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Request for Quotation/Offer for Up-gradation of Existing HVAC system for NNFC at CeNSE, IISc

- The GEECI (Gallium Nitride Ecosystem Enabling Centre and Incubator) at SID-Indian Institute of Science is seeking bids from qualified agencies for Up-gradation of existing HVAC system for NNFC (Cleanroom) at CeNSE, IISc.
- Companies need to submit two bids, a technical bid and a commercial bid, in two separate sealed envelopes. The bids should be submitted no later than 21 days from the date of posting of this tender, as listed on the website date/time stamp, and by 5 pm on the 21st day or next weekday in case the 21st day falls on a weekend or a national holiday.
- Both technical and commercial bids should be addressed to “The Chief Executive, SID, IISc, Bangalore 560012.”
- The envelopes should be addressed to “Prof. Srinivasan Raghavan, CeNSE, IISc, Bangalore, 560012” and submitted to the office at CeNSE, IISc in Room No. GF 15 between 9 am and 5 pm.
- All questions regarding this tender should be addressed to Mr.Raghupathy at the email address raghupathyn@iisc.ac.in
- Post such submission all vendors should send an email to sraghavan@iisc.ac.in with the subject line: “GEECI_Bidder’s name system/Tool Name” to intimate him of the submission within one day.
- Deviations from the technical specifications requested are allowed. Such deviations must be highlighted and justified. Their acceptance or rejection will be left to the discretion of the technical committee.
- The equipment sought will be placed at the Centre for Nano Science and Engineering (CeNSE), Indian Institute of Science (IISc). IISc is India’s No. 1 institution on higher learning and the Center for Nano Science and Engineering is home to one of the best academic fabs in the world.
- The technical response, corresponding to the system being offered, should be in the form of a compliance table with at least 5 columns.

Serial number in column 1. Each of the numbered technical items below should be addressed in a separate row of the table in column 2. Compliance to this requirement, in Yes/No, deviation from it and justification should be provided in the neighboring columns 3-5. Post the opening of a hard copy of the technical bid the committee will request for a soft copy of the files for further processing. Companies should NOT mail soft copies of the files unless specifically requested for.

Please find the Annexure below :-

Annexure 1	Technical Requirements.
Annexure 2	Scope of work



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Annexure 3	P & ID of Existing HVAC system P & ID of Proposed HVAC system P&ID of Proposed wet scrubber P&ID of Proposed dry exhaust
Annexure 4	BMS IOs

- Detailed technical specifications of the system/equipment being offered should be included.
- 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.
- If multiple systems can fulfill the requirements, vendors can submit multiple bids.
- Vendors are encouraged to highlight the advantages of their tools over comparable tools from the competitors.
- The commercial bid should be broken up to the maximum extent possible into separate items with a cost against each to enable better comparison of price for various configurations across the bidders. As an option, please provide itemized cost for any suggested accessories/addons that may enhance the usability, capability, accuracy or reliability of the tool. Vendors are encouraged to quote for as many add-ons as their System/Equipment portfolio permits.

The quotes should be split into a line item indicating the base price and then each optional item should be listed separately with its pricing.

Procedure

Only vendors who are compliant with the technical requirements will be considered for commercial comparison. The bid is awarded to the lowest cost vendors (referred as L1).

Only vendors participated in the EOI for Modification/Upgrade of Existing HVAC system for National Nano-fabrication Facility from Indian Vendors. (23/12/2021) will be eligible for tender.

Eligible vendors must do the thorough site survey for equipment locations, routing of ducting, pipe line, valves, fittings etc. And submit the GA and P&ID drawings with the technical bid.

The commercial comparison is made as per Government of India rules, specifically GFR 2017. Note that GFR has recently been amended. As per recent edits to the GFR, there are three classes of vendors distinguished by their "local content". In the cover letter, vendors must mention which applies to them:

Class 1 supplier: Goods and services have a local content of equal to or more than 50%.



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Class 2 supplier: Goods and services have a local content more than 20% but less than 50%

Non-local supplier: Goods and services have a local content of equal to or less than 20%

This tender will only apply entertain Class 1 or Class 2 suppliers. Vendors must provide a self-declaration of what Class they belong to.

In the commercial bid, please provide an itemized cost of the system and required accessories, such as ducting, cabling, panel, piping etc.,

As an option, please provide itemized cost for any suggested accessories/add-ons that may enhance the usability, capability, accuracy or reliability of the system. Vendors are encouraged to quote for as many add-ons as their tool portfolio permits.

The quotations should be in INR only and must include transportation cost.

Mention GST separately. IISc will be taxed at 5%. IISc will provide the GST exemption certificate against invoice.

Please indicate the warranty provided with the Equipment/System. Warranty of 3 years or more is required. Any exclusions or consumables must be specified in annexure.

As an option, provide itemized cost for required spares and consumables for 2 years of operation from the time of installation.

Clarify if periodic (preventive) maintenance be done by a trained on-site engineer or requires a specialist from the OEM.

If maintenance requires OEM, as an additional option, provide cost of an annual maintenance contract (AMC) for 3 years, post-warranty. The AMC must cover 4 scheduled and 12 emergency visit per year. The AMC cost must also include an itemized list of spares that are essential for the scheduled visits.

The technical proposal must include references from 5 previous installations in India. Please provide the names and contact addresses of the referees so that the committee can contact them independently.

Annexure-1

Technical Requirements

1	Application	Providing Heating, Ventilation & Air -conditioning for a semiconductor foundry.
2	Industry type	Semiconductor cleanroom class 100 and class 1000
3	Air Handling Units (AHUs)	<p>Required Capacity: 18000 CMH, 5.0 m³/s. Qty : 01</p> <p>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 galvanised sheet steel and aluminium die cast channels. Zinc deposition on the GI sheets shall be minimum 120 gsm.</p> <p>AHU shall be of double skin, with 45+5 mm thick PUF insulation sandwiched 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 38 Kg/m³.</p> <p>The framework for each section shall be joined together with soft rubber gasket in between to make joints air tight.</p> <p>Suitable air tight access doors with Aluminium die cast/melamine heavy duty hinges and locks shall be provided for various sections.</p> <p>The casing shall incorporate thermal break profile aluminium and all other necessary design features to ensure that condensate does not occur during all seasons.</p> <p>The AHUs shall be having Sound attenuators at Suction and delivery of AHUs to reduce the sound to 70+2 dB (A).</p> <p>CIRCULATION FANS:</p> <p>Fan Type: Direct driven, two numbers in parallel, Plug type high efficiency centrifugal fan.</p> <p>Noise level shall be reduced to 70+10 dB (A) or less by suitable sound attenuators on supply and return air path. Total static pressure: 150 mm WG.</p> <p>Fans shall have backward curved blades.</p> <p>Fan blades shall be made of Aluminium alloy or non-metal.</p> <p>Motor and fan assembly shall be floor mounted and placed on Extruded aluminium sections and on vibration isolators to reduce amplitude to less than 25-50 microns.</p>

	<p>Motor: Adequately sized, TEFC Squirrel cage induction motor with VFD drive and suitable for 415V + 10%, 3 phase, 50 Hz+ 5% AC power supply. The motor shall be of high Efficiency IE3 class as per IS 12615 – 2011.- Non FLP.</p> <p>Motor shall be compatible for VFD operation.</p> <p>Flexible connection fabricated of neoprene coated flame proof fabric attached by screws or bolts at 6" interval to be provided. Flexible connection to be provided with the sufficient material width to prevent interference with the free operation of the fan vibration system.</p> <p>Fan shall be factory statically and dynamically balanced as required to achieve field balance levels.</p> <p>Vibration measurement shall be made in three orthogonal areas at each bearing location. Where equipment configuration precludes measurement at bearing, measurement shall be made on adjacent routine structure.</p> <p>Peak to peak displacement at the rotational frequency shall be measured. Governing displacement shall be at the rotational frequency of fan. Controlling displacements at frequencies other than the rotational frequencies are not in compliance with the balance requirements.</p> <p>COOLING COILS :</p> <p>Cooling medium: Medium temp. chilled water at a temperature of 7 ± 0.5 Deg C</p> <p>The velocity across the cooling coils shall not exceed 2.25 m/s. accordingly, cooling coil area to be selected.</p> <p>Coils shall be of seamless copper tubes with Al fins, 8 rows deep, with 12-13 fins/inch, with copper header, flange connection and SS 304 enclosure.</p> <p>Copper tubes shall be 26 SWG and hydrostatically tested for 21 kg per sq. cm.</p> <p>Cooling coil condensate tray shall be of 14 SWG SS 304 material.</p> <p>Vertically stacked Cooling coils shall have SS 304 drip trays between them and SS pipe drain connection left at the drain tray and finally connected to drain point with suitable trap to check ingress of outside air.</p> <p>Fouling factor: 0.0002 hr. m² O C/K cal</p> <p>Accessories: Frame, support, inlet and outlet header, vent connection and drain connection with valves, pressure gauges with valves at inlet and outlet and their associated fitting</p> <p>FILTERS :</p> <p>There will be 3 stages of filtration in each AHU.</p> <p>First stage/Pre-Filters: The pre-filters shall be of G4 grade as per EN 779, non-woven synthetic material sandwiched between HDPE mesh on both sides with minimum thickness of 150mm flange type with an initial pressure drop of 5 mm WG or less, suitable for cleaning with dry air or water jet.</p>
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		<p>Second stage/Fine Filters: Fine filters shall be of F7 grade as per EN779, non-woven synthetic material sandwiched between HDPE mesh on both sides and suitable for minimum thickness of 300mm initial pressure drop of 6-8 mm WG or less, suitable for cleaning with dry air or water jet. HEPA filters Efficiency: 99.995% down to 0.3 micron. Air handling capacity: 18000 CMH Filter media: Micro fibre glass The filters shall have Anodised Al frame with a module size of 600mm x 600mm (preferably). The filter media shall be epoxy/PU bonded to the filter casing Pressure drop < 15 mm of WG Accessories: Frame, supports, sealing gasket (Neoprene gasket pasted on the back side of the flange), quick release mechanism. Filters face velocity shall not exceed 2.25 m/sec. Filter mounting frame shall be made out of extruded aluminium material. The frame shall be strong enough to withstand the weight of two persons which may climb the frame during the filters replacement. Between Filter sections, minimum spacing of 600 mm shall be maintained. Filters shall be having a quick release mechanism and sealing gasket. All the filters shall have Al frame (flange type) with a module size of 600mm x 600mm (preferably).</p> <p>HEATER SECTION: The AHUs should be having Electrical heaters section to maintain the clean room temperature/Humidity throughout the year. Capacity: 95 Kw Strip/Tubular heaters of sufficient capacity shall be selected in each AHU. The heaters shall complete with mounting frame, Thermostat, humidistat, airflow switch in redundant arrangement along with all control devices which will be controlled by thyristors.</p> <p>HUMIDIFIER Type: Pan type, Electrical heating Humidification capacity: Sufficient capacity to maintain the required RH levels inside the cleanrooms in the dry season. For calculating humidification by the above humidifier so as to maintain dew point temperature of the treated fresh air at 12.5 ± 0.5 Deg C, an outside peak winter temperature as per the outdoor condition to be considered. Preferred Makes of AHU: VTS, System Air</p>
4	Chiller	<p>Required Capacity :270 TR $\pm 5\%$ Qty : 1 No • Energy efficient Air-cooled, high efficiency Scroll chillers of specified Tonnage as per design requirement and BOQ, using environment friendly</p>

		<p>refrigerant (Non CFC), suitable for outdoor installation with weatherproof enclosure.</p> <ul style="list-style-type: none"> • Microprocessor-control panel along with chiller load management option inbuilt, to be hooked up to BMS for parameters monitoring and control. • The total load to be catered by preferably multiple scroll compressor as per seasonal load demand. • OEM to stand guarantee to supply chiller spares for a minimum period of 10 years after warranty. • Chiller OEM (Original Equipment Manufacturer) shall have local trained personnel in India, in case of imported chillers. The chillers should be AHRI certified. <p>Preferred Makes: Mcquay, Carrier, Trane</p>
5	Chilled water Pumps	<p>Pumps should be Horizontal end suction/back pull out type water pump sets with SS304 Impellers and mechanical seals for chilled water re-circulation complete with TEFC squirrel cage motor of adequate rating, coupling, base plate, anti-vibration pads etc. The capacity and head of the pump will be as per the specifications</p> <p>MOC: ss304 capacity: 500 LPM Head: 3 bar Qty: 1 Working + 1 Standby.</p> <p>Pressurization units should be included for making up the water in the line and maintaining required design pressure.</p> <p>Makes: Groundfoss , wilo or Armstrong</p>
6	Chilled water Piping	<p>Pipe Work: Supply, installation, testing and commissioning of GI Class "C" pipes of reputed make preferably (TATA/JINDAL), Pipeline with all bends, fittings, supports and hangers. Pipes and pipe fittings shall be seamless .The pipe should be insulated by 50mm thick Puff/EPS with adequate vapour barrier and finish will be 26G aluminium cladding.</p> <p>All piping work shall conform to quality standards and shall be carried out as per specifications and details given hereunder & shall follow the applicable on relevant Indian 34 standards. Pipes: All pipes up to 150 MM shall be Pi The AHU manifold: AHU piping will be consists piping, bends, fittings, butterfly valve, 1 no. of three way motorized valve with return air temp sensor, automated purge valve, Ball valve for drainage, Pressure gauge with 4" dia type SS body with syphone and cock, Temp. gauge with 4" dia type. Y-Strainer. The insulation will be of EPS/Puff with 26G aluminium cladding.</p> <p>Fittings:The dimensions of the fittings shall conform to I.S.1239/69 Part-II unless otherwise indicated, in the specifications.</p>

		<ul style="list-style-type: none"> • All bends in sizes upto 150 MM and larger dia. seamless type and as same dia of Pipe. • All fittings such as branches reducers etc. in all sizes shall be seamless of the same Dia. of pipe. • All the flanges used for pipe line shall be PN 16 rated stub end/Slip on type. <p>Valves:</p> <p>Butterfly Valves:</p> <ul style="list-style-type: none"> • The butterfly valve shall be CI body preferably in two piece Construction. • The disc shall consist of disc pivot and driving stem shall be in one piece centrally located. • The valve seat shall be synthetic material suitable for water duty. It shall line the whole body. • The disc should move in slide bearings on both ends with 'o' ring to prevent leakage. • The handle should have arrangement for locking in any set position. All valves 200mm Dia. and above shall be gear operated. The valve should be suitable for 16 Kg/cm² working pressure. <p>Ball Valves</p> <p>All Valves 40 mm Dia. and below shall be of SS304 single piece type PN 10 rated.</p> <p>Ball type Valves with (FPT) female threads conforming to class 2 of IS 778 and mating flanges fitting.</p> <p>All Ball valves shall be ISI Marked.</p> <p>Duel Plate Check Valves</p> <ul style="list-style-type: none"> • The body of the check valve shall be made from CI PN 16 rated, single piece casting in cylindrical shape • There shall be two plate, which shall be hinged in the centre of the circle. Both plates shall behave springs attached to them for assisting in closing action of the valve. • There shall be properly/designed metal to metal seal between the plates and the outer body, to ensure non leaking sealing. • The valve design shall confirm to API 594 or equivalent specifications. <p>Strainers :</p> <ul style="list-style-type: none"> • strainers shall either be pot type or 'Y' type CI body PN 16 rated, tested upto pressure applicable for the valves as per design. • The strainers shall have a perforated bronze sheet screen with 3 mm perforation and with a permanent magnet, to catch iron fillings. <p>Joining</p> <ul style="list-style-type: none"> • All pipe lines shall be joined with MIG welded. • Square cut plain ends will be welded for pipes upto and including 100 MM Dia.
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		<ul style="list-style-type: none"> All pipes 125 MM Dia. or larger will be beveled by 35 DEG. before welding. <p>Pipe Supports/Hangers</p> <ul style="list-style-type: none"> Pipe supports shall 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. All vertical pipe support shall be made of 10mm M.S. Rods and the horizontal support shall be of M.S. angles of 50x50x4 mm thick. Pipe supports shall be adjustable for height and prime coated with rust preventive paint & finish coated with black paint using approved grade of paint. <p>Testing</p> <ul style="list-style-type: none"> In general, tests shall be applied to piping before connection of equipment and appliances. In no case shall the piping, equipment or appliances be subjected to pressures exceeding their test ratings. The tests shall 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. After tests have been completed the system shall be drained and flushed 3 to 4 times and cleaned of all dust and foreign matter. All strainers, valves and fittings shall be cleaned of all dirt, fillings and debris. All piping shall 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 shall be rectified to the satisfaction of the Engineer In-Charge, <p>shall be PN 16 rated stub end/Slip on type.</p>
7	Ducting for Air supply	<p>Supply and installation of factory fabricated Ducting with TDF type flange. All ducting must be fabricated according to the latest SMACNA standards and must be cleanroom compatible. Air handling ducts and ducting joints must be made of corrosion resistant material that is resistant to any acid vapors and must have a minimum thickness of 22 gauge (~0.8mm) conforming to the latest SMACNA and cleanroom standards. The clause regarding acid resistance may be relaxed for portions, that the vendor has sufficient reason to believe, would never be exposed to acid vapors. However, the vendor must provide suitable drawings/documentation to support this. Ducting must be low noise and vibration free. All ducting/joints must be tested for leakage before commissioning and the leakage must be within the limits specified in the latest SMACNA standards.</p> <p>Duct fabrication:</p>

		<p>a. Ducts shall be straight and smooth and shall have neatly finished joints. All joints shall be made air tight using 5mm neoprene rubber gaskets, and/or RTV-sealed, or soldered as specified. The gasket will be fixed with a suitable adhesive to the flange.</p> <p>b. Changes in dimensions and shape of ducts shall be gradual. Curved elbows, unless otherwise approved, shall have a centre line radius equal to one and a half times the width of the duct. Air turns shall be installed in all abrupt elbows and shall consist of curved metal blades or vanes, arranged to permit the air to make the turn without appreciable turbulence. Turning vanes shall be invariably provided at all turns and grille-collars. Splitters and dampers shall be provided at all branches/tappings whether shown on the drawings or not.</p> <p>c. All ducts shall be rigid and shall be adequately supported and braced. Where required, standing seams, tees or angles of ample size to keep the ducts true to shape and to prevent buckling, vibration, etc. shall be provided.</p> <p>d. At all connections between ducts & AHU; fire-retardant, lint-free double canvass/rexin connections of heavy gauge shall be provided.</p> <p>Duct installation: Ducts shall be supported on hangers as per following specifications:</p> <table border="1"> <thead> <tr> <th>Dimensions</th> <th>Spacing of Supports (m)</th> <th>Sheet thickness SWG(mm)</th> </tr> </thead> <tbody> <tr> <td>Up to 750 mm</td> <td>2- 2.5</td> <td>24 G (0.63 mm)</td> </tr> <tr> <td>751 to 1500 mm</td> <td>1.5 - 2</td> <td>22 G (0.80 mm)</td> </tr> </tbody> </table>	Dimensions	Spacing of Supports (m)	Sheet thickness SWG(mm)	Up to 750 mm	2- 2.5	24 G (0.63 mm)	751 to 1500 mm	1.5 - 2	22 G (0.80 mm)
Dimensions	Spacing of Supports (m)	Sheet thickness SWG(mm)									
Up to 750 mm	2- 2.5	24 G (0.63 mm)									
751 to 1500 mm	1.5 - 2	22 G (0.80 mm)									
8	Insulation for ducting	Supply, installation of 19 mm thick Class "O" Insulation with one side Aluminium faced. The Insulation Material shall be FM Approved. The insulation shall 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.									
9	Fire dampers	Automatic fire dampers shall be provided wherever shown on the drawings. The damper shall be multi blade louvre type. The blades should remain in the air stream in open position and shall be constructed with minimum 1.8 mm thick galvanised sheets. The frame shall be of 1.6 mm thickness. Other materials shall include locking device, motorised actuator, control panel to trip AHU motor etc. • The fire dampers shall be capable of operating automatically on receiving signal from a fire alarm panel. All control wiring shall be provided between fire damper and electric panel. • A hinged and gasketed access panel measuring at least 450 mm x 450 mm shall be provided on duct work before									

		each reheat coil and at each control device that may be located inside the duct work.
10	Electrical Panel and Cabling for AHUs, chiller and Pumps.	<p>Supply of Floor mounted, powder coated sheet steel enclosure Panel. The motor and switchgears required for various items shall generally be as per specifications given below :- 3 Phase, 50 Hz ,415 volts A.C. supply +/- 10%. Cabling for electrical supply from floor mounted electrical panel to respective AHUs/Chiller/Pumps/Dehumidifier shall be armoured copper cables. Copper lugs should be used for cable termination. Bus bar for incoming should be of Copper. Cabling for all the equipment shall be laid through GI ladder or conduit. AHU blower should operate on VFDs Heaters control should be through SCR Star-delta starter for chilled water pumps Electrical Panel with bypass arrangement DOL/SD type electrical control panel and provision Microprocessor controller with display for Temperature, RH controlling, monitoring with status (AHU) interlocking with DX & Strip heater system and SCR for Heater controllers. Provision for : AHU(Heaters, Blower, Humidifier) Chillers Pumps Incomer to HVAC electrical panel from Utility Building(NNFC), MSB Approved make: Regin.</p>
11	Wet Exhaust System	<p>Blower : MS FRP Coated direct driven centrifugal blower of 20656 CMH/5.73 m3/s, 300 mm total static, 4 – Pole / 3-Phase 1450 RPM / 415V, MOC: Fan casing: 5 mm thk M.S. IS-2062,FRP Coating Fan Scroll: 5 mm thk M.S. IS-2062 Impeller: M.S. IS-2062 a. Back plate: - 6 mm thk. b. Blade: - 5 mm thk. c. Shroud: - 5 mm thk. d.Structure :- M.S. IS-2062 QTY : 1 Working + 1 Standby</p>

		<p>The wet exhaust system scrubber should be aqueous, being dosed with a reagent solution to neutralise the fumes being exhausted to atmosphere and should contain the following elements:</p> <p>A saturation chamber. Scrubbing vessel. Entrainment separator or mist eliminator. Recirculation pumping system. Exhaust stacks system.</p> <p>Scrubber must be single tower suitable for 5.73 m³/s/20656 CMH MOC : 10mm thick PP/FRP Packed Bed Scrubber. Ducting : PP + FRP Duct (5 mm PP + 5 mm FRP) of 900 mm diameter for Main Header with suitable branch lines along with dampers to be provided inside cleanroom plenum area of 250 mm dia dampers. All Lines in cleanroom plenum are non FRP.</p>
12	Dry Exhaust System	<p>Blower :</p> <p>S.S.304 direct driven centrifugal blower of 2.11 m³/s/7600 CMH, 200 mm total static, 4 – Pole / 3-Phase 1450 RPM / 415V, MOC: Fan casing: 5 mm thk S.S. Fan Scroll: 5 mm thk S.S. Impeller: S.S a. Back plate: - 6 mm thk. b. Blade: - 5 mm thk. c. Shroud: - 5 mm thk. d. Structure :- S.S. 304 Ducting: S.S. 304 (1.2mm thick) spiral ducting of 350 mm diameter for main header with suitable branch lines along with dampers to be provided inside cleanroom plenum area. QTY : 1 Working + 1 Standby</p>
13	Electrical panel for Wet & Dry Exhaust system	<p>Supply of Floor mounted, powder coated sheet steel enclosure with incomer of suitable MCCB, four outgoing feeders each having a suitable MCCB for each exhaust blowers with VFD with Auto/Manual option . Copper cabling with suitable capacity. Potentiometer control for speed variation and with suitable wiring as per standard electrical practices. The VFD must be Danfoss make of suitable model. Electrical Cabling must be with Metal trucking and supporting Systems.</p>
14	BMS	<p>The Building Management System should be based around local DDC outstations with associated I/O modules and a PC supervisor station within</p>

		the Control Room. Control cabling should be routed through out the facility on a suitable cable management system. As per Annexure 4. Approved make: Regin
15	Acoustic enclosure	Noise cancelation to be considered for existing and new Chiller, wet, dry and general exhaust blowers.
16	Civil works, Plinths and Elevated Metal structures	Suitable plinths, elevated metal structures and vibration Isolators to be provided for Chiller, AHU, Pumps, Electrical panels etc.
18	Installation and Training	Installation and training at customer site, by the experts from principals should be part of the package. During the installation all the parameters should be verified for acceptance by the customer.
18	Documentation	Must submit a basic design (based on site visit) as part of the technical bid. The design must include a P&ID diagram. Committee may ask for more details to evaluate suitability. The winning bid must submit a detailed design document of the “as-implemented” system with engineering drawings, P&ID diagrams, electrical diagrams, BoM, servicing and maintenance information. The detailed designs must be submitted both in hard and soft-copy.

Annexure- 2

Vendor Responsibility

	Any type of Civil / Structural works such as foundation for equipment and making of openings for the passage of ducts, pipes, cables, framework for grills/diffusers etc.
	Any deviation in quantities will be provided by Vendor. IISc will pay separately any extra items against actuals. Any leftover item will be retained by SID/CeNSE, IISc.
	Safety: The installation technician should follow all site safety terms. Mandatory PPE: Safety helmet with face shield, electrical insulated gloves, electrical insulated safety shoes. The Installation should be carried out by trained technicians.
	The GEECI/NNfC Office, GF-20, CeNSE, IISc must be intimated prior 5 weekdays before start of work. The vendor must obtain explicit permission for any shutdown needed to implement the project. The request for shutdown must be escalated at least 10 weekdays prior.
	A series of tests will be done on the HVAC system after installation to validate the system.



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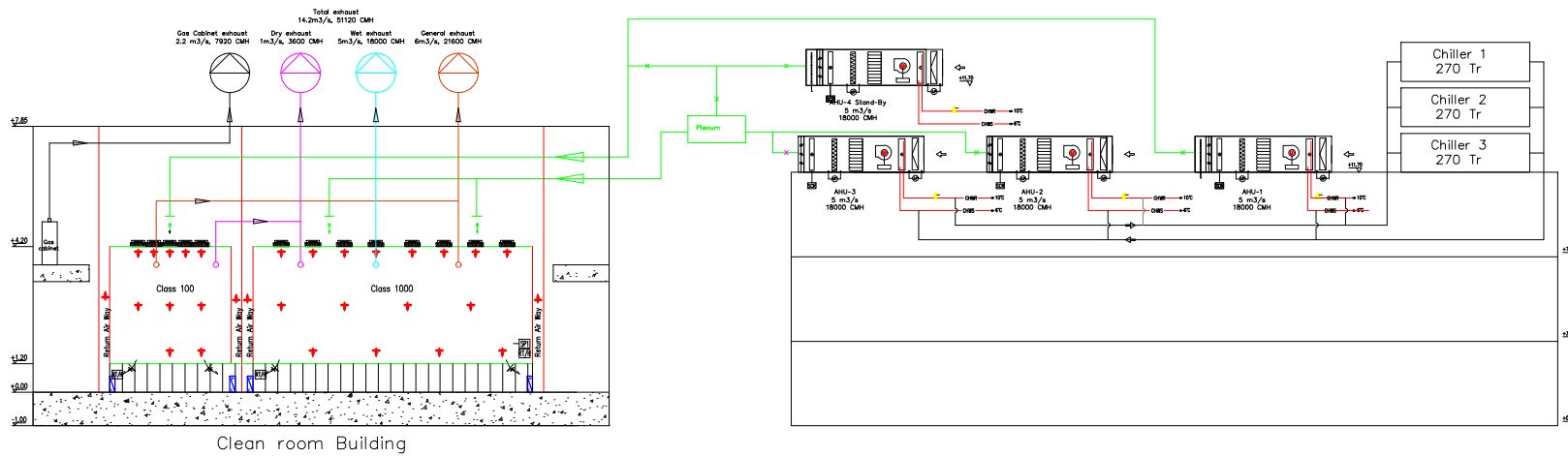


IISc Responsibility

	Free power supply / water for erection, testing and commissioning of the system will be provided.
	Free storage space at site will be provided.
	IISc will provide technical help in connecting the HVAC system to the electricity.
	Payment will be within 30 days against a tax invoice, after satisfactory implementation of the project.

ANNEXURE 3

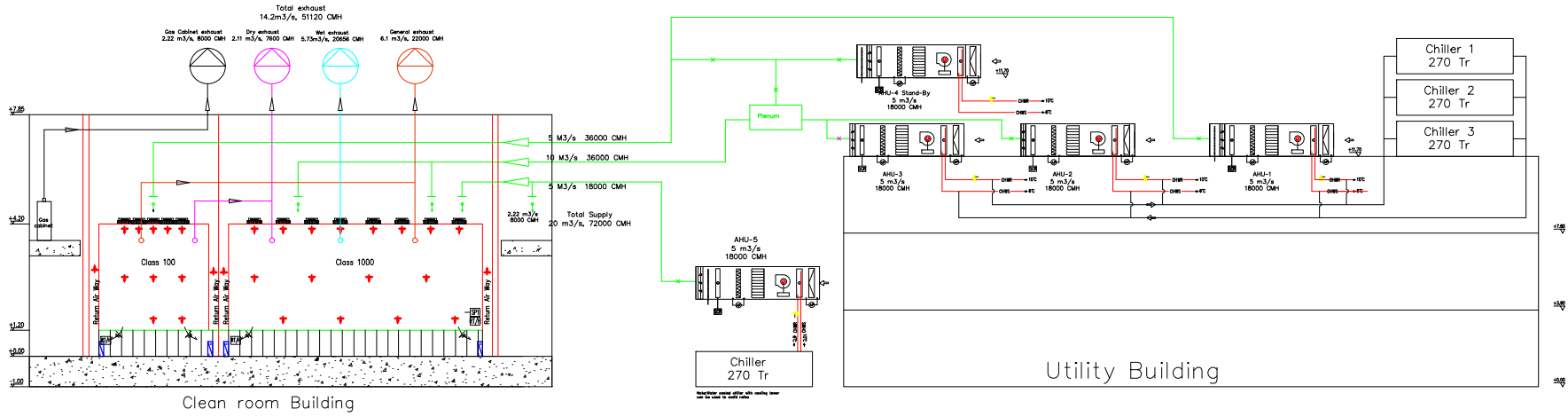
Existing HVAC Schematic



SCALE	NAME	SIGN	DATE			
N.T.S.	GAJA					
PREP. BY	GAJA			DWG. NO.		SHEET NO.
CHKD. BY						REV
DRN. APP. BY						

ANNEXURE 3

Proposed HVAC Schematic 2



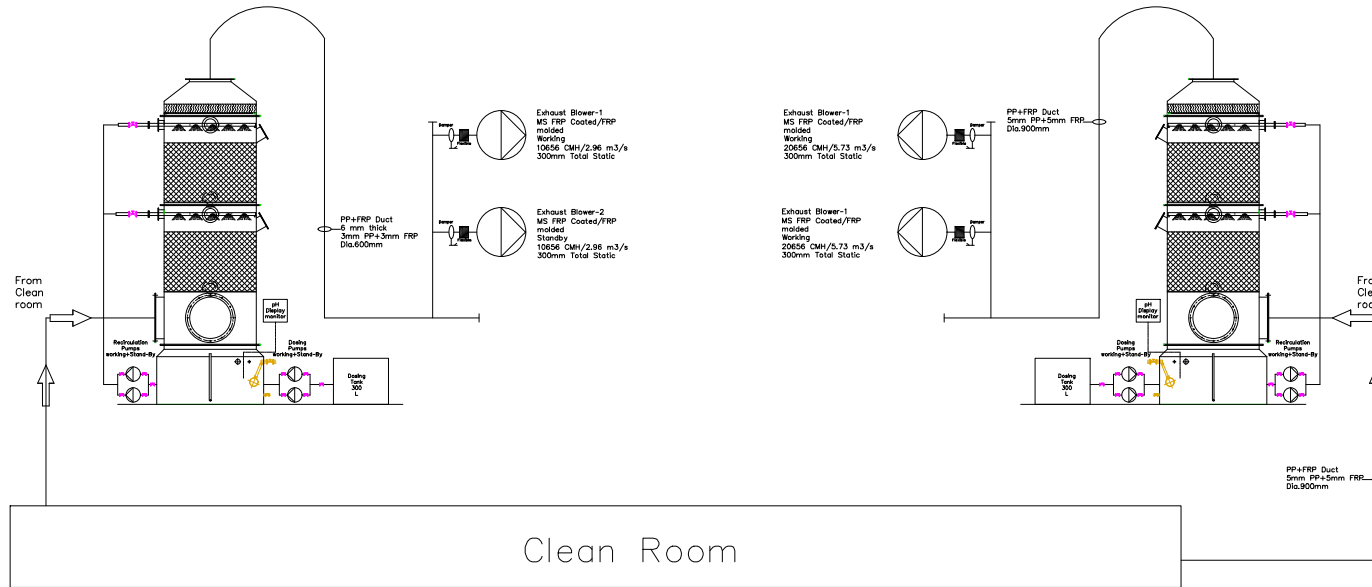
SCALE	NAME	SIGN	DATE			
N.T.S.	GAJA					
PREP. BY	GAJA			DWG. NO.		SHEET NO.
CHKD. BY						REV
DRN. APP. BY						

ANNEXURE 3

Wet Scrubber Schematic Option

Existing Scrubber
PP+FRP
Dim: 1500mm dia.x4500mm H

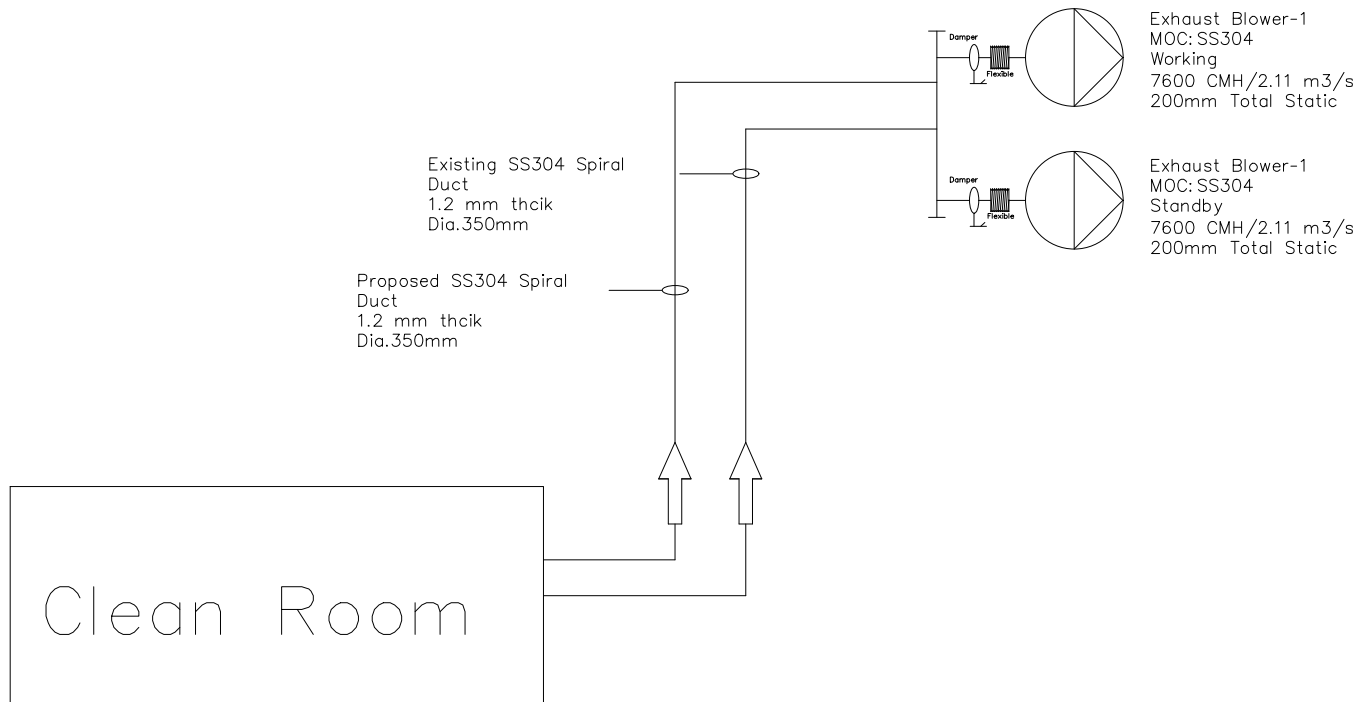
Proposed Scrubber and blower
PP+FRP
Dim: 1500mm dia.x4500mm H



SCALE	NAME	SIGN	DATE			
N.T.S.	GAJA					
PREP. BY	GAJA			DWG. NO.		SHEET NO.
CHKD. BY						REV
DRN. APP. BY						

ANNEXURE 3

Dry Scrubber Option-2



SCALE N.T.S.	NAME	SIGN	DATE			
PREP. BY	GAJA					
CHKD. BY				DWG. NO.	SHEET NO.	REV
DRN. APP. BY				2	1	

