

## Revised Specification (Annexure –A)

### TECHNICAL SPECIFICATION FOR BSL-3 LAB ROOMS WITH SUPPORTING INFRASTRUCTURE

SCOPE OF WORK: to Plan, supply and install BSL-3 Laboratory , with objectives of complete environment control and in accordance with the specifications, bill of quantities, including necessary Turnkey works.

#### 1. SELF LOADING WALL & CEILING CLADDING SYSTEM

1) The Wall Cladding system will be based on a technological, modular unit designed to self-stand and to furnish interior spaces in controlled bacterial environments, in a flexible and functional manner. The Inner surface of a Wall surface should be created with high technology ANTIBACTERIAL SURFACE.

System should offer total ease of cleaning and sanitization of the inner surfaces, it should be designed avoiding sharp angles and corners; adjacent surfaces should be molded flushed by means of connecting elements. System should afford the maximum versatility at the planning stage and flexibility during erection, ensuring trouble –free maintenance. During the installation of first the structural parts and subsequently the finishing elements, the system should ensure perfect integration of technical networks and allows ample operational flexibility on the construction site.

The clean, dry installation method should enable optimum programming of the various work phases, allowing optimization of the installation of technical systems and any necessary alterations to be made – right up to checking and final testing of the installed systems – before the modules are sealed.

System should comprise of:

1. A self-loading sub frame load bearing structure.
2. Perimeter finishing panel.
3. Absolutely no Sealing gaskets (the appearance of Lab should be completely joint free, only permitted joints will be light fittings and accessories. No joint in walls and ceiling should be protruded, in order to make LAB inner surfaces completely free of infection all panels and joints should be flushed to one level.

System should assure the maximum independence from the surrounding environment because it should be composed of a sub frame made of specially designed Galvanized steel framework specifically manufactured for the self-standing structure and designed to create the necessary technical voids to house utility networks and pipe/cable drops.

#### Self-loading, sub frame comprising of:

PPC steel fabricated Horizontal guides and rails sized to support the self-loading modules and prearranged for the future attachment of the connecting profile.

Horizontals made of galvanized steel pillars/rails with broad cross section and dual cavity, with geometry designed to achieve exceptional rigidity.

Perimeter finishing panels composed as follows:

#### WALLS

The self-loading wall system should be clad with 60 mm thick PUF panels made out of 1mm thick PPGI on outer side and 1mm GI sheet on the internal surface duly injected with PUF to a minimum density of 40kg/sq metre , which is to be finished in ANTIBACTERIAL FLEXIBLE SURFACE:

- The result should be a durable and uniform bacteria static material that should be easy to clean and extremely hygienic.
- **Reaction to fire: class 1.**

The panels should be supplied with specially designed steel/PVC electrical conduit pipes inserted at pre-determined intervals that allow them to be used for MV/LV electrical supplies.

In order to create a smooth uninterrupted surface between adjacent panels, thereby preventing the risk of the accumulation of dust and bacteria in gaps, the panel should be installed in an apparently single full height floor-to ceiling piece with Cam lock system to ensure tight interlocking between two adjacent panels.

Continuous electrical conductivity of the partition modules for the scope of earth bonding or in order to create a Faraday cage effect should be obtained by interconnecting sub-structural elements with jumper leads.

#### CEILING

The hermetic ceiling for sterile rooms should be a self-load bearing structure in heavy gauge extruded PP Galvanized steel profiles with durable coating; The ceiling panels made of 50mm thick PUF panel with PUF density not less than 40KG/sq metre with outer surface laminated are mounted, interlocked with each other through tongue and groove joints. The Ceiling should be free of any apparent joint including gaskets, the ceiling will be both horizontal and ceiling and coving at the sides, entire ceiling structure will be of self-supporting type. It should be supported on the walls of same PUF panels, in such a manner that the flexibility is achieved even in complete suspension system.

#### **COVING**

Aluminum covings shall be installed on vertical corners, as well as wall /ceiling joinery to avoid 45 degree angle duly finished with epoxy filler and later sanded and painted with epoxy anti bacterial paint in approved shade

#### **FINISHING OF SURFACE**

Internal Finishing of the wall and ceiling panels: The joints of the wall and ceiling shall be filled with an epoxy filler duly sanded to a smooth finish to a regular plain surface, this surface shall be given a coat of etch primer and finished with epoxy anti bacterial paint to no less than 300 micron thickness in approved shade

The outer surface of the panels open to air shall have the joints and crevices filled with epoxy filler duly sanded to a smooth finish

#### **2. FLOORING -ANTISTATIC CONDUCTIVE**

A floor screed should be provided, flat to within a tolerance of +/- 3mm over any 3-metre area. Onto this sub floor, a self-leveling compound should be laid prior to laying of the floor finish. Copper grounding strips (0.05mm thick, 50mm width) should be laid flat on the floor in the conductive adhesive and connect to copper wire of grounding. The floor finishes in the operating room should be 2mm Conductive PVC tiles or roll, laid on a semi conductive adhesive base. The floor finish should terminate at the room perimeter passing over a concealed cove former and continuing up the wall for 100mm. All joints should be welded with electrodes of the same compatible material to provide a continuous sealed surface. The floor should have an electrical resistance of  $2.5 \times 10^6$  Ohms, as per DIN 51953 ATM F-150 or NFPA 99, B1 class of fire resistance and should meet UL standard 779. Fulfill product requirements as per EN 649.

#### **3. HERMETICALLY SEALED Clean room DOOR SYSTEM.**

To maintain sterility and correct Negative air pressure in the Clean room, all doors should be single leaf multi Hinged and hermetically sealed type. The door should meet following specifications:

International quality and safety requirements.

Noise level of movement should not be more than 60 decibel.

- Environment temperature should be  $-20^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$ .

The door frame should be made of high quality and robust design. Door panel should be made of PUF filled PPGI sheets that can withstand high abrasion. To ensure efficient sealing of the doors frames should be provided.

The door should seal on all four edges in the closed position & should be surface installed type.

The door frames should have Heavy duty concealed fixings that are adjustable during installation to ensure a 100% hermetic seal is achieved.

Vision panels, 300mm x 300 mm should be provided in the doors. The doors installed in "Lab 3 and extraction room, Emergency EXIT door, doors in Dirty corridor towards shower room" should have opening arrangements only on one side of the Door to achieve absolute sterility, Doors should not be equipped with arrangements that it can be opened from the undesired direction.

All other doors will have opening arrangements and hardware on both sides of the doors.

#### **CONSTRUCTIONAL FEATURES OF CLEAN ROOM DOORS**

Structure frame and panels should consist of an Outer skin: 0.35 mm Pre-coated GI and an Inner Skin: 0.35 mm Plain GI, Door Panel thickness should be Minimum 40mm thick injected with 40kg / cum density, CFC free PUF insulation

Frame work: Extruded Thermal Break aluminum profile combined with PP GI frames

Gaskets and sealings: Heavy duty sealing arrangement as per clean room specs

#### **LIGHT :**

It should be fitted flush with the ceiling in the clean room. It should be suitable to the required illumination in LAB. Peripheral lights and clean room luminaries fitted in the frame, LED lamps, should have highly spectacular anodized Aluminum reflectors

and optical antiglare system for adjustable light distribution. Luminaries cover made of highly resistant, disinfectant proof laminated safety glass with fine grained surface, glass pane with white powder coated steel frame. Luminaries' body made of sheet steel, white, powder coated supplied ready for connection. The reflectors should be of high quality, cleanable and non-deteriorating. LED lamps of reputed companies to be used and diffuser should be constructed with opaque acrylic diffuser material in powder coated aluminum frames/ SS-304 frames. It should have flicker less design with color. Recess frames should be gas tight. The fitting should be flush with the ceiling and should be removable from bottom. Lighting units should be properly sealed with the ceiling by means of fillers and beadings so that all lighting units are airtight with ceiling panels. The light fitting should be uniformly and aesthetically distributed on the ceiling to provide uniform illumination. lighting should be done according to IP65 protocol.

#### **LAB CONTROL PANEL-**

Control panel should be user friendly and ease of operating and maintaining purpose.

The touch screen typed Control Panel should be stationed in the sterile field. The Control Panel should be configured to incorporate the service required by the staff in the Lab. It should be mounted flush in the Lab wall. Hands free telephone set with memory card.

#### **DISTRIBUTION BOARD AND ELECTRICAL WIRING, CONDUITING WITH FIXTURES INSIDE THE LAB COMPLEX**

Electrical Distribution Board along with UPS, Transformers, Mains, Relays, Circuit protective equipment, for all circuits shall be installed in the remote cabinet. All electrical wiring should be terminated to the connectors mounted on rail and labeled with indelible labels. Individual fuse and miniature circuit breakers should protect all internal circuits. Complete schematic diagram drawing description should be enclosed with the equipment.

Laying of PVC conduits, Modular Switch Boxes, Modular Switches-sockets, Power and Light wiring including Earthing wire for all the lighting controls, Pendant and other equipment fixtures and fittings inside the theatre Wiring with low leakage current wires of FRLS wires should be as per requirements. Wiring for 250 volts single phase and neutral 6/16 Amps switched socket outlet with 4 sq.mm and 2.5 sq.mm PVC insulated copper conductor 1100 volts stranded flexible wires should be concealed with conduit. Installation of all electrical cabling must be of IS: 1554 (As per latest amendment) standard and wiring as per IS: 732 standard and proper earthing of LAB and other accessories in the LAB room as per standard guidelines of BIS. Fittings should be sealed on accordance with the standard IP54. Earthed equipment bonding of all exposed metal work should be provided.

#### **SCRUB STATION**

Compact Surgical Scrub sink -1Bays should be designed for use in LAB complex providing personnel with a convenient sink for pre-LAB scrub up. The Scrub Sink should be made of 1.5mm thick AISI-304 Stainless Steel and top surface(Counter). The scrub sink should be provided with a front access panel which should be easily removed for access to the water controlled valve, waste connections, stoppers and strainers. Thermostatic mixing, valve control should be located behind the access panel and maintain constant water temperature.. All units should have reduced splash resistant front. It should have manual foot operation mode.

#### **PASS BOX:**

A Hatch (Pass box) should be provided. Each Hatch should be equipped with two doors and the door should be operated electro mechanically .The Hatch should be designed in such a way that only one door should be opened at one time. The UV light should be so installed that it is kept on while both the doors are closed, this UV light has to be automatically turned off in case of opening of either of the doors. There shall be indicators on both sides of the LAB so that the door open/close status can be monitored from both ends. The material of construction should be Stainless steel of LAB grade; it should preferably be a SS Sandwiched panels design.

**Magnehelic Gauge:** STAND ALONE TYPE ( 4 Nos) It should have an undistorted plastic face for ease of read. It should be designed for quick response to pressure changes with no delay in asserting critical situations. Pointer should prevent damage if set points are crossed. Range 0-60 Pascals.High accuracy, due to diaphragm in vertical position. Size 4inch.

#### **HVAC SYSTEM**

100 percent fresh and treated air should be supplied in each CLEAN room to prevent cross contamination of air from clean and dirty areas. The Treated air should be supplied in these clean room duly filtered and at a desired temperature of 18-21

degree centigrade. Suitably sized and properly insulated air ducts should be strategically placed outside of these rooms, which will be connected to clean room SUPPLY air Diffusers.

The air supplied in the clean rooms then will be extracted out of the rooms through a heavy duty extraction Fan Filter Unit which will ensure elimination of pollutants before the air gets discharged in the atmosphere. This will be achieved by a UV chamber and H 14 Grade HEPA filter section. A well balanced and in line fan will be installed in these extractors for effective maintenance of negative Air pressure in Clean Room.

First class aluminum extrusions should be used for supply and return grills body and with high grade Powder coated aluminum extruded sheet for blades.

The air treatment system should comprise of following:

Air supply unit: The air will be supplied to the Clean room after proper filtration, supplying air to provide temperature range of 19-22 degree Celsius.

### **CONSTRUCTIONAL FEATURES OF Supply UNIT for 3 Lab rooms**

Outer skin: 0.6mm Pre- coated GI

Inner Skin: 0.6mm Plain GI

Panel thickness: 50mm thick injected with 40kg / cum density, CFC free PUF insulation

Frame work: Extruded Thermal Break aluminum profile

Material of Drain pan: 20G SS-304 with 12mm thick chemically cross linked fire retardant Polyurethane foam insulation.

Unit Base Frame: Heavy Gauge GI

DX COOLING COIL (R-410a Gas):-

Coil Casing: GI

Tube Material: Imported special grade copper tube

Tube Dia (inch/mm): 3/8"

Thickness of tube (mm): 0.5mm

Header Material: Copper

Fins Material & Thickness: Special grade aluminum blue fins Chemical salt fog spray 1.5 times long life instead of plane aluminum fins alloy-sine wave and staggered pattern/ 0.13mm

Fins Spacing (FPI): 11-12

Face velocity across coil: 500 FPM

Expansion of tubes for perfect bonding of copper tubes with fins: Hydraulically

Testing Pressure: 21 kg/sqcm (300psig) pneumatically dipped in water for 2 hours

FAN:-

Fan Section: With imported DIDW centrifugal Backward Curved Blower

Fan make: Nicotra/ Kruger(AMCA certified)

MOTOR:-

Motor make: ABB /BHARAT BIJLEE/HAVELLS/CROMPTON/MARATHON

Motor Protection: IP 55

Electrical Characteristics: 415 V/3 Phase/50 HZ AC Supply

Rated efficiency: IE-2

Drive set: Taper lock drive set (statically & dynamically balanced) with V-belts

FILTER :- (combo type)

Make Of Filters: Spectrum/Merchair or EQ

Media of Filters: Nonwoven Synthetic type supported with wire mesh

Efficiency of Pre-Filter(EU-4): 90 % down to 10 micron

Efficiency of Fine-Filter(EU-5): 99 % down to 5 micron

Type of filter: Flange type

Mixing Box: should be Provided

Strip Heater: should be Provided

CFM : 3200 Static Pressure 25-40

### **CONSTRUCTIONAL FEATURES OF Supply UNIT Dirty corridor, De gowning area and sterilizer room**

Outer skin: 0.6mm Pre- coated GI  
Inner Skin: 0.6mm Plain GI  
Panel thickness: 50mm thick injected with 40kg / cum density, CFC free PUF insulation  
Frame work: Extruded Thermal Break aluminum profile  
FAN:-  
Fan Section: With imported DIDW centrifugal Backward Curved Blower  
Fan make: Nicotra/ Kruger(AMCA certified)  
MOTOR:-  
Motor make: ABB /BHARAT BIJLEE/HAVELLS/CROMPTON/MARATHON  
Motor Protection: IP 55  
Electrical Characteristics: 415 V/3 Phase/50 HZ AC Supply  
Rated efficiency: IE-2  
Drive set: Taper lock drive set (statically & dynamically balanced) with V-belts  
FILTER :- (combo type)  
Make Of Filters: Spectrum/Merchair or EQ  
Media of Filters: Nonwoven Synthetic type supported with wire mesh  
Efficiency of Pre-Filter(EU-4): 90 % down to 10 micron  
Efficiency of Fine-Filter(EU-5): 99 % down to 5 micron  
Type of filter: Flange type  
Mixing Box: should be Provided  
Strip Heater: should be Provided  
CFM : 3200  
Static pressure : 25-40

Exhaust Unit: The air will be extracted out of the Clean room creating a negative pressure of -15 to -20 pascals, this extracted air will be properly treated to decontaminate the air by passing it through the UV Chamber and H14 Grade HEPA filter units, before it gets discharged into the atmosphere

#### **CONSTRUCTIONAL FEATURES OF AIR Extraction/Discharge UNIT**

##### **STRUCTURE FRAME & PANELS:-**

Outer skin: 0.6mm Pre- coated GI  
Inner Skin: 0.6mm Plain GI  
Panel thickness: 50mm thick injected with 40kg / cum density, CFC free PUF insulation  
Frame work: Extruded Thermal Break aluminum profile  
Unit Base Frame: Heavy Gauge GI

##### **UV Chamber (Gas Type):-**

The UV chamber should work on advanced Oxidation Process in which Hydrogen Peroxide is added in presence of UV light to generate (OH). The chamber should be a sealed proof properly Insulated chamber in which air from clean room is passed at a relatively slow rates by means of baffle obstruction where UV light is installed

##### **FAN**

A. DIDW centrifugal Curved Blower  
Fan make: Nicotra/ Kruger(AMCA certified) or equivalent

##### **MOTOR:-**

Motor make: ABB /BHARAT BIJLEE/HAVELLS/CROMPTON/MARATHON  
Motor Protection: IP 55  
Electrical Characteristics: 415 V/3 Phase/50 HZ AC Supply  
Rated efficiency: IE-2  
Drive set: Taper lock drive set (statically & dynamically balanced) with V-belts  
B.OR Variable Frequency Drive Unit

CFM: 4000  
STATIC PRESSURE 90-125

FILTER :- (combo type)  
Make Of Filters: Spectrum/Merchair or EQ  
Media of Filters: Nonwoven Synthetic type supported with wire mesh  
Efficiency of Pre-Filter(EU-4): 90 % down to 10 micron  
Efficiency of Fine-Filter(EU-5): 99 % down to 5 micron  
Efficiency of HEPA-Filter(H-14): 99.999 % down to 0.3 micron  
Type of filter: Flange type

Air cooled Air conditioning Unit:  
Nominal Cooling Capacity: 102000 Btu/Hr, 25704 K Cal/Hr.  
Refrigerant: R22/R 407 C  
Housing: Pure polyester Powder coated GI Steel.  
Nominal Air Flow: 5780 CMH/ 3400 CFM.  
Compressor: Hermetically sealed scroll  
Condenser: Air Cooled  
Condenser Fan Type: Propeller  
Controller: Microprocessor Based with LCD display  
Filter: Non-woven polyester media enclosed by HDPE Mesh .

Ducting and insulation: The ducting and insulation will be designed in such manner that chances of air leakages is completely eliminated, besides providing heat insulation and air volume transfer.as per ASME.

***Note:- The validation facility of the lab will be processed by CSIR-NBRI by his own way. The final payment of the vender executed BSL-3 Lab work will be released after satisfactory report.***

