² °C/Kcal or better</p> <p>8) Accessories Requirement: Frame, support, inlet and outlet header, vent connection and Drain connection with valves, pressure gauges with valves at inlet and outlet and their associated fittings.</p>	
1.4	<p>Heater:75KW</p> <p>The AHUs should have Electrical heaters section to maintain the clean room temperature in the specified range.</p> <p>1) Strip/Tubular heaters of sufficient capacity should be selected in the AHU to maintain the area temperature.</p> <p>2) The heaters should be complete with mounting frame, Thermostat, Humidistat, Air Stat in redundant arrangement along with all control devices which will be controlled by Thyristors.</p>	
1.5	<p>Humidifier:</p> <p>1) Type: Pan type, Electrical heating</p> <p>2) Humidification capacity: Sufficient capacity to maintain the required RH levels inside the cleanrooms in the dry season.</p> <p>3) For calculating humidification by the above humidifier so as to maintain dew point Temperature of the treated fresh air at 20 ± 1 °C, an outside peak-winter (night) temperature as per the outdoor condition to be considered.</p>	
1.6	<p>Filter:</p> <p>1. There should be 3 stages of filtration in the AHU:</p> <ul style="list-style-type: none"> - 1st stage Pre-filters should be of G4 grade as per EN 779, non-woven synthetic material sandwiched between HDPE mesh on both sides with minimum thick ness of 150 mm flange type with an initial pressure drop of 5 mm WG or less, suitable for cleaning with dry air or water jet. - 2nd stage Bag filters should be of F7 grade as per EN779, non-woven synthetic material sandwiched between HDPE mesh on both sides and suitable for minimum thickness of 300 mm initial pressure drop of 6-8 mm WG or less, suitable for cleaning with dry air or water jet. - 3rd stage HEPA Filters should be of H14 grade, suitable for AHU capacity. Filter media should be of micro fibre glass, Efficiency required: 99.995% down to 0.3 micron. The filters should have Anodized Al frame with a module size of 600mm x 600mm (preferably). The filter media should be epoxy/PU bonded to the filter casing, Pressure drop < 15 mm of WG. <p>2. Filters face velocity should not exceed 2.25 m/sec.</p>	

	<p>3. Filter mounting frame should be made out of extruded aluminium material. The frame should be strong enough to withstand the weight of two persons for climbing the frame during the filters replacement.</p> <p>4. Between Filter sections, minimum spacing of 600 mm should be maintained.</p> <p>5. Filters should have a quick release mechanism and sealing gasket.</p> <p>6. All the filters should have Al frame (flange type) with a module size of 600 mm x 600 mm (preferably).</p> <p>7. Accessories Requirement: Frame, supports, sealing gasket (Neoprene gasket pasted on the Back side of the flange), quick release mechanism.</p>	
2	Chillers: 2 No. of chillers; 1 working & 1 standby	02 No.
2.1	<p>1. Energy efficient Air-cooled, high efficiency Scroll chillers of Tonnage NOT LESS THAN 40.0 TR, using environment friendly refrigerant (Non CFC), suitable for indoor installation shall be provided. The bidders shall provide justification if lower tonnage chillers would suffice the required project. Operating temp 6 deg C to 9 deg c.</p> <p>2. Microprocessor-control panel along with chiller load management option inbuilt, to be hooked up to BMS for parameters monitoring and control.</p> <p>3. The total load to be catered by preferably multiple scroll compressors as per seasonal load demand.</p> <p>4. OEM (Original Equipment Manufacturer) to stand guarantee to supply chiller spares for a minimum period of 10 years after warranty.</p> <p>5. Chillers' OEM shall have local trained personnel in India, in case of imported chillers. The chillers should be AHRI certified.</p> <p>6. The footprint of the chiller shall not exceed more than 2 meter in any directions.</p>	
2.2	<p>Chilled Water Piping:</p> <p>1) The line shall be Seamless SS304 pipes.</p> <p>2) Booster pumps with one working and one stand-by arrangement (for each AHU) shall be provided in the chilled water line.</p> <p>3) The line shall be complete with all the fittings like valves, flanges, bends etc.</p> <p>4) The flanges shall be SS heavy duty (rating PN 16).</p> <p>5) The gaskets shall be good quality neoprene of appropriate thickness.</p> <p>6) Pressure gauges having suitable range and ½" connection size shall be of 4" dial type, with Bourdon movement. All internal parts shall be of SS316. The over range protection shall be 125% of maximum range.</p> <p>7) The temperature gauges of suitable range shall be 4 inches dial type. The sensor, capillary and thermo- well shall be SS316.</p> <p>8) The bolts and nuts shall be of not less than 8.8 Grade. Spring washers of required thickness shall be used with pumps, motors and other moving machinery while plain washers of required thickness shall be used at all other places.</p> <p>9) Insulation on chilled water piping, valves, fittings, pumps etc. shall be done using PUF of 50 mm thickness and having density not less than 40 Kg/m³. The pipes and the other surfaces where insulation is to be applied shall be cleaned so that surface is free from rust, dust and</p>	1 lot

	<p>other foreign materials.</p> <p>10) Two coats of 85/25 bitumen/CPRX shall be applied on the entire pipe surface and the inside surface of the pipe section/slabs (as required) of insulating material so that the insulating mass sticks with the pipe properly. Thereafter white transparent polyethylene sheet of thickness not less than 500 gauge shall be wrapped all along sealing the insulation mass, overlapping the joints by not less than 50 mm and sealing them properly using bitumen/CPRX/ good quality adhesive tape. Over the polyethylene sheet, 0.5 mm thick aluminium sheet shall be used as cladding to cover the insulation in a quality manner.</p> <p>11) Water flow direction to be marked on the respective pipes. Insulation shall be applied only after the piping system has been satisfactorily tested for leaks as per specifications.</p>	
2.3	<p>Butterfly Valve:</p> <p>1) The butterfly valve should be SS304 body with EPDM liner and SS316 disc preferably in two-piece construction.</p> <p>2) The disc should consist of disc pivot and driving stem shall be in one piece centrally located.</p> <p>3) The valve seat should be synthetic material suitable for water duty. It shall line the whole body.</p> <p>4) The disc should move in slide bearings on both ends with 'o' ring to prevent leakage.</p> <p>5) The handle should have arrangement for locking in any set position.</p> <p>6) All valves 200mm Dia. and above should be gear operated.</p> <p>7) The valve should be PN16 rating (suitable for 16 Kg/cm² working pressure).</p>	1 lot
2.4	<p>Ball Valve:</p> <p>1) All Valves should be of SS304 single piece type PN 16 rated.</p> <p>2) Ball type Valves with (FPT) female threads conforming to class 2 of IS 778 and mating flanges fitting.</p> <p>3) All Ball valves should be ISI Marked.</p>	1 lot
2.5	<p>3 Way Modulating Valve:</p> <p>3-Way proportioning control valve with a PN16 rating suitable for required pipe sizes (with all necessary concentric reducers and flange connections to be included) shall be Provided. Materials of Construction (MOC): Cast Iron (CI).</p>	1 lot
2.6	<p>Dual Plate Check Valve:</p> <p>1) The body of the PN16 rated check valve shall be made from SS304, single piece casting in cylindrical shape.</p> <p>2) There shall be two plates, which should be hinged in the centre of the circle.</p> <p>3) Both plates should have springs attached to them for assisting in closing action of the valve.</p> <p>4) There should be properly/designed metal to metal seal between the plates and the outer body, to ensure non leaking sealing.</p> <p>5) The valve design should confirm to API 594 or equivalent specifications.</p>	1 lot
2.7	<p>Strainers:</p>	1 lot

	<p>1) Strainers should either be pot type or 'Y' type SS304 body PN 16 rated, tested upto pressure applicable for the valves as per design.</p> <p>2) 2) The strainers should have a perforated bronze sheet screen with 3 mm perforation and with a permanent magnet, to catch iron fillings.</p>	
2.8	<p>Joining:</p> <p>1) All pipelines should be joined using the TIG welding.</p> <p>2) Square cut plain ends should be welded for pipes upto and including 100 mm diameter.</p> <p>3) All pipes 125 mm diameter or larger should be bevelled by 35 deg. before welding.</p>	1 lot
2.9	<p>Pipe Supports/Hangers:</p> <p>1) Pipe support should be provided and installed for all piping wherever indicated, required or otherwise specified. Wherever necessary, additional hangers and supports shall be provided to prevent vibration or excessive deflection of piping and tubing.</p> <p>2) All vertical pipe support should be made of 12 mm thick Mild Steel (MS) rods and the horizontal support should be of MS angles of appropriate thickness.</p> <p>3) Pipe supports should be adjustable for height and prime coated with rust preventive paint & finish coated with black paint using approved grade of paint.</p>	1 lot
2.1	<p>Testing:</p> <p>1. Various tests should be performed to the piping before connecting equipment and appliances. In no case should the piping, equipment or appliances be subjected to pressures exceeding their test ratings.</p> <p>2. The tests should be completed and approved before any insulation is applied. Testing of segments of pipe work will be permitted, provided all open ends are first closed, by blank offs or flanges.</p> <p>3. After tests have been completed the system should be drained and flushed 3 to 4 times and cleaned of all dust and foreign matter. All strainers, valves and fittings should be cleaned of all dirt, fillings and debris.</p> <p>4. All piping should be tested to hydraulic test pressure of at least one and half times the maximum operating pressure but not less than 10 kg/cm² for a period of not less than 12 hours. All leaks and defects in the joints revealed during the testing should be rectified to the satisfaction.</p>	1 lot
3	<p>Chiller Water Pumps: 1 working & 1 standby</p> <p>1. They shall be capable of providing a pump flow rate required by the chillers and other cleanroom equipment.</p> <p>2. Heavy duty pumps for continuous operation</p> <p>3. MOC: SS304</p> <p>4. Impellor: SS304</p> <p>5. Motor: Adequately sized TEFC, squirrel cage induction motor having high efficiency rating IE3 Class and suitable for 415V + 10%, 3 Phase, 50 Hz + 5%.</p> <p>6. Pump shall be horizontal, closed coupled, single stage, centrifugal, end suction with back pull-out design. Hence, the rotating unit can be removed and serviced without disconnecting the suction and discharge pipe.</p> <p>7. The noise level shall not exceed 75 dBA at 1 m from the source.</p>	02 No.



	8. Accessories: Pressure gauges at suction and discharge, isolating butterfly valves at suction and discharge, check valve, strainer, integral piping, base frame, foundation bolts, nuts, vibration isolator/rubber pads etc.	
4	Instrumentation & Control: 1. Three-way flow control valve, complete with all the accessories and with a manual bypass line with an isolation valve. 2. All three areas/partitions shall have temperature sensors with accuracy of ± 0.2 degC or better and humidity RH sensors with accuracy of $\pm 1\%$ or better. 3. The cooling coil water-inlet and water-outlet shall have temperature sensors cum transmitters. 4. Pressure gauges with isolation ball valves at inlet and outlet of the coils. In order to ensure a protection, a temperature gauge shall come with a thermowell. 5. Pressure gauges with isolation ball valves at inlet and outlet of all the pumps 6. Differential pressure sensor across pre filters and fine filters. 7. VFDs for AHU fans. 8. HMI control panel for monitoring Temperature, T and humidity, RH of all partitions/rooms. AHU supply air volume shall be varied based on the room exhaust flow rates.	1 lot
5	Ducting: 1. Ducts shall comprise of factory fabricated uninsulated GI sheet metal ducting with zinc deposition of 120 gm/m ² as per SMACNA with all required accessories and fittings with RTV sealant, gaskets complete with GI supports, MS flanges duly painted, fully threaded GI rods, GI nuts and bolts, vanes, splitters etc. as per SMACNA standards for pressure class rectangular ducts. 2. Air flow direction to be marked on the respective ducts. The gauge of ducting material shall depend upon the sizes as per Standards mentioned below: a) 18 G (1.27 mm thick) suitable for > 50 inch diagonal ducts b) 20 G (0.95 mm thick) for > 40 inch ducts c) 22 G (0.8 mm thick) for > 30 inch ducts d) 24 G (0.64 mm thick) for > 20 inch ducts <i>Construction Features (applicable only for factory fabricated ducts):</i> 3. All ducts transformation pieces and fittings shall be made on CNC profile cutters and all ducts shall be factory made using lock forming machine. The sheet thickness, brazing, flanges and length of the ducts shall be as per ISO standards. 4. Non-toxic, AC-application grade PE or PVC gaskets shall be provided between all mating flanged joints gasket sizes shall conform to flange manufacturing specifications. 5. To avoid leakage silicone sealant shall be used and leakage from duct joints shall be minimum (3 to 5% or better). 6. The specific class of transverse connectors for a given duct dimensions shall be as per SMACNA 2005 standard for duct pressure class of 4" wg (1000 Pa). 7. Rectangular duct shall be supported from roof / purlins / truss / ceiling using hanger rods. Ducts shall rest on supporting MS slotted angle or channel. The supporting angle or Channel shall be supported by MS rods with threads. Steel anchor fasteners shall be Provided	1 lot



	by contractor for duct hanging (wherever required). Anchor fasteners shall be loaded to maximum 20% of the maximum rated capacity specified by the manufacturer, engineer in charge shall approve all anchor fasteners used for supporting duct.	
	8. The size of angle and round rod above are indicative of general requirement. However higher sizes of MS angle and MS rod shall be provided for duct supports if required. Lock nuts (double nuts) shall be provided to each MS rods supporting the ducts, lock nuts (double nuts) shall be provided to each GI rods supporting the ducts.	
	9. All bends offsets and branch connections shall be made for smooth and noise less flow of air and minimum pressure drop. In case of full radius elbow optimum ratio of centreline radius of elbow to duct dimension of 1.25 shall be considered. However due to space constraint shorter radius elbow or square elbow with guide vanes may be provided contractor shall furnish the details of guide vanes i.e. Number of vanes, Location etc., in the drawing.	
	10. All curved elbows shall be provided with air turning vanes consists of curved metal blades of vanes arranged so as to permit the air to make abrupt turns without appreciable turbulence.	
6	Insulation: Supply and installation of 19 mm thick Class O Insulation with one side Aluminium faced. The Insulation Material should be FM Approved. The insulation should have fire performance such that it passes Class 'O' as per BS 476 Part 6 for Fire Propagation and Class 1 as per BS 476 Part 7 for surface spread of flame. All insulation joints (including Flange joints) to be sealed with 3" width Self Adhesive tape. All the exposed ducts shall be aluminium clad 0.5 mm thick for protection against rain and other extreme atmospheric Conditions.	1 lot
7	Fire dampers: 1. The damper should be multi blade louvre type. The blades should remain in the air stream in open position and should be constructed with minimum 1.8 mm thick galvanised sheets. The frame should be of 1.6 mm thickness. Other materials should include locking device, motorised actuator, control panel to trip AHU motor etc. 2. The fire dampers shall be capable of operating automatically on receiving signal from a fire alarm panel. All control wiring should be provided between fire damper and electric panel. 3. A hinged and gasketed access panel measuring at least 450 mm x 450 mm should be provided on duct work before each reheat coil and at each control device that may be located inside the duct work.	2 nos
8	Room conditions Temperature: 21 +/- 2 deg c. RH: 50 % +/- 5% Noise level: <62 dB	
9	Civil works: 1. AHU foundation etc. 2. Dismantling masonry walls for making pockets for Duct, Cable, Pipe entry and making good the same.	



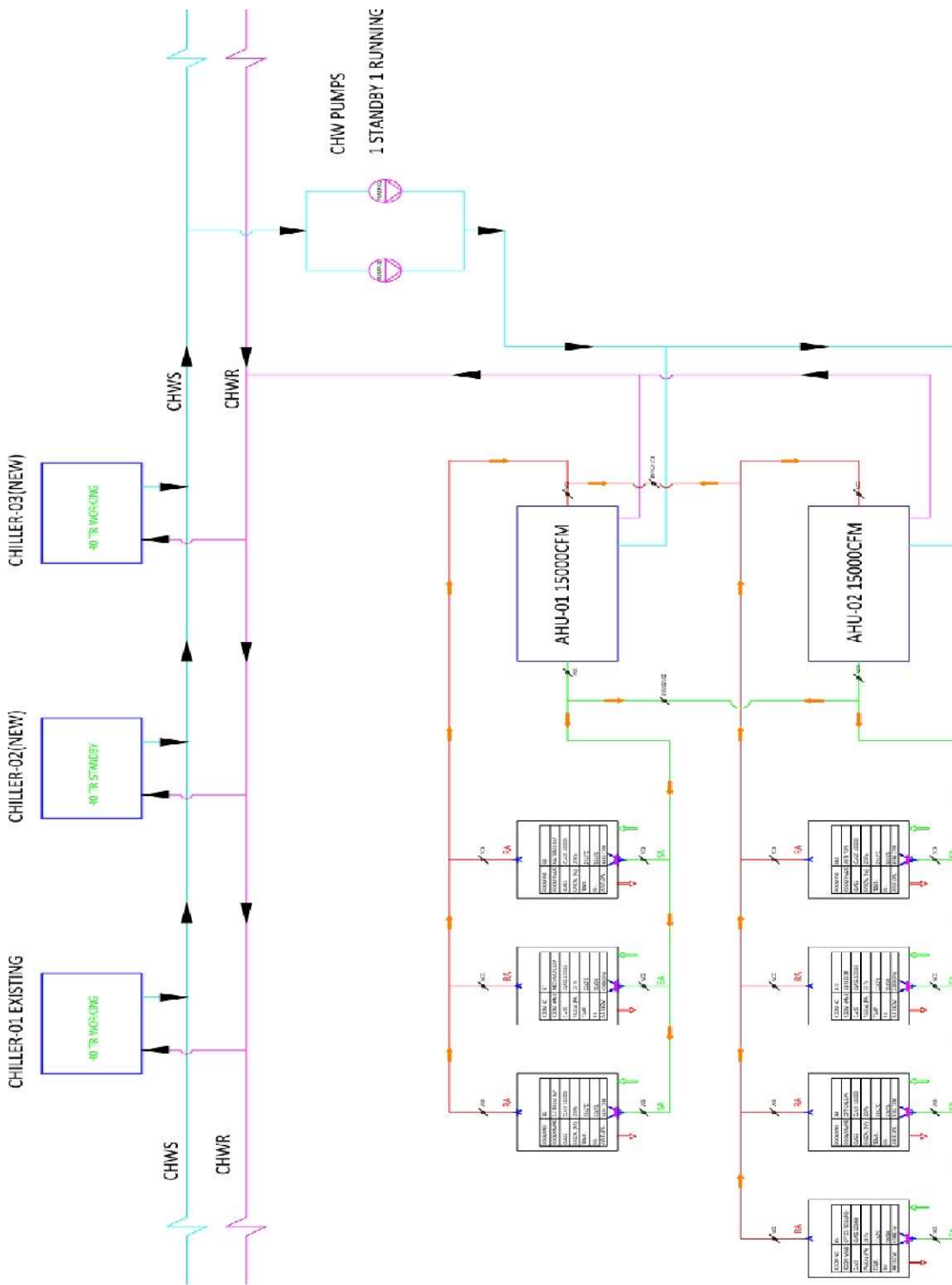
	3. Making cut-outs/ penetrations etc. for routing ducts etc. in the building and making goods the same with painting is in the vendor's scope of work.	
10	Electrical works:	1 lot
	1. General Design Consideration	
	a) System configuration	
	i. Frequency :50 Hz \pm 5%	
	ii. No of Phase and grounding: 3 Phase & Solidly ground earth	
	iii. Power Distribution: AC, 3 Phase 5 wire for 3 Phase system, 1 Phase 3 wire system	
	b) Bidder shall provide an estimate of Total Power Consumption for the complete Cleanroom system.	
	c) Bidder shall also provide sufficient information on requirement of Generator Set and/or backup UPS.	
	d) Code & Standards: All electrical equipment and accessories to be furnished, installed and commissioned shall be designed, manufactured, tested and installed in accordance with relevant Indian Standard Specifications (ISS), Indian electricity rules and any other applicable regulations.	
	2. Cabling for electrical supply from wall mounted electrical panel to respective AHUs/Chillers/Pumps/Humidifier/Exhaust Blower shall be armoured copper cables.	
	3. Copper lugs should be used for cable termination.	
	4. Bus bar for incoming should be of Copper.	
	5. Cabling for all the equipment shall be laid through GI ladder or conduit.	
	6. AHU blower should operate on VFDs	
	7. Heaters control should be through SCR	
	8. Star-delta starter for chilled water pumps	
	9. Electrical Panel with bypass arrangement: DOL/SD type electrical control panel.	
	10. Electrical panel with provision for connection to AHU (Heaters, Blower, Humidifier) and Pumps.	
	11. Microprocessor controller with display for Temperature, RH controlling, monitoring with AHU status (AHU) interlocking with 3 way modulating valve & Strip heater system and with SCR for Heater controllers.	
	12. AHU panel shall have following interlocks	
	i) Flow Switch interlock	
	ii) AHU Door interlock	
	iii) Smoke and Fire interlock	
	iv) Thermal Interlock	
	v) Access control Emergency interlock	



Recommended makes for HVAC system:

Sr. No.	Description	Makes
1	Air handling unit(AHU)	Citizen / VTS / Flaktwoods Systemair/ Zeco
2	Motors for AHU	Crompton/ Greaves/ ABB/ Siemens/ Schnider
3	Chillers	Daikin, Trane, Mcquay, Carrier.
4	Starter	Siemens/ ABB/ L&T/ Schneider
5	Fire dampers	Air Master/ Caryaire/ Ajanta/ System Air/ Cosmos
6	Pan type humidifier	rapid cool/ nordamann/ walter meier/ appidi
7	Ducting – GI Sheets	SAIL/TATA/Jindal
8	Duct insulation	Armaflex/k flex/supreme/aeroflex/ trocellene
9	Butterfly & ball valves	Regin/Siemens
10	3-way, 2-way mixingvalve	Honeywell/Siemens/Johnson/Belimo/Regin
11	Balancing valve	L&T/Advance/Bell & Gossett/Tour & Anderson
12	Y-Strainer	Sant /DS Engg/Lehry
13	Pumps	Johnson/ Grundfos /Armstrong/ wilo ,Blue Star
14	Pipe SS	TATA/Ratanamani/Jindal
15	Pressure and Temperature gauges	WIKA/FORBE MARSHALL/HGURU/WAREE

HVAC layout



AIR FLOW DIAGRAM