

**VETRINARY TYPE CULTURE COLLECTION (VTCC),
NATIONAL RESEARCH CENTRE FOR EQUINES (NRCE)
HISAR, HARYANA**

TENDER

**FOR
CONSTRUCTION OF BIOSAFETY LEVEL-3 (BSL-3)
LABORATORY AT NRCE, HISAR**

**VOLUME-IV
TECHNICAL SPECIFICATION**

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SECTION – I

DESCRIPTION AND SCOPE OF WORK:

1.0 PREAMBLE

Indigenous equines including donkeys, mules and ponies constitute 98% of the entire equines population of approximately 1.77 million in India. These animals provide livelihood to the landless, small and marginal farmers of our rural and semi-urban society. NRCE is committed to improve the performance of these equines by ensuring freedom from various ailments and by exploiting their production potential. The efforts of NRCE has been focused towards development of improved diagnostics biological for major equine ailment, nationwide monitoring of equines diseases, improving equine production by timely pregnancy diagnosis & adapting artificial insemination using cryo- preserved semen and providing advisory & consultancy services to the equine farmers and breeders.

The main campus of NRCE is located at Hisar (Haryana) and has state of the art laboratories for undertaking research in areas of equine virology, bacteriology, parasitology, immunology, pathology, medicine, biochemistry, and bio-technology. To strengthen its existing infrastructure, NRCE plans to set up a High Containment Bio-Safety Level-3 Laboratory in its campus at Hisar.

Considering the current and future need and to add to its existing infrastructure, NRCE desires to set up a High Containment Laboratory of Bio-safety level-3 (BSL-3) in the NRCE campus.

2.0 OBJECTIVES

Some of the major projects undertaken by NRCE are :

- Development and evaluation of improved diagnostics for EHV-1 infection
- Development of drug for treatment of Trypanosome Evans infection of equines
- Standardization of ELISA for rapid diagnosis of rotavirus associated diarrhea
- Improved diagnostics of equine piroplasmiasis cause by Babesia equi.
- Development of Molecular diagnostics for differentiation of different equines pathogens/strains (EHV-1 and EHV-2)
- Development of Monoclonal antibodies for improvement of various diagnostics
- Seromonitoring of important equine diseases

To enhance the scientific process of the Institute it is proposed to set up a BSL-3 Laboratory Facility in the Institute campus.

2.1 SCOPE OF WORK:

The Scope of work involves '**Construction, Testing, Commissioning and Validation of Bio-safety level 3 (BSL-3) Laboratory & associated works on "Turnkey Basis" in compliance with CDC, USA guidelines as minimum and its maintenance during the defect liability period**'.

The scope of work shall include complete construction and establishment of BSL-3 laboratory facility including civil works, electrical works, Public health engineering works etc. complete in all respect. All the fixed equipment and system like Autoclave, Bio-Safety Cabinets, Pass Box, dunk tanks, HVAC system and its components (including A/C plant, air handlers, exhaust systems, filters, controls etc.), Hot water generator (for hot water shower during winters), Air compressor, Computers, Laboratory workstations, Un-interrupted power supply system, door interlocks, Access Control System, building management system, Fire Detection & Alarm System, fire extinguishers and any other equipments/systems essentially required to meet the intent and purpose of setting up of BSL-3 laboratory shall be provided and included in the scope of works.

Items/equipments like Incinerator, scientific laboratory instruments and equipments used for research purpose like freezers, refrigerator, incubators, centrifuge, PCR Thermal Cycler, Gel Documentation System and Electrophoresis etc. shall not be provided and included in the scope of works as the same shall be provided by the Employer i.e. NRCE. However, the contractor shall carry out planning for all such scientific laboratory instruments and equipments and providing the services and utilities like power, water, compressed air, drain etc. required for such items/equipments shall be provided and included in the scope of works of the contractor. The site landscaping works and providing internal roads shall also be excluded from the scope of works of the contractor. Items/equipments like Biosafety Cabinet, Autoclaves, Pass Boxes, Dunk Tank, Biological Effluent Treatment Plant, D.G. Set shall be provided by the Contractor.

The scope of works shall also include:

- Supply and laying of the required power supply cables from the existing electrical room (LT Panel room) upto the proposed BSL-3 Lab for its power supply.
- Extension of existing LT panel by providing feeder panel with switchgears of required capacities to meet the power requirements of BSL-3 Lab.
- Construction of boundary wall and extension of existing water supply lines upto the BSL-3 Lab to meet its water supply requirements.

Supply and installation of following equipments and systems :

- Autoclaves
- Bio-Safety Cabinets

- Pass Box and Dunk Tank
- HVAC system and its components (including A/C plant, air handlers, exhaust systems, air distribution ducting, filters, controls etc.)
- Hot water generator (for hot water shower during winters)
- Steam Boiler for BLED plant and Autoclaves
- Process Air compressor
- Workstations for BSL-3 Laboratory
- UPS with Batteries
- Door interlocks and Access Control System
- Building Management System
- Fire Detection & Alarm System
- Laboratory Surveillance (CCTV) System
- LAN System & Intercom System
- Portable Fire extinguishers
- Diesel Generator Set
- Water Softening Plant
- 6 passenger Lift
- Biological Liquid Effluent Decontamination (BLED) Plant

The Layout Plan of NRCE Campus indicating the proposed site of construction of BSL-3 Laboratory is enclosed with the tender documents for reference purpose.

3.0 AREAS PROPOSED IN THE BSL-3 LABORATORY FACILITY

The proposed BSL-3 Laboratory facility shall be constructed in accordance with Centre for Disease Control & Prevention (CDC), Atlanta, USA Guidelines as minimum and shall be complete with all the required civil, electrical, Public Health Engineering, HVAC and other associated works including fixed equipments and accessories on 'Turnkey Basis". The minimum requirements, parameters and features of the proposed BSL-3 Laboratory Facility are broadly described as under.

3. The proposed BSL-3 Laboratory Facility shall be planned and designed on Box-In-Box concept. The approximate plinth area of the Building shall be 540 SqM. The building shall have a three tier spatial arrangement as under :

Ground Floor -	ETP and Plant room, reception, 3 nos. general purpose laboratories (approx. 5 m x 7.6 m), staircase, lift and lobby area and toilet block
First Floor -	BSL-3 Laboratory & support area (approx. 23 m x 18 m), office area, toilet block, lift, staircase and lobby area

Second/Mezzanine floor- Service area for ducts, electrical conduits, shower system, exhaust blowers, HEPA plenums etc.

The concept layout plan of Ground Floor (Drawing No. HSCC/NRCE/A&P/101) and First Floor (Drawing No. HSCC/NRCE/A&P/102) are enclosed in the tender documents. The works shall be executed as per the finally approved drawings/designs, specifications, samples, prototypes etc. which shall be submitted by the contractor and approved by the owner/consultant.

4.0 CRITICAL CONSIDERATIONS TO BE FOLLOWED IN DESIGNS

4.1 The proposed BSL-3 Laboratory shall be constructed in accordance with CDC Guidelines as minimum. Some of the minimum essential critical considerations for construction of the proposed BSL-3 Laboratory Facility shall be as under :

- Restricted and controlled access shall be provided for entry into the laboratory
- Access Control System for tracking & recording of entry / exits shall be provided
- Shower facility (Mandatory shower during exit) from BSL-3 areas shall be provided with hot water supply during winters.
- Appropriate negative differential pressures in laboratory rooms/zones shall be maintained
- Air from the laboratories, animal areas and other areas shall be exhausted only after appropriate filtration & treatment as per guidelines/standards.
- Leak proof dampers with provision to prevent backflow of air shall be provided in supply and exhaust air systems of laboratories and other critical rooms for isolation of rooms/zones
- Pressure balancing system to maintain room/zone pressures within specified set limits shall be provided which should be done automatically and shall be controlled through Building Management System.
- Standby exhaust systems shall be provided for BSL-3 laboratories and animal rooms
- The door interlocks, BMS and exhaust blowers of BSL-3 laboratories and animal room shall be provided with un-interrupted power supply system.
- The internal building finishes shall be monolithic, impervious, non-particle shredding, chemical resistant and suitable to withstand chemical use during decontamination/fumigation
- The doors shall be with gaskets and shall be with/without view panels as required. Door finishes shall be with chemical resistant, anti fungal and anti bacterial properties. Windows shall be non-openable type with toughened glass and shall be installed flushed with the walls
- All Bio-safety doors shall be leak proof and DOP tested
- Wall to wall, wall to ceiling and wall to floor corners shall be provided with approx. 3" coving to prevent accumulation of dust and to enable easy cleaning
- Suitable Building Management System (BMS) shall be provide for operation, control and monitoring of various systems and critical laboratory operating parameters like room/zone pressure, temperature, humidity etc.

- Ventilation Ducting shall be leak tested and shall be in chemical resistant material
- Emergency Hand / Eye wash station shall be provided at strategic locations
- Emergency exit facility from the BSL-3 Laboratory shall be provided for personnel exit in case of an emergency
- Laboratory work stations shall be of non particle shredding material and shall be chemical resistant to allow chemical disinfection/CIP.
- All electrical light fixtures, switch/sockets, controls, sensors etc. provided in the BSL-3 laboratories and animal room shall be of sealed type, chemical resistant construction and shall be able to withstand fumigation with disinfectant chemicals.
- Fire detection and alarm system (FDA System) and fire fighting systems shall be provided as per the guidelines/standards.

5.0 GENERAL CONSTRUCTION

The shop drawings shall be submitted by the contractor for review and approval by the client/ Consultant. However some of the critical elements of the building and features are highlighted here under :

- 5.1 The contractor shall carry out the site survey including topographical and geotechnical survey of the proposed site for construction, as required, for carrying out the building civil and structural designs.
- 5.2 The building Civil Structure shall be designed as per relevant Codes and Standards of NBC&BIS and considering the earth quake factor, high working negative pressures inside the BSL-3 Laboratory area, equipment load and other relevant and associated factors. The superstructure shall be in RCC framed structure.
- 5.3 The internal building construction of BSL-3 Laboratory shall provide impervious and monolithic construction with non particle shredding material.
- 5.4 The internal partition and ceiling in BSL-3 Laboratory areas shall be capable to withstand high negative pressure of (upto -150 Pa), without any sag or buckling.
- 5.5 Wall to wall, wall to floor and ceiling to wall corners shall be provided with covings for easy cleaning.
- 5.6 The wall and ceiling surface finish in BSL-3 Laboratory areas shall provide impervious, monolithic, chemical resistant (organic solvents, acids and alkalis), antibacterial and antifungal finish and allow use of wide range of chemicals for fumigation of lab space.

- 5.7 The windows/ view panels shall be internally flushed with the wall. The window / view panel shall be in Powder Coated/Epoxy Painted/SS frame. The windows/view panel shall have double glass panels in 6 mm toughened glass.
- 5.8 The window frame and glass panels shall be sealed to prevent ingress of air inside the laboratory due to the negative pressure.
- 5.9 The doors frames and door shutters shall be in metallic construction with chemical resistant finish. Inspection windows in doors shall be provided as per requirement. The doors shall be provided with lip gaskets on sides and top and drop down gasket at the bottom. The doors shall be complete with door closer, SS kick plate (wherever required), handle and key lock.
- 5.10 The Door frames and door shutters for Air-Locks and Showers shall be constructed in SS 304 and shall be provided with compressible door gaskets, to minimize the air flow through these doors. The doors shall be complete with door closers and handles.
- 5.11 Services like water, steam, compressed air etc. in laboratory and animal areas shall enter through ceiling mounted service pendants. All the joints and penetrations in the building shall be sealed with suitable sealing compound.
- 5.12 The drainage and effluent piping system from the BSL-3 areas shall be in chemical resistant material. The floor traps shall provide air breaks suitable for high negative operating pressures of laboratory rooms. The floor traps shall also have provision for inserting and holding disinfectant chemical. The drain lines from the BSL-3 Laboratory areas shall be segregated from drain lines of other areas. The drain lines of BSL-3 Laboratory are shall be terminated to the BLED Plant whereas the drain lines from other areas shall be terminated to the normal sewer.
- 5.13 The BSL-3 Laboratory rooms shall be provided with stainless steel sink. The sink may be stand alone type or integrated with the work station, as per final layout drawing. The sinks in BSL-3 Laboratories shall be fitted with elbow operated taps. Each BSL-3 Laboratory room shall be provided with an emergency eye wash facility.
- 5.14 Two nos. 10,000 Ltrs. Overhead water storage tanks shall be provided for storage of water.
- 5.15 Terrace Water Proofing shall be carried out in Brick Bat Coba or other method approved as per the CPWD/Indian Standards.

- 5.16 The staircase area, reception, office etc. shall be provided in approved high quality internal finishing for good aesthetics.
- 5.17 The building PHE works shall be complete comprising of water distribution piping, water distribution pumps, drain piping, toilet fittings & fixtures, rain water piping from terrace, external manhole chambers and interconnecting piping, providing of soak pit etc. complete as required.
- 5.18 External development works like construction of Boundary Wall (approx. 170 rmt.), backfilling work, construction of internal road, external lighting, external drainage piping, construction of manholes and landscaping work shall be carried out by the contractor and shall be included in the contractors scope of work.
- 5.19 PA, FDA, Fire fighting, EPABX, BMS system, LAN may be provided

5.20 Building Construction and Finishing :

The building Structure shall be including factors like earth quake, high negative working pressures inside the BSL-3 Laboratories and other associated wear and tear. The building shall be provided with suitable means of rodent proofing.

The internal building finishing shall provide impervious and monolithic construction and all materials used for internal construction and finishings shall be non particle shredding type and chemical resistant. Joints like wall to wall, wall to floor and ceiling to wall shall be provided with covings for easy cleaning. The services like water, steam, compressed air etc. in laboratory and animal areas shall enter through ceiling mounted service pendants. All the joints and penetrations in the building shall be sealed.

The drainage and effluent piping system from the BSL-3 areas shall be of chemical resistant materials. The floor traps shall provide air breaks suitable for high negative operating pressures of laboratory rooms.

6.0 HEATING VENTILATION & AIR-CONDITIONING (HVAC) SYSTEM

The entire building shall be air-conditioned. The toilet shall be suitably ventilated. 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.

6.1 Air Conditioning Plant :

The Air-Conditioning plant shall be with DX system or other appropriate system for ease in operation and maintenance with sufficient backup provisions. The air-conditioning plant shall provide enough flexibility in operation such that selective areas can be operated, if

required, to economise on the operating costs. The Air-conditioning plant shall be complete in all respect with all the equipments and accessories as required.

6.2 Air Handling System :

The conditioned air shall be supplied to the BSL-3 laboratory and other areas by the Air Handlers which shall contain cooling/heating components, filter sections, High static blowers with motors etc. The air after filter plenums shall be supplied through ducting to various rooms / zones. Each room/zone shall be provided with dedicated Air Handlers for flexibility in operation. The BSL-3 Laboratory facilities and animal rooms shall be provided with once through system. The other areas may have re-circulatory systems as per the guidelines/standards. The air change rates inside the laboratory rooms shall be maintained as per the guidelines/ standards.

6.3 Air Filtration :

The supply air to the laboratory and exhaust air from the laboratory areas shall be filtered through appropriate sets of filters and treated as per the guidelines/standards.

The filter handling systems shall be provided such that it protects the maintenance staff from acquiring any infections while handling/replacing the filters. The filter plenums of BSL-3 laboratories and Animal areas shall have provision and allow in-situ decontamination of filters.

6.4 Pressure Control :

Automatic pressure control system shall be provided for the laboratory rooms/zones. On-line monitoring system of room pressures shall be provided. The following dampers shall be provided in supply and exhaust ducts/systems of the BSL-3 areas as minimum.

- a) Modulating Dampers – For controlling air quantity and pressure inside the rooms/labs
- b) Isolation Dampers – To Isolate the various Areas/Zones of the Laboratory. The Isolation dampers shall be with ‘Fail Safe” feature such that in case of power failure or any other abnormality these isolation dampers shall turn to fully closed mode as a safety measure.

Alarm system shall be provided for warning in case any abnormality in maintenance of room pressure occurs during the operation of the laboratory.

6.5 Standby Exhaust System :

The exhaust systems of the BSL-3 Laboratory and animal areas shall be provided with redundant backup exhaust blowers so that in case of failure of one blower the standby blower shall take over automatically to maintain the required pressure inside the laboratory/zone.

6.6 Fire Dampers :

As a safety feature, fire Dampers shall be provided in each of the supply and exhaust air systems. The fire dampers shall prevent spread of fire and smoke to other areas of the lab/building. The fire dampers shall be interlocked with the AHU blower motors such that in case of fire, the AHU blower motor should get switched off automatically.

7.0 ELECTRICALS

The electrical power requirement for the proposed BSL-3 laboratory facility shall be calculated and submitted with details by the contractor. All the required panels, cabling, switchgears and arrangements etc. for the purpose of energizing the BSL-3 Laboratory facility shall be carried out by the contractor.

All the Electrical fittings and fixtures in the Laboratories and Animal Areas shall be suitable for clean room application and shall be sealed type, leak proof and capable to withstand chemical exposures during fumigation. Electrical fittings and fixture in office and administration areas shall be decorative type.

The electrical power distribution scheme shall be provided to provide main power supply from the state electricity authorities, Un-interrupted Power supply to the critical components and equipments through UPS and Standby power supply through existing Diesel Power Generator Set.

8.0 BUILDING MANAGEMENT SYSTEM (BMS)

A customized BMS shall be provided to enable operation, monitoring and control the critical laboratory HAVC system and equipments. The BMS shall allow to monitor and control the following minimum parameters :

- Individual Room/Zone Pressures
- Air Handlers ON/OFF and RUN status
- Exhaust Blowers ON/OFF and Run status
- ON/OFF and RUN status for each of the exhaust blowers
- Individual Room/Zone temperature and relative humidity
- Isolation Damper OPEN/CLOSE status
- Pressure drop across each HEPA filter
- VFD status for each Air Handler and exhaust blower
- Biological Safety cabinets ON/OFF and RUN status

The BMS shall have sensors and DDC controllers, fully wired to a central computer with display and printout facility, zone monitoring & control functions and related software/s. Parallel display of pressures and other critical lab operating parameters shall be provided in the individual labs. The BMS shall have the facility to give alarm in case of deviations during the operation from the set operating ranges. The BMS sensors for indoor installations inside the

laboratory rooms shall be chemical resistant and suitable to withstand fumigation.

The Building Management System shall have 'Manual' mode to allow operation and monitoring in case of failure or disruptions in the system.

9.0 FIRE DETECTION & ALARM SYSTEM

- Fire Detection and Alarm System shall be provided for the entire BSL-3 Laboratory Facility to detect any eventual case of fire in the building.
- The Fire Detection and Alarm system shall give an audible alarm in case of fire in any of the room/zones,
- The Fire Detection & Alarm System shall meet the statutory requirements

10.0 FIRE FIGHTING SYSTEM

The contractor shall comply with the statutory requirements of the fire authority. Portable fire extinguishers shall be provided inside the BSL-3 Laboratory. The fire extinguishers shall be Chemical Extinguisher (CO₂) type / Gas expelled (ABC) Type / Dry powder type, depending upon the application.

11.0 UNINTERRUPTED POWER SUPPLY SYSTEM

A central UPS console shall be provided to cater to the extreme essential power requirement of the laboratory. All critical components like Door Interlocks, BMS, Operation of Isolation Valves, exhaust blowers of BSL-3 Laboratory and Animal Rooms and critical equipments shall be provided with Uninterrupted Power Supply.

12.0 ENTRY / EXIT PROTOCOLS

Access control systems shall be provided for restricted and controlled access/entry to the Laboratory. Appropriate sets of change-shower-change rooms shall be planned and provided. The change-shower-change door opening/closing logic shall be evolved by the contractor and approved as per users requirement.

All the entries/exits into the Lab shall be monitored and shall be logged on to the BMS computer which can be accessed at any time by an authorized persons.

13.0 SERVICE & UTILITIES

13.1 Power :

Power required for the BSL-3 Laboratory shall be tapped from the existing feeder lines (through its expansion and laying of required power cablings) in

NRCE Campus. All necessary arrangements like extension of existing feeder/busbars, laying of power cables etc. for tapping of required power shall be made by the contractor.

13.2 Water :

Water supply to the BSL-3 Laboratory shall be provided through the existing water distribution network in NRCE Campus. All the necessary and required arrangements for tapping and extension of existing water line from the adjacent building shall be made by the contractor. All the water distribution pipings in the BSL-3 areas shall be exposed type and with chemical friendly materials suitable to withstand chemical fumigation of rooms.

13.3 Internal / External Communication Facility

The BSL-3 Laboratory facility shall be provided with all the provisions for Intercom, Telephone and internet facility. External communication lines from the state telecom department shall be obtained by the client, if required.

13.4 Biological Effluent Treatment Plant

The BSL-3 Laboratory facility shall be provided with a Biological Effluent Treatment Plant with all the provisions along with standby facility.

13.5 Diesel Generator Set

The BSL-3 Laboratory facility shall be provided with suitable rated Diesel Generator Set meeting the Power requirement on full load during Mains power failure.

14.0 SPECIALIZED LABORATORY SUPPORT EQUIPMENTS AND SYSTEMS

14.1 Autoclaves :

The autoclaves shall be provided for decontamination purpose and shall be of double door type of suitable capacities as required. The autoclave for sterilization purpose shall be single door type of required capacities depending upon the requirement. The autoclave control system shall be PLC controlled, programmable and shall allow pre-programmed cycles. The logic of pre-programmed cycles shall be developed as per the protocols. The autoclaves shall be with in-built steam generators of required capacities such that the required steam pressure inside the chamber during sterilization/decontamination cycle is attained in not more than 30 minutes time.

14.2 Dunk Tank :

Dunk tank/s shall be provided at strategic / required locations for transfer of samples, chemicals and materials to and from the laboratories. The dunk tanks shall be filled with approved chemicals like NaOH, Sodium Hypo-Chloride Solution etc. during active use.

14.3 Pass Box :

Pass Box (Dynamic / Static type) shall be provided at strategic / required locations for transfer of samples, chemicals and materials to and from the laboratories. The dynamic pass box shall provide clean environs of desired level as required.

14.4 Hot Water Calorifier System

A Suitable capacity hot water calorifier shall be provided for supply of heated water to the change room showers in winters. The hot water distribution system shall be complete with water recirculation pumps, batch controllers, flow meters, valves, electrical connections, controls and wiring, piping etc. complete in all respect.

14.5 Biological Safety Cabinet

Biological Safety Cabinets (BSC) shall be provided inside the BSL-3 Laboratories at the required locations. The Biological Safety Cabinets shall be CII B2 type or other type depending upon the requirements. The exhaust from the Biological Safety cabinets shall be ducted out from the laboratory. The BSC shall be NSF compliant and with safety indications and alarms. The bio-safety cabinet shall in SS construction and complete with supply/exhaust blowers. Blower motor, HEPA filters, pre-filters etc. complete in all respect and shall be NSF 49 compliant.

14.6 Air Compressor

Air compressors system shall be complete with compressor motor, reservoir, air filters, controls, distribution piping, pressure regulating valves etc. complete in all respect. The air compressors shall be non-lubricating type.

14.7 LAN System

Provision for LAN system shall be provided in each room of the laboratory. The contractor shall provide all the required hardware, software, servers, computers, licences etc. for the complete LAN system. All the rooms of the laboratory shall be provided with LAN connections and one desktop PC.

14.8 Ventilated Type Garment Storage Cabinet

Ventilated type garment storage cabinet shall be provided in the Change Rooms-II. The ventilated garment storage cabinets shall be in SS construction and shall be with blower, motor, HEPA filter, activated carbon filter for odour neutralization, UV lamp etc. complete in respect as required.

14.9 EPABX System

A suitable EPABX System shall be provided for the laboratory. All the rooms

of the laboratory shall be provided with intercom connections and telephone instrument.

14.10 Laboratory Workstations

Laboratory workstations shall be planned and provided. The work stations shall be constructed in SS and shall be chemical friendly. The workstations shall be with suitable under table lockable storage space. Sinks shall be provided integrated with the work station or standalone type as required.

14.11 Individually ventilated cages (IVC's)

Individually ventilated cages shall be provided in the BSL-3 animal room for handling mice, rats, rabbits and guinea pigs. One set of 12 cage system shall be provided for handling mice/rats and one set of 12 cage system shall be provided for handling rabbits/guinea pigs.

15.0 STATUTORY APPROVALS

The contractor shall be responsible for obtaining all the required approvals from statutory regulatory authorities like local municipal Corporation, Fire Authorities, Pollution Control Board, Electrical Inspectors etc.

At the request of the contractor, only the required documents for submitting the applications for approval shall be signed by the client/employer as Owner. All the necessary follow-ups etc. for obtaining such clearance shall be carried out by the contractor.

16.0 VALIDATION

16.1 After completion of the construction and installations, the entire laboratory facility, all the equipments, systems and services shall be validated by the contractor under supervision of a committee of the consultant / client.

16.2 Prior to validation, the contractor shall prepare and submit a detailed 'Validation Document' for approval. The Validation Document shall provide the detailed procedure for validation, parameters for validation, validation schemes and formats for recording the validation details.

16.3 The validation results shall be recorded and documented

16.4 The contractor shall provide all the instruments, tools, tackles, manpower etc. required for the validation.

17.0 THIRD PARTY VALIDATION

19.1 If the client/employer desires to get the laboratory validated by a third party, the contractor shall provide all the required assistance for carrying out the

validation.

- 19.2 All the required validation instruments, tool, tackles, manpower etc. shall be provided by the contractor, if asked by the client/employer.