ANNEXURE I
TECHNICAL BID

S.No	Technical specification	Complied (yes or No)	If compliance given, mention the page no. of your technical document where the details are provided.
1	Dismantling of existing internal partition walls, floors etc. including site clearance works as required		
2	Internal construction works with pre-fabricated partition wall and ceiling panels, doors and view panels etc. in complete facility, as per approved drawing		
3	Supply and laying of the required power supply cables from the existing electrical room approximately 20 meters (LT Panel room) up to the proposed negative pressure lab for its power supply		
4	Extension of existing LT panel by providing feeder panel with switchgears of required capacities to meet the power requirements of negative pressure lab. Dedicated earthling for the negative pressure lab shall be installed as required by the vendor		
5	Power required for the negative pressure laboratory shall be tapped from the existing feeder lines (through its expansion and laying of required power cablings) or panels (approximately 20 meters). All necessary arrangements like extension of existing feeder/bus bars, laying of power cables etc. for tapping of required power shall be made by the contractor. Supply should be three phase and with proper earthing and required capacity of 440V for AHU Unit for negative pressure lab		
6	Extension of existing water supply (currently available inside the lab) lines up to the negative pressure lab to meet its water supply requirements. Supply and erection of water tank 750-1000litres in case of inadequate or absence of water supply for emergency shower and eye wash stations.		

	The specifications for Civil and Plumbing works shall be in accordance with latest C.P.W.D. specifications, including revisions/correction slips issued till date.		
	For the item not covered under CPWD Specifications mentioned above, the work shall be executed as per latest relevant standards/codes published by B.I.S. inclusive of all amendments issued thereto or revision thereof, if any, till date		
	In case of B.I.S. codes/specifications are not available, the decision of the Engineer based on acceptable sound engineering practice and local usage shall be final and binding on the contractor		
7	**Restricted and controlled access** shall be provided for entry into the laboratory.		
	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, complete in all respect as required.		
8	A suitable software shall be programmed/loaded on the computer to allow perform the following operations.		
	1. Assign the access rights to the individual proximity cardholder/s		
	2. Create database for bio-metric readers for the authorized persons and assign them access rights.		
	3. Enable/disable access for specified time periods (for visitors etc.)		
	4. Record the transactions and generate transaction reports		
9	The access control system shall be powered through UPS supply for uninterrupted operation even during mains power failure.		
10	Access control system for entry / exits should be provided. 20 numbers of card to be provided.		
	HEATING VENTILATION & AIR-CONDITIONING (HVAC) SYSTEM		

11	The entire laboratory shall be air-conditioned. The HVAC systems shall be provided to maintain the desired inside conditions in terms of temperatures, humidity conditions, air filtration requirements, room/zone pressure requirements and air change rate.		
12	**Housing/Casing of AHU unit**: Air Handling Units shall be of sectionalized constructions with an under frame of extruded heavy aluminum profiles. The under frame shall be mechanically strong and shall take double skinned insulated panels. The powder coated panels shall consist of 0.8 mm galvanized iron outer skin and 0.63 mm galvanized iron inner skin with 13 mm thick injected PUF insulation in between two panels. The AHUs shall be with true thermal break. There should not be any projections inside the AHUs and the covings has to flush with the side panels. Air tight access panel with suitable neoprene gaskets shall be provided in the fan section, coil and filter section. Similar gaskets should be used at all other joints of the AHU and its ducting. Units meant for indoor locations shall be specially designed to meet the arduous and corrosive atmosphere.		
13	**Platform for AHU**: In places where firm, even and concrete surface not available, the same will have to be constructed (masonry work) for the entire surface area which will be enclosed within AHU shed (approximately 250 sq. ft.).		
14	There would be independent supply and exhaust system with unidirectional inward airflow and 100% exhaust		
	Supply Unit:		
13	**Air Conditioning Plant**: The Air-Conditioning plant (of suitable capacity based on requirements of the lab's AHU) shall be with Direct Extension (DX system). The condenser unit shall have multiple compressors such that at least one compressor shall be as standby. The AHU shall comprise of Cooling Coil Section with 8 row deep DX coil, necessary component, 18 gauge SS 304 drain pan with 13 mm thick closed cell self-sticking polyethylene insulation, having slope at one side, drain connection from other side. Inlet and outlet coil nipples shall be sealed against unit casing by means of neoprene gaskets. Alternately, the cold air from the existing Central Air-Conditioning plant may be taken		

14	The laboratory rooms will be supplied with pre-conditioned (heating, cooling) fresh air by a mechanical ventilation system. Temperature inside the lab shall be maintained at 22°C±2.		
15	The air will be cooled to 12ºC - 13ºC then reheated with an electric duct coil to maintain required space conditions. This is required to maintain proper humidity conditions in the lab and humidity level should be maintained at 60±10%. To heat the air in the winter, an electrical heater unit (of adequate capacity) would be planned. This heater will be the same heater that will function as dehumidifier unit in summer		
15	**Design of Supply air system:** One variable speed supply fan of Gebhardt/ Krugger/ Nicotra or equivalent reputed OEM (Original Equipment Manufacturer) should be installed. Fan is designed for the whole required supply air amount (100% Redundancy). The fan shall be backward (or forward) curved centrifugal double inlet multi blade with optimized selection for low noise and high efficiency. Fans shall be statically and dynamically balanced for vibration free operation. Fans shall be enclosed in galvanized steel scroll cases and shall be driven by a variable frequency drive (VFD). The VFD should be pre-set programme for five different varying fan speed with selector switch for user operation. Fan and motor assembly shall be mounted on vibration isolators eliminating the need for external vibration isolators. Provision shall be made for belt tensioning. Motor should be of required capacity of Crompton Greaves/ Siemens/ ABB or equivalent of reputed OEM make. The fan should not exceed noise level of 75 db (A) from 1 m distance. A spare motor shall be provided in case of any burn out/breakdown for immediate repair/replacement. 4-5 spare fan belts shall also be provided which can be used for replacement in case of wear/tear.		
16	**Volume Control Dampers:** The distribution of air is planned via air inlets in the laboratory rooms. To control the air volume flow variable volume boxes in the supply air ducts are planned (at mouth of supply, after blower and after fine filter). The housing for these dampers (in fact all) will be of extruded aluminum, Low Leakage Aero foil design. A constant volume mechanical control damper valve will be installed which will also be easily accessible for corrective purposes. The supply air needs to be constant to maintain the proper air change rate.		

17	A wire mesh screen to prevent entry of rodents/birds/insects, etc. will be placed in front of the damper at the mouth of supply		
	Filters:		
18	There will be three sets of filters- coarse filters at mouth of supply and fine filter after blower motor of supply unit and HEPA filter housing in the supply ducting at a distance of about 500mm from fine filter unit. Coarse filter will be in outside fresh air pre-filter section and will be G4 washable filter (50 mm deep) class having average arrestance of 85-98% for 10 microns size as per EN779 2002, after damper at mouth of supply (as mentioned in volume control damper).		
19	Fine filters will be F7 filter (300 mm deep) Average Efficiency 99.97% for 0.3µ micron particle size as per EN 779 2002 standards and placed after coarse filter before air goes into DX system.F-7 filter to be provided with test port elbows (pre and post) to put in magnehelic gauges tubing for measure differential pressure across it. These test port elbows will remain sealed/closed in routine condition.		
20	The HEPA filter plenums (Containment Housing) shall be made in SS 304 (14 gauge) with air tight and leak proof construction. The HEPA filter plenums shall be provided Isolation dampers at Inlet and Outlet and shall have provisions and facility to carry out on site HEPA filter scanning, testing and validation, magnehelic pressure gauge to monitor pressure drop across the HEPA filter, fumigation ports to allow IN-SITU decontamination of HEPA filters and Bag-In-Bag-Out facility for change/replacement of filters. The quantity of HEPA filter should be provided on the basis of supply air room volume, length of duct		
21	**Ducting:** Ventilation ducting shall be made out of minimum 24 gauge GI sheet, all the ventilation ducting shall be leak proof and with thermal insulation (the colour of insulation material will not be black). This insulation is made of nitrile rubber or glass wool. The GI duct should be fabricated as per SMACNA standards. To prevent air leakage, all the lateral joints and flanged joints of GI ducting should be sealed using silicone sealant.		
22	**Ducting design** will be submitted by the vendor along with details of bends, dimensions of the duct at various places from AHU to the negative pressure lab, number of inlets/outlets planned, etc. which would be suitable from the lab. It will have to be consulted with lab design expert and the lab i/c and approved before construction is carried out.		

26	**Noise Reduction:** To avoid the allowed noise level, sound absorber will be installed on the housing of the AHU.		
	Exhaust System		
27	**Design of Exhaust Air System**: One variable speed exhaust fan of Gebhardt/ Krugger/ Nicotra or equivalent reputed OEM (Original Equipment Manufacturer) should be installed. The fan shall be backward (or forward) curved centrifugal double inlet multi blade with optimized selection for low noise and high efficiency. Fans shall be statically and dynamically balanced for vibration free operation. Fans shall be enclosed in galvanized steel scroll cases and shall be driven by a variable frequency drive (VFD). The VFD should be pre-set programme for five different varying fan speed with selector switch for user operation. Fan and motor assembly shall be mounted on vibration isolators eliminating the need for external vibration isolators. Provision shall be made for belt tensioning. Motor should be of required capacity of Crompton Greaves/ Siemens/ ABB or equivalent of reputed OEM make. The fan should not exceed noise level of 75 db (A) from 1 m distance. A spare motor shall be provided in case of any burn out/breakdown for immediate repair/replacement which can be done by local engineer. 4-5 spare fan belts shall also be provided which can be replaced by local engineer in case of wear/tear.		
28	Exhaust Air System will be designed such that it ensures directional air flow by differential pressure gradient across different rooms and maintains minimum 6-12-fold air change per hour in the lab area (including separate exhaust ducting for BSCs installed).		
	Ducting: Exhaust ducting (like supply) shall be made out of minimum 24 gauge GI sheet. The GI duct should be fabricated as per SMACNA standards. To prevent air leakage, all the lateral joints and flanged joints of GI ducting should be sealed using silicone sealant. All the ventilation ducting shall be leak proof and with thermal insulation (the color of insulation material will not be black). This insulation is made of nitrile rubber or glass wool		

29	**Air Filtration**: The exhaust air filter handling systems shall be provided with HEPA Filters such that it protects the maintenance staff from acquiring any infections while handling/replacing the filters -Bag in Bag out system (BIBO). It is essential that the maintenance person wears PPE while doing so. The HEPA filters will be located prior to exhaust unit at a place which is easily accessible and has adequate space for BIBO to function effectively. The HEPA filter housed in BIBO should have efficiency of H13 or H14 tested as per EN1822 at MPPS (Maximum Penetrating Particle Size). The HEPA filter plenums (Containment Housing) shall be made in SS 304 (14 gauge) with air tight and leak proof construction. The HEPA filter plenums shall be provided Isolation dampers at Inlet and Outlet and shall have provisions and facility to carry out on site HEPA filter scanning, testing and validation, magnehelic pressure gauge to monitor pressure drop across the HEPA filter, fumigation ports to allow IN-SITU decontamination of HEPA filters and Bag-In-Bag-Out facility for change/replacement of filters. HEPA Filters of 99.99% efficiency would be used in all exhaust. All the HEPA filters should have 0.3µm filtration.		
	Supply Air system to be electrically interlocked (fans, dampers, electrical) with exhaust air system, to prevent sustained positive pressurization.		
30	**Appropriate negative differential pressures** (for e.g. the negative pressure room where bio safety cabinets are placed shall be -12.5 Pa (-0.05" WG) relative to the anteroom, anteroom shall be -12.5 Pa (-0.05" WG) relative to change room if planned, and the change room shall be -12.5Pa (-0.05" WG) relative to the outside atmospheric pressure. Manual differential pressure gauges shall be placed outside Change Room, Ante room and main lab. Pressure balancing system to maintain room/zone pressures within specified set limits shall be provided which should be done through manual control. Magnehelic gauges used will be of DYWER/ WAREE/ WIKA or equivalent reputed OEM (Range -50 to 0 to +50 Pascal's) with supporting SS Hardware with Top plate & suitable Box SS 304 including tubing & suitable fitting & accessories in wall panel		

31	**Fire Dampers for supply and exhaust air:** As a safety feature, fire dampers shall be provided in both supply as well as exhaust duct. In supply system it will be in between variable damper and inlet (but at an accessible point from outside). In the exhaust system it will be located in exhaust ducting coming out of the building and prior to BIBO assembly at an accessible point from outside. These dampers are curtain type made of SS interlocking blades with fusible link which melts at 74°C		
32	**Leak proof dampers** with provision to prevent backflow of air shall be provided in supply unit (after blower motor and before volume control damper) and in exhaust unit (in between blower motor and volume control damper). It is made of SS blades with neoprene gasket		
	AHU SHED:		
33	It will be required at sites where AHU is installed on roof/ outside the lab building. AHU shed with provision for fencing, door with lock-key arrangement.		
	a. Framework vertically made of M S Square Pipe frame: 2 Inches X 2 Inches, 16 Gauge		
	b. M S Fencing with wire mesh: ½ inch X ½ inch		
	c. Supporting Structure M S Angle: 50 X 5 mm		
	d. GI pre-coated corrugated profile roof sheet: 0.5 mm thick duly supported with J Hook		
	e. 10 SWG with provision of door with lock and key		
	AHU Shed with fencing should be duly enamel painted and with anti-rust coating from both sides. The height covered shall be at least 8 feet. There should be no gap between roof sheet and wire mesh, if any angle creates gap, it should be covered with iron bars and wire mesh in between.		
	Electricals		
34	The electrical power requirement (power matrix) for the negative pressure laboratory should be calculated and provided by the lab.		
35	Supply should be three phase supply with proper earthing and required 440 V capacity to support the functioning of AHU Unit.		
36	**Earthing**: the vendor will do the necessary grounding work to ensure entire negative pressure Lab has adequate earthing.		

	EARTHING		
37	A complete earthing network comprising cables, copper tapes, electrodes and earth bonding of all relevant necessary non-current carrying metal parts of equipment/ apparatus shall be connected as required. The Earthing shall conform to IS 3043.All earthing conductors shall be of high conductivity copper/ G.I. and able to protect against mechanical damage as per requirement. The cross-sectional area of earth conductor shall not be smaller than half that of the largest current carrying conductor.		
38	All the required electrical panels, cabling, switchgears, surge and spike protection system and arrangements, etc. for the purpose of energizing the negative pressure laboratory facility shall be carried out by the contractor.		
37	PVC Conduit		
	1. All conduits shall be high impact rigid 2mm thickness PVC heavy duty type and shall comply with I.E.E. regulations for non-metallic conduit as per IS-9537/1983 (Part-III).		
	2. All sections of conduit and relevant boxes shall be properly cleaned and glued by using epoxy resin glue and the proper connecting pieces.		
	3. Inspection type conduit fittings such as inspection boxes, drawn boxes, fan boxes and outlet boxes shall be of M.S. or otherwise mentioned.		
	4. Conduit shall be terminated with adopter/PVC glands as required.		
38	PVC Conduit Accessories		
	1. Accessories used for conduit wiring shall be of an approved type conforming to IS: 3837-1966.		
	2. Standard PVC circular junction boxes are to be used with conduits for intersection, Tee-junction, angle-junction and terminal. For the drawing-in of cables, standard circular through boxes shall be used.		
	3. All jointing of PVC conduits shall be by means of adhesive jointing. Adequate expansion joints shall be allowed to take up the expansion of PVC conduits.		
39	Wiring / Cabling		
	1. All the wiring installation shall be as per IS: 732 with latest amendment.		

	2. Cables shall be continuous throughout conduit lengths and no joints are permitted. There shall be no kink in cables, neither any cut, abrasion or chink in the cable insulation.		
	3. Cables for power and lighting circuits and extra low voltage systems shall not be drawn into the same conduit. Lighting and power circuits shall run in separate conduits. In the case of three phase circuits, all three phases including neutral, if any, shall be drawn into the same conduit.		
	4. Maximum number of PVC insulated 650/1100V grade/copper conductor cable shall conform to IS:694-1990		
40	Lighting switches outside the containment area shall be Modular Type, single pole, quick make and break, silent action type and totally enclosed for flush or surface mounting as required. Lighting switch inside BSL-3 Lab containment area shall be IP 66 rated. 6/16AMP Switch Socket Outlets. Switch socket outlets shall be as per BS: 1363 single pole 6Amp 3round pin, except otherwise specified and suitable for surface or flush mounting according to location.		
41	Switches shall be of the quick-make and break type silent action totally enclosed with solid silver alloy contacts. Switched socket outlets for indoor use shall be housed in suitable galvanized steel boxes as per BS: 4662 with conduit knockouts. Types and finishes of socket plates shall match those for the lighting switches. 6/16 AMP Switch Socket inside BSL-3 Lab containment area shall be IP 66 rated		
42	MCCBs shall comply with standards IS/IEC 60947-1 & 2. The breaking capacity performance certificates shall be available for category A to the above mentioned standards. RCCBs must conform to IS12640 -1 and IEC/EN 61008 standards. RCCBs shall be suitable for operation at 240V/415V, 50Hz supply. The RCCB ratings shall be available from 25A-125A in SPN and TPN versions with the sensitivity of 30mA (for personal protection) and 100/300mA (for Fire protection), as per the BOQ requirements. Rated conditional short circuit shall be 10KA RMS		
43	RCCBs shall carry ISI marking		
44	All the electrical fittings and fixtures in the laboratories areas on the walls shall be sealed (all conduits, outlets shall be sealed with silicon sealant), leak proof and capable to withstand chemical exposures during fumigation.		

45	Lighting should be on ceiling and surface mounted, LED of reputable manufacturer, suitable capacity and arranged as per the layout provided. Light fixtures inside shall be with gasket or otherwise sealed with silicon.		
46	The Laboratory rooms lighting shall provide 400-450 lighting Lux level. All the Light Fixtures shall be LED and surface mounted type constructed in CRCA Powder coated housing, powder coted bottom frame, LED panel with suitable driver. The construction shall be in slim panel.		
47	Rating -40 W and 20 W ,		
48	Light Fixtures shall be IP 55 rated		
49	The electrical power distribution scheme shall be provided to provide back-up power supply to the critical components and equipment through a UPS (to prevent any disruption of work) and through Diesel power generator set for the entire lab.		
50	Every workbench should have at least one socket which received electrical input through UPS of negative pressure lab. Extractor fans of BSC' ducting should also receive electrical input through this online UPS of the negative pressure lab.		
51	Power sockets with lid (15-20 in each room) should be provided for equipment (as per the layout provided). Modular type, power sockets with lid of 5A/15A are to be provided at various locations on the wall as per discretion and strategic arrangements /provisions for lab equipment. The Sockets meant for UPS should be screen printed as (UPS) for ease of operation and identification marked wires and cables used shall be copper wire of standard make (ISI Marked) and manufacturer.		
	AHU Control panel:		
52	Cabling from the panel to individual AHUs and control wiring will be in the scope of HVAC contractor. However cabling up to the electrical panel will be provided by site. Termination will be done by HVAC contractor. In case of power failure, the alternate power through Main Diesel Generator Set of the Hospital Supply to be used. The Panel is to be design accordingly.		
53	Housing of the AHU panel shall be GI 16 gauge powder coated, with cable inlet and outlet going through grommet and with earthing connection arrangement.		
54	Multi-function meter displaying voltage, load and power factor for electricity supply to AHU panel should be present.		

55	LED indicator for ON/OFF will be provided for RBY phase, AHU supply, AHU exhaust, Standby exhaust, Condensation unit, Heating Coil of Supply Unit		
56	DOL Starter Switch to be provided for AHU exhaust, AHU Supply and Condensation Unit (in the order)		
57	All electrical equipment used should be high quality of reputed manufacturers like VFD may be Allen Bradley, Siemens make or equivalent, MCCB may be of Havells, Legrand, Anchor, Siemens, L&T or equivalent, wiring of Havel's, Polycab or equivalent make, etc.		
58	Control panel should show simple instructions for starting the AHU		
59	Diagrams of electric circuit should be displayed on the backside of door of panel.		
60	Control panel should have its lock and key (for controlled access)		
61	SOP for lab condition for operating VFD with selector switch for manual operation of AHU		
62	MCCB panel suggesting supply and safety mechanism for different sections of the lab should be provided at adequate place near AHU control panel.		
63	**Fire Safety:** Fire detection and alarm system (FDA System) and fire extinguishers of Type ABC (2kg) shall be provided at strategic locations (negative pressure lab Room, Ante Room and outside at entrance of negative pressure lab and near control panel, near AHU and should overall comply with fire safety guidelines). Training should be provided for its operation.		
	Emergency Preparedness:		
64	One emergency shower and one eye wash station for each site shall be provided at strategic location in compliance with ANSI / ISEA Z358.1. The water supply for emergency shower shall be sufficient to supply at least 3 GPM for 10 minutes. Shower shall be hands free and stay open valve type. The water supply for eye wash shall be sufficient to supply 0.4 GPM (1.5 liters) for 10 minutes in low velocity flow.		
65	Emergency Exit door with panic latch door from the negative pressure laboratory shall be provided wherever mentioned for personnel exit in case of an emergency and can also be used for equipment placement inside lab. Door should be equipped with hooter/audible alarm every time it is opened.		

66	**UNINTERRUPTED POWER SUPPLY SYSTEM (UPS)**: A central UPS console shall be provided to cater to the extreme essential power requirement of the laboratory. All critical components like lights, Door Interlocks, exhaust blowers of BSCs and critical equipment shall be provided with uninterrupted power supply. UPS for adequate load to support the AHU for 30 minute shall be provided by vendor. Cabling and installation shall be done by contractors end.		
	Interiors of the negative pressure lab:		
67	Modular walls**:** The internal building finishes shall be monolithic, impervious, non-particle shredding, chemical resistant especially to Hypochlorite cleaning and suitable to withstand chemical use during decontamination/ fumigation. Modular wall should be made for Clean Room application, pre-engineered 60 mm thick PUF panels with GPSP Sheets with PUF insulation of minimum 38-40 kg/m^3. Both surfaces should be 0.8 mm thick GPSP sheet and has to be installed along the outer walls, partitions and false ceiling to create an impervious shell which is fully sealed. The panels on either side will be coated with Epoxy painted. These panels must have good aesthetic appeal as well and have to be easily maintainable. Glass View Panels shall be provided in the Modular Wall panel of negative pressure lab section and Ante Room for provision of natural lightening and for viewing from outside (in corridor side/other area) appropriately and aesthetically. Glass View Panel shall be fixed type vaccumised and insulated type with 6 mm toughened glass with proper sealing along all the side as well as on the edges and with provision for easy cleaning and maintenance. The height of wall shall be minimum 9 feet (to accommodate BSC with its thimble and damper).		

68	Modular false ceiling: The internal building finishes shall be monolithic, impervious, non-particle shredding, chemical resistant especially to Hypochlorite cleaning and suitable to withstand chemical use during decontamination/ fumigation. Modular false ceiling panels should be made for Clean Room application, pre-engineered 60 mm thick PUF panels with GPSP Sheets with PUF insulation of minimum 38-40 kg/m^3. Both surfaces should be 0.8 mm thick GPSP sheet and has to be installed along the ceiling, to create an impervious shell which is fully sealed. The panels on inner side will be coated with Epoxy painted and powder coated on outer side. These panels must have good aesthetic appeal as well and have to be easily maintainable. The construction of false ceiling shall be strong to allow 1 person weighing 50-60 kg to easily walk/crawl above it for necessary work. Service window will be provided for access above false ceiling preferably outside negative pressure lab.		
	Flooring shall be of 5 mm (3 mm + 2mm) of self-levelling industrial epoxy including screed compound for adhesion, 3 mm semisolid cladding of EPOXY will be applied over a uniform cemented flooring and 2 mm semi-liquid epoxy over 3 mm hardened surface with bubble free perfect smooth finishing completed in three steps: Cementing (Uniform Flooring), Hardening (3 mm epoxy) and smoothening (2mm epoxy). Epoxy used for this application will be self-levelling and clean room compatible. Flooring outside the negative pressure lab facility where required for aesthetic purpose will be covered with vinyl flooring.		
	Doors:		
69	Flush Door finishes shall be 45mm thick with chemical resistant, anti-fungal and anti-bacterial properties.1.2mm thick GPSP sheet suitable to fix on 60 mm thick wall panel with provisions for double glazing glass for all door and hardware like push plates and handle on both side, lock and key, etc. PUF Panels will be with GPSP Sheets, epoxy painted on both sides and PUF insulation of minimum 38-40 kg/m3. Concealed hardware for fixing of door frames, TS-71 door closure, SS hinges, SS Door handle, SS ball bearing butt hinges, concealed tower bolt for the double door, both sides lock and key arrangement. Suitable neoprene “Y seal” type gaskets may be used between the doors jam and door stop.		

70	Door interlocking systems shall be complete with controller module, push button stations with LED indication, electromagnetic locks. To take care of malfunctioning of interlocking, alternative electrical switch to manually open the doors should be provided.		
71	Vision Glass for doors shall be fixed type vaccumised and insulated type with 6 mm toughened glass and shall be installed for natural lightening flushed with surfaces of the door. Fixed flush to both faces of the door / wall panels to provide ease of cleaning and maintenance. No crevices / joints / sloped profiles are used for fixing the glass. This will avoid particle contamination and dust accumulation.		
72	Covings: Extruded aluminum anodized R75 clip-on type (Male & Female connectors) covings for entire wall to floor, wall to wall & wall to ceiling joints. Extruded aluminum double cove integrated with top track of the partition panels. Corner internal & external cove joining pieces in aluminum anodized finish. Having similar construction and finish as the walls and properly sealed with silicon sealant with wall & ceiling. Covings used in construction shall include Wall to Wall Coving -R-75, Wall to Ceiling Coving-R-75, 90°Corner, 3-D Corner,2-D Corner		
73	All penetrations through walls, ceiling & floors will be sealed using a suitable caulking. Caulking shall be applied around pipes and conduit. The interior of electrical and cable conduit shall also be caulked.		

74	**Pass Box:** Pass Box (Static type) shall be provided at strategic / required locations for transfer of samples, chemicals and materials to and from the Laboratories (as indicated in the design submitted). In case of two pass box, one will be to receive the sample within and second will be for sample discard to autoclave room or for disinfected waste collection. It shall be made of SS 304, with inbuilt UVGI system, with interlocking in such a way that both doors cannot be opened simultaneously, panel mounted, with buzzer to indicate open status for any door, fixed at a height of 750 mm from floor in sandwich panel, with dimension of 610 mm (L) X 610 MM (W) X 610 MM (D), with load bearing capacity of 40 Kg, door make-Single door in each side, with glass and air tight gasket, with door latch for one door(door opening outside), with handle of superior quality, with viewing glass made of polycarbonate or 10 mm thick tempered glass, hinges made of SS304, with one LED lamp inside pass box, chemical resistant especially to Hypochlorite solution, alcohol, etc., flange to seal pass-box and sandwich panel, with indicating lamps in both sides to show status-On/OFF switches for all lamps. A SOP must be developed for pass-box decontamination.		
	Furniture inside the lab:		
75	**Laboratory work stations** (numbers as per the Lab design) Frame shall be made up of SS 304, with nylon cushion/bushing for the legs, non-particle shredding material and shall be chemical resistant to allow chemical disinfection. It should be strong to hold the granite top/workbench as well as equipment places on the workbench. There shall be no drawers or safe in the workstation and shall have arrangement for placing the UPS below the work bench.		
76	**Garment Storage Cabinet**- One garment storage cabinet (approximate size 5X2 feet size) that can be locked shall be provided in the Change room/Ante Room. It shall be of SS 304 with two compartments and shelves for storage of clean items of suitably large dimension to fit in the Ante/ Change Room (size to be consulted with site i/c)		
77	**Coat hangers** 8-10 individual hangers made of SS30, in group of 6 each, will be provide to hang gowns/ aprons in Ante Room and change room (in consultation with site i/c)		

78	**Shoe rack** (one)- It should be made of SS 304 with 5 shelves, open type and wide enough to hold two pairs of shoes in each shelf and shall be able to fit in available space as per design.		
79	**Wash Basin** (two): Modular standalone hand washing sinks made of SS 304 with elbow or foot operated mechanism shall be provided as per design inside lab and in change or ante room. Wall hanging soap dispenser to be provided along with each wash basin unit. A Tissue paper rack with a mechanism to pull out tissue papers, will be provided near the wash basin to dry hands. Water lines that penetrate the negative pressure lab space shall be equipped with back-flow prevention devices. Outlet pipes should be made of PVC with closure outside lab made of SS plate.		
80	**Laboratory Stools** (five): Laboratory grade hydraulic SS stools with back support, foot rest, rotating type with castor wheels at the base, shall be provided by contractor.		
81	**Trolleys**: Two tier trolleys (two quantity) made of SS 304, size 2'x1'6" with side walls to prevent fall of items from sides and wheels at bottom for smooth movement, shall be provided. **Plus,** one similar trolley will be provided for each BSC. One of the trolleys for transportation of material from lab to the Autoclave room shall be provided with a lid to prevent direct exposure of material to outside.		
82	**Monitoring Mechanism:** Monitoring of crucial parameters will be made available in the lab for the following:		
83	Visual display of Room Pressure, Relative humidity and temperature in the negative pressure lab		
84	Differential pressure through Magnehelic gauges in Ante-room, Change Room (where available) and outside negative pressure lab		
85	In the Control Panel- Multi-function meter displaying voltage, load and power factor for electricity supply to AHU panel and LED indicator for ON/OFF will be provided for RBY phase, AHU supply, AHU exhaust, Standby exhaust, Condensation unit, Heating Coil of Supply Unit		
86	CCTV footage from the various sections in the Microbiologist's room		
87	Hooter/alarm when the emergency exit door is opened as well as when fire detection system is activated in incidence of fire.		
	Connectivity:		

88	LAN wiring for internet access inside the lab with sockets to be provided at strategic locations (near work benches) in negative pressure lab Room.		
89	A suitable EPABX System shall be provided for the laboratory. Telephone instrument with line will be kept in Microbiologist room, Staff room and negative pressure lab room and any other place as suggested by Site i/c. Telephone with speaker for hands free operation will be provided inside negative pressure lab Room.		
	SPECIALIZED LABORATORY SUPPORT EQUIPMENTS AND SYSTEMS		
90	Split Ac 2 Ton- 3 no's		
	Communication Facility (Intercom & LAN)		
91	The intercom and LAN shall be fully wired in CAT 6 cable should be provided by the contractor.		
92	**Biological Safety Cabinets** : Class 2 B2 Supply, installation and commissioning with external blower- 1 no's		
93	The Biosafety Cabinets shall be Class II A2 type and shall conform to NSF 49 standards. 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.		
94	The Bio-Safety Cabinet shall be complete with following accessories, features and specifications :		
95	Approx. Work Space of 9000 mm (W) x 660 mm(D) x 610 mm (H)		
96	Supply Air Face velocity not to exceed 0.65 m/sec		
97	Working chamber to operate under > 10 mm negative w.r.t room pressure		
98	Drain receptacle with drain faucet		
99	Fluorescent light & UV light		
100	Extract plenum and Air control dampers		
101	2 Nos. Power outlet switch/sockets		
102	80 to 100 fpm air inlet velocity at 8-10 inches of sash opening		
103	Supply and Exhaust HEPA filters shall be mini pleat separator less type with 99.97 % efficiency down to 0.3 micron particle size		
104	Supply and Exhaust Blowers with motor, statically and dynamically balanced.		

105	Magnehelic differential pressure gauge for chamber and HEPA filters		
106	Control console with indication lamps		
107	The Biosafety Cabinet shall be factory tested and certified and shall be validated on-site after installation		
108	Supply and Installation of Autoclave (Vertical)- 1 no		
	AUTOCLAVE		
109	Double door Stainless steel make cylindrical type shape size 450 mm dia X 900 mm Long. Semi-Automatic type. Including all interconnected piping, controls, supporting stand etc complete as per the manufacturer's specifications.		
110	The autoclave shall be free standing type. The autoclave should be complete with a compatible in built steam generator.		
111	CONSTRUCTION		
	1. The chamber shall be constructed of heavy duty SS of 316 with full argon welding. The chamber material and construction shall meet ASME standards for unfired vessels. The chamber shall be duly reinforced with the help of carbon steel.		
	2. Doors and jacket shall be constructed of stainless steel sheet of 304 grade. Doors must be provided with automatic safety locking and unlocking devices. All doors must have a gasket to ensure a high temperature seal.		
	3. Chamber and doors must be designed for working under positive pressures up to 31 psig at temperature up to 135o C.		
	4. The autoclave shall be insulated with 50 mm thick resin bonded glass wool to minimize heat loss and restrict the skin temperature within reasonable limits.		
	5. Pipes and fittings shall be of stainless steel and bronze. Valves shall be ball type, self-cleaning type.		
	6. Key locked main power switch should be provided for additional safety and security.		
	7. The autoclave must be complete with a vacuum pump of required capacity.		
	8 The autoclave shall be complete with steam generator compatible with the autoclave. The steam generator shall be fabricated from SS 316 L with industrial immersion heater of reputed make. The immersion heaters shall be heavy duty type in stainless steel construction.		

112	The heater shall be of suitable capacity so as to give the required operating temperature and pressure in less than 30 minutes of switching it on and should be capable of maintaining the pressure and temperature thereafter during various load cycles of the autoclave.		
113	The steam generators should have automatic pressure control and other safety features like low water cut off to safeguard heaters etc. The steam generator should be complete with all accessories, inlet, outlet, drain connections etc. Shall be electrical operated, shell and tube type and should be compatible with the autoclave.		
	CONTROLS		
114	The autoclave shall be fully programmable type with microprocessor and designed to control and monitor a wide variety of sterilizing cycles, depending upon the load to be sterilized. A manual operation facility shall also be provided as a standby in case of control failure. The automatic control shall have following features (but not limited to) :		
	- Audible alarms in case of any cycle interruption or cycle failure.		
	- The autoclave should be equipped with a printer to record and print relevant information concerning operation during the cycle such as temperature, pressure, cycle time etc.		
	- The control system should be self-diagnostic and must provide fault message to the operator.		
	- Cycle parameters should be adjustable with the help of codes to prevent adjustments by non-authorized persons.		
	- The autoclave should have following safety features to prevent the opening of door in following instances (but not limited to).		
	* When the chamber is pressurized		
	* When the sterilization cycle has not completed		
115	ACCESSORIES		
	The Autoclave shall be complete with following accessories :		
	- Jacket Steam Valve		
	- Chamber Steam Valve		
	- Safety Valve Exhaust to Drain		
	- Pressure Reducing Valve		

	- Jacket and Chamber Steam inlets		
	- Moisture separator		
	- Rupturing Disc		
	- Non return valves and strainers		
	- Steam Filter		
	- Solenoid Valve/s		
	- Vacuum break valve		
	- Vacuum break filter		
	- Compound Gauge		
	- Pressure Gauge		
	- Safety Valves		
	- Steam Trap		
	- Jacket drain valve.		
	Digital Thermometer		
	Electrical Control Console/Panel with printer to record cycle parameter at defined frequency.		
116	OPERATING STANDARDS		
	a. The vacuum autoclave shall give a minimum of three vacuum cycles to purge the autoclave of all the air.		
	b. Operating temperature shall be 121o C or 135o C, as per programmed cycle parameters, which will be discussed and finalized with the Engineer.		
	c. The autoclave should completely kill the approved biological indicator at the maximum design capacity. Biological indicator shall be Bacillus stearothermophilus spores using vials or spore strips, with at least 1X106 spores per milliliter. The steam condensate shall meet EU WFI Specifications.		
117	INSTALLATION AND TESTING		
	Installation		
	The autoclave shall be installed/ mounted on a sturdy tubular stand of SS.		
118	Hydraulic Test :		

	The autoclave chamber shall be tested to 1.5 times of the working pressure, sterilization jacket to twice the working pressure. The test pressure will be maintained for a minimum of 2 hours.		
119	DUNK TANK		
	Dunk tank shall be provided. The dunk tank shall be constructed in SS 304 (16 gauge) for active use of disinfectant chemical like NaOH, Sodium Hypo-Chloride Solution. Approx. size of dunk tank shall be 550x5500x900 mm		
120	**EMERGENCY SHOWER AND EYE WASH SYSTEM**		
	An emergency deluge shower shall be provided in the exit air lock. The shower system shall be with hand operated lever and shall conform to ANSI/ISEA Z358.1 standards		
121	**UVGI**		
	UVGI system shall be installed in BSL-3 Laboratory room. The UV lamp wattage/capacity shall be selected as per the laboratory floor area conforming to standards		
	Laboratory bench with storage cabinet(4'X2')- 2 no's		
	Cupboard with self in Anti Room-1 no		
	Biometric Access Control System with accessories- 1no		
122	**CCTV Monitoring Devices:** Camera to continuously monitor the activities inside and outside the negative pressure lab by providing Central CCTV Monitor. Six Camera unit should be installed(one/two outside the negative pressure lab covering the entry and corridor area, one in ante room and two inside negative pressure lab Room and one covering AHU Area). Supply, installation, testing and commissioning of the following shall be done:		
123	• Color Camera 1/3" CCD, IR type, dome shaped, 480 TV lines resolution which work in low light.		
124	• 6 Channel standalone / Network version DVR Make: DAHUA /equivalent reputed OEM		
125	• Hard Disk with 1 TB (TERA byte) Capacity -Make -Seagate or equivalent reputed OEM		
126	• 6 Channel Power Supply of reputed Make		
127	• Supply Laying of Co-axial Cable with necessary Accessories		

128	• Wall mounted monitor (at least 20 inch LED/LCD) located in head of the department room or as suggested by site i/c.		
	Civil works and Plumbing:		
129	Ensure water proofing of the roof (if required) is done prior to carrying out the work. Levelling of the floor where required will be carried out the vendor. Civil works to create new door arrangement/ closure of exiting openings, sealing of the existing windows, etc. will be carried out by the vendor.		
130	Drain: All the liquid drain coming out from the laboratory shall be connected to a single drain with back flow prevention, which would be further connected to existing local ETP plant in the hospital campus if available. All drains shall be equipped with “p traps”. Penetrations made in walls and floors must be properly sealed.		
131	Water connections for the emergency shower and eye wash and wash basins to be appropriate provided.		
132	Ensure that pipes and connections are leak proof to avoid flooding behind modular walls.		
	Labelling to be done as per following details:		
133	Biohazard label should be placed outside the laboratory.		
134	Labels for all switches (to be provided) including in the MCCB panels, LT Panel and AHU Control panel		
135	Labelling of the negative pressure lab and Ante Room/ Change room including Emergency exist.		
136	negative pressure laboratory layout should be provided at the entrance of Lab		
137	**Final performance and capacity testing and validation:** All the certification and validation parameters for negative pressure lab must be done in accordance in with NIH certification requirement. BSCs will be validated and calibrated as per NSF 49and EN 12469 standards.		
138	There will be periodic mid-term assessment of the project (after plumbing, electrical works, ducting and AHU installation, construction of interiors and dry run) by identified technical people and Site i/c to assess the timely and proper execution of the project.		
139	After completion of the construction and installations, the entire laboratory facility, all the equipment, systems and services shall be validated by the contractor under supervision of a committee of the consultants / client or lab i/c as follows:		

	For Bio Safety Cabinet:		
140	Validation of BSC: Particle count test, PAO (Filter Integrity test for pre-filters, filters ULPA filter/ HEPA filters), Air in-flow velocity and down-flow velocity test as per national standards with devices traceable to National/International Standards, UV and Fluorescent light intensity		
141	Maintenance of the BSC to be carried out if existing one to be used (and not covered under warranty) i.e. complete and thorough cleaning of working Area of cabinet, cleaning of exhaust filter from the top to eliminate and external clogging or disturbance and inspection of ducting, cleaning and oiling of sliding sash movement system, checking of switches, tube lights and UV light fittings, checking of airflow and exhaust system, calibration and validation of Magnehelic Gauges if existing, etc.		
142	**For negative pressure lab**- The installation as a whole shall be balanced, tested and validated upon completion, and all relevant information, including the following shall be submitted to the Institution		
143	Pressure in each room/zone as per the design, differential pressure readings including across filters.		
144	Air inflow velocity and outflow velocity test across all inlets and outlets to measure/derive air change rate per hour (minimum 6-12 ACH) and as per design		
145	Smoke pattern test for directional airflow should be performed during validation including for Pass box.		
146	Temperature shall be maintained at 22°C±2 and humidity level should be maintained at 60±10%		
147	HEPA Filter (in BIBO) integrity test based on PAO test and manufacturer's certifications		
148	Electrical current readings, in amperes on full load work, average running, and on starting, Testing of power cabling, earthling, AHU control panel, MCCB panel and LT panels		
149	Containment room -the walls, floors, ceilings, penetrations, and other containment barrier features have adequate integrity		
150	**Operational performance testing for :**		
	HVAC including Blower motors in the Supply, exhaust including emergency, extractor of BSC ducting and condensation unit		

	Ducting for any potential leakages and insulation breakage		
	Dampers including variable control, leak proof and fire control (only verification)		
	Magnehelic Gauges		
	Temperature control sensors; pressures control sensors,		
	Pass box		
	Split ACs		
	Fire Detection system		
	EPABX System		
	Access Control System		
	CCTV System		
	UPS Back up system		
	Emergency Shower and eye wash station		
	Interlocking of supply blower motor and exhaust blower motor		
151	Prior to validation, the contractor shall prepare and submit a detailed 'Validation Document' for approval.		
152	The Validation Document shall provide the detailed procedure for validation, parameters for validation, validation schemes and formats for recording the validation details.		
153	The contractor shall arrange to do a mandatory third party validation		
154	The contractor shall arrange for all the instruments, tools, manpower etc. required for the validation. The validation results shall be recorded and documented and shared with the site and hiring/funding agency.		
155	The above validation tests shall be performed Annually during the warranty as well as maintenance period		
157	In addition to the above validation tests, preventive maintenance servicing of all installations, operational performance testing as listed above shall be carried out on a quarterly basis during the maintenance as well as defects liability period.		

158	**Maintenance Services**: After the completion of defect liability and warranty period of two years, it will be appropriate to have a longer term comprehensive annual maintenance for a period of at least three years through the same agency who construct the lab. Apart from annual validation and quarterly preventive maintenance servicing as described above, it should include attending breakdown maintenance calls as and when required, repair/replacement of compressors, refrigerant gas charging of condensing units, besides replacement of spares required (due to wear and tear) at pre-fixed rates.		
159	**Training of personnel:** Institution personnel to be trained over 2 days for:		
	Operation of HVAC Plant and all other equipment and systems.		
	Adjustments of settings for controls and protective devices		
	Servicing and Preventive maintenance		
	Emergency response training.		
160	**Submission of specialized systems and services layout schemes prior to initiation of the work:** Conceptual layout plans and schematic drawings of various specialized services and utilities showing tentative locations of equipment and furniture such as to be submitted before initiating work at site for approval to hiring agency and site i/c		
	HVAC system		
	Air filtration system		
	Pressure control system including differential pressure zones		
	Fire Detection and Alarm system		
	Air distribution System including ACH		
	Electrical distribution system		
	Monitoring system including CCTV and three important parameter monitoring (pressure, temp and humidity)		
	Water supply and drainage system		
	AHU Control Panel System with VFD controls and SOP for lab condition for operating VFD with selector switch for manual operation of AHU		
	Chart for defining the AHU fan and its speed for air quantity being delivered by supply and exhaust blower at different speed		
	Un-interrupted Power Supply system		
	Specialized laboratory support equipment/ primary containment barriers such as		

	Pass boxes		
	Entry exit protocols		
161	**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.		
	a) Once all the equipment and systems are found to be working satisfactory, the Validation of the BSL-3 Laboratory shall be carried out by the Contractor in the presence of authorized representatives/committee of NIRT, Chennai. 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.		
	b) Before start of the validation process, the Contractor 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.		
	After completion of the validation process, the Contractor shall compile the validation results and submit to NIRT, Chennai.		
	d) The Contractor shall provide all the test and measuring instruments, tools, tackles, manpower etc. required for the Testing, Commissioning and Validation Process.		
	DOCUMENTS & DETAILS TO BE SUBMITTED ON COMPLETION		
	on Completion of the works, the Contractor shall submit the following documents to NIRT, Chennai in three sets:		
	1. Complete Set of 'AS BUIT DRAWINGS'		
	2. Operation and Maintenance Instructions & Manuals for individual Equipment and Systems		
	3. Recommended List of Spares and Consumables		
	4. Preventive Servicing and Maintenance Schedule		

	The Contractor shall submit the Technical Specifications and Data sheet for all the equipment/s and systems supplied and installed.		
	b) The Contractor shall submit a written undertaking that spares and after sales services for all the equipment, systems and services installed in the facility shall be made available for a period of at least five years from the date of handing over the facility. The after sales services may be availed by the Employer from the executing Contractor under a separate Operation and Maintenance Contract.		
	External Validation:		
	NIRT, Chennai may desire to get the BSL-3 Laboratory validation done by external experts and if it is so desired and directed, the contractor shall provide all the required assistance for carrying out the validation by external experts. The Contractor shall extend full cooperation and provide the validation instruments, tool, tackles and manpower etc., as required and asked by the employer.		
162	**COMPREHENSIVE ANNUAL OPERATION &MAINTENANCE SERVICES**		
	After Completion of Works and Handing Over, NIRT, Chennai may ask the Contractor to provide Comprehensive Operation and Maintenance services for a period of 1-5 years at the quoted and pre-approved rates invited in the tender, and enter into a contract for comprehensive annual operation and maintenance services with the Contractor. The Comprehensive Operation and Maintenance Services to be provided by the Contractor shall include:		
	Providing qualified, experienced and trained manpower for handling operation of the Laboratory Facility on day-to-day basis on all working days		
	To carry out routine and preventive servicing and maintenance of the equipment, system and services like Condensing Unit, AHU, Exhaust Blowers, Autoclave, Biosafety Cabinet, Pass Box, Access Control System, BMS, Building Electrical System, Fire Alarm system etc., installed in the facility.		
	Attend to and carry out any breakdown maintenance works required from time to time, as and when it occurs and notified by the Employer.		
	Maintain daily Log Sheet of laboratory operating parameters		
	Providing Spares and Consumables for various equipment, systems and services		

	like BMS, Access Control System, Gaskets (for Doors and Pass Box), Filters, Valves, Light Fittings, spare switches and sockets etc. and maintain suitable inventory at site during the period.		
	Maintenance of electrical system, services and construction works executed by the contractor		
	Annual Validation of the Laboratory Facility		
	During the operation and maintenance period, the RESPONSE TIME by the contractor should not exceed 24 hours from the time the breakdown intimation is given by the user.		
	During the operation and maintenance period, it is expected that the Contractor shall attend the breakdown and rectify the fault/s promptly with minimum possible downtime. The maximum permitted DOWNTIME shall be 48 Hours from the time the intimation is given by the user.		
	If the repair/rectification is not carried out by the Contractor within the maximum permitted DOWNTIME, the Employer shall charge penalty, for each breakdown instance, subject to a maximum of 10% of the Annual Contract		
	The contractor shall maintain sufficient Inventory of required spares and consumables at site to minimize the downtime and to ensure smooth operation and functioning of the Laboratory		
	Before entering into the Comprehensive Operation and Maintenance Contract, the Contractor shall submit details of manpower proposed to be deployed at site, detailed schedule of preventive servicing and maintenance works, the formats for maintaining Daily log sheet and servicing and maintenance records and details of spares and consumables to the Employer		
	Warranty : Two years warranty + 2 years comprehensive Maintance contract and One year Annual Maintance Contract.		