MINISTRY OF HEALTH & FAMILY WELFARE (GOVT. OF INDIA)

DR. RAJENDRA PRASAD GOVT. MEDICAL COLLEGE,TANDA,KANGRA

Tender

for

Supply, Installation, Testing & Commissioning of Modular Operation Theatre at Dr. Rajendra Prasad Govt. Medical College, Tanda (Kangra)

VOLUME – IV

TECHNICAL SPECIFICATION

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(Consultants & Engineers for Mega Hospitals & Laboratories)
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TECHNICAL SPECIFICATION FOR MODULAR OPERATION THEATRE

SCOPE OF WORK : Complete design, supply construction, and commissioning of Modular Operating Theatre in accordance with the specifications, bill of quantities including necessary Turnkey work and providing of free spare parts and service during One (1) year Defect Liability Period. The design and construction of theatre shall be made using a pre-engineered solution with objectives of Infection control, Promoting high standard of asepsis, Facilitating coordinated services, Ensuring maximum standard of safety, Optimizing utilization of OT with flexibility and staff time, Optimizing working condition, Ensuring functional separation of spaces, Patient and staff comfort in terms of thermal, acoustic and lighting requirements, minimizing maintenance and regulating flow of traffic.

1 WALLS &CEILING CONSTRUCTION:

The prefabricated modular construction for 50 mm thick Double skin totally flushed False Ceiling panels should be constructed with 0.8 mm thick AISI-304 Stainless steel on both side with 36 ± 2 kg/m³ density PUF as infill or 1.60 mm thick AISI-304 Stainless Steel backed by 12mm thick Gypsum board to provide seamless operating room or High-tech materials like Solid Mineral Composite Sheet(SMCS) and supporting hardware to provide seamless operating Room.

The ceiling suspension from concrete ceiling should be as:
Suspension elements : Suspension bracket with tension spring
Suspension Height: Continuously adjustable from 250 to 1100 mm
Stability: Permanent and non-stop after adjustment.
Material High quality galvanized steel

The external wall of the room shall be constructed with solid brick and mortar by the hospital authority. Clearance between inner panel and outer wall preferably should be 45-55 cm to allow the maintenance personnel for service. This closed space should be flushed continuously to eliminate dust and bacterial accumulation. 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 produced in a single full height floor-to ceiling piece. The total distance between inside and outside surfaces of the operating room should be sufficient for flush mounting of the equipment. All the sharp edges and corners of the OT room should be rounded /coved to avoid bacterial contamination. The wall panel and Ceiling design and construction should be strong enough to allow for the installation and support of all equipment and should have provision of opening required for the installations without affecting rigidity and strength. Access Boxes should be fitted to the rear of all wall-mounted equipment to enable maintenance to be carried out from outside the operating room. Wall paneling should be of DIN 410272 fire protection or Reaction to fire class-1 norm. Room lighting, air supply inlet, Ceiling Service units, return air outlets etc should be integrated with SS metal/SMCS ceiling system. The individual

panels except those at the edges should be removable individually. The Walls and suspended Ceiling should be hermetically sealed. All the four corners should have return air duct outlets and grill for the same made of steel duly powder coated with the color choice to suit the hospital's choice. The system should afford the maximum versatility at the planning stage and flexibility during erection, ensuring openness to future alternations and 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 allow ample operational flexibility at 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.

The cavity between the inner and outer walls should be left with minimum obstructions for the possible addition of equipment at a later date and to enable services, pipes, conduits etc, to be run within the cavity. The wall panel should be fixed to the brick wall with supports/sub-frame on which individual wall panels will be mounted. The wall panel should be fixed to the brick wall with supports. The individual metallic wall panels shall use the tongue and groove technology for joining two panels in case PUF panels are used. All joints and cavities should be filled with Metallic Epoxy sealer and sanded flush to provide seamless finish/ Silicon gasket joints. The internal surface of the wall panel should be either solid Mineral Composite Sheet or SS-304 grade material.

In the case of SS-304 panel:-

The internal surfaces of the walls and ceiling of Operation theatre should be sprayed with **anti-bacterial paint** (Factory Internal test report to be submitted) to a minimum dry film thickness of 300 microns with primer. The anti bacterial paint coating should overlap the floor coving, ceiling system and door frames by 25 microns to provide a continuous sealed surface. The anti bacterial paint coating should be non-reflective type, highly resistant to abrasives, water, detergents and weak acids and alkali used in cleaning area. The coatings should have no loss of performance or adhesion to the substrate in the case of regular steam cleaning. Imported Anti bacterial paint applied should not leach out in order to maintain anti- microbial system throughout the life of the product. The coating should have biocide action and prevention property against growth of mould, bacteria and yeasts for at least 10 years.

In the case of SMCS :-

The surface facing the interior of OT should be bacteriostatic, dense and non-porous. The panels should be made of durable and uniform material that should be easy to clean and extremely hygienic. The total thickness of the panel should be not less than 18 mm. Panel should be resistant to water & detergents normally used in hospitals. The Panel should adhere to fire class-I Norms (Fire resistant norms). To create smooth uninterrupted surface between adjacent panels for presently risked accumulation of dust and bacteria in gaps, the panel should be produced in a single full height floor to ceiling piece.

Vertical and horizontal gaskets in non-toxic silicone rubber around all the contact perimeters between the various materials, and the hermetically sealed gaps between modules, should ensure optimum space segregation and ensure that sterile air pressure values are maintained in the

protected environment, this be being a fundamental prerequisite for guaranteed sterility. A Galvanized steel cover plate shall be installed between the inner and outer wall panels, sealing and protecting the cavity from the ingress of vermin and contaminants, whilst allowing the removal at a later date for upgrading, disassembly, enlargement, or relocation.

Internal colour of the wall and ceiling panel shall be as suggested by the Institute.

2 CEILING FILTRATION SYSTEM / LAMINAR AIR FLOW SYSTEM (AIR MANAGEMENT SYSTEM) -IMPORTED

The Ceiling Filtration System should be designed to ensure homogenous low turbulence unidirectional laminar flow of sterile air. The Laminar flow system should comprise of thick extruded aluminum profiles frame and sealed gasket. The filters installed in the plenum should be suitable for application for laminar flow and clean rooms.

These filters should meet following specification.
EN 1822 class : H14
MPPS average efficiency: > 99.95%
3 Micron DOP efficiency > 99.97%
Pressure drop : 600 pa(max)
Maximum Operating Temp : 60 degree Celsius
Maximum RH : 90 %.

Others:
Protective grids : White epoxy painted micro drawn grid
Separators : Continuous thermo plastic chord
Sealant : Polyurethane
Gasket : One piece polyurethane

Efficiency test : Filters individually tested and certified (Submission of test certificate for the filters from original manufacturer is must along with its supply).
Filter should be according to ULPACAT test as per EN 10204. Filter frames and top plenum should be made of AISI-304 Stainless steel. The filtration should have flow equalizer for uniform & constant air distribution over the whole surface. The high quality Diffuser should secure the unidirectional airflow according to EN ISO 14644. It should have low noise recirculation systems in compliance with noise levels of 45 to 48 db. **Air and Light diffuser made out of two layer of mono filament precision woven polyester for the plan air ceiling to proved Laminar flow.** Frame should be rigid frame system and made out of AISI-304 Stainless steel which enables the perfect integration of the OT ceiling with surrounding installations. The OT lighting should be integrated into a frame system which ensures its air sealed integration with the OT ceiling. The frame system should allow the seamless and air-sealed coverage of all gaps among the various installations and OT ceiling. The Ceiling system should be equipped with **"H"** class HEPA filters with different performances according to their position in the ceiling to achieve different flow velocities. The filtration ceiling system should have flow equalizer to achieve uniform & constant air distribution over the whole surface .it should also have connection for surgical lamp to be fitted in place of any filter. The technology must avoid turbulences which may draw germs from the non-sterile area in the operating field. The complete

filtration ceiling system should be factory assembled. Perfect tightness should be guaranteed by a liquid seal between filters and holding structure enabling no bypass of Mini Pleat filters. A written confirmation from the original product catalogue is required. Laminar air flow system and mini Pleat HEPA Filters should meet relevant European/ US standards.
Testing & maintenance of air quality with periodic replacements of Mini Pleat HEPA filters should be done at least once in 6 months or earlier if required. The supplier should provide test certificate for HEPA filter and laminar air flow systems from the original manufactures
Modular OTs should be constructed considering all stipulated requirements of Air management system etc.

3 OPERATION THEATRE FLOORING (ANTISTATIC CONDUCTIVE TILES)

The Operation theatre floor finish should be laid with 2 mm antistatic seamless conductive PVC tiles on a semi-conductive adhesive base. The floor should be scratch resistant, fire resistant, chemical resistant, non-corrosive, slip resistant, smooth, anti fungi, antimicrobial impervious material conductive enough to dissipate static electricity but not conductive enough to endanger personnel from electric shock. The floor finish should pass over a concealed cove former and continue up the wall for 100mm. The floor should be provided flat to within a tolerance of ±3mm over any 30 Sq.mtr area. Copper grounding strip (0.05 thick, 50 mm width) should be laid flat on the floor in the conductive adhesive and connect to copper wire of grounding. The connection from copper grid(Grid-1m x 1m) should be brought out uniformly at places to form equi-potential grid. A self-leveling compound should be laid prior to lying of the floor finish. One earthing lead should be brought out of from every 150 Sq.ft. area and attaching it to main earthing strip/ground. Continuous roll should be used and all the joints should be welded by heat fusion process to get seamless floor. The joints in the flooring should be sealed by using a PVC welding bar of matching colour and hot air gun for fusion of welding bar with flooring to provide a continuous sealed surface, confirming the European/US standards. The sheets should be highly durable with resistance to shock, scratch proof and indentation. Corners should be uniformly curved. The conductive material should be uniformly impregnated as grains. The floor should be inert to body fluids, chemicals, detergents and disinfectants and it should not be affected by temperature variation within the OT. Colour should be uniform, pleasant and matching with ambience. The floor should have electrical resistance(Point to ground) within 2.5x10 to $2.5x10^6$ Ohms as per NFPA-99/ DIN 51953/ATMF-150 B1 class of fire resistance. The floor should efficiently discharge electric charges upto 2 KV. The floor should not allow build up of electrical charge beyond 100 volts due to antistatic effect. It should fulfill product requirement s as per EN649. The corner should not be terminated sharply and concealed cove-former (Aluminum) should be used overlap to a height of approx.25mm and sealed perfectly and uniformly. Self-leveling compounds should be used for this purpose. Radius for corner coving - 70R

4 DOORS AND FRAMES (AUTOMATIC HERMETICALLY SEALED SLIDING DOORS)

To maintain sterility and correct air pressure in the theatre, the door should be sliding and hermetically sealed type. The door should meet following specifications confirming to relevant European/ US standards:

- Meets international quality and safety requirements.

- Controller should be Microprocessor based controller (CE marked) and should have digital display
- Regulated electro-mechanical sliding door drive.
- Suitable capacity of Motor should be equipped.
- Noise level of movement should not be more than 60 decibel.
- Power efficiency should be 0.95 (in AC 100 V full load).
- The track should be made up of single piece extruded aluminum
- Environment temperature should be –20 ºC to +55º C.
- Electrical safety codes for High & Low voltage system design should meet HTM 2020 /2021 standards.
- The door and control should comply current IEE regulations and BS 7971 standard.

Hermetically sealed Sliding Automatic Door shall be with Vision Panels 300 mm x 300 mm with double glazed panels and hermetically sealed should be equipped for OT.

In the case of HPL Board

The door panel should be hygienic compact HP laminated board that can withstand high abrasion. The thickness of the door core should be 48mm. The top layer on both sides is high Pressure laminate of size 6mm. The overall thickness of the door shutter is 60 mm. The inner part of the door should be filled with CFC free polyurethane foam (PUF).

In the case of SMCS

The door material should be of the same material as wall panel i.e SMCS and should be able to withstand high abrasion.

Sealed airtight system should be provided to prevent further ingress of any microbial organism. The door should be fixed to SS frame(Same as Wall Panel in case of SS). Colour should match the interior case. Reinforcement of Extruded Anodized Aluminium material for HP Laminated Board Panel/SMCS should be with door frames. Nylon runner guides should be fixed to the door in such a way that there shall be no obstruction to the Trolley movement. The door leaf should have high quality synthetic rubber gasket with long life to ensure hermetic sealing to maintain pressure differential. Air tightness 99.99% at a pressure 50 (Test certificate for hermetic sealing with door frame should be provided with pre-despatch documents. The finished door on either side of the door should be perfectly level (maximum permissible difference +1mm). The door should provide X-Ray protection(Optional as per the requirement of OT) as per AERB regulation (Lead equivalent at 100 KV is 0.27mm). The track of the door should be made up of single piece Stainless steel/extruded Aluminum and the running surface for the top rollers shall be suitably angled to reduce resistance to movement. The door leaf should be hung by means of hard plastic rollers of high quality with double bearing at the top. Roller should be provided under the stainless steel/extruded aluminum track to enable smooth the noiseless movement. The doorframe, track and the wheel should be designed in such a way that during last 50 mm at travel on the closing cycle the door should make a tight sealing with the frame. The door should be provided with high quality cylindrical lock. The lock should be activated or switched off by means of the key switch. The door should be governed by two sensors for half and full closure. The door controller should sense overload condition and in overload case the door shall be automatically stopped and reversed the direction of travel. The controller should be capable of

either operated by elbow switch; foot switch & radar switch (Touch fewer sensors). The door should be operated easily manually in the event of failure of the power supply or the automatic mechanism. Door opening handle should be strong and sturdy and the handle material should be AISI-304 Stainless steel and glossy finish. High and Low voltage system of the door should meet electrical safety code..
The starting time after receiving signal should be adjustable between 0.5 secs. to 25 secs. Speed of closing movement-20-120 mm/sec. Slow speed -20-220mm/sec, Opening speed –equal to 600 mm/sec approx., Closing speed – equal to 500 mm/sec approx.

5. DOORS AND FRAMES (AUTOMATIC HERMETICALLY SEALED SLIDING DOORS) AT THE SCRUB ROOM SIDE

Technical specification same as Sl. No.4.

6 PRESSURE RELIEF DAMPERS

The Pressure Relief Dampers are to be equipped with the theatre to prevent contamination of air from clean and dirty areas. The Dampers of suitable size should have AISI-304 Stainless Steel blades of thickness 1 mm each. The body should be epoxy powder coated as per standard BS colours. The statically and dynamically balanced Pressure Relief Damper should be properly placed. The Dampers enable to maintain differential room pressure to close tolerance inside the Operation theatre. Counter-weight balancing system should be provided in the Pressure Relief Damper to maintain positive pressure inside the operation room. The PRD should remain closed at pressure below the set pressure and should open fully at a pressure only fractionally above the threshold pressure.

7 INTERNAL DUCTING

The internal ducting **till the existing AHU system** of the Operating theatre should be done as per ISI-655 duly fabricated out of 22 swg Aluminum sheet complete with flanges and accessories such as GI suspenders and GI supports completely sealed with Silicon sealant duly insulated with Aluminum foil Nitrile rubber self adhesive type insulation. The type of insulation and its thickness should be such that there is no sweating.

8 PERIPHERAL LIGHT CUM CLEAN ROOM LUMINARIES

It should be fitted outside the air ceiling system area and flush with the ceiling in the operation theatre suitable to required illumination (500 Lux) of OT. Peripheral lights and clean room luminaries fitted in the frame should be 8 Nos in numbers for each OT. The fluorescent lamps 36 W 16mm Ø- 2 nos / Non-hygroscopic high glow low power LED based peripheral lights (1’x2’) having high quality low wattage LED lighting system with highly spectacular anodized Aluminum reflectors and optical antiglare system for adjustable light distribution. Luminaire cover made of highly resistant, disinfectant proof laminated safety glass with fine grained surface, glass pane with white powder coated steel frame. Luminaire body made of sheet steel, white, powder coated supplied ready for connection. The reflectors should be of high quality, cleanable and non deteriorating. Dimmable ballasts of reputed companies to be used and diffuser should be constructed with opaque acrylic diffuser material in aluminum 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 form top or 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 in the OR. Peripheral lighting should be done according to **IP65 protocol**. Light should not interfere when green mode of Endoscopy is performed.

9 OPERATION THEATRE CONTROL PANEL –(Imported)

The OT Control Panel should be designed to cope with changing technology and equipment in operating environments. Control panel should be user friendly and ease of operating and maintaining purpose.

The **touch screen** typed Control Panel should be 19" color TFT/LED panel flushed with the Wall Panel. The Control Panel should be configured to incorporate all the services required by the staff in the Operation theatre. It should be mounted flush in the theatre wall.

The Control Panel should comprise of following services in addition to Instruction board, Communication interfaces- both audio and video etc.:

- Day Time Clock
- Time Elapse Day Clock
- General Lighting System
- Hands free telephone set with memory card
- Temperature and Humidity Indicator with Controller
- Hepa Filter status
- Medical Gas status/alarm
- Digital Room Pressure indicator
- Music control

Day Time clock/Time Elapsed day Clock should be digital type and bright and the height not less than 30mm

Temperature and Humidity Indicator should indicate temperature and humidity of the theatre and the display shall be digital and bright and the height not less than 30mm. The temperature and Humidity controller should be connected to the Air Conditioning system.

General Lighting System should incorporate all the necessary controls of all the lighting system including Dimmer for peripheral/plan air lights. Medical Gas Alarm should indicate high, normal and low of gas pressure for each gas service provided in the Operation room. Alarm should be equipped with audible Buzzer. The pressure sensor of the Alarm should be connected to MGPS for monitoring the pressures.

The control panel should be user friendly and ease of operation and maintenance. All internal wires should be marked with plastic ferrule type cable markers, for ease of identification. The control panel should be able to be integrated with the commonly used OT software in future.

The control panel should meet Electrical Safety Code for High and Low voltage system, wired to the current IEE regulations

10 ANAESTHETIC PENDANT (Imported)

Pendant should be CE certified with four digit CE number

Should be double Arm Pendant with horizontal movement

One swivel arm of 800 mm and another of 600 mm.

Both arms should have electromagnetic/pneumatic brake.

Swiveling angle should be 330°.

The swivel arms move only horizontally and the length in fully stretched position is (800+600) = 1400mm

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Anesthesia pendant should have medical outlets like Oxygen outlets X 4, Air(4 bar) X 2, Nitrous oxide X 2 and Vacuum outlet X 4, AGSS outlet X 2. Outlets should be CE certified/UL listed. Each terminal unit should be identified by the appropriate recognized name or symbol, colour, coding and shape as per HTM 02-01 /NFPA 99C(Outlets of the Pendant should be as per the prevailing standard of the existing Medical Gas Manifold System of the hospital.).

Pendant should have eight 5A/15A combined electrical socket. Electrical socket should be of reputed make. One electrical socket should be connected with central UPS and should of different colors for easy identification.

Pendant should have two open shelves to keep Monitors/ESUs etc

Should have provision RJ 45 /cat 5 for telephone communication.

Should have provision RJ 45 /cat 6 for data communication.

11. SURGEON PENDANT (Imported)

Pendant should be CE certified with four digit CE number

Should be double Arm Pendant with horizontal movement

One swivel arm of 800 mm and another of 600 mm.

Both arms should have electromagnetic/pneumatic brake.

Swiveling angle should be 330°.

The swivel arms move only horizontally and the length in fully stretched position is

(800+600) = 1400mm
Surgeon's pendant should have 7 bar Surgical Air outlet x 2 Nos for pneumatic drills. Surgeon's pendant should have Carbon dioxide outlet x1 No. in laparoscopy and endoscopy theatres. Outlets should be CE certified/UL listed. Each terminal unit should be identified by the appropriate recognized name or symbol, colour, coding and shape as per HTM 02-01 /NFPA 99C(Outlets of the Pendant should be as per the prevailing standard of the existing Medical Gas Manifold System of the hospital.).

Pendant should have eight 5A/15A combined electrical socket. Electrical socket should be of reputed make. One electrical socket should be connected with central UPS and should of different colors for easy identification.

Surgeons pendant should have infusion management system.

Pendant should have two open shelves to keep Monitors/ESUs etc

Should have provision RJ 45 /cat 5 for telephone communication.

Should have provision RJ 45 /cat 6 for data communication.

12 X-RAY FILM VIEWER

The three (3)-plate viewing LED type/4 pieces of high frequency fluorescent lamps X-Ray Viewing Screen should be designed to provide flicker free luminance for clear film viewing. Each plate should be able to illuminate films up to 14"x17" size. 'Dimming is controlled using dimming ballast and PCB mounted inside the box. The mounting of the Screen should be installed flushed with Operation theatre wall to avoid dust accumulation and microbial growth and ease of cleaning. The diffuser should diffuse the light evenly and to provide adequate luminance for film viewing. Body should be of extruded aluminum powder coated black with bacteria and disinfectant resistant finish. Proper spring loaded film clip with rollers should be provided to holes of the films firmly and to remove the film without scratches. The X-Ray Film viewer should comply with relevant Electrical Safety Codes for High and Low voltage system.

13 HATCH/PASS BOX

It should be of 610mmx610mm size for disposal of dirty linen/waste to non-sterile store with Door open/close indication. Each Hatch should be equipped with two doors and the door should be operated electronically. The Hatch should be designed in such a way that only one door will be opened at one time. The Hatch Box should be constructed of Stainless Steel AISI-304 Door and completed with interlocked UV light and electro-magnetic mechanism complete with indicators and hours meter. This UV light should be automatically turned off in case of opening of either of the doors. Indicators should be provided on both sides of the OT so that door open / close status can be monitored from both sides.

14 WRITING BOARD (OPERATING LIST BOARD)

Writing Board as operating list Board of size-1000x700x60deep should be made of ceramic having magnetic properties and should be flushed to the wall of the operating Room.

15 BUILT-IN STORAGE UNIT

Storage Unit should be made out of 1.60 mm thick AISI-304 Stainless steel. The storage unit should be divided 2 or more parts and each part should have individual glass doors with high quality locking system. These doors should be installed on the storage units with the help of imported fittings allowing an opening allowance of 90-100 degree. Each part should be provided with steel racks which should be completely detachable type. The storage unit should be fitted with 5mm thick glass door and mounted flush with the theatre wall. The storage unit should be continuously ventilated by positive air in the OT through ventilation holes provided at the bottom and top of opposite sides. The dimensions of each storage unit should not be less than height 1800mm x width 900mm x depth 350mm.

The storage units should be designed in a way that they are flush with the OT wall panels and the units should be air tight, not allowing any leakage between units and the wall panels.

16. DISTRIBUTION BOARD ELECTRICAL WIRING, CONDUITING WITH FIXTURES INSIDE THE OPERATION THEATRE

Electrical Distribution Board along with all high voltage equipment should be installed in a separate enclosure. Electric Distribution Panel, UPS, Transformers, Mains, Relays, Circuit protective equipment, for all circuits of Operation theatre shall be installed in the remote cabinet. All electrical wiring should be terminated to the connectors mounted on DIN/CE approved 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 OT and other accessories in the OT room as per standard guidelines of BIS. Fittings should be sealed on accordance with the standard IP54. Earthed equipotent bonding of all exposed metal work should be provided.

17 MEDICAL GAS LINE INSTALLATION

Oxygen, Air(Medical & Surgical), Vacuum, Nitrous Oxide and AGSS supply to Operation Theatres from the existing manifold system should be provided. The medical gas alarm system shall be installed which fully satisfies the principles of HTM 02/NFPA.
Medical graded Copper pipes shall be solid drawn, tempered, seamless, phosphorous deoxidized, non-arsenic and degreased for oxygen service. Copper to Copper joints shall be made on site using silver-copper-phosphorous brazing alloy to BS-1845. Copper to brass or gunmetal joints shall not be made on site. Except for mechanical joints used for components, all metallic pipeline joints shall be brazed or welded. All pipelines shall be routed in such a way that their not exposed to a temperature less than 5 deg Celsius above the dew point of the gas distribution pressure. The chemical composition shall be as per BS-6017: 1981 Table 2, Cu-DHP grade. Distribution Copper Pipe manufactured as per BSEN:13348:2008 Each pipe shall be capped at both ends before supply. Pipeline shall be supported at interval to prevent sagging.

The supply of pipes shall accompany with manufacturers test certificates for physical properties and chemical composition. The supply of pipes shall be further substantiated with inspection certificates from third party inspectors like LLOYDS.

Medical graded Copper Piping should be laid down from Pendants of OT to the nearby Valve Box outside the Operation Theatre.

18 EXHAUST AIR CABINET

The openable and cleanable return-air exhaust cabinets should be provided in the operation theater. Designed flow rate should not be less than 1000 m3/hr. Fixed type exhaust air cabinet (non-openable) type should not be supplied. The air cabinets should have suction from top as well as from bottom. Specification of materials and aesthetic should match perfectly with the ceiling system.

19. SCRUB STATION (With hot water supply)

Compact Surgical Scrub sink -3 Bay should be designed for use in Operation theatre complex providing surgeons with a convenient sink for pre-OT scrub up. The Scrub Sink should be made of 1.5mm thick AISI-304 Stainless Steel and top surface(Counter) should be made of one piece molded mineral composite and polished to seamless satin finish. 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. Hands free operation should include infra-red sensors with built-in range of adjustment. Thermostatic mixing, valve control should be located behind the access panel and maintain constant water temperature. User defined time 1, 3,5,10 min. are available. This timing should be adjustable to meet individual application requirements, provided with infrared sensors, thermostatic control taps with fail-safe temperature controls. All units should have reduced anti splash front. It should have manual foot and

operation mode. The station should also have inbuilt soap dispensers. Scrub Station should be equipped with Hot Water Geyser of suitable capacity for supply of hot water to the sink.

20. FALSE CEILING OF SCRUB ROOM

Providing and fixing 15mm thick densified regular False ceiling of Calcium Silicate tiles of approved texture of size 595 x 595 mm in true horizontal level, suspended on inter locking metal grid of hot dipped galvanized steel sections (galvanizing @120grams per sqm including both sides) consisting of main 'T' runner suitably spaced at joints to get required length and of size 24 x 38 mm made from 0.33 mm thick minimum sheet and cross 'T' of 24 x 28 mm made out of 0.33mm (Minimum) sheet. Grid rests on periphery walls/partitions on a Perimeter wall angle pre-coated steel of section (24 x 24) made of 0.4 mm thick (minimum) with the rawl at 450mm centre to centre with 25mm long dry wall screws @230 mm interval. Main 'T' runners to be suspended from ceiling using G.I slotted cleats of size-25x35x1.6 mm fixed to ceiling with 12.5 mm dia and 50mm long dash fasteners 4mm G.I adjustable rods with galvanized steel level clips of size 85x30x0.8mm. Bottom exposed with 24mm of all T-sections shall be pre-painted with polyester baked paint. False Ceiling should be fitted with the Diffusers of HVAC system.

21. LIGHTING OF SCRUB ROOM

Providing and fitting of Clean room light fitting at the convenient location at the false ceiling of the Scrub Room. The lighting system shall be with highly spectacular anodized Aluminum reflectors and optical antiglare system for adjustable light distribution. Luminaire cover made of highly resistant, disinfectant proof laminated safety glass with fine grained surface, glass pane with white powder coated steel frame. Luminaire body made of sheet steel, white, powder coated supplied ready for connection. The reflectors should be of high quality, cleanable and non deteriorating. 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 top or 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.

22. FLOORING OF SCRUB ROOM

Providing and laying of 3mm thick Epoxy resin based seamless anti static floor coating in three coats (Primar coat, base, top coat) Supply and laying of 150 mm wide Epoxy coving (60-70mm R) for floor to wall.

23. WALL PAINTING OF SCRUB ROOM

Epoxy painting to a minimum thickness of 300 microns with primer. The epoxy paint coating should overlap door frames by 25 microns to provide a continuous sealed surface.

In addition to the above mentioned equipment/appliances, if the contractor thinks it necessary to include any other equipment/appliances, accessories etc. for the Modular OT then that may be provided after approval from Engineer in-charge.

The sizes are approximate. Minor variations in sizes shall be acceptable subject to prior approval of the Engineer.

24. IN ADDITION TO THE ABOVE, FOLLOWING <u>TURNKEY WORKS</u> FOR INSTALLATION AND COMMISSIONING OF MODULAR OT ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR :

Bidders are advised to visit the site for assessment before the submission of tender offer.

The turnkey work includes all modifications to the built up space provided at the hospital site including civil modifications, electrical works, plumbing works, all cable trenches and railings wherever required, interior decoration, air conditioning duct, furniture and other related works of the Operation Theatre required for the smooth and efficient functioning of the centre. These works shall comply with all relevant safety and standards guidelines. The vendor is fully responsible for installation and commissioning of all equipment mentioned in the tender.

- **Demolishing and dismantling of existing False Ceiling, Floors, Lighting, Doors, Plenum, Ducting, POP/Putty and other all internal set-up and then Reconstruction, patch works Plumbing, Repainting, Rewiring and closing of door towards dirty entry with the brick wall inside the OT and the Scrub rooms should be carried out by the contractor.**

- **Electrical cabling** of IS : 1554 standard(Latest) and wiring as per IS : 732 standard from MDB(Single point source) to Electric Distributional Panel and to the corresponding load points

- Providing fixing of **Electrical Gadgets** like ELCB, MCB, Light Points, Power points, in the Modular OT room. • Number of fans, power point, bulbs/tube light. Apart from these supplies to the individual equipments with ELCB & MCB for Modular OT • Installation of MCB, ACB, ELCB & OCB of Havell/Siemens/L&T/Schneider etc for Control Panel for Modular OT.
  In addition to the above mentioned equipment/appliances, if the contractor thinks it necessary to include any other equipment/appliances, accessories etc. for the Modular OT then that may be provided and any other necessary work required for satisfactory working of the Modular OT and not mentioned.

- Contractor should provide suitable fire extinguishers

The sizes are approximate. Minor variations in sizes shall be acceptable subject to prior approval of the Engineer.

In addition to the above mentioned equipment/appliances, if the contractor thinks it necessary to include any other equipment/appliances, accessories etc. for the Modular OT then that may be provided and any other necessary work required for satisfactory working of the Modular OT and not mentioned

The sizes are approximate. Minor variations in sizes shall be acceptable subject to prior approval of the Engineer.

APPROVED MAKES

1.	HEPA Filter	-SAGICO FIM/THERMODYNE/ADVANCE/PENTAGON
2.	Cable	-/KEI/UNIVERSAL/NATIONAL/RRCABLE
3.	Control Panel	- L & T/ SIEMENS/ SCHNEIDER
4.	PVC Pipe Class III with Fitting	- FINOLEX/ SUPREME/ PRINCE/ ORI-PLAST
5.	G.I. / M.S. Pipe Heavy Class	-TATA/ JINDAL(HISSAR)/SAIL /SURYA PRAKASH
6.	MCCB/Contactor/Relay	-L&T/ABB/SIEMENS/SCHNEIDER
7.	Pressure Gauges	- H.GURU /FIEBIG
8.	Stainless Steel	- TATA/SALEM/JINDAL/MUKUND/BHAYANDER/AMBICA
9.	Copper Pipe	- MAXFLOW/PRECISION/RAJCO

Note: All electrical accessories like cable wire, electrical outlets, switches etc supplied by the contractor should be fire proof of reputed make, certified for electrical safety.

- **Wherever makes have not been specified for certain items, the same shall be as per BIS and as per approval of HSCC.**
- **The contractor should provide test certificate for all material used for construction of pre-fabricated Modular OT**
- **The contractor should prepare and submit layout plan for Modular OTs, Laminar flow System including ducting, Electrical Wiring, to HSCC for approval before beginning of supply and installation and <u>As-built drawing</u> after installation.**
- **The contractor shall be responsible for the complete works including submission of working drawing and walk through view.**
- **The contractor should provide complete Operation Manual/Equipment & parts manual/Service manuals for all systems and subsystems.**
- **The contractor shall bear the cost of Final electrical safety test, system test and calibration to be done by authorized person with test instruments.**
- **Training for 30 working days should be provided by the contractor.**
- **Third party quality certification of the imported Modular OT items from SGS/TUV/Lloyds should be submitted by the contractor as "Certifies that the Modular OT items for installation meet the technical specification and BOQ of the tender document vide contract No (Mention Contract No.)."**