

Sealed Tenders are invited for;

Design, Supply, Installation, Testing, and Commissioning and Validation of Modular Bio-Safety Laboratory Level-III containing 1) Bacterial lab; 2) Virus lab; and 3) Animal Biosafety lab as per below specifications and reference design layout.

- The Bidder shall have should have trained/certified Biosafety professionals/Engineers by any International Biosafety Association and a copy of certificate to be enclosed with tender.
- Firms preferred to be ISO 9000 compliant
- The Bidder shall have experience of successful supply/ installation of at least 1 Biosafety Laboratory level-III (BSL-III) in last 3 years.
- The Bidder shall have the experience and setup for providing Operation and Maintenance Services for at least **one/two** BSL-3. Details shall be submitted along with copies of work orders from the client.
- One engineer should be stationed for the Routine maintenance of the BSL-3 Lab.
- Lab should be in compliance with national and international standards as per WHO, BMBL, NIH Guidelines
- The bidder should not have been blacklisted, debarred or expelled by Union Government/State Governments/ PSU's etc. on the date of submission of Bid.

Scope of Work:

Includes Design, Supply, Installation, Testing, Commissioning (SITC) and validation of the Modular BSL-3 facility containing a bacterial lab, virus lab, and animal biosafety and handling (ABSL-3) lab on Turnkey Basis and its Operation and Maintenance. Scope will include design, engineering and installation of a prefabricated BSL-3/ABSL-3 Laboratory including the basement civil work (construction of the pillars and basement for the BSL3 modular lab), with double skin PUF panels, HVAC system including complete air management system for maintaining the lab environment as per the biosafety guidelines, all related internal lighting and wiring work with UPS for smooth and safe operation of BSL-3/ABSL-3. The scope also includes the arrangement of power cables upto the main LT panel of BSL3, design and construction of drain and sewer line from BSL3 lab to the available drain line, arrangement of water connection to the water storage tank of BSL3 from ILS water tank.

For safe operations as per the guidelines and monitoring of the facility, the system must have necessary monitoring, operations & control through a DDC based system with requisite sensors for controlling indoor conditions/environment including pressure gradient, temperature, humidity, exhaust, etc. An addressable fire detection system, Access Control System and CCTV System shall also be provided. Any other work related to smooth working of the facility shall be treated as a part of scope of the bidder. The entire lab shall be validated as per the International Guidelines and necessary documentation and validation report will be submitted at the time of handing over.

Note: In addition to quoting a lump sum price for the BSL3/ABSL3 facility please do quote prices for the basement civil work, external electrical line, drainage line, and water connection as per unit basis.

Following Reference Standards to be adapted:

- WHO, GENEVA Laboratory Biosafety Manual – 3rd Edition, Biosafety Level 1 – 4
- Biosafety in Microbiological and Biomedical Laboratories – 5th Edition
Biosafety Level 1 – 4
- Canadian Standard, Laboratory Biosafety Guidelines – 3rd Edition 2004
- EN12128 -1998, Biotechnology- Laboratories for research development and analysis-
containment levels of microbiological Laboratories, areas of risks localities and physical
safety requirement. PCL- 1– 4 Physical Containment Level Laboratory
- EN12738-1999, Biotechnology Laboratories for research, development and analysis –
Guidance for containment of animals inoculated with microorganisms in experiments.
ACL- 1-4 Animal Containment Level Laboratory
- NIH Guidelines for research involving recombinant DNA molecules (Jan 2001) Biosafety
Level 1—4,

Details of the laboratory space

- Overall size should be similar or bigger than the enclosed reference design
- Inner Lab Temperature: 22C +/- 5C
- ACPH: More than 20 ACPH
- Cleanliness standards: Class 10000

HVAC SYSTEM AND BUILDING MANAGEMENT SYSTEM

The proposed Modular BSL-3/ABSL-3 Laboratory and support areas shall be air-conditioned through separate dedicated Central AC System comprising of Chiller Pack, Air Handling Units, Exhaust System, Air Filtration System and Air Distribution System complete in all respect. The system shall be **with standby and backup provisions** capable to provide un-interrupted continuous 24x7x365 days operation of the Laboratory to maintain the required temperature, humidity, air-change rate, differential pressure gradient and air filtration conditions of the Laboratory Facility. Submit the HVAC system and BMS design and working drawings for prior approval. The HVAC system shall comply with the given specifications and performance requirements and shall be complete in all respect, as required and approved.

Exhaust Fan location for BSL-3 : Minimum 25 ft from AHU intake

Air velocity at exhaust discharge : 15-20 m/s (3000-4000 fpm) for BSL-3

PRESSURE GRADIENT TO BE MAINTAINED IN VARIOUS AREAS OF LABORATORY

ROOM	OPERATING PRESSURE
BSL-3 Room (Bacterial/Viral/ABSL3/Procedure)	-40 Pa
Airlock	-20 Pa
Shower Room	ATM
Change Room	ATM

Wash and Autoclave Room	ATM
Preparation Room	ATM

Air Conditioning Plant:

Inner Laboratory Temperature to be maintained at 22C +/- 5C

a) Chiller:

Air cooled condensing unit shall consist of hermetic scroll air-conditioning compressor assembly with cooling of capacity 30TR or higher, air cooled coil, propeller-type condenser fans, and a control box, copper piping, refrigerant gas (Non-HCFC and non-CFC), automatic low pressure and high pressure cutouts with microprocessor controlled system, electronic regulation, Acoustic isolation, gas charge and should be integrated with DDC system of the main lab. It should also have electronic thermostats for tripping the compressors after reaching set temperature with suitable insulation of the suction line.

Supply, Installation, testing and commissioning of CHILLING UNITS each complete with compressor, motor, insulated chiller, flow switch, condenser fans, vibration isolators, integral refrigerant piping and wiring, accessories as required and called for. The Chiller Pack shall be skid mounted with Air Cooled Condenser, Evaporator/Chiller, Micro-processor control panel including interconnecting control and power wiring, refrigerant charge etc. complete in all respect. To economize the operating cost and provide backup capacity, the chiller pack shall have multiple compressors. The noise level not to exceed 80 dBA @ free field condition. Approved Eco Friendly Refrigerant R-134 a / R-410 a. Foundation to be provided by prime civil contractor.

Air Handling Unit (AHU):

The AHU constructed over a metallic structure made with a normalised steel profiles, covered with sandwich type panel. The panel is made with lacquered galvanised stainless steel plates, with 120 kg/m³ rock-wool foam core. The gaps between panel and structure will be sealed with neoprene joints in order to guarantee the air tightness of the AHU. Several maintenance doors are built in the AHU, the one for maintenance being double and safety check.

AHU includes the following sections: Mixing sections, with regulation dampers for fresh intake air and return air, Pre- filtration section, electrical resistance for heat battery, cool battery made of copper pipes and aluminium blades, fan section including high-pressure fan, absolute filtration section H-14. AHU must be installed over an anti-vibration platform, and the connections between AHU and ducts will be done with flexible ducts.

All the supply AHUs comprise of following sections: Intake louver, Pre- filter section with 20 microns and 10 microns filters, Cooling coil section, blower section, driver set and pulley, fine filter section with 5 micron filter. Other accessories like dampers, SS 304 drain pan, Common base frame with vibration isolators pads, Suitable inspection doors for filter, coil & blower sections, are provided. They are connected to HEPA filters for all BSL-3 rooms, corridors and air-lock rooms. All HEPA filters, the lay-in type, are at 99.99% efficient to @ 0.3 micron particle

size, hermetically sealed and ducted aluminum terminal units. Each unit has an upstream sample port, and protective painted aluminum face screen. The Supply Air Handling Unit will be connected to AHU of suitable capacity for temp and RH control. The HEPA filter should be capable to withstand corrosive agents and gases used for lab fumigation. The Exhaust/Blower fan shall be turned at once to achieve the set value of negative pressure.

Air Flow:

- No recirculation, one pass design
- Air control by a series of motorized damper with PC-controlled actuator
- Pressure is measured by digital type pressure differential gauge and feedback into the control software for pressure setting, maintenance and alarm setting.

Air Filtration System:

- All incoming air filtered by three stages Filtration in AHU
- All main lab exhaust air pass through BIBO HEPA.

Three Stages for supply Pre- Filtration:

ASHRAE 1st stage	30% efficiency
ASHRAE 2nd stage	90% efficiency
Final Stage HEPA Filtration	99.99% efficiency

HEPA filters for Exhaust:

BIO HEPA Filter	0.3 micron @ 99.99% efficient
------------------------	--------------------------------------

Ducting and Insulation for Supply and Exhaust Ducts:

The supply air and exhaust ducting shall be carried out in GI sheet (class VIII with zinc coating of 120 gm/sqm). All duct fabrication work, thickness of sheet metal, supports, hangers shall conform to SMACNA standards. All the joints shall be sealed with silicone sealant.

Duct Insulation:

Closed cell, Fire retardant, self extinguishing type crossed linked polyethylene insulation density not less than 24 Kg/sqM, "K" value not more than 0.028 Kcal/degC with adhesive tape etc, on duct complete as per specification and drawings

Motorized Airtight Damper:

Consists of aluminium casing with factory fitted motorized damper. Casting and attachment should in stainless steel. The damper blade with plastic seal when closed should comply with DIN EN 1751, CLASS 4 (Exception normal size 100 and 125, class 3) also complies with the

requirement of DIN 1946, Part 4 (leakage < 10 M3/h. M2 of damper cross section with a 100 Pa Pressure differential).

Fire Dampers:

Fire Dampers provided in the supply and exhaust air systems shall be interlocked with the AHU blower motors such that in case of fire, the AHU fan motor should trip automatically. Fire dampers may be linked to the control panel

Sound Damper:

These are used for reducing the noise level of the air which is travelling through the duct. These are to be placed after the air throwing machines so that these can absorb the extra noise. And surrounding will not be affected by the noise & it will be noise proof.

Control Pressurization:

Laboratories should remain at a higher negative pressure in relation to the corridors/Airlocks and other non-laboratory spaces. The pressure gradient condition should be maintained in various areas of the laboratory.

Ultra Violet Germicidal Irradiations (UVGI) System

Supply, installation, testing, commissioning and handling of the UVGI System for maintaining the indoor air quality. The components of the system must be in strict conformity with the specifications. The price to include all inter connected wiring between the UVGI lamps. The UVGI system shall be installed in supply air ducts or AHU itself.

BUILDING MANAGEMENT SYSTEM (BMS):

A customized Building Management System shall be designed, programmed and provided to:

- i. Control and monitor the operation of HVAC system and other laboratory operating parameters in the BSL-3 Lab rooms/zones like: Room/Area/zone pressure, temperature & RH, Ambient temperature & RH, AHU and Exhaust Blower operating status, VFD status & VCD status, OPEN/Close dampers status, Supply & exhaust air quantity in each BSL-3 Laboratory rooms/zone.
- ii. The BMS shall be complete with PLC, Sensors, Controllers, power and control wiring, customized Software and other associated field devices, hardware and accessories complete in all respect, as per requirement and approved design.
- iii. The HVAC system START and STOP sequence shall be interlocked to prevent positive pressurization of the BSL-3 laboratory, at any point of time.
- iv. A dedicated desktop PC shall be provided for the BMS operation and control along with a parallel secondary display screen of 32" size at the BSL-3 laboratory entrance to show the operating parameters.

- v. The BMS control panel shall be powered through UPS. Upon restoration of power after a power failure, the BMS shall start the HVAC system automatically without any human interface and restore the normal operational set points of the system.

Alarm and Monitoring Systems:

- a) Pressure gauge
- b) Pressure alarm visual/audio
- c) Temperature/RH alarm visual/audio
- d) Emergency panic button (break glass type) - audio all rooms/control room
- e) Emergency door-open” button (For interlock door)

At the Control Side – Biosafety BSL3- control software

Computerized Controls (PLC/DDC):

The control System, consist of PLC (Programmable Logic Controller) should automatically adjust system airflow and maintain system as the designated negative pressure.

The PLC/DDC should have the following features:

- The system controller (Programmable Logic controller) controlled via a dedicated software program.
- Centralized Control
- Automatic air flow control.
- Pressure, Temperature & Humidity monitor and control.
- Doors interlock - controlled by PLC/DDC and display on the PLC/ DDC control panel.
- HEPA filter resistance and efficiency monitoring. When the pressure of the filters reaches the setting value, the PLC/ DDC has the alarm.

The DDC System should be real time control on the internet and realize different control strategy separately. The DDC system should address the bubble tight position according to the negative pressure feedback signal to control the negative pressure of the laboratory at the value which is set up. Emergency shutdown when system integrity breaches the correct sequence. In case of the normal fan failures, the stand by fan should be turned on at once to achieve the set value of negative pressure in 60 seconds. When opening the lab, first turn on the exhaust fan, then turn on the supply fan; pressure stability accomplished within 15 minutes from the start up. When turning off the lab, first turn off the supply fan, then turn off the exhaust fan.

BMS PB (Computer Specification): Supply and Installation of Main Operator Station Comprising Main P.C. with Intel i series or latest 2.5 Ghz CPU complete with accessories such as 21” LCD color monitor, 1 TB hard disk or higher, 5 GB RAM or higher, 101 Keys Key Board, Optical Mouse & Pad, DVD writer drive with A4 B/W Laser Printer including UPS with half an hour battery backup.

BMS SOFTWARE: Supply, Installation, Testing and Commissioning of the BMS System Software: Graphical Software meeting the requirements in the Given I/O Summary and technical specifications including configuration and facility to create / provide the graphic mapping for all I/O summary points, configurable password protection for Building Mgmt System as per Specifications. Software shall be able to communicate with Bacnet, Modbus devices simultaneously, with unlimited web user license capacity. Same software can be used as programming / commissioning software.

BMS PANEL: Automation stations/ Direct Digital Controller with I/O module etc. The networkable controllers shall be 32 bit, UL listed microprocessor with built in networkable (IP) type with real time clock with SD-CARD programmable memory. Minimum one networkable DDC (32 bit, UL Listed) should have inbuilt graphics display with knob operation. The networkable DDC's shall be capable of either direct sitting on IP LAN or peer to peer communication with lockable MS mounting cabinets duly powder coated connector strip, internal wiring and space to house controller & relays, connector etc. as per IO summary.

Door Interlock and Access Control System

The door interlock and access control system shall be provided with combination of proximity card based, numerical key pad lock based and push button based system. The system shall be complete with access logic controllers, door electromagnets, proximity cards and card reader/s, numerical keypad locks, door release push buttons, emergency door release buttons, PC communicator, control and power wiring and cabling and other required accessories, hardware, and software. The access control system shall be powered through UPS supply for uninterrupted operation even during mains power failure. The door Electromagnetic Lock shall be suitable for installation on doors/frames. The electromagnetic lock and armature shall be constructed and designed to provide trouble free service.

CCTV System

CCTV System shall be provided for surveillance of the Laboratory. The number of Cameras will be as per the floor plan with one Camera in each room. The CCTV system shall be complete with wall/ceiling mounted high resolution color cameras, multiplexer cum DVR of 16 Channel, LCD color monitor 32" size (as required), associated power and control cabling etc. and required hardware and software. The output of the CCTV system cameras shall be displayed on LCD monitor, to be installed at approved location. The cameras shall be high resolution color cameras and shall be suitable for indoor installation. The multiplexer cum DVR shall be suitable for saving up-to 16 channels analog data, audio, text data and event data with play back feature. The DVR memory/Hard disk capacity shall be 1 TB. For convenient backups the DVR shall be compatible with Windows based OS so that it can be backed up through a PC.

Fire Detection and Alarm System

The complete BSL-3 Laboratory and support areas shall be provided with Addressable type Fire Detection and Alarm System. The Fire Detection & Alarm System shall be complete with Smoke detectors, Heat detectors, Fire Alarm Panel, manual call points, response indicators, power and control wiring and cabling etc. complete in all respect.

- a) Temp/RH/Pressure Sensor
- b) Pressure alarm visual/audio
- d) Emergency panic button (break glass type) - audio all rooms/control room
- e) Emergency door-open" button (For interlock door)

ELECTRICAL SYSTEM AND ASSOCIATED WORKS:

Electrical power distribution system scheme for the complete BSL-3 Laboratory should be provided. The electrical distribution system shall be designed and installed as per the Indian Electricity Rules and shall conform to NBC. The electrical load calculation sheet, power and light wiring diagrams, GA and Single Line diagrams for Electrical Distribution Panels, cable routing etc., before proceeding with the work.

i) Power Distribution System:

The executing agency shall design and provide the main power distribution (LT) panel, sub-distribution boards and panels complete with required switchgears, breakers, circuit breakers, power and control wiring, etc. for power distribution system for complete Laboratory Facility. The power distribution system shall include supply and laying of cabling/wiring for HVAC System and Fixed equipment and systems like Autoclaves, Bio-safety cabinets, access control system, CCTV system etc., required and provided for the Laboratory.

For circuit and power distribution, the DB's shall be 8/12 way TPN vertical/Horizontal with double door 3 phase/ 1 phase, fitted with ELCB, RCCB, MCB etc. complete as required. The circuits, lighting and power distribution shall be fully wired and complete in all respect. Only multi-stranded copper conductor wires shall be used for sub-main wiring, circuit wiring, light and power wiring.

All joints shall be made at main switches, distribution board socket and switch boxes only. No joint shall be made in conduits and junction boxes. Conductors shall be continuous from outlet to outlet.

ii) Internal Light Points, Power Points, Fittings and Fixtures

The Electrical fittings and fixtures in the BSL-3 Laboratory and support areas shall be sealed type, explosion proof, capable to withstand chemical exposures during laboratory fumigation. The Laboratory rooms shall provide 400-450 lighting Lux level and the light fixtures shall be surface mounted type. The switches, sockets and light fixtures in BSL-3 Lab and support areas shall have IP 55 or better protection.

All the electrical points, power points, light and power sockets shall be fully wired with switches, sockets, connections complete in all respect as required. Some of power points / sockets should be suitable for high power consumption instruments like deep freezers, floor model centrifuges, biosafety cabinets etc and will be decided based on floor map. Only multi-stranded copper conductor wires shall be used for light and power wiring. The internal wiring shall conform to the Indian Electricity Rules and BIS standards. The conduit work for light points, power points, voice and data points, FDA system etc., shall be concealed type and shall be done in rigid PVC as per IS specifications. All the conduit pipes shall be sealed to prevent ingress of air.

iii) UPS

An UPS of 30 KVA (or as required depending on the overall load with economic annual maintenance charges) capacity shall be provided for un-interrupted power backup to critical components like Door Interlock and access control system, BMS Operation and shower control panel operation. The power backup through the UPS shall be for minimum 30 minutes. The UPS shall be complete with battery bank, battery rack, interconnecting cabling and wiring, complete in all respect.

iv) Communication Facility (Intercom & LAN)

The Laboratory areas and support and service areas shall be provided with Data (LAN) and Voice points (Intercom) for communication. The system shall be complete with required conduit and wiring. The Data and Voice points shall be fully wired with CAT6 cable complete with output terminals. A suitable EPABX shall be provided for upto 2 incoming lines and 10 outgoing lines for the laboratory for internal communication. All the rooms shall be provided with intercom connection and telephone instrument set.

INTERNAL CONSTRUCTION WORKS & FINISHES:

The internal partition walls and ceiling construction in BSL-3 Laboratory, Screening Lab and the support areas shall be carried out with prefabricated, non-particle shredding panels in Powder Coating finish. The ceiling shall be walk-able type for access of services above for maintenance purpose.

i) Modular Wall & Cladding Panels:

Double skin modular wall panels made of 0.8mm thick GPSP (galvanized plain skin pass) sheet powder coating with min. 60 Micron on both sides with PUF of density $40\pm 2\text{kg/m}^3$ as infill, GI profiles for reinforcement along the periphery, floor track in Painted GI with EPDM rubber below Floor Track using Fastener bolts, self-tapping screws at suitable interval, suitable to accommodate the epoxy floor flush with wall panel. Joints shall be sealed with clean room compatible silicon sealant. Including all material, lead lift T&P, Labour etc.

Wall panel is sealed airtight, that ensures air leakage. There are cut-outs on the walls to accommodate electrical outlets, telephone & intercom pipelines, control panels, monitoring devices, emergency warning systems, pass-thru' cabinets and piping where are applicable.

Wall Panel Thickness	-	80-100 mm
Cladding Panel Thickness	-	50-60 mm
Outer Skin (both sides)	-	Powder Coated GSS sheet in 0.8 mm thickness
Insulation/Filler material	-	PUF having density of 35-40kg/m ³
Shade / Color	-	As approved
Services	-	Pre-inserted conduits for electrical wires/cables etc.
Sealing of Joints	-	Silicone Sealant
Sealing of Penetration	-	Silicone Sealant

Ceiling Panels:

Double skin totally flush walkable false ceiling made of 0.8mm thick GPSP (galvanized plain skin pass) sheet powder coating with min 60 micron on both sides with PUF of density 40 ± 2 kg/m³ as infill, GI profiles for reinforcement along the periphery, including ceiling grid for easy installation and necessary hardware like threaded rods, Fastner Bolts, self-tapping screws, nuts and bolts etc. Joints shall be sealed with cleanroom compatible silicon sealant. (Load bearing capacity- 150 kg/m²).

- Double skin modular wall panels made of 0.8mm thick GPSP (galvanized plain skin pass) sheet powder coating. The solid ceiling panels will be placed side by side and fastened together. Ceiling trim (PVC) pieces will be installed on the ceiling to seal the ceiling panel airtight. The GI panel edges are sealed with Room Temperature Vulcanizing (RTV) Silicone to the structural frame and fasten on both sides to form an airtight sealed panel.
- The wall and ceiling system should be impervious, non-corrosive, antibacterial and antifungal surface finish suitable for use of wide range of chemicals like Hydrogen peroxide, formalin etc. for laboratory decontamination.
- The solid ceiling panels of size 80mm and 50mm shall be capable to withstand the high negative operating pressure of BSL-3 and shall be suitable for normal walking pressure and strong enough to allow personnel to climb above for installation and servicing via the service access on the side of the laboratory.
- **The Radius Coving (wall-to-wall, and wall-to-ceiling, from inside to outside corner):** Smooth radius coving should be installed at all wall-to-wall and wall-to-ceiling joints. All seams should be carefully sealed with RTV sealant. Corners at floor - coved from PVC floor sheet to the wall.

Flooring

Flooring shall be in 3 mm Self-level epoxy in approved shade, complete with base coat, sealer coat and 3 mm top coat in self-levelling epoxy conforming to IS :4631.

Doors

All Air-Tight Doors (air-lock to the outside of the BSL-3 Laboratory) are constructed with steel and powder-coated (for easy cleaning). 46 mm thick doors made with PU painted 0.8mm thick GPSP sheets on both sides with honeycomb kraft paper as infill, 1.2 mm thick GPSP powder coated door frames, hardware like SS push plate, SS 'D' handle, SS ball bearing butt hinges, Double glazed view panel with Automatic Concealed door bottom drop seal and 1.2mm thick SS304 kick plate.

The door is installed completely with pull-door-handle door, closer and electrical interlock mechanism. The Airlock doors and emergency Exit Door shall be Air-Tight Doors. These Air Tight Doors should have adequate gasket arrangement to provide air tight seal and may have a step-over seal.

The interlock logic shall be such that while entering or exiting the facility, traffic from the other side should not get access, to ensure privacy.

EQUIPMENTS & SYSTEMS

- 1) **BIOSAFETY CABINET BSCs** shall be Class II B2 type. 5 Qtys, 2 each in Bacterial and Virus labs and 1 in ABSL3 procedure room. The Bio-Safety Cabinet body, frame and supports shall be constructed in SS 316 L (18 gauge). The work surface shall be perforated SS 316 L (18 gauge). The front shall have SS 316 L (18 gauge) top section and sliding sash in toughened glass with required counter weight.

The Bio-Safety Cabinet shall be complete with following accessories, features and specifications:

- Approx. Work Space of 1000 mm (W) x 610 mm(D) x 610 mm (H)
- Supply Air Face velocity not to exceed 0.65 m/sec
- Working chamber to operate under > 10 mm negative pressure
- Drain receptacle with drain faucet
- Fluorescent light & UV light
- Extract plenum and Air control dampers
- 2 Nos. Power outlet switch/sockets
- 80 to 100 fpm air inlet velocity at 8-10 inches of sash opening
- Supply and Exhaust HEPA filters shall be mini pleat separator less type with 99.97 % efficiency down to 0.3 micron particle size

- Supply and Exhaust Blowers with motor, statically and dynamically balanced.
- Magnehelic differential pressure gauge for chamber and HEPA filters
- Control console with indication lamps

- 2) **AUTOCLAVE; 1 QTY**, shall be double door, rectangular, steam operated, high pressure high vacuum, suitable for horizontal loading of waste. The autoclave shall be with bio-seal design. The chamber size shall be approximately 600 mm x 600 mm x 900 mm, of 325 Ltr capacity or higher. The autoclave shall be free standing type. The Autoclave shall be PLC controlled, programmable and shall be loaded with different pre-programmed decontamination and sterilization cycles.

The chamber and door plate should be made of non-corrosive stainless steel AISI 316 quality and electric steam generator would be made of stainless steel AISI 304 quality. The jacket would be made of Boiler Quality steel.

The chamber & jacket should be hydraulically tested to 2 times the working pressure. The normal working pressure would be 2.1 Kg/cm² corresponding to temperature 135°C.

The unit should be incorporated with water ring vacuum pump to create vacuum of 24” when the temperature of cooling water to the pump is less than 30°C for total evacuation of the air from the chamber, thus allowing complete sterilization of the load in shortest possible time.

The system shall be PLC based microprocessor with the facility of HMI (Human-Machine-Interface) which is incorporated with the sterilizer.

The Micro-Processor based control Panel (Microster) will control entire cycle of sterilization and steam pulsing automatically through water ring vacuum pump. The control panel shall house the complete automatic process control arrangement including timers, relays, contactors etc.

- 3) **PASS BOX** shall be provided at required locations as per floor plan for transfer of samples, chemicals and materials into the laboratory. Pass box with UV to be provided. The Pass Box shall be constructed in 18 swg SS 304. The corners inside the Pass Box chamber shall be coved for easy cleaning. The pass box chamber dimension shall be approximately 610 mm x 610 mm x 610 mm. The unit shall be complete with HEPA filters, blower, motor, door electromagnets, door interlock, UV Lamp with timer, necessary wiring, controls and all other accessories. etc. complete.

The Pass Box doors shall be interlocked by providing suitable electromagnet, so that both the door cannot be opened simultaneously. The interlock shall provide visual indicator

for door open/close conditions. The blower motor of Pass Box shall of suitable rating and shall be dynamically and statistically balanced. Magnehelic differential pressure gauge shall be provided to indicate the pass box chamber pressure. The pass box shall be provided with UV light with ON/OFF switch and shall be interlocked with the pass box doors

- 4) **EFFLUENT DECONTAMINATION SYSTEM** The Chemical Decontamination System for BSL-3 Laboratory effluent shall comprise of two nos. Effluent Collection tanks (1 Working +1 Standby), each of full required Capacity. The decontamination tanks shall be constructed in SS 304 (14 gauge). The drain line from BSL-3 Laboratory containment area shall be terminated to the effluent decontamination tanks. The effluent decontamination tanks shall be provided with motorized OPEN/CLOSE valves connected with liquid level sensor such that when one tank get filled up to full volume, the supply valve shall automatically close and the supply valve of the standby tank shall automatically open to allow collection of effluent. One number chemical storage tank in SS 304 (14 gauge) fitted with transfer pump and measuring device, piped and connected to both the decontamination tanks shall also be provided for introducing disinfectant chemical into the decontamination tanks. The system shall be complete with items: - Motorized valve connected with liquid level sensor through control panel - Disinfectant Chemical storage tank - Disinfectant Chemical dosing pump - Non return valves - Interconnecting piping including piping for chemical dosing - Pumps for discharging decontaminated effluent into sewer/drain (1W+1S) - Power and control cabling/wiring for pumps and motorized valves with control panel.

SERVICE & UTILITIES

- **Power:** The bidder should make arrangement of power cables upto the main LT panel of BSL3.
- **Water:** Water supply for the BSL-3 Laboratory will be arranged and provided by the bidder from the ILS water storage tank and the BSL-3 Laboratory
- **Drain & Sewer Line:** The drain from the BSL-3 Laboratory, after decontamination, should be connected to the nearest available drain line. The bidder should design and construct the drain and sewer line from BSL3 lab to the available drain line.
- **Utilities for laboratory equipment/s:** Utility connections like power, water, drain etc. required for the laboratory equipment should be provided.

TESTING, COMMISSIONING AND VALIDATION

- a) After completion of the construction and installation works, all the equipment, systems and services shall be commissioned and tested to check the operation and performance of each of the equipment and system.
- b) Once all the equipment and systems are found to be working satisfactory, the Validation of the BSL-3 Laboratory shall be carried out by us in the presence of authorized

representatives/committee of the Institute. The Validation of the BSL-3 Laboratory shall be carried out in accordance with the NIH Guidelines for commissioning and validation of BSL-3 Laboratories. During the validation process, operation and functioning of complete installations shall be checked to verify that the equipment and systems are delivering the desired and approved performance results. It will be checked to ensure that all the biosafety and biosecurity requirements are met, are in place and are functional.

c) Before start of the validation process, we shall submit a detailed validation document giving details of validation checks and tests to be performed, the acceptance criteria as per the approved designs and drawings and the formats for recording the check and test results.

The list of test to be performed is as below:

- Containment Barrier Integrity Test
- HEPA Filter Leak Test – According to the US Federal Standard 209E
- Ducting Pre-welding leak test
- Ducting post-welding leak test
- Room Differential Pressure test
- Particle Count Test for Cleanliness
- Air Velocity/ Pattern smoke Test
- Room Air change Rate Test
- Light intensity Test
- Noise level Test
- Biological Safety Cabinet Test
- Temperature and RH

Details of the Civil work to be presented

1. Foundation design details, size of foundation, steel used in foundation
2. Flooring details
3. Details of shed, frame design, roof sheet details,
4. Drain and Sewer line design details

Approved Make List

Note: Citing appropriate reasons you can also include items/parts from other companies/manufacturers not included in the list, that meet the appropriate quality standards.

Air Cooled Chilling Units	VOLTAS/BLUESTAR/CARRIER/ TRANE/YORK
Chilled Water Pump	KIRLOSKAR/ CROMPTON GREAVES/ ARMSTRONG/ GRANDFOSS/ KSB
Supply & Exhaust AHU	CITIZEN/VTS/FLAKTWOODS/SYSTEM AIR/ZECO/EQUIVALENT
Hot Water Generator	RAPIDKOOL/KHOKAR/EMERALD/EQUIVALENT
Supply & Exhaust AHU blower	NICOTRA/KRUGER/COMFRI/EQUIVALENT
Motors(for AHU)	ABB/SIEMENS/BHARAT BIJILI/CG/EQUIVALENT
VFD	SIEMENS/ABB/SCHNEIDER/DANFOSS/EQUIVALENT / OEM MAKES ACCEPTABLE
Chilled Water Piping	TATA/ JINDAL/SAIL/ HSL/RAVINDRA/EQUIVALENT
Butterfly valve	ADVANCE/ INTERVALVE/ AUDCO/C&R/CASTLE/ARROW/EQUIVALENT
Balancing Valve	ADVANCE/ INTERVALVE/ AUDCO /C&R/CASTLE/ARROW /EQUIVALENT
Gate Valve	LEADER/SANT/DIVINE/ADVANCE/CASTLE/ EQUIVALENT
NR Valve	ADVANCE/ INTERVALVE/ AUDCO/C&R/CASTLE/ARROW/EQUIVALENT
Flow Switch	JOHNSON/HONEYWELL/STAEFA/EQUIVALENT
Y strainer	SANT / EMERALD/RAPIDKOOL/EQUIVALENT
Temperature Gauges/ Pressure Gauge	WAREE/H GURU/FIEBIG/JAPSIN/FORBESMARSHALL/EQUIVALENT
Air Vents	I TAP / ANERGY/SANT/H GURU/CASTLE/EQUIVALENT
Pipe Insulation	AEROFLEX/ ARMACELL/SUPREME/PARAMOUNT/K FLEX/EQUIVALENT
Duct Insulation	AEROFLEX/ ARMACELL/SUPREME/PARAMOUNT/K FLEX/EQUIVALENT
Ducting GI Sheets 280 GSM with certificates	TATA/ JSW/ SAIL/JINDAL/EQUIVALENT
Volume Control Dampers/ Fire	CARYAIRE / AIRMASTER / AJANTHA/ SYSTEMAIR/ CONTINENTAL/

Dampers – Fusible Link	EQUIVALENT
Bag In Bag Out HEPA Filters with Module	AAF / CAMFIL/THERMADYNE/EQUIVALENT
HEPA Filter with Filter Module	AAF / CAMFIL/THERMADYNE/EQUIVALENT
Wall Panel/ Ceiling Panel/ Doors	FABTECH/I-CLEAN/GMP/SYNERGY/ NICOMAC /AIRTECH
Grills/Diffusers/Dampers	AIR MASTER/ AJANTHA/ SACHIN IMPEX / CARYAIRE /MKPRECISION/ CONTINENTAL/ SYSTEMAIR/ EQUIVALENT
Heaters	HEATCON/DASPASS/ESCORTS/UTKAL/EQUIVALENT
I BMS System/ Modulating 3 Way valves/ Thermostats/Humidistat/Sensors	HONEYWELL / SIEMENS/JOHNSON CONTROL/ROCKWELL/EQUIVALENT
Magnehelic Gauge	DWYER/EQUIVALENT
Air Circuit Breaker & Bus Couplers	L & T/SIEMENS /ABB/EQUIVALENT
MCCB	L & T/SIEMENS/SCHNEIDER/ABB/CG/EQUIVALENT
MCB's	L & T/SIEMENS/SCHNEIDER/ABB/CG/HAGER/LEGRAND/EQUIVALENT
ELCB's	L & T/SIEMENS/SCHNEIDER/ABB/CG/LEGRAND/EQUIVALENT
Power/Control Contacts, Over load Relays, Timers, etc.	L & T/SIEMENS/SCHNEIDER/ABB/EQUIVALENT
Fuses	CG/L & T/SIEMENS/EQUIVALENT
Energy Meters	L & T/CONZERVE/EQUIVALENT
Power Cables/Control Cables/Wires etc.	FINOLEX/UNIVERSAL/POLYCAB/KALINGA/HAVELLS/RR CABLES/ EQUIVALENT
CAT 5/6 Cables	AT&T/KABEL/DIGILINK/LAPP/LUCENT/EQUIVALENT
Electrical Conduits	BHARAT/GUPTA/POLYCAB/PRECISION OR EQUIVALENT MAKE WITH ISI STD.
PASS BOX	THERMADYNE/ENERTIA/EQUIVALENT.
PVC Conduit	POLYCAB/PRECISION/SUPREME/EQUIVALENT
Switches & Sockets	POLYCAB/CROMPTON/NORTHWEST/LEGRAND/WIPRO/PHILLIPS/MK/

	HAGER/LEGRAND/EQUIVALENT
LT Panel	CPRI APPROVED MANUFACTURER
Distribution Board	LEGRAND/ L&T/ABB/HAVELLS/SCHNEIDER/EQUIVALENT
Light Fixtures	POLYCAB/CROMPTON/NORTHWEST/LEGRAND/WIPRO/PHILLIPS/MK/ HAGER/LEGRAND/EQUIVALENT
Biosafety Cabinet	ESCO/NUAIRE/THERMO/BIOSAFE/EQUIVALENT
Pre-insulated Valves, strainers	CR VALVES/ AUDCO/ ADVANCE/ LEADER/SANT/CASTLE/ INTER VALVE/ KIRLOSKAR/EQUIVALENT
Epoxy Coating	APURVA/DR. BECK/FOSROK/CLEANCOATS/EQUIVALENT
Autoclave	NAT-STEEL/ MACHINFABRIC/ EQUIVALENT
CCTV Camera	CPPLUS/BOSCH/PALCO/SONY/LG/SAMSUNG/MOBOTIX/VIVOTEK/ EQUIVALENT
Fire Alarm System	HONEYWELL/BOSCH/ SIEMENS/SYSTEM SENSOR/GST/EQUIVALENT
Door Interlocking & Access control system	REALTIME/HID/LG/ESSL/EQUIVALENT