HSCC (INDIA) LIMITED

(A Subsidiary of NBCC (India) Limited)
(A GOVERNMENT OF INDIA ENTERPRISE)

Dated: 14.02.2020

AMENDMENT No.– VI

Project Name: **Tender for "Construction of Hospital, Academic Block, Residential Campus and Allied Buildings, etc. and their Maintenance during Defect Liability Period on Comprehensive Design, Engineering, Procurement and Construction (EPC) basis for AIIMS, Rajkot"**

Tender No. **HSCC/AIIMS/Rajkot/EPC/2020 dated 17.01.2020**

This has reference to subject work, the following Amendment may be noted, which shall be treated as a part of the contract to be uploaded along with tender/ bid:

1. Technical Specifications for MGPS & MOT Works under Specialized Services have been amended and uploaded on HSCC e-tender portal **http://www.tenderwizard.com/HSCC.**

   The Bidders are advised to follow the "Amended Technical Specifications for MGPS & MOT Works".

All other terms & conditions of the tender shall remain unchanged.

Prospective bidders are advised to regularly scan through HSCC e-tender portal **http://www.tenderwizard.com/HSCC** & HSCC website http://www.hsccltd.co.in as corrigendum/amendments etc., if any, will be notified on this portal only and separate advertisement will not be made for this.

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DGM (Projects),
HSCC (India) Ltd

TECHNICAL SPECIFICATIONS FOR MGPS (MEDICAL GAS PIPELINE SYSTEM)

Scope of work: S**upply, installation, testing, commissioning including turnkey work and handing over of Medical Gases Piping System to the client. Bidder should provide free spare parts and service during DLP.**

Standards/Guideline

The design & selection of all items should be of standard like NFPA 99(latest version) standard and UL listed or ISO-7396-1/DIN/ EN (latest version) and UL listed/European CE or HTM 02 01 (latest version) guideline and BIS/European CE. This supersedes single/multiple standards mentioned at any other places in the tender specification involving item/system/capacity etc. The products should be of one standard only. All indigenous items should be of high quality and to be compatible to the main system.

Quality Standards – BIS/USFDA/European CE with 4 digit notified body no. /ETL/UL etc. for quoted model.

The system comprises of :

1. Primary LMO tank system (20 KL & 10 KL inclusive Control Panel & Automatic Switchovers)
2. Secondary Oxygen Manifold and Emergency oxygen manifold with automatic control panels
3. Nitrous Oxide Manifold and Emergency N2O Manifold with automatic control panel
4. CO2 Manifold and Emergency CO2 Manifold with automatic control panel
5. Medical Air Supply System (4 Bar & 7 Bar) complete.
6. Medical Vacuum (suction) Supply System Complete.
7. Distribution Piping Complete with Accessories.
8. Area Valve Service System.
9. AGSS system Complete
10. Alarm Systems (Master & Area)
11. Gas Outlets with Probes
12. Bed Head Panels
13. Other associated works

Scope and Technical Specification:

1. Oxygen Supply System

1.1 Fully Automatic Oxygen Control Panel:

Automatic control panel should be constructed in accordance with the requirement of International standards. The fully automatic oxygen control panel should comply with HTM 02-01/NFPA 99C/DIN/EN/ISO-7396-1 standards. It should be BIS/US FDA/European CE Certified with 4 digit notified body number or American ETL/ UL listed.

The manifold assembly should provide two stages of pressure regulation. A single stage primary regulator, one for each cylinder bank should be used to initially reduce cylinder pressure and two single stage pressure regulators should be provided in the control cabinet for final delivery pressure regulation. One delivery pressure regulator in service and one should be ready for service in a standby mode. The Manifold control panel should be digital, fully automatic type and switches from "Bank in Use" to "Reserve bank " without fluctuation in delivery supply line pressure. Changeover should be performed by electrically/pneumatically operated valves contained in the control cabinet. In the event of an electrical power failure the valves should automatically open to provide an uninterrupted gas flow. It should be 100% automatic and should not require manual adjustment. Instruction/indication for changing the cylinders should be clearly identified on the front of the control panel. Control Panel should have digital display.

All functional components should be enclosed in corrosion resistant robust material.
All components inside the Control Panel like Pressure Regulators, piping and control switching equipment should be cleaned for Oxygen Service and installed inside the cabinet to minimize tampering with the regulators or switch settings.

The Control Panel shall include two pressure relief valves, one high pressure approx. 200/350 psi and one low pressure approx.75 psi.

The heavy duty control panel should be provided with a flow capacity of **2000or more LPM** at 50 to 60 psi.

The Automatic Control Panel should be installed in such a way to meet the peak flow requirement of the Hospital/Institute (If the requirement is more than flow capacity requirement automatic control panel the bidders has to supply 02 numbers of Automatic Control Panel and design the system in such a way to meet the flow requirement of respective institute).

Control Panel should show the status of the Manifold and controlling alarm indications shall be shown in Master alarm".

1.2 Oxygen Manifold Supply System (without Cylinders)

The size of Manifolds should be as mentioned in BOQ of respective Institute and it shall be compatible with Class-D type bulk cylinders.

Manifold shall consist of two/one high pressure header bar assemblies to facilitate connection of primary and secondary cylinder supplies. Header bar/s shall be provided with respective numbers of cylinder pigtail connections to suit cylinder valves as per IS.3224/ BS/ ASMEincorporating a check valve at the header connection. Header bar/s assembly shall be provided with a high pressure shut off valve. Header bar/s assembly shall be as per standard mentioned .

Oxygen Manifold should consist of 2/1 row/s of respective numbers of class D-type bulk oxygen cylinders. The manifold should be hydraulically tested to 3000 psig or as per standard to be followed. The manifold should be so designed that it shall suit easy cylinder changing and positioning. The system should have non – return valves for easy changing of cylinders without closing the bank. The cylinder should be placed with the help of cylinder brackets and fixing

chains which should be galvanized. Manifold system should not contain any Halogenated Polymer materials.

1.3 Emergency Oxygen Manifold (without Cylinders)

The size of Manifolds should be as mentioned in BOQ of respective Institute and it shall be compatible with Class-D type bulk cylinders.

Manifold shall consist of two/one high pressure header bar assemblies to facilitate connection of respective numbers of primary and secondary cylinder supplies. Header bar/s shall be provided with respective numbers of cylinder pigtail connections to suit cylinder valves as perIS.3224/ BS/ ASME incorporating a check valve at the header connection. Header bar/s assembly shall be provided with a high pressure shut off valve. Header bar/s assembly shall be as per standard mentioned .

Oxygen Manifold should consist of 2/1 row/s of respective numbers of class D-type bulk oxygen cylinders. The manifold should be hydraulically tested to 3000 psig or as per standard to be followed. The manifold should be so designed that it shall suit easy cylinder changing and positioning. The system should have non –return valves for easy changing of cylinders without closing the bank. The cylinder should be placed with the help of cylinder brackets and fixing chains which should be galvanized. Header bar/s assembly shall be as per standard mentioned in the technical specification of tender.

1.4 Oxygen Flow meter with Humidifier Bottle

Back Pressure Compensated flow meter for accurate gas flow measurement with following features:

A) Control within a range of 0-15 LPM.
B) It should meet strict precision and durability standard.
C) The flow meter body should be made of brass chrome plated materials.
D) The flow tube and shroud components should be made of clear, impact resistant polycarbonate.
E) Flow tube should have large and expanded 0-15 LPM range for improved readability at low flows.
F) Inlet filter of stainless steel wire mesh to prevent entry of foreign particles
G) The humidifier bottle is made of unbreakable & reusable polycarbonate /polysulfone material autoclavable at 121 degree centigrade.
H) Humidifier Bottle should be covered under warranty & CMC.
I) should be BIS/USFDA/European CE certified with 4 digit notified body number or American ETL/ UL Listed

1.5 LIQUID MEDICAL OXYGEN STORAGE TANK

The double walled Vacuum Insulated Evaporator shall be constructed of stainless steel inner vessel contained within a carbon steel outer vessel. The annular space between the vessels shall be filled with non-inflammable perlite insulation material to insulate under vacuum. The VIE should be self-pressurizing type by partial evaporation of liquid oxygen through a pressure building coil by a non-ferrous imported pressure regulator. The vessel shall be supplied as a

functional whole with all materials of construction & the cleaning regime suitable for medical grade liquid oxygen.

Quantity	:	20 KL x 1 No. and 10KL x 1 No
Installation	:	Outdoor
Type	:	Double walled, vertical
Capacity	:	Minimum 2**0000 ltrs** water capacity- 1 No and Minimum **10000 litres** water capacity – 1No
Design Code	:	ASME Sec.VIIIDiv.I Latest Edition/EN 13458-2 Annexure –C/AD2000 MARKBLATTER 2004 Edition
Max working pressure	:	17 -17.6 Bar G
Design temperature	:	- 196^0C to + 50^0C
Hydraulic test pressure	:	26 bar G or as per EN 13458
Type of Insulation	:	Vacuum, Perlite filled
Safety Valve Set pressure	:	17 Bar G (dual safety valve with three way diverter valve)
Bursting Disc Set pressure	:	23 Bar G (Bursting disc)
Standard fittings	:	Pressure rising coil, Pressure building regulator of adequate capacity and size, dual safety valve with three way diverter valve, bursting disc., pressure gauges, liquid over flow line, Liquid level gauge and adequate numbers of extended spindle glove valve etc.
Maximum Evaporation Rate	:	<0.35% of net value.
Material of Construction	:	Inner shell and wetted parts of SS-304
		Outer shell of CS ASTMA 516 Gr.70/CG3412002 EN13455 S275/S355
Joint Efficiency	:	100% or as per code EN 13458
Radiography	:	100% for inner, for outer spot
External piping	:	From LMO Tank to Vaporizer SS304
		From Vaporizer to Inlet of Pressure
		Reducing Station SS304

		From Outlet of Pressure Reducing Station to Main header Copper
Cryogenic Valves	:	Non Ferrous .
Cryogenic Safety Valves	:	Imported
Pressure Building Regulator	:	Non ferrous .
Leak Detection test	:	Helium Leak Detection
Painting	:	Primer and finish with White RAL 9010
Inspection	:	By 3rd party (SGS/LLOYDS/TUV)
Cleaning	:	Degreasing for Oxygen Service and Pressurize with Nitrogen.
Withdrawal rate	:	1000 Cum hr. at 12 Bar G

Accessories :

LMO Tank along with P & ID shall be fitted with the following accessories:

- Top Fill Valve
- Bottom Fill Valve
- Liquid charging line blow valve
- Liquid Delivery valve
- Overflow Valve
- Gas blow valve
- Filling Coupling
- Vaporizer Coupling
- Liquid Level Gauge (Dial 100 mm)
- High Level Valve
- Equalizing Valve
- Low level Valve
- Pressure Gauge (100mm dial, Range 0-25 kg/sq.cm)
- Pressure Gauge Isolation Valve
- Pressurizing Valve
- Pressurizing Coil
- Filter
- Pressure Regulator
- Economizer
- Check Valve
- Evacuation Port
- Vacuum Gauge Connection Port/Vacuum probe valve.
- Telemetry

SAFETY FITTING:

The vendor should ensure that all international safety norms and standards applicable as implemented and certified by the CCOE.

Following are the mandatory provisions for vessel:

- Vessel low liquid level alarm
- Vessel low pressure alarm
- Pipeline low pressure alarm.
- Twin regulator
- Non return valve and 3 way diverter (bypass) valve
- Automatic changeover to manifolds with control panel
- Alarm on indicating manifold in use in case the vessel is not in use.
- Alarm on low pressure back-up manifold cylinders
- Two safety valves for inner vessel fitted on pipe line with flow divert valve.
- Rupture disc for inner vessel
- Safety valve for inlet pipeline
- Safety valve for pipeline of pressurizing evaporator
- One rupture disc/safety device on outer vessel.

SUBMITTALS:

The Liquid Medicals oxygen tank shall accompany the Original Quality Test Certificate covering following documents:

-Approvals letter from CCOE along with approved drawing from CCOE.

-Approval letter from CCOE for use of cryogenic vessel(s) at site.

-Certificate from the authorized inspection agency.

-Heat chart for pressure parts.

-Dimension checks parts.

-Dished End reports.

-Mechanical properties test reports.

-Visual inspection report.

-Radiography examination report.

-Liquid penetrant examination.

-Cleaning inspection report.

-Hydro-pressure test report.

-Pneumatic pressure test report.

Inner vessel rub-off sheet.

Material test reports for pressure gauges, level gauge etc.

NOTE :

- All valves shall be long stem valves with SS body.

Liquid Oxygen supply system.

One vessel of 1 x 20 KL Liquid Oxygen VIE vessel system will be the primary (main) supply source another vessel of 1x10KL will be secondary source. In case of failure in liquid oxygen supply, it should automatically switch over to an emergency oxygen manifold having 2x20 Cylinder bank.
The unit should consist of a double walled vertical vessel (inner pressure vessel made of stainless steel and outer vessel of carbon steel). It should be fitted with standard accessories and should be passed the standard inspection requirement at factory for VIE. The copy of certificate should be forwarded to HSCC prior to shipping and original should be enclosed along with the shipping document. Bidder should follow international standards.

Product and Service specification:

Proposed capacity of the primary liquid oxygen storage tank is 20x1KL and secondary is 10KL Gas outlet pressure to be maintained at 4.2 kg/cm2.

Space taken for installation should be as per regulations of Indian explosive controller and having easy access for LMO tank.

The site would be protected by fence around, well lit by sodium vapour lamps and demarcated with proper signage

Indication of liquid oxygen level and outlet gas pressure should be provided.

Automatic change over should be provided between the primary and secondary LMO tanks. In case of failure in liquid oxygen supply, it should automatically switch over to an emergency oxygen manifold having 2 x 20 cylinders

Specification of Components

Product: The liquid medical oxygen (LMO) supplied at site should be of IP grade. The LMO supplied should comply with all relevant SMPV regulations and standards under the preview of the Indian Drugs and Cosmetic Act rules. They should also satisfy the IP 2007 specifications.

Storage Tank Specifications

The storage tank and the vaporizer coils should be designed as per the ASME

Sec.VIIIDiv.I latest Edition / EN -13458-2 Annexure-C/ AD2000 , MARKBLATTER 2004 Edition
The cryogenic vessel shall be of cylindrical shape with vaporiser and the pressure control system. It should be provided with the essential components to fill the liquid, to build up pressure, to relieve pressure, to withdraw product and to evacuate the vessel. All protective, safety and alarm provisions mandatory to Liquid Medical Oxygen plants should be supplied.

The requirement of the Cryogenic Vessel should be:

1. Configuration: Vertical
2. Inner vessel maximum allowable working Pressure: 17 kg/cm2
3. Inner vessel hydrostatic test pressure: Greater than 26 kg/ cm2
4. Outer vessel material of construction: Carbon steel
5. Inner vessel material of construction: Stainless steel
6. Independent AV coil should be provided with each vessel.

Storage Tank Capacity

Vacuum insulated evaporator vessel should have a capacity of 20X1 kilo liters and other with 1X10 kilo litres. The AV coil should have adequate capacity to handle the gas flow requirements of the hospital.

Vaporiser Coil

1. Maximum operating Pressure: 20 kg/cm2
2. Design Pressure: 22 kg/cm2
3. Pneumatic test Pressure: Greater than 24 kg/cm2
4. Inlet temperature: - 196 to +40°C.
5. Duty cycle: Continuous duty
6. Flow rate : 1200 cubic metre/ hour

The fence, foundation, lighting, signage, approach gate etc are to be designed and installed by the vendor.

Safety

The vendor should ensure that all international safety norms and standards applicable as implemented and certified by the CCE.
Following are the mandatory provisions for vessel:
Vessel low liquid level alarm
Vessel low pressure alarm
Pipeline low pressure alarm.
Twin regulator
Twin safety valve
Non return valve and 3 way diverter (bypass) valve
Automatic changeover to manifolds with control panel
Alarm on indicating manifold in use in case the vessel is not in use.

Alarm on low pressure back-up manifold cylinders

Statutory Requirements
All statutory requirements of the Chief Controller of Explosives of India and SMPV rules need to be followed, besides all regulations and guidelines put forward by the Govt. Of India from time to time should be followed.

Interconnection to LMO tank

Bidder should include all installation, material (Copper pipes fittings etc) trenches and labour etc charges as per site condition for interconnection.

Maintenance

All routine preventive maintenance and break-down maintenance of the liquid oxygen plant should be done by the vendor. Experienced personnel should be readily available.
Log of all works undertaken in the plant should be meticulously maintained by the vendor.

2. NITROUS OXIDE SYSTEM

2.1 Fully Automatic Nitrous Oxide Control Panel

The fully automatic N2O control panel should comply with HTM 02-01/ NFPA 99 C/ EN /DIN/ISO 7396-1 STANDARD. It should be BIS/US FDA/European CE Certified with 4 digit notified body number or American ETL/UL listed.
The manifold assembly should provide two stages of pressure regulation. A single stage primary regulator, one for each cylinder bank should be used to initially reduce cylinder pressure and two single stage pressure regulators should be provided in the control cabinet for final delivery pressure regulation. One delivery pressure regulator in service and one should be ready for service in a Standby mode. The Manifold control panel should be digital, fully automatic type and switches from “Bank in Use” to “Reserve bank “ without fluctuation in delivery supply line pressure. Changeover should be performed by electrically/pneumatically operated valves contained in the control cabinet. In the event of an electrical power failure the valves should automatically open to provide an uninterrupted gas flow. The manifold should not require any manual resetting or adjustments after the replacements of the depleted cylinders.
The Control Panel shall include two pressure relief valves, one high pressure approx.200/350psi and one low pressure approx.75 psi.

The control panel should also have heaters to prevent ice formation on the regulators at high flow rates.

The Control Panel should be made to provide Heavy Duty and have a flow capacity of **1000 LPM or more** at 50 to 60 psi.

The Automatic Control Panel should be installed in such a way to meet the peak flow requirement of the Hospital/Institute (If the requirement is more than flow capacity requirement automatic control panel the bidders has to supply 02 numbers of Automatic

Control Panel and design the system in such a way to meet the flow requirement of respective institute)

Control Panel should show the status of the Manifold and controlling alarm indications shall be shown in Master alarm".

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2.2 Nitrous Oxide Manifold (Without Cylinders)

The size of Manifolds should be as mentioned in BOQ of respective Institute and it shall be compatible with Class-D type bulk cylinders.

Manifold shall consist of two/one high-pressure header bar assemblies to facilitate connection of primary and secondary cylinder supplies. Header bar/s shall be provided with respective number of cylinder pigtail connections to suit cylinder valves as perIS.3224/ BS/ ASMEincorporating a check valve at the header connection. The high-pressure header bar shall be designed in such a manner that it can be extended to facilitate additional cylinder connections. Header bar/s assembly shall be provided with a high pressure shut off valve. Header bar/s assembly shall be as per standard mentioned .

The manifold should be hydraulically tested to 3000 psig or as per guideline of standard. The manifold should be so designed that it shall suit easy cylinder changing and positioning. The cylinder should be locked with the help of cylinder brackets and fixing chains which should be galvanized.

2.3 Emergency N2O Manifold (Without Cylinders)

The size of Manifolds should be as mentioned in BOQ of respective Institute and it shall be compatible with Class-D type bulk cylinders. Manifold shall consist of One high-pressure header bar assemblies to facilitate connection of primary and secondary cylinder supplies. The header bar shall be provided with respective numbers of cylinder pigtail connections to suit cylinder valves as per IS 3224/ BS/ ASME incorporating a check valve at the header connection. The high-pressure header bar shall be designed in such a manner that it can be extended to facilitate additional cylinder connections. Each header bar assembly shall be provided with a high pressure shut off valve. Nitrous oxide manifold should consist of 1 row of respective numbers of cylinders. The manifold should be hydraulically tested to 3500 psig. The manifold should be so designed that it shall suit easy cylinder changing and positioning. The system should have non – return valves for easy changing of cylinders without closing the bank. The cylinder should be placed with the help of cylinder brackets and fixing chains which should be galvanized. Header bar/s assembly shall be as per standard mentioned .

3. MEDICAL AND SURGICAL AIR SYSTEM

Air-cooled **Oil-Less** compressors for continuous duty application with highest output of compressed air, low power consumption and very low vibration resulting in low noise level.

The medical air plant shall fully comply with the requirements of the HTM 02-01/ NFPA 99C/EN/DIN/ISO 7396-1. It should be BIS/US FDA/European CE certified with 4 digit

notified body number or American ETL/ UL listed(In-case of NFPA 99c the control panel of plant must be UL Listed and Undertaking from manufacturer for this tender reference must be submitted for using the same control panel in the system offered). Combination or decombination of Medical Air & Surgical Air System should be followed as per standards mentioned.

3.1Air Compressor Modules

It should be **Oil-Less Screw Compressors /Scroll Compressors** to produce the plant output as per system requirement and should be as per standards. Standby in Air Plant should be as per standard.

Medical quality air shall be delivered at a nominal pressure of 400 kPa (4 bar) and 700kPa(7bar) gauge for supply of the hospital medical air and surgical air. Compressor plant should be designed in such a way that compressors will switch on in sequential manner as per flow demand. Air Compressor should be factory fitted , factory tested, packed, prewired & pre-piped. The compressors should be standalone ones with independent power supply. Each Compressor should be suitable for both continuous and frequent start/stop operation at a nominal plant pressure of 10bar or more. The duty compressors shall be automatically rotated by the plant control system to ensure even wear. Compressors shall be supplied and installed in such a way after cooler with a quiet running fan to maximize cooling and efficiency. Each desiccant dryer shall be provided with a dew point sensing switch that shall provide an alarm on the plant control panel and central hospital alarm system when the water concentration in the delivered air rises above the limit or Desiccant dryer shall be provided with a dew point sensing switch that shall provide an alarm on the plant control panel "or as per the guideline of standard to be followed. Duplex desiccant dryer and filtration modules shall be provided with three or more individual stages of filtrations follows:

Stage 1: Coalescing filter upstream of the desiccant dryer for removing liquid water particles down to 1micron.
Stage 2: Particulate filter after the desiccant dryer for dust protection and removing particles down to 1 micron.
Stage 3: Bacteria filter for removing particles down to 0.01 micron. Purity test should be as per manufacturer's test recommendations (certificate) and it may be tested if required. The plant control and power management system shall monitor the safe operation of the plant, providing signal into the alarm system as per the requirements of the standard.

Pressure Reducing Station: for 4 bar and 7 bar should fully comply and meet with the requirements of the standard. Simplex pressure reducing station shall comprise as in-line pressure regulator, with downstream pressure gauge. Isolation valves and pressure release valves should be provided as per the standard. Duplex pressure reducing station to have two branches, connected to the MGPS in parallel in order to allow maintenance on the components of one branch, while the gas flow is maintained in the other branch. Ball Valves - Full bore which operate from fully open to fully closed position with a quarter turn of the handle.Completepressure reducing station with base plate mounted for ease of installation. Padlocks available to allow locking of the valves in both open and closed positions and must have easy to read pressure gauges or as per guideline of standard to be followed. Base plate

mounted and supplied with copper stub pipes for ease of installation using inert joining procedures.

The compressor system should have-

1. Intake filter Check Valve Delivery pipe or as per guideline of standard to be followed.
2. Mounting on air tank along with all standard fittings viz. safety valve, pressure gauge,delivery valve, drain valve etc.
3. Bidder shall provide all electric control panels, starters etc required for proper functioning of motor.
4. Desiccant Air Dryer – 2 nos.(Duplex)
5. 2-Stage or more Breathing Air Filters – 2 sets(Duplex)
6. Outlet pressures for drills/equipment and ventilators should be a minimum of 7 bar and 4 bar respectively.
7. Duplex pressure reducing station

The compressor should be heavy duty, reliable with long MTBF. Each compressor cylinder is to be protected by a temperature switch, which will stop the drive motor and provide an alarm signal in the event of abnormal discharge air temperature. Each compressor module should include an inline filter with particle retention of 10 microns, inlet isolation valve, discharge isolation valve, and pressure relief valve. The capacity should be capable to take care of total load of all the outlets.

3.2 Vertical Air Receiver

Total air receiver capacity shall be as per requirement or as per guideline of standard to be followed. Each air receiver shall be protected by a pressure relief valve, a fusible plug and include a pressure gauge with isolating valve and a draincock. The corrosion resistant coated receiver is to be equipped with tested safety pressure relief valve, sight glass pressure gauge, automatic drain, three-valve by-pass and source isolation valve. Should be fabricated as per ASME/BS/ISO

3.3 Air Treatment Module

The air treatment module should include dual dryers, dual filtration system and a dewpointtransmitter with local audible and visual signals and dry contacts for remote monitoring. The components should be mounted on a common base with interconnecting copper/brass piping and upstream and downstream isolation valves. The isolation valves must allow either set of components to be serviced without shutting down the system. Dryers should be of heatless desiccant design and sized to provide for the peak calculated demand. The desiccant dryers should be equipped with dew point dependent switching feature to minimize the need for purge air. The dual filtration system should remove liquid and particulate matter, consisting of 0.5microncoalescing filters with differential pressure indicators and automatic drain, airline pressure regulators with gauges, final pressure relief valve, and sampling valve. Each bank should consist of three stage treatment. Digital dew point monitor is to be supplied with alarm contacts as per requirement of the standard.

3.4 System Controls

System control to be offered as per requirement of the standard. The "Continuous on Demand" feature will stop the operation of the motors during periods of lower no

demand. The control include individual self-protected combination motor controls with short circuit protection, single phase and thermal overload protection, individual control circuit transformers with fuse primary and secondary protection or as per standards, pressure sensors, temperature switches with reset buttons, and an electronic controller to automatically change the operating sequence of the compressors or as per guideline of standard to be followed. The cabinet shall have status display to include system pressure, dew point pump operation, accumulated time, maintenance interval, fault conditions, and silence button, lighted Hand-Off-Automatic selector switches and safety disconnect operating handles. All required local alarm functions shall be integrated in to the packaged system.The system should be designed to function even if the programmable controller fails.

3.5 Accessories

Accessories including for job site installation such as inlet and discharge flexible connectors, vibration mounting pads, and source isolation valve should be supplied.

All the filters should be covered under warranty period and CMC Period.

4. VACUUM SYSTEMS

It should be BIS/US FDA/European CE certified with 4 digit notified body number or American ETL/UL listed. (In-case of NFPA 99c the control panel of Plant must be ETL/UL Listed and Undertaking from manufacturer must be submitted for using the same control panel in the system offered)and should comply with HTM 02-01/ NFPA 99C/EN/DIN/ISO 7396-1. Vacuum System should be factory fitted, factory tested, packed, pre wired & pre piped.

4.1 Vacuum Pump Module

It should be **Oil Sealed Rotary Vane Type** to produce the plant output as per requirement and should be as per standards. Standby in Vacuum plants should be as per the standard .The vacuum plant shall comprise air-cooled, oil lubricated rotary vane vacuum pumps suitable for both continuous and frequent start/stop operation at inlet vacuum levels between 500mmHg and 660 mmHg. The control system should normally employ automatic rotation of the lead pump to maximize pump life and ensure even wear. Vacuum pump inlets shall include a wire mesh filter and integral on-return valve to prevent oil suck back and pressure increases in the vacuum system. Each vacuum pump shall be fitted with anti-vibration pads between the pump foot and mounting frame. The plant shall be fitted with duplex bacteria filter system.

4.2 Vacuum Receiver

The vacuum receiver shall be made of rust free corrosion resistant steel and fabricated as per ASME/BS/ISO/DIN standard for a vacuum pressure of 760mmHg. It should include bypass valves,manual drain valves, vacuum gauge. Vacuum reservoir shall have total volume **as per system requirement and as per standards.** in one minute in terms of free air aspired at normal working pressure or as per guideline of standard to be followed.

4.3 System Controls

System Controls shall be as per requirement and standard. The control include individual self-protected combination motor controls with short circuit, single phase and thermal overload protection, individual control circuit transformers with fused primary and secondary protection or as per standard, pressure sensors, temperature switches with reset buttons, and an electronic controller to automatically change the operating sequence of the compressors or as per guideline of standard to be followed. The system should have a status display to show the system pressure, elapsed time, maintenance interval, fault conditions, and silence button, lighted Hand-Off-Automatic selector switches and safety disconnect operating handles.All required local alarm functions should be integrated into the packaged system. The circuitry should be designed so that the audible signal can be silenced and the visual indicator will remain until the fault has been cleared and the reset button resets. Local alarm functions should be enunciated for reserve pump in use.

4.4 Bacterial Filters

The filters should be designed for removal of solid, liquid and bacterial contamination from the suction side of vacuum pump systems, preventing damage to the pump and the potential biological infection of the surrounding environment. The dryer should be particulate filter dryer with ability to remove particles as small as 1micron.Each individual filter shall have the capacity to deliver full design flow such that one set is designated duty and the other will be standby. Bacteria filters shall have efficiency at least99.999% when tested by the sodium flame method in accordance with BS 3928:1969/as per respective standard utilising particles in the 0.02 to 2 micron size range. The pressure drop across each clean filter at 50% of the system design flow should not exceed 25 mm Hg (3 kPa) at vacuum of 475mm of Hg (63 kPa). Bacteria filters shall be marked with the legend ‘Bio-Hazard’. Each bacteria filter shall be provided with a transparent sterilizable collection jar to collect condensate. The total water capacity of the pressure vessels shall be at least 100% of the design flow rate of the plant in 1 minute in terms of free air aspired.

4.5 Accessories

Accessories included for job site installation are inlet and discharge flexible connectors, vibration mounting pads, and source isolation valve, inlet check valve, oil temperature gauge, thermal malfunction switch and vacuum control switch. Flexible connectors on inlet and exhaust of each pump, exhaust tee with union as well as copper tubing with Shut-off-cock for gauge/bypass valve and vacuum switch etc.

All the filters should be covered under warranty period and CMC Period.

5. Ward Vacuum Units

It must consists of the following:-

1. 1no of Suction Regulator and 1no of 1000 ml to 2000 mlpolysulfone /polycarbonate collection jar.
2. Digital/AnalogueSuction Regulator: Suction regulator should be supplied with a safety jar, including and antibacterial filter and an anti-overflow safety device. Should have wide membrane continuous suction controller.In case of digital suction regulator, battery should be replaced by the bidder during warranty & CMC period.
3. Should have vacuum levels: 0-750 mm of Hg or more

4. Should have vacuum gauge fitted with a protective bumper device.
5. Should have on/off knob allowing for the quick restoration of a readjusted vacuum level.
6. Must have central adjustment knob with a color coded for 0 to 750 mm of Hg or more. Should havePolysulfone/polycarbonate 100 cc safety jar, autoclavable at 121º C at 5mins, unbreakable, fitted with an anti-overflow safety device and equipped with a plastic antibacterial filter. It should be totally transparent, to ensure perfect sucked liquid visibility.
7. It should be BIS/US FDA/European CE certified with 4 digit notified body number or American ETL/UL listed

6. Low flow ward Vacuum Unit (Digital/Analogue) -

Should have vacuum levels: **0-150 mm of Hg (± 10%)**

It should be BIS/US FDA/European CE certified with 4 digit notified body number or AmericanETL/UL listed

7. Theatre Vacuum unit for OT

It must consist of the following: -

1. **Digital/AnalogueSuction Regulator** and 2nos. **1500 ml or more**polysulfone/ polycarbonate collection jar and both to be mounted on a trolley.
2. **Digital/AnalogueSuction Regulator**: Suction regulator should be supplied with a safety jar, including an anti-bacterialfilter and an anti-overflow safety device. Should have wide membrane continuous suction controller.In case of digital suction regulator, battery should be replaced by the bidder during warranty & CMC period.
3. Should have vacuum levels :**0-750 mm of Hg or more**.
4. Should have vacuum gauge fitted with a protective bumper device.
5. Should have on/off knob allowing for the quick restoration of a readjusted vacuum level.
6. Must have central adjustment knob with a color coded for **0-750 mm of Hg or more**. Should have polysulfone/polycarbonate safety jar, autoclavable at 121º C, unbreakable, fitted with an anti overflow safety device and equipped with a plastic antibacterial filter.
7. Collection jar should be totally transparent, to ensure perfect sucked liquid visibility.

8. It should be BIS/US FDA/European CE certified with 4 digit notified body number or American ETL/UL listed

8. AGSS (Anesthetic Gas Scavenging System) Plant

Anaesthetic Gas Scavenging System (AGSS) of as per system requirement and as per standard. It should be BIS/US FDA/European CE Certified with 4 digit notified body number or BIS/Americal ETL/UL listed (In case of NFPA.99c the Control panel of Plant must be BIS/UL/ETL Listed and Undertaking from manufacturer must be submitted for using the same control panel in the system offered) and should comply with HTM 02-01/ NFPA 99 C/EN/DIN/ISO 7396-1.AGSS should be factory fitted, factory tested, packed, pre-wired & pre-piped. The package should consist of two dry rotary vane/Claw type vacuum pumps (Dry/Oiless) or as per guideline of standard to be followed**,** a control panel, and mounted on a common base frame. AGSS pump: AGSS pump shall operate completely dry. Eachpump

should be completely air cooled and have absolutely no water requirements. The suitable wiring from OTs to AGSS plant for remote control/suitable reservoir (as applicable) is the responsibility of the bidder. System in-line non-return values should allow individual pump servicing. Active anaesthetic gas scavenging systems should be designed to safely remove exhaled anaesthetic agents from the operating environment and dispose of them to atmosphere from the highest point of the hospital building, thus preventing contamination of the operating department and providing a safe and healthy workspace for the personal. AGSS design should be dependent upon flow rate and pressure drop characteristics of the individual components of systems. It is essential that terminal units, remote controls (If required) and pump units work in synchronized manner after connection of workstation to the AGSS System. Installation should be on roof top/suitable location. Piping, Non-Return-Valves (NRVs), and inlet nozzle should be suitably placed. Connecting hose suitable to fit with anaesthesia workstation should be provided.

9. DISTRIBUTION PIPING

8.1 Piping specifications

Copper pipe should be as per standard BS: EN 13348:2008/ ASTM B819 standards, Solid drawn, seamless, deoxidized, non-arsenical, half hard (hard can be accepted only for sizes 54mm or more), tempered and degreased copper pipe conforming to the standard. All copper pipes should be degreased & delivered capped at both ends. The pipes should be accompanied with manufacturers test certificate for the physical properties & chemical composition. Copper pipe must have reputed third party inspection certificate (Eg. Lloyd's or TUV or SGS).Fittings should be made of copper and suitable for a working Pressure of up to 17bar and especially made for brazed socket type connections. All valves shall be pneumatically tested for twice the working pressure and factory degreased for medical gas service. Copper fittings should comply with EN 1254:1 factory degreased and brazing filler metals shouldcomply with EN 1044. Fitting should be degreased, individually packed for medical use. The minimum thickness of copper pipes of 35mm and above outer diameter, should be 1.2mmand the thickness of copper pipes less than 28mm outer diameter, should be 1mm as mentioned in respective BOQ.

8.2 Installation & testing

Installation of piping shall be carried out with utmost cleanliness. Only pipes, fittings and valves that have been degreased and fittings shall be used at site. Pipe fixing clamps shall be of nonferrous or non-deteriorating plastic suitable for the diameter of the pipe.
Inert gas welding technique should be used by passing oxygen Free Nitrogen Gas inside the copper pipes during silver brazing, in order to avoid carbon deposition inside the copper pipes. Only copper-to-copper joints are permitted on site except threaded or flanged joints may be made where pipelines are connected to items such as valves and control equipment. No flux shall be used for joining Copper to Copper joints and on for joints made on site. Copper to copper joints shall be brazed using a 5% silver-copper phosphorous brazing alloy CP104. A total of 5joints shall be cut out for examination to establish the quality of the joints being made on site. The insides shall be clean and free from oxides and particulate matter and the minimum penetration of the brazing alloy at any point shall be three times the wall thickness of the tube. If the joints examined do not conform to these requirements, then adjacent joints shall be cut out and examined until the extent of faulty workmanship has been made good. Copper-to-brass or gunmetal joints shall only be made under controlled conditions off site. The joints are

ordinarily used to join short copper pipe tails to brass, gunmetal or bronze fittings to permit their connection into the pipeline. The sub-assemblies shall be degreased and individually sealed in bags or boxes before delivery to site. Adequate supports should be provided while laying pipelines to ensure that the pipes do not sag. Suitable sleeves shall be provided wherever pipes cross through walls / slabs. All pipe clamps shall be non-reactive to copper.After erection, the pipes are to be flushed with dry nitrogen gas and then pressure tested withdry nitrogen at a pressure equal to twice the working pressure or 150 psig, whichever is higherfor a period of not less than 24 hours.
Length and quantity of individual items (Copper pipes, AVSUs, Alarm panels, Isolation valves, Outlets, pendants etc.) are mentioned. However quantity will be calculated and paid at actuals.Bidder should quote unit price for all the items as detailed **Maximum interval between supports (Horizontal and Vertical)**(12mm Pipe - 1.5m, 15mm pipe - 1.5m, 22mm pipe – 2m, 28mm pipe-2m, 35mm pipe-2.5m,42mm pipe -2.5m, 54mm pipe - 2.5m, 76mm pipe – 3meter)

a. Painting

All the pipes from manifold/plant upto the outlets should be painted with two coats of synthetic enamel paint and colour codification should be as per standards followed and with consultation with competent authorities of the Institute/HSCC.

10. GAS OUTLETS

Terminal Units (Gas Outlets) with probes/Adaptors for O2, N2O, Compressed Air 4, Air 7, AGSS,Vacuum & CO2 (CO2 can be optional depending on the requirement)The Medical gas outlets shall confirm to HTM 02-01/ NFPA 99 C/EN/DIN/ ISO 7396-1. Front loading Type Terminal Outlets should be designed to dispense medical gases (or an inlet for medical vacuum) to the secondary equipment (flow meters, Suction regulators, etc.) at the point of use and is gas specific so that secondary devices cannot be “attached” to the wrong gas. When not in use the gas in a non-flowing state within the Outlet (Terminal unit) sealed by “O” ring. The adapter when inserted pushes the poppet inside and the gas starts flowing and sealing is ensured by the “O” ring or a seat. The Outlets are Quick Connect Type and gas specificity is accomplished by "Pin indexing."

The outlets should have following features:
• Push to insert and press-to-release mechanism for probes.
• Allows plugging of probes from front.
• Self-sealing valve on disengaging the probe (Quick disconnect)
• Smooth quite action.
• Non return valve for on line servicing/ repairing
• Indexed to eliminate inter-changeability of gas services
• Color-coded gas specific front plate
• Totally leak proof, safe & easy to operate
• Configurations possible: surface, flush & Bead-head.
•Outlet should be European CE certified or American UL listed
•All outlets should have respective label (i.e.O2/N2O/CO2/Air4/Air7/Vacuum/AGSS/etc.)displayed accordingly.
- Outlets should be BIS/US FDA/European CE certified with 4 digit notified body number or American ETL/UL listed.

11. AREA VALVE SERVICE UNIT (With Valves)

Area valve service units should fully comply and meet with HTM 02-01/NFPA99C/EN/DIN/ISO7396-1, It should provide a zone isolation facility for use either in an emergency or for maintenance purpose .The Area Valve Service Unit should incorporate prefitted ball valve in a box with emergency access. The Area Valve Service Unit should incorporate a ball valve with NIST/else connectors either side mounted in a lockable box with emergency access or as per guideline of standard to be followed. It should be reliable and easy to operate and must have NIST connectors facilitate easy purge, sample & pressure testing and emergency supply system or as per guideline of standard to be followed. Medical gas/vacuum services should be fixed copper, piped to and from their respective area valve service units. A color coded service identity label should be fitted behind the valve handle. It shall be as per standards.

The unit should provide a zone isolation facility. Gas Flow direction should be indicated.
The box shall be made from extruded aluminium/MS powder coated to prevent corrosion or as per guideline of standard to be followed. All wetted parts (except seals and gaskets) should be brass or copper. Each unit assembly should be factory tested for gas tightness. Rubber pipe grommets should be provided to ensure any leaking gas does not escape from the unit into a wall cavity. All visible aluminium/MS surfaces should be powder coated.

12. ALARM SYSTEM

12.1 Master Alarm

Should be BIS/European CE certified with 4 digit notified body number or American ETL/UL listed. Complies with HTM 02-01 / NFPA 99C/EN/DIN/ ISO 7396-1 standards. Master Alarm should be digital or as per standard .Each Master Alarm should be modular in design and be fitted with required number of master alarm modules. The master alarms should be capable to monitor minimum 30-40 Point. Each point represents an alarm condition that the source equipment might have. When an alarm condition exists, a red light flashes and the audible alarm sounds. If several alarm conditions occur simultaneously, the most recent alarm light should flash, while the other alarm lights should remain lit. When an alarm condition is created, an audible thickness and equipped with mounting brackets panel shall display and/or input up to 30-40 point alarm should be actuated. A dry contact module should be available to interface with a building management system.The box material should be of gauge steel of requisite Panel should be ready to use with BMS system. Bidder shall be responsible for all cabling alarms. from local alarm panels (OTs, ICUs) to Master Alarm. The emissions from alarms should conform with EMC standards or as per guideline of standard to be followed. Master alarm management system should be designed to display alarm conditions from the source supply units indicating the broad status of the source equipment and manifolds as well as the master distribution status from the source supplies. Depending on the alarm priority, visual and audible alarm should be initiated to indicate an alarm condition. Each
The master alarm must be able to monitor the following source alarm conditions.

- Oxygen Source Empty/Fault

Panel.

- Oxygen Cylinder Bank Empty/Fault Empty
- Oxygen Emergency Bank /Fault

- Air Compressor Faulty/Operation
- Vacuum Pump Faulty/Operational
- Vacuum Deficiency Vacuum Reservoir
- And Other MGPS Signals & Alarms

Bidder shall be responsible for all cabling from local alarm panels to master alarm panel.
Master alarm should be integrated with BMS/HIS/HMIS

12.2 Medical Gas Area Alarm

The medical gas central alarms should be capable of monitoring up to 6 medical gas services by means of pressure sensors which detect deviations from the normal operating limits of either pressure or medical vacuum. **The area alarm should have a digital display or as per standard mentioned.** The medical gas area alarm should fully satisfy the HTM 02-01/ NFPA 99 C/EN/DIN/ISO 7396-1 requirements and should be BIS/European CE certified with 4 digit notified body number or American ETL/UL listed. An audible warning should sound simultaneously with any failure indication and a mute facility should be provided. "

Note : The bidder may offer combined unit of AVSU & alarm, bidder has to match the quantity of AVSU/Alarm whichever is higher.

13. Line Isolation Valves

The Lockable line valves must be degreased and complete valve with stuffed pipe & fittings, factory tested and complies with HTM 02-01/ NFPA99 C/EN/DIN/ISO 7396-1 standard.

14. Supply of O2 Cylinders – Class D Type
Should be as per BIS/IS/ASME Standard. Valve Guard should be fitted on all cylinders for protection of Cylinder Valve.

15. Supply of N2O Cylinders – Class D Type
Should be as per BIS/IS/ASME Standard. Valve Guard should be fitted on all cylinders for protection of Cylinder Valve.

16**Supply of CO2 Cylinders – Class D Type**
Should be as per BIS/IS/ASME Standard. Valve Guard should be fitted on all cylinders for protection of Cylinder Valve.

17. **Horizontal/ Vertical Bed Head Panel**

It shall confirm to HTM 02-01/ NFPA 99 C/EN/DIN/ISO 7396-1. The design should be approved by the respective institute/HSCC before installation and it is responsibility of the bidder after getting order they have to discuss with respective institute and finalized the Bed Head Panel(Vertical/Horizontal) as per site condition. Vertical BHP should be upto False Ceiling level and all outlets and sockets should be located at reachable height. Horizontal BHP should be of maximum 1200 mm for 2/3 gas outlet configuration, 1500 mm for 4/5 outlets configurations.

It should have following features:-
Efficient, Safe & Robust design in extruded aluminium section. Smooth curved surfaces, and choice of base colour and fascia plates. Unit should have integrated rail system to mount accessories. The headwall system should be constructed of aluminium extrusions joined together to form carcass to suit the particular application. Unit should be factory assembled for electrical and mechanical components. Segregation of services i.e. Low voltage supplies, High Voltage supply and Medical gases should be maintained with minimum 3 Channel/2 tier/2 channel/3 partition rows arrangements. Front fascia plate should be removable individually to access for respective service.
It should have one rail for mounting Accessories**.**
Each bed-head unit shall be supplied with electrical and electrical outlets pre-fitted, wired and certified. (Wired up to the distribution box provided with leakage protection & proper earthling arrangements)
Note: Gas Outlets quantities should be taken in consideration of quantities of respective outlets .

Should have per unit as under:
Oxygen – 2Nos
Vacuum – 2Nos
Medical Air-1No
Holder for vacuum collection jar –1No
Nurse call switch – 1 No(Only space for Nurse call switch should be provided by MGPS vendor)
Lamp with flexible LED lighting/Built-in light feature/Light clamped with rail – 1No
Infusion pump mount pole with adapter for mounting at least two infusion pumps
5 /15A combined Electrical switch and sockets – 8 Nos. or more
RJ-45 socket/ Ethernet -01No
Two spare spaces
Monitor Bracket

18. High pressure tubes for O2, N2O, Compressed Air,& Vacuum
It should be colour coded for individual services i.e. white for Oxygen, Blue for N2O and Yellow for Vacuum, Black for air. Antistatic rubber tube should be as per ISO standards. It should be BIS/CE marked/UL Listed. (The 200m Hose- Gas wise requirement should be taken fromrespective institute before supply total lengths should be 200m inclusive of all type. If instituterequires more than payment will be made on actual basis as per finalized BOQ rate)

19. Electrical Wiring with Electrical Panels –
All wiring inside the Manifold Room and Plant room required for MGPS equipment and General electrification. Institute will provide one point supply only. Others are under the scope of bidder. All the work should be as per BIS/CE standard and material used should be reputed make only.

20. CARBON DIOXIDE SYSTEM

Medical CO2 Manifold as per requirement & Standby with Class-D type Cylinders and control panel. Control panel of CO2 should be BIS/US FDA/European CE certified with 4 digit notified body number or Americal ETL/UL listed.

The Modular Manifold supply system shall provide carbon dioxide piped distribution system.The Modular Manifold system should be in such a way that it increases flexibility and allows easy enlargement of the manifold capacity in case of future expansion. Should be complies with HTM02-01/ NFPA 99 C/EN/DIN/ ISO 7396-1 standard.

Fully Automatic Control panel for CO2 System

The Manifold Control System should supply any type of medical gas from both left and right hand manifold banks. Operation and performance criteria should fully satisfy the requirements of HTM02-01/ NFPA 99 C/EN/DIN/ ISO 7396-1 standard. The fully automatic CO2 control panel should comply with the standard. It should be BIS/European CE Certified with 4 digit notified body number or American ETL/UL listed. The Manifold Control System shall supply on uninterrupted flow of 500 L/min. to a 400 k Pa (4bar) distribution system. Either the left or right hand manifold bank may be designated "Duty "and should automatically changeover to supply the distribution system from the "Standby" bank when pressure in the "Duty" bank falls to a predetermined level.

21. Site Modification

i. Bidder should be responsible for Antistatic Rubber/Ironite flooring with minimum thickness 5mmflooring in the manifold room and thickness of flooring not less than 1inch.
ii. Bidder should provide a raised Loading/Unloading Platform of suitable sized adjacent to manifold room, so that cylinder can be loaded & unloaded easily form the lorry/vehicle.
iii. Bidder should be responsible for foundation of Plant Room (If required) for Medical Air Plant, Vacuum Pant & AGSS Plant.
iv. Bidder should co-ordinate with respective Institute/Authorities for the availability of Office Room for & Toilet for MGPS Operator into Manifold/Plant Room.
v. Bidder should be responsible for all civil modifications and repair for successful completion of MGPS Plant, Manifold, and Pipeline installation and commissioning throughout the proposed blocks/buildings

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a **Construction of MGPS Operator Room & Toilet** Bidder should be responsible for construction of Operator Room of 10X8Feet and Toilet 6x5Feet full finished with all fixtures & general electrification with Fan & Ventilation and it should be in same building or adjacent. All works should be as per CPWD/PWD Specifications.

b **Construction of Overhead/Under Ground trench size approx 1.5mx1m –** Please quote rate for per meter basis all inclusive, Payment will be made on actual basis. Note: All bidder has to quote 20meter Overhead/Under Ground trench as standard for interconnection between buildings/plant/manifold/etc block and extra will be paid on the basis of actual requirement.

c Construction of 9" brick wall (500 Sq.ft) with Plaster on both sides with paint matching the surrounding premises. Payment shall be made at actuals.

d Demolition of brick wall 200 Cu.ft. Payment shall be made at actuals.

e **Construction of Liquid Oxygen Tank area (15m x 9m)- 2nos for 20KL & 10KL as per guideline of CCOE, Nagpur**

Note 1: General: Bidders are requested to make sure that they should attach the list of equipment for carrying out routine and preventive maintenance wherever asked for and should make sure that Electrical Safety Analyzer / Tester for Medical equipment to periodically check the electrical safety aspects as per BIS Safety Standards IS-13540 which is also equivalent to IEC electrical safety standard IEC-60601 is a part of the equipment. If the Electrical Safety Analyzer/Tester is not available they should provide a commitment to get the equipment checked for electrical safety compliance with Electronic Regional Test Labs /Electronics Test and Development Centres across the country on every preventive maintenance call.

Note 2: Adequate training of personnel and non-locked open software and standard interface interoperability conditions for networked equipment in hospital management information system (HMIS)The successful tenderer will be required to undertake to provide at his cost technical training for personnel involved in the use and handling of the equipment on site at the institute immediately after its installation. The company shall be required to train the institute personnel onsite for a minimum period of 1 month All software updates should be provided free of cost during warranty period and CMC period

Manufacturer Authorization: Eligible bidders should submit a mandatory letter of authority from the Foreign Principal / Manufacturer, mentioning country of origin with name of manufacturing company for major products quoted by them.

For the following major items, Manufacturer's Authorization should be submitted:

1. Fully Automatic Oxygen Control Panel
2. Oxygen Flow meter
3. Fully Automatic Nitrous Oxide Control Panel
4. Fully Automatic Control panel for CO2 System
5. VACUUM SYSTEMS
6. MEDICAL AND SURGICAL AIR SYSTEM
7. ALARM SYSTEM
8. AREA VALVE SERVICE UNIT
9. BED HEAD PANELS
10. GAS OUTLETS
11. AGSS (Anesthetic Gas Scavenging System)

Note:

1. **Warranty:**

a) **Five years(5)**Comprehensive Warranty as per Conditions of Contract of the tender document forcomplete equipment (including Batteries for UPS, other vacuumatic parts wherever applicable) from the date of installation, commissioning and Turnkey Work from the date of satisfactory installation, commissioning, trial run & handing over of equipment to Institution.

b) 98% up time Warranty of complete equipment with extension of Warranty period by double the downtime period on 24 (hrs) X 7 (days) X 365 (days) basis.

c) All software updates should be provided free of cost during Warranty period.

2. **After Sales Service**:

After sales service centre should be available at the city of Hospital/Institution/Medical College on 24 (hrs) X 7 (days) X 365 (days) basis. Complaints should be attended properly, maximum within 8 hrs. The service should be provided directly by Tenderer/Indian Agent. **Undertaking by the Principals that the spares for the equipment will be available for at least 10 years from the date of supply.**

3. Training:

On Site training to Doctors/ Technicians/ staff shall be provided by Principal/ Indian Agents (if they have the requisite know-how) for operation and maintenance of the equipment to the satisfaction of the consignee.

4. **Annual Comprehensive Maintenance Contract (CMC) of subject equipment with Turnkey**:

a) The cost of Comprehensive Maintenance Contract (CMC) which includes preventive maintenance including testing & calibration as per technical/ service /operational manual ofthe manufacturer, labour and spares, after satisfactory completion of Defect liability period shall be quoted for next **Five years** (**5) years** on yearly basis for complete equipment (including Batteries for UPS, other vacuumatic parts wherever applicable) and Turnkey (if any). The supplier shall visit each consignee site as recommended in the manufacturer's technical/ service/operational manual, but at least once in six months during the CMC period

b) There shall be 98% uptime warranty during CMC period on 24 (hrs) X 7 (days) X 365 (days)basis, with penalty, to extend CMC period by double the downtime period.

c) During CMC period, the supplier should visit at each consignee's site at least once in 6 months commencing from the date of the successful completion of warranty period for preventive maintenance of the goods.

d) All software updates should be provided free of cost during CMC.

Responsibility of bidder

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

1. Bidder shall be responsible for complete design, supply, installation, testing and commissioning including turnkey works, demolition and construction as applicable.The bidders are required to survey the site before furnishing the quotations.

2. Bidder shall execute all required civil, electrical, plumbing, lighting, fire safety, exhaust systems and other works as maybe required for complete installation and trouble-free functioning as apart of the 'turnkey work'. Providing and fixing of Exhaust fan with IS

marked Motor and louver for ventilation of MGPS Plant room and Manifold room only. Electrical Power supply will be provided at one location inside the Plant room by client. Air Conditioning (Ductable with exhaust) to run 24x 7 inside the plant room and Manifold room. Providing and fixing of cable from local alarm panels (OTs & ICU).

- Construction of overhead/under ground trench size approx. 1.5m x 1 m as standard for interconnection between buildings/plant/manifold etc. block. SITC of 3.5 core 185 sq.mm XLPE Cable as per IS: 7098 inside the gas manifold and plant room including Electrical Distribution Panel for plant and Manifold rooms.
- Providing of dedicated chemical earthing of MGPS Plant room as per IS 3043
- Wiring for light point/fan point/exhaust fan point/call bell point with 1.5 sqmm FRLS PVC insulated copper conductor single core cable in surface/recessed medium plate, suitable GI box and earthing the point with 1.5sqmm FRLS PVC insulated copper conductor single core cable etc. as required. Group A- Point = 30 , Group B- point =2 and Group –C – point =15 .

3. Hospital will provide one point electrical supply with isolator in the plant. The wiring, peripheral lighting, fans, exhaust etc have to be done by the bidder.

4. Control panel for Vacuum system and Air plant system has to be supplied by the bidder.

5. Rota meters for measurement of consumption of Oxygen and Compressed air

6. Bidder shall be responsible for trenching or other associated work related to installation and commissioning of complete MGPS system.

7. The MGPS bidder has to terminate/interconnect all the medical gas lines upto/to the OT/MOT Valve Box.

8. Installation and commissioning of area valve service unit and alarm unit for the operation theatre shall be done by the MGPS bidder.

9. MGPS bidder shall cooperate with the MOT bidder for associated works (The interconnection of MOT Gas pipelines, is the responsibility of MGPS bidder, MOT vendor will keep all MGPS line outside of the MOT)

10. The bidder shall be responsible for the complete works including the submission of working drawings, and isometric views, detailed work schedule and materials. Bidder shall be responsible for design, supply, installation, testing and commissioning of medical gas supply system in coordination with respective institute authorities & HSCC.

11. Bidder shall be responsible for free maintenance of all component of Gas pipeline system during warranty period including all filters & consumables.

12. Bidder should provide factory test certificates for the materials used. Bidder should supply complete set of manuals, **Operation and Service manuals and As-built drawing** for all the equipment, systems and sub systems supplied. Final electrical safety test, system test, leakage and calibration should be done by authorized persons using calibrated test equipment as per standards.

13. The Medical Gas Pipe Line System must follow Single Standard any one only from: NFPA 99c/HTM02-01/ ISO 7396-1/DIN/EN except Copper pipe.

14. All Gas outlets in MOT (i.e O2, N2O, MA4, MA7, Vacuum, CO2 etc will come with OT Pendants (Under MOT tender) Bidder has to provide pipe lines up to all MOTs.

15. The following systems/items must be from the same principal company/Manufacturer:

a. Control Panels & Manifold for O2, N2O & CO2
b. Medical air plant
c. Medical Vacuum Plant
d. AGSS Plant
e. Area & Master Alarm
f. All types Outlets
g. AVSU
h. Line Isolation valves
i. High Pressure tubes

Medical Gas Pipeline System except accessories like Ward Vacuum Unit, Theatre Vacuum Unit , Flow meter with Humidifier bottle must follow single standard any one from BIS/NFPA 99/HTM 02-01/ISO 7396-I/DIN.

16. Third party quality certification of the MGMS equipment from SGS/TUV/Lloyds/Bureau Veritas should be submitted as "Certifies that the MGMS equipment meets the technical specification and BOQ of the tender document".

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17. Based on the building drawings to be provided, **Bidder has to submit drawing and data sheet within 15 days after Letter of commencement**.

18. Bidder should be responsible for suitable arrangement of heat dissipation, Ventilation/ Air-condition as per offered MGPS plant requirement/recommendation from the Manufacturer and as per local site condition for 24 x 7 as per requirement. Bidder should also take care of backup arrangement for AC(If required) and Exhausts as the MGPS Plant may run 24x7 as per the requirement. In the case of AC, suitable TR of AC (ductable with exhausts) shall be considered for ranking purpose and price to be included in Turnkey works.

19. Bidder should be responsible for dedicated earthling (Chemical type) for MGPS Plant room (If required)

20. Bidder has to design the MGPS as per the Outlet disposition and technical specification mentioned in the tender, any clarification/suggestions regarding design of MGPS should be submitted at Pre-bid meeting.

21. Bidder has to clarify their doubts or prerequisites during pre-bid meeting. Bidder has to submit the list of prerequisites along with bid. No further pre-requisite/requirement after placement of NOA will be addressed.

22. Zoning of MGPS should be done to meet the peak flow requirement with suitable back up arrangements for all services, if required.

23. Inter connection to Manifolds with LMO tank with necessary automatic switchover panels between LMO & Manifold will be up to responsibility of bidder upto 100m distance.

24. Bidder should submit the MGPS plant and Manifold equipment loading design with foot print of all components as per their offered plant along with bid within the area of 200 sq.m bidder may keep tanks inside. Bidder has to consider proper sitting space for technicians, cylinder storage space for filled and empty including Plant room equipment.

25. Bidder should be responsible for complete development of LMO area as per CCOE.

TECHNICAL SPECIFICATIONS OF MOT (MODULAR OPERATION THEATRE)

SCOPE OF WORK

The turnkey work includes all modifications to the built up space provided at the hospital site including Installation of Medical Equipment, Communication Systems, civil modifications, electrical works, plumbing works, interior decoration, air conditioning ducting inside MOT, Medical Gas Pipe Lines & interconnection with HVAC 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, testing and commissioning of all equipment mentioned in the tender. Bidders are strongly advised to visit the site for assessment before the submission of tender offer

Quality Standards – BIS/European CE with 4 digit notified body number/FDA/ETL/UL etc.

1. WALL& CEILING SYSTEM (SMS)

The wall system should be based on a technological modular unit designed to clad and to divide interior space in controlled bacteria environments in a flexible and functional manner. The design ensures that the unique self-loading and free standing substructure can be clad with all types of engineered finishing panels without use of screws and any other fixed mechanical joints (Screwless Technology)The outer surface of a wall surface should be created with high –tech materials such as Solid Mineral Composite Sheet (SMS) with backing of Aluminium frame. System should offer total ease of cleaning and sanitization of the partitions. It should have no corners and adjacent surfaces should be molded flush by means of connecting elements. 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, first the structural parts and subsequently the finishing elements to be installed. The system should ensure perfect integration of technical networks and allow 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:

i. Sub frame/Structure
ii. Wall Panels
iii. Angular Air Extraction module
iv. Sealing gaskets
v. Ceiling Panels

Wall and ceiling system, Sub frame and Sealing Gaskets must be of same manufacturer.

i) Sub Frame/Structure:

Sub Structure frame made of galvanized steel pillars with broad cross section and dual cavity, with geometry designed to achieve exceptional rigidity. The substructure, with its FREE-STANDING technology, minimize the interference with all electro mechanical systems to be installed. Possible to adjust and secure the profiles, ensuring the maximum rigidity and self-loading capacity of the subframe system.

ii) Wall panels:

Cladding shall be with composite panels the finishing of which should be Solid Mineral Composite Sheet (SMS) thickness of 03mm backed by structural panel thick 15 mm consisting of a trapezoidal aluminium corrugated core glued between two flat aluminium sheets.

a. External facing should be bacteriostatic, dense and non-porous material
b. The panel should be made of a durable and uniform material that should be easy to clean and extremely hygienic.
c. Internal balancing core with suitable geometry to ensure the maximum rigidity
d. The total thickness of panel including Aluminum backing should not be less than 18mm.
e. Panels should be resistant to water and detergents normally used in hospital.
f. Reaction to fire class 1 norm

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 wall modules should be individually dismountable independently from ceiling and floor system to allow inspectability, maintenance of technical systems, and any variations that may become necessary for future alteration, modification and repair.

iii) Sealing gaskets:

Should be 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. Should be seamlessly connected surface.

Or

Panel shall be joined with Monolithic welding

iv) Ceiling Panels

The hermetic suspended ceiling should be a loading structure in heavy gauge material forming the grid on which the ceiling panels made of Solid Mineral Composite Sheet (SMS) thickness of 03mm.The total thickness of panel including Aluminium backing should not be less than 9mm.The integration of sealed lighting fixtures, air an emostats and /or various service units. The variable module grid should make it possible to adapt the size of the ceiling module to match the equipment to be mounted. It should also allow the use of different module sizes within the same room. The grid should be formed of loading profiles, suspended from the ceiling slab, to which the crossbar profiles are secured by means of rigid mechanical couplings. The thus formed grid should be rigid and remains perfectly stable during all the subsequent site operations. The suspended ceiling should be hermetically sealed by means of nontoxic silicon gasket application and it should be durable and non-degradable & resistant to microorganism attack. Color of inner surface wall & Ceiling of MOT shall be finalized after approval of consignee.

The certificates of the Wall & Ceiling System should be BIS/European CE Certified with notified 4 digit body no./UL Listed.

2. PVC FLOORING

a) It should be with 2mm antistatic seamless PVC flooring
b) Floor should be smooth, non-slip, impervious material conductive enough to dissipate static electricity butnot conductive enough to endanger personnel from electric shock.
c) Electrostatic charge dissipation combat PVC seamless flooring of very high quality should beprovided.
d) Thickness not less than 2 mm. Continuous roll should be used and joints should be welded by special PVCthermal welding units using PVC welding bars of same colour.
e) The sheets should be highly durable with resistance to shock and indentation. It should be scratchproofalso. The conductive material should be uniformly impregnated as grains.
f) It should be inert to body fluids, chemicals and disinfectants. Should not be affected by temperaturevariation within the OT.
g) The floor should efficiently discharge electric charges up to 2 kV
h) Flooring should be done by skilled workers of accredited agencies authorized by the supplier of PVCsheets. The electrical resistance (point to ground) should be within $2.5x10^4$ to $5x10^6$ ohms. The floorshould not allow buildingup of electrical charge beyond 100 volts due to antistatic effect. The corners shouldnot be terminated sharply and concealed cove- former (aluminum) should be used to overlap the wallpanel to a height of approx.25mm and sealed perfectly and uniformly. Self-levelling compounds should beused.
i) The conductive copper grid laid underneath the PVC sheet should be supported by liquid epoxycompounds allowed to set as a uniform and level surface. The copper strips to be made visible by grindingand no copper strip should project more than 0.5mm above level surface to avoid damage to the PVCsheet. One earthing lead should be brought out from every 150sq.ft area and attaching it to the mainearthing strip/ground.
j) Copper grounding strips (0.05 mm thick, 50 mm width) should be laid flat on the floor in the conductiveadhesive and connected to copper strip of grounding. The connection from copper grid should be broughtout uniformly at places to form equipotential grid.
k) Flooring should be mechanically shock proof, scratch proof, flame retardant and anti-microbial
l) Corners should be uniformly curved
m) Final surface should be non-corrosive to biological fluids and detergents.
n) Colour should be uniform pleasant and matching with ambience
o) Suitable self-levelling should be done before PVC flooring to avoid undulation with the MOT.

3. LAMINAR AIR FLOW SYSTEM

a) The ceiling filtration system should be designed to ensure unidirectional distribution of sterile air of thesurgical theatre to ensure the cleanliness of all the area covered by the air flow.
b) 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 -
Separators : continuous thermo plastic chord
Sealant : Polyurethane
Gasket : One piece polyurethane
MPPS average efficiency: > 99.95%
3 Micron DOP efficiency > 99.99%
Final Pressure drop : 600 pa (max)
Maximum Operating Temp: 60 degree Celsius
Maximum RH : 40-50 %

c) The ceiling system should be equipped with “H 14” class HEPA filters position in the ceiling to achieve0.25m/sec flow at the diffuser.

d) Filtration Ceiling System holding structure, Filter frames and top plenum should be made ofAluminium/Stainless Steel.

e) The filtration ceiling system should have diffuser/flow equalizer to achieve uniform &constant airdistribution over the whole surface. It should be CE/UL certified

f) The air management system should be designed to achieve class 100 with the following parameters:

Bacteriological class =B (5 CFU/m3)
Particle decontamination kinetics CP =5 min
ISO 14644/1 classification = ISO 5

g) The positive pressure should be maintained inside the OT to prevent contamination due to air fromoutside the OT.

h) The supplier should provide test certificate for HEPA filter and laminar air flow systems from the originalmanufactures.

i) Size of laminar airflow system minimum 8 feet X 8 feet or more.
j) Should be CE certified.

k) Note: Prospective bidders are advised to collect the information regarding CFM and AHU capacityfrom the respective institute site. Total flow rate of filter bank shall match the CFM of AHU.

4. INTERNAL HVAC DUCTING AND EXHAUSTION SYSTEM

a) All the ducting inside the MOT shall be scope of the MOT bidder
b) All necessary HVAC interconnection for supply and return air shall be the scope of bidder (the institute will provide the duct up to outside of the MOT)
c) All the ducting should be as per industry standard and sheet should be Aluminium of appropriate thickness and insulated as per industry standard.
d) Return air exhaust grill should be provided in the OT
e) The exhaust cabinets should be cleanable
f) These cabinets should have suction from bottom and top also.
g) Designed flow rate should not be less than 1000 m^3/hr. Distribution of exhaust air volume should be divided between fluff strainers to maintain the required pressure within the theatre without causing turbulence.
h) The exhaust air cabinet should be manufactured and supplied by the supplier of wall and ceiling system supplies.
i) Return air exhaust cabinet should be made from SS-304 and should be from the same manufactured of wall panel. Also it should match perfectly with ceiling system aesthetically.

5. PERIPHERAL LIGHTING AND CLEAN ROOM LUMINARIES

a) To provide peripheral lighting and clean room luminaries with intensity min 500 Lux, it should be 8-10 innumbers for each OT. Luminaries cover should be made of highly

resistant, disinfectant proof laminated safety glass with stylishfine grained surface, glass pane with white coated steel frame.

b) The white luminaries body should be made of sheet steel/ perfectly powder coated, supplied ready forconnection optionally for individual or series circuit with digital electronic control gear.
c) Recess frames should be gas tight. The fitting should be flush with the ceiling and should be removablefrom top or bottom. The light fitting should be uniformly and aesthetically distributed on the ceiling toprovide uniform illumination in the OT. Light should not interfere when green mode endoscopy isperformed
d) Peripheral lighting should be done according to IP65 (international protection rating 65).
e) Control equipment for the general lighting and the light dimming should be provided in the theatrecontrol panel
f) Size of Peripheral light shall be 2' x 2' or 3' x 1' or 581mm x 581mm.

6. TOUCH SCREEN CONTROL PANEL 20" or more

a) The control panel should be touch screen panel. This control panel should work as the central controlpanel for the HVAC controls, instruction board, light control, gas alarms, etc. It should be BIS/European CE certified with notified 4 digit body notified number/UL Listed.
b) The touch screen should be wall mounted, stationed in the visibility line of the surgeon and OT staff. Theaccess height should be convenient for the nurse to operate and help/assistant when in need.
c) The panel should accommodate digital clock and the elapsed time indicator.
d) The medical gas alarm should indicate high and low gas pressures for each gas service present in the OTand normal/low indication for vacuum. This should be supported by audible alarm also. The panel should have an alarm mute(fault annunciation) facility. The sensors (pressure switches) should be at the nearest isolation valve.
e) Control for general lighting: ON/OFF and dimming controls organized in groups to provide uniform illumination.
f) Control of the operating light (major and satellite (on/off and intensity control) and Hand free telephone set with memory should be located at one side.
g) Temperature and humidity control for the room connected to the AHU. (Adjustable from the panel) The controller should be capable of adjusting the temp adjustment of +/- 5 Deg with in 5Minutes whereverseparate AHU is provided for each OT . "
h) Digital room pressure indicator in cm of H2O or equivalent (signal from pressure sensor shall be providedto indicate pressure differential between OT and outside)
i) HEPA filter bank differential pressure indicator.
j) The Control Panel should be able to be integrated with HMIS/BMS/HIS
k) The Control Panel should be able to display the Isolation Panel Alarm Conditions along with MGPS Alarm

7. X RAY FILM VIEWER

a) LED type flat panel X-ray viewing panel should be supplied.
b) This should comply with relevant electrical safely codes.
c) Total 2 Nos Panels. Each panel should be able to illuminate films up to 14"x17" size. It may be One integrated wall Panel or adjacent.
d) Mounting should be flush with the wall to avoid dust accumulation and growth or organisms between walland panel.
e) Body should be of extruded Aluminum powder coated with bacteria resistant and disinfectantresistant finish.
f) The diffuser on the front panel should be a uniformly lit screen.
g) Dimming electronic control should be enclosed at the bottom of the cabinet.

h) Proper spring loaded film clip with rollers should be provided to hold the films firmly and to remove thefilm without scratches.

8. STORAGE UNIT

a) The storage unit should be made with SMS or minimum 0.8-1.0 mm thick stainless steel 304 panels and should be withsame finish of OT Walls.
b) The shelves should be of SS-304 with 2 or more. 25mm dia holes on each shelf for air circulation inside the Storage unit .
c) The storage unit should be divided 2 or more parts and each part should have individual glass doors . Each glass door shall be with 6mm dia 2 or more holes on each halve of storage unit. Storage unit shall be with high quality locking system.
d) The overall size should be approx200 cm X 120 cm X 40 cm / 210cmx120cmx35cm
e) Should be flush mounted/built-in to MOT panel with same finish.
f) Bidder should provide suitable arrangement for continuous air circulation inside the storage unit to blow off stagnant air to prevent microbial growth.

9. HATCH BOX

a) A hatch should be provided in each operation theatre to remove waste materials from the operationtheatre to dirty linen area/corridor just adjacent to Operation Theatre.
b) Each hatch box should be equipped with two doors and the door should be operatedelectrically/motorized.
c) The hatch should be designed in such a way that only one door should be opened at one time ie doors shall be interlocked.
d) The UV light should be so installed that it is kept on while both the doors are closed. This UV light has tobe automatically turned off in case of opening of either of the doors.
e) Indicators should be provided on both sides of the OT so that door open / close status can be monitoredfrom both sides.
f) Hatch Box material should be of SS304.
g) Size of the Hatch box minimum: 600mm x 600mm.

10. PRESSURE RELIEF DAMPERS

a) Pressure relief dampers or over flow ports should be provided in each room to prevent contamination ofair from clean and dirty areas.
b) Suitably sized air pressure relief damper should be strategically placed, enabling differential roompressure to be maintained and ensure that when doors are opened between clean and dirty areas.
c) Counter- weight balancing system should be provided in the PRD to maintain positive pressure inside theoperation room.
d) Air pressure stabilizers should have unique capability of controlling differential pressure to closetolerance. The PRD should remain closed at pressure below the set pressure and should open fully at apressure only fractionally above the threshold pressure.
e) The frame, body and blade should be of SS304 stainless steel.

11. HERMETICALLY SEALED DOORS

a) The door should be a hermetically sealed, single sliding of following size
   a. A - Door of 2.1 (H) X 1.8 m (W)

b) The controller should be capable of being operated by elbow switches/foot switches as well as touch lesssensor.

c) The track should be of stainless steel/Aluminum and the running surface for the top rollers should besuitably angled to reduce resistance to movement
d) The door leaf should be hung by means of hard plastic rollers of high quality with double bearing at thetop. Rollers should be provided under the stainless steel/Aluminium track to enable smooth and noiselessmovement.
e) Opening and closing of the door should be microprocessor controlled electromechanical movement.
f) The door material should be of SMSColor should match the interior and care should be taken tomake the leaf strong and light weight.
g) One should be able to open and close the door effortlessly in case of failure of automatic mechanism.
h) Door opening handle should be strong and sturdy. Material should be of SS (glossy/Matt finish). Should beprovided with high quality cylindrical/ESPg lock.
i) Door leaf should have high quality synthetic rubber gasket with long life to ensure hermetic sealing (tomaintain air pressure differential). Air tightness 99.99% at a pressure of 100Pa.
j) The finished floor on either side of the door should be perfectly level (maximum permissible difference+1mm).
k) The overall thickness of the finished door should be 40 to 60mm. The inner part of the door should befilled with CFC free polyurethane foam thickness of 48mm or nearby. (Sealed airtight to prevent furtheringress of any microbial organism).
l) The door and controls should comply with IEE regulation/EU Directives. All motors used should be DC brushless/PMDC motorswith essential isolation from mains.
m) Door should be with vision window 300 mm x 300 mm with double glazed panels and hermetically sealed.
n) Door movement should have minimum noise.
o) The starting time after receiving the signal should be adjustable between 0.5 to 20 seconds.
p) The door controller should be CE marked.
q) Test certificate for hermetically sealed door frame (factory test certificate) should be enclosed with thepre dispatch documents.

11A.**HERMETICALLY SEALED DOORS (Size-2.1 X 1.0)**

Same as Sl.No.-11

12. **VIEW WINDOW** (WITH MOTORIZED BLINDS) (1.5m x 1m / 1.2mm x 1.0 m / 2m x 1.5m)

a) View window with motorized horizontal Venetian blinds sandwiched in two parallel temperedglasses of thickness 5/6 mm should be complete with FHP Motor Control for 90° rotation.
b) TheWindow frame should be powder coated Aluminum of approved shape flush mounted to wall panelling material with proper sealing.
c) The entire assembly should be completely sealed and fitted with proper Aluminum/SMS profile.
d) The assembled thickness of the Window should be minimum 33-40 mm. The window blinds should be operated with Remote Control /manually.

13. OPERATING LIST BOARD

a) One operating list board should be provided in each operating theatre.
b) It should be made of ceramic having magnetic properties and should be flushed to the wall of theoperating room.

14. SCRUB STATION (1500mm minimum)

a) Compact surgical scrub sink should be designed for use in OT complex providing for pre procedural scrubup.(Double sink combination as suitable)
b) Each fixture should be fabricated from heavy gauge type 304 stainless steel (minimum thickness 1.5mm)and should be seamless welded construction, polished to a satin finish
c) The scrub sink should be provided with a front access panel which should be easily removed for access tothe water controlled valve, waste connections, stoppers and strainers.
d) Hands free operation should include infra-red sensors with programmable adjustment.
e) Thermostatic mixing, valve control should be located behind the access panel and maintain constantwater temperature.
f) Timing should be adjustable to meet individual application requirements.
g) Provided with infrared sensors, thermostatic control taps with fail safe temperature controls.
h) All units should have reduced anti- splash fronts.
i) Should have dispenser for soap/disinfection scrub solutions.
j) Knee/foot operated switch should be provided additionally.

15. ELECTRICAL INSTALLATIONS

a) Power distribution within the OT should be "provided' from distribution boards located local to eachtheatre. Sub mains power to these panels should be by the general electrical contractor. From thesepanels all distribution services within the departments should be run. Isolated power supply, insulationmeasuring and protection as per IEC standards should be provided. The unit should be EN/CE/UL/FDA/IEC certified
b) Institute/HSCC will provide one point supply at MOT.
c) Light fittings within the clinical areas should be recessed LED type with control gear
d) Earthed equipment bonding of all exposed metalwork should be provided.
e) Power sockets within the Operating Theatres ancillary areas should be matched to the rest of the hospital.
f) Fittings should be sealed In accordance with the standard IP54.
g) All equipment should be fully and permanently labelled to identify and describe the function, operation and voltage of the apparatus concerned. Throughout and upon completion of the electrical installation, tests in accordance with relevant sections of the local wiring regulations should be carried out and the results recorded.
h) Each wall of MOT should have minimum 02 Nos 6/16A hybrid Antibacterial switch socket & 32A industrial socket at any two walls as per IEC standard

16. DISTRIBUTION BOARD

a) Distribution box, isolation transformer, leakage relays, cable tray, etc for OT should be under the scope of MOT contractor.
b) All high voltage equipment should be installed in a separate enclosure.Bidder should provide two DB for each MOT should be installed with suitable wiring (One DB dedicated for UPS power supplies and Other for Raw power supplies to MOT equipment).
c) The remote cabinet should house the operating lamp transformers, mains failure relays, UPS, electricaldistribution equipment & circuit protection equipment for all circuits within the operating theatre.
d) All internal wiring should terminate in connectors with screw & clamp spring.
e) Connections of the clip- on type mounted, on a CE approved rail & labelled with indelible proprietary labels.
f) Individual fuses or miniature circuit breakers should protect all internal circuits.
g) Complete schematic drawing with description should be enclosed with the equipment.

h) DB should have minimum two 32A/16A (As per requirement) extra circuits with MCCB/MCB for future

17. SURGICAL OT LIGHT WITH HD CAMERA

A. OT Light – LED

Operating Room Surgical Lighting System should provide an ideal combination of brightness, manoeuvrability, and shadow resolution without sacrificing color accuracy through a consistent LEDtechnology.

Such Lighting System should have the following technical specifications:

a) Number of Light heads : Two per suspension
b) Colour Temperature range: 3800 k -5000 (±10 %) - Variable colour temperature.
c) Field Size Diameter: 15 to 28cm (+/- 10%)
d) Depth of Field : 750 to 1100mm (+/- 10%)
e) Illumination Level : 160000Lux at both domes
f) Controls : Control Panel (wall and on dome)
g) Rotation : 360 -330degrees
h) Sterilizable Handle: 02 Nos.
i) Mounting Type : Ceiling
j) Supply Voltage : 230 VAC 50 Hz
k) Bulb Type : LED
l) Dimming Range : 50% - 100% or 30% - 80%
m) Operating/Storage Humidity: 10-95%
n) Life of Light Source : >40,000 Hrs
o) Should have provision to mount the Camera in one dome
p) Surgical Light System Should be compliant with relevant BIS/European CE with 4 digit /US FDA standards or Declaration of conformity for quoted model with ISO 13485.

HD Camera System – 1080 p/i

Integrated In-Light Camera System should be integrated at the centre of one of the domes of thislighting system/ third arm in order to capture images & video sequences of the open cases.

Such an autofocus – Locable camera should have the following specifications

a) Signal to Noise Ratio (S/N Ratio) : >50 dB
b) CCD/CMOS : 1/3”or 1/2.8”
c) Optical Zoom : 10X
d) Digital Zoom : 12-15X
e) Video Output : HD, DVI, S-Video & Composite Video
f) White Balance & Gain : Automatic/Manual
g) Light and Integrated Camera should have a control through Touch Panel of the controlequipment placed inside the operating room (This feature is applicable only for integrated MOT only not applicable for non-integrated MOT.)
h) It should be BIS/USFDA/European certified.

18 HD LED FLAT PANEL MEDICAL GRADE MONITOR

a) Should be 30”-32” High Definition Progressive Scan Flat-panel Medical Grade Monitors with ceilingmounted spring arm suspension to support high definition/HDTV progressive Scan

images and shouldbe able to support and display DVI/HDTV, RGBHV, S-Video, Composite video signals. Aspect ratio16:9/16:10. Resolution – 1920X1080 or better.

b) The flat Panel suspension should be ready with the cables for integration of High Definition Digital(DVI/HDTV), RGBHV (High Resolution), SVHS (S-Video), Composite video signals to travel from thevarious sources of video like endoscopic camera, room camera, in light camera, high definition flatpanel monitors, while assuring native resolution / signal.

c) Monitor should capable of displaying from other sources like endoscope, microscope etc. necessary provision should be provided as standard.

d) It should be BIS/ European CE Declaration of Conformity to be provided.

-HD Flat Panel Monitor should be done according to IP 54 regulations.

-ESG Safety Glass Cover is must to protect the Monitor Screen from breakage and for additional Safety of Patient.

-For optimizing the quality of Pictures, it should have DicomPreset, BT 709, BT 1886 features.

-Video Connectors on the back side of Monitor is to be hide by Cover of Aluminum from the Back side of Monitor.

-Monitor should be integrated by Command Bar shown in the front side of Monitor.

It should be BIS/USFDA/European CE certified.

18B RECORDING SYSTEM

a) Recording system to be offered separately (Only for non-integrated OTs).
b) Recording system should be full HD medical grade monitor LCD 19"touch screen or more and having the **one TB** storage space and 1 SSD in addition for operating system.
c) Data cable for communication from both pendants and monitors should be laid down upto outside ofOT in a patch port for future expansion for all OTs where there is no integration
d) Patch panel for power & signal to be laid down for 31"-32" LCD Monitor at wall of MOT
e) Recorder should be capable of recording video from other sources like- microscopes, endoscopes etc. suitable provision should be provided as standard.
f) Should be flushed mounted on the OT wall with suitable frame
g) Recording system should be integrated streamingwith streaming.
h) ESG Safety Glass Cover is must to protect the Monitor Screen from breakage and for Additional Safety of Patient.
i) Recording system should be done according to IP 54 regulations.
j) Recording System should have P-CAP Multi-Touch Display
k) It should be BIS/Medical Grade Class-1 Device and European CE Declaration of Conformity to be provided/USFDA

18C MONITOR –DIGITAL DISPLAY (PACS/HMIS)

a) Medical grade monitor size should be minimum 32 inch.
b) Should be integrated with hospital PACS. Vendor has to do the necessary coordination with PACS/HMIS contractor or hospital authorities for connecting the monitor to hospital PACS/HMIS.
c) If PACS/HMIS is not available in the hospital, vendor should terminate all monitors connection to switch (should be located at MOT corridor) from where hospital will connect further.

d) Monitor should be flush mounted with suitable frame in MOT wall. Frame should be openable/serviceable for service.
e) HD Flat Panel Monitor should be done according to IP 54 regulations.
f) ESG Safety Glass Cover shall be used to protect the Monitor Screen from breakage and for additional Safety of Patient.
g) For Optimizing the quality of Pictures, kindly add it should have Dicom Preset, BT 709, BT 1886 features.
h) Accessories like keyboard and Mouse is to be provided along with PACS Monitor.
i) Video Connectors on the back side of Monitor is to be hide by Cover of Aluminium from the Back side.
j) Monitor should be integrated by Command Bar shown in the front side of Monitor.
k) It should be BIS/European CE Declaration of Conformity/USFDA to be provided.

19. PENDANTS FOR ANESTHETIST AND SURGEON

19A Double arm moveable Pendant for Anaesthetist

a) The Pendants should comply with NFPA 99C/HTM 02-01/ISO 7396-1/DIN. The support arms shouldbe extremely robust and revolve on high quality bearings, so that the pendant head glides smoothly and quickly to any desired position

b) Double moveable arms (any combination) with total coverage of min 1800mm and 330 deg.Horizontal movements for each arm. Vertical movement should be motorized and the arm heightshould remain to a height greater than 6.5 feet above floor level
c) Weight carrying capacity of the arm should not be less than 150-180 Kgs. should have electromagnetic/pneumatic brakes

d) Each arm should be capable of 300-340 degrees of rotation, which can be easily adjusted to suit the desired mode of operation.
e) The Pendant Service Heads should be modular with 600-800mm head. The heads should be capable of accepting a range of shelves, and infusion poles, electrical switches & sockets, gas outlets other accessories. The Pendant Heads should support the range of Physiological Monitor Mounting Solutions and all the fittings, all gas outlets, electrical switch & sockets and shelves.
f) The Pendant Service Heads should be supplied with medical gas terminal units and 5/15 or 6/16 Amps antibacterial hybrid sockets with switches.
g) Double arm pendant anaesthesiologist : Each pendant should be supplied with outlets and probes as mentioned below :
   Oxygen Outlets – 2 nos.,
   Vacuum Outlets – 2 nos.,
   Nitrous oxide –1 nos.,
   Air(4 bar) Outlets - 2 nos.,
   AGSS outlet - 1 no
   Electrical switch &sockets(**Antibacterial**) - 10 nos.
   Shelf with two rails one on each side – 2 nos. or more
   IV Fluid Pole with 4 hooks – 1No.
   Data socket RJ-45 -2 nos.
h) The pendants should be BIS/European CE certified with 4 digit notified body number or USFDA approved.
i) Pendant supplier should provide cutouts for Patch Panels in Integrated OTs. (only for integratedOT)
j) For Safety reasons, Pendant should have NIST Connection for Individual Gases, Manometer for each gas.

k) Pendant should be supplied with Ceiling Flange Tube, Ceiling Plate from OEM along with shipment. It should not be fabricated in India.
l) Pendant should have IV Pole with IV Hooks on both side required for operation.
m) Shelf of Pendant should be made of High quality Bio- Clean Material.
n) Pendant should have Anti-microbial/powder Coating.
o) For Safety reasons, all the Electrical Sockets should have Earthing Points

19B DOUBLE ARM MOVEABLE PENDANT FOR SURGEON

a) The Pendants should comply with NFPA 99C/HTM 02-01/ISO7396-1/DIN. The support arms should beextremely robust and revolve on high quality bearings, so that the pendant head glides smoothly andquickly to any desired position

b) Double moveable arms (any combination) with total coverage of min 1800mm and 330deg. Horizontal movements for each arm. Vertical movement should be motorized and thearm height should remain to a height greater than 6.5 feet above floor level
c) Weight carrying capacity of the arm should not be less than 150-180 Kgs. Should have electromagnetic/pneumatic brakes
d) Each arm should be capable of 300 - 340 degrees of rotation, which can be easily adjusted tosuit the desired mode of operation.
e) The Pendant Service Heads should be modular with minimum 800mm head. The heads
f) should be capable of accepting a range of shelves, and infusion poles or other accessories.The Pendant Heads should support the range of Physiological Monitor Mounting Solutions.
g) The Pendant Service Heads should be supplied with medical gas terminal units and 5/15 or6/16 Amps antibacterial hybrid Sockets with switches.Each pendant should be supplied with outlets and probes as mentioned below :
Oxygen Outlets-2 nos
Vacuum Outlets – 2nos,
Air (7bar) Outlet- 01nos,
CO2 Outlet - 01 nos.,
Electrical switch & sockets (**Antibacterial**)- 10 Nos.
Expandable shelf (minimum width: 70cm & Depth min. 45cm) – 3 Nos or more with two rails one on each side for hanging arrangement.
Data socket RJ-45 -2 no.
IV Fluid Pole with 2 hooks – 1No. (Pole should be capable of stacking 4 nos of syringe pumps)
h) The pendants should be BIS/European CE certified with 4 digit notified body number or USFDA approved.
i) Pendant supplier should provide cut outs for Patch Panels in Integrated OTs. (only for integrated OT)
j) For Safety reasons, Pendant should have NIST Connection for Individual Gases, Manometer for each gas.
k) Pendant should be supplied with Ceiling Flange Tube, Ceiling Plate from OEM along with shipment. It should not be fabricated in India.
l) Pendant should have IV Pole with IV Hooks on both side required for operation.
m) Shelf of Pendant should be made of High quality Bio- Clean Material.
n) Pendant should have Anti-microbial Coating.
o) For Safety reasons, all the Electrical Sockets should have Earthing Points

20. Medical Gas Pipe Line

a) The bidder should ensure that all works carried out as per HTM 02-01 /NFPA 99C / DIN/ISO 7396-1standard

b) Bidder should provide Oxygen, Air4, Air7, Co2, Vacuum, AGSS, and Nitrous Oxide, etc. supply toOperation Theatres from the existing lines terminated outside the MOT.
c) Bidder shall be responsible for supply, installation, testing and commissioning of complete MGPSsystem inside the operation theatre including Distribution piping, connection to Pendants, outletsand other essential accessories.
d) Copper pipes should be of solid drawn, seamless, deoxidized, non-arsenical, half hard, temperedand degreased copper pipe. All copper pipes should be degreased & delivered capped at bothends. The pipes should be accompanied with manufacturers test certificate for the physicalproperties & chemical composition. The copper pipe should comply with BS EN 13348:2008
e) Copper pipe must have reputed third party inspection certificate (Eg. Lloyd's, TUV, SGS).
f) Fittings should be made of copper and suitable for a working Pressure of up to 17bar andespecially made for brazed socket type connections.
g) The copper fitting should comply with EN 1254-1
h) The Brazing filler material should comply with EN 1044

21.ISOLATION TRANSFORMER

Should be medical grade Insolation panel
Should have fault detection feature
Should be compliant to CEI 64-8 / **IEC 60364-7-710/BS7671 Standard**
Should be compact and mountable on wall **or flush on brick wall**
The IPS should be able to integrate with HIS/BMS and Surgeon Control Panel as standard
Capacity shall be 20-25 KVA
Isolation Panel System should have facility to detect fault of leakage current and same should be integrated touch screen control panel of MOT and alarm status should be displayed on the touch screen control panel.
Isolation Panel System of minimum 20 KVA should be provided for every operation theatre which ensures the safety of staff and patient. System should have isolators provided through leakage relays etc. (if required) according to IEC recommendation. This unit should be EN/CE/UL/BIS/FDA/IEC certified. These systems are to be commissioned by specialists.

22.ONLINE CENTRAL UPS

The room for the central UPS will be provided by the respective institute/hospital preferably at same OT floor and one point electric supply will be provided to the UPS Room by the respective institute/hospital.
Bidder should provide required electrical wiring from UPS to all modular MOT as per IEC/International standard.
Electrical control panel complete with MCCB, Switchgears etc should be provided **for distribution of power.**
Bidder shall offer UPS from make – APC/ TATA Liebert/ Delta /Hitachi/ Consul Neowatt/3EM Powe/Uniline/Servokon
Per MOT UPS load should be provided minimum **20 KVA with one 20 KVA** backup for all OTs and redundancy(n+1) should switch automatically. The battery bank may be common for UPS. **For eg. If there are 10 MOT, the USP should be 20KVAx10 and one 20KVA as standby, total 200KVA+20KVA and battery bank may be common, also if MOTS are in 2 places like, 6 MOT at 4th floor and 4 MOT at 3rd floor, in this case bidder has to provide 6x20KVA +20KVA and 4x20KVA+20KVA or bidder may offer 20KVAx10 +20KVA but wiring from UPS room to all floor should be done by bidder only.**
UPS make – APC / TATA Liebert / Delta / Hitachi/ Consul Neowatt/3EM/Uniline

23. Turn Key Job to be provided by the Bidder

1. Commissioning and installation of SMS wall & ceiling panelling, Frame Structures &substructure, PVC flooring, Lighting, Touch Screen Control Panel, laminar flow, pendants, OT Light, Painting (if any), electrical work, ups, windows (if any)and Doors, etc. as per technical specification.
2. All cable conduit, trenches and railings wherever required.
3. All electrical accessories like cable wire, electrical outlets, switches, Control panels, etc should be fireproof, of reputed make, certified for electrical safety.
4. Bidder has to provide and install hatch box, storage shelves, scrub basins and other service areas as mentioned in the tender.
5. Testing, Installation and commissioning of all equipment/services.
6. Any other necessary work required for satisfactory working/performance of the modular OT and not mentioned/specified.

Note :

Warranty:

a) Five years Comprehensive Warranty as per Conditions of Contract of the TE document for complete equipment (including Batteries for UPS, other vacuumatic parts wherever applicable) from the date of installation, commissioning and Turnkey Work from the date of satisfactory installation, commissioning, trial run & handing over of equipment to Hospital.

b) 95% up time Warranty of complete equipment with extension of Warranty period by double the downtime period on 24 (hrs) X 7 (days) X 365 (days) basis.

c) All software updates should be provided free of cost during Warranty period.

2. After Sales Service:

After sales service centre should be available at the city of Hospital on 24 (hrs) X 7 (days) X 365 (days) basis. Complaints should be attended properly, maximum within 8 hrs. The service should be provided directly by Tenderer/Indian Agent. Undertaking by the Principals that the spares for the equipment shall be available for at least 10 years from the date of supply.

3. Training:

On Site training to Doctors/ Technicians/ staff is to be provided by Principal/ Indian Agents (if they have the requisite know-how) for operation and maintenance of the equipment to the satisfaction of the consignee.

4. Annual Comprehensive Maintenance Contract (CMC) of subject equipment with Turnkey:
a) The cost of Comprehensive Maintenance Contract (CMC) which includes preventive maintenance including testing & calibration as per technical/ service /operational manual of the manufacturer, labour and spares, after satisfactory completion of Warranty period may be quoted for next 5 years on yearly basis for complete equipment (including Batteries for UPS, other vacuumatic parts wherever applicable) and Turnkey (if any). The supplier shall visit each consignee site as recommended in the manufacturer's technical/ service /operational manual, but at least once in six months during the CMC period

b) There will be 95% uptime warranty during CMC period on 24 (hrs) X 7 (days) X 365 (days) basis, with penalty, to extend CMC period by double the downtime period.

c) During CMC period, the supplier is required to visit at each consignee's site at least once in 6 months commencing from the date of the successful completion of warranty period for preventive maintenance of the goods.

d) All software updates should be provided free of cost during CMC.

RESPONSIBILITY OF BIDDER

1. Bidder shall be responsible for complete design, construction, testing and commissioning of modular operation theatres.
2. Bidder shall execute all required civil, electrical and peripheral lighting, plumbing, air-conditioning system(Ducting inside the OT), demolition and other works as may be required for complete installation and trouble-free functioning of the operation theatres as a part of the "turnkey work". Necessary coordination with fire-safety vendor for the installation of fire safety sensor/instrument inside the MOT and also other necessary coordination with civil contractor to be done by the MOT bidder.
3. The bidder shall be responsible for the complete works including the submission of Working Drawings, andwalk through view.
4. Bidder shall be responsible for installation and commissioning of medical equipment for MOT incoordination with respective institute/hospital authorities.
5. The bidder should provide UPS power supply in OT complex with necessary cabling as per electricalstandard (if UPS for OT is under the scope of bidder)
6. Bidder shall be responsible for free maintenance with spares of modular operation theatres duringwarranty period.
7. Bidder shall be responsible for commissioning of Medical Gas pipe lines, Pendants, LED OT Light and Gasoutlets for the OTs and other associated works to make MOT fully functional. MOT Bidder should coordinate with MGPS, Integration and other vendors for the successful completion of MOTs.
8. Bidder shall be responsible for maintaining suitable air conditioning inside the operation theatre (Ductinginside the OT). Setting and monitoring of temperature and RH should be in the scope of the MOT.(Necessary coordination with HVAC vendor to be done by the MOT bidder)
9. Bidder should provide factory test certificates for the material used for the construction of modulartheatres.
10. Bidder should supply complete set of Operation manuals, service manuals and As-Built drawing for all the systems and subsystems supplied.
11. Training should be provided for a week by the factory trained engineers /Original Equipment Manufacturer(OEM).
12. Final electrical safety test, system test, and calibration should be done by authorized persons usingcalibrated test equipment.
13. OEM or his authorized agent should post a trained engineer who should be available at site or should reachthe site within 24 hrs of raising a service call.
14. Regarding Outlets of the Anaesthesia & surgeon Pendants, bidders have to supply same type of outlets asinstalled in the same building/block. Before shipment of the Pendants, bidders should take necessaryaction for selecting the same outlets.
15. Third party quality certification of the imported equipment from SGS/TUV/Lloyds/Bureau Veritas should be submitted by the contractor as "Certifies that the imported Modular OT items meet the technical specification
16. Third party test certificate and manufacturer test report for the items/equipment should be provided at the time of pre-despatch inspection.

17. Training should be imparted to the hospital staff for 2 weeks by the contractor.

Manufacturer Authorization for the following items should be submitted by the bidder with the bid:

1. OT Light with HD Camera
2. HD Flat Panel Monitor
3. Pendants for Anesthetist and Surgeon
4. Recording System
5. Laminar Air Flow System
6. Wall & Ceiling system (SMS)
7. Touch Screen Control Panel
8. Monitor Digital Display (PACS/HMIS)