TECHNICAL SPECIFICATIONS OF MGPS SYSTEM:

Technical specifications of the Centralised Medical Gas Pipeline System for the respective

Sites under the Assam Cancer Care Foundation are as follows

1 MGPS Technical Specification

The MGPS comprises of:

1.1 Connection from primary source (LMO) to the MGPS plant room

1.2 Secondary Oxygen Manifold and Emergency Oxygen Manifold with automatic control panels

1.3 Nitrous Oxide Manifold and Emergency NO2 Manifold with automatic control panel

1.4 CO2 Manifold and Emergency CO2 Manifold with 2 Nos of Double-stage Regulators/ Automatic Control panel

1.5 Medical Air Supply System (4 Bar & 7 Bar) complete.

1.6 Medical Vacuum (suction) Supply System Complete.

1.7 Distribution Piping Complete with Accessories.

1.8 Area Valve Service System.

1.9 AGSS system Complete

1.10 Alarm Systems (Master & Area)

1.11 Gas Outlets with Probes

1.12 Bed Head Panels

1.13 Other associated & Optional works

1.14 Manifold Cylinders of O2, N2O, CO2 of D, B, A and AA type

2 RESPONSIBILITY OF BIDDER

2.1 Bidder shall be responsible for complete design, supply, installation, testing and commissioning of MGPS System. The bidders are required to survey the Site before furnishing the quotations

2.2 Bidder shall exclude all required civil, electrical, plumbing, lighting, fire safety, exhaust systems, false ceiling trap door/ cut out and repair (if any) and other works as may be required for complete installation and trouble-free functioning as a part of the 'Civil Modification'

2.3 The hospital will provide a one-point electrical supply with an isolator in the plant room. The selected bidder must do the wiring, lighting, fans, exhaust, etc.

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

2.5 Consignee /TIE will not be responsible for trenching or other associated work related to the installation and commissioning of complete MGPS system. The same has to be done by the selected bidder.

2.6 The MGPS bidder has to terminate/interconnect all the medical gas lines upto/to the OT/MOT

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

2.8 Medical gas pipeline inside the minor operation theatre has to be done by the MGPS bidder. MGPS bidder shall cooperate with the Modular OT (MOT) bidder for associated works (The interconnection of MOT Gas pipelines, is the responsibility of MGPS bidder, MOT vendor will keep all MGPS lines outside of the MOT)-scope of work for Modular OT vendor to be verified wrt pendant connection, outlet connection and system integrity commissioning. The bidder shall be responsible for the complete works, including the submission of working drawings, isometric views, detailed work schedule and materials.

2.9 Bidder shall be responsible for design, supply, installation, testing and commissioning of medical gas supply system in coordination with respective institute authorities & Assam Cancer Care Foundation.

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

2.11 Bidder should provide factory test certificates for the materials used. Bidder should supply complete set of part manuals, service manuals and user manuals for all the systems and subsystems supplied. Final electrical safety test, system test, leakage and calibration should be done by authorized persons using calibrated test equipment as per standards.

2.12 The Medical Gas Pipeline System must follow Single Standard any one only from: NFPA 99c/HTM 02-01/ ISO 7396-1/DIN/EN, except for Copper Pipe, AVSU, For AGSS Ventury type is not acceptable.

2.13 All Gas Outlets in MOT (i.e. O2, N2O, MA4, MA7, Vacuum, CO2 (if required), etc.) will come with OT Pendants (Under MOT RFP). Bidder has to provide pipelines up to all OT'S (Major & Minor). However, if required, the selected bidder may be asked to do gas pipeline work inside the OT'S within the scope and copper pipeline payment shall be made based on actual measurement.

2.14 Bidder shall coordinate with respective department heads for their final Gas Outlets requirement per bed in their wards and should incorporate the same in the drawing.

2.15 The final Payment will be made on the actual consumption of the BOQ Items and ranking will be done with RFP BOQ.

2.16 The following systems/Items must be from the same principal company/Manufacturer

a) Control Panels
b) Area & Master Alarm
c) AGSS
d) All types of Outlets

2.17 The third-party compliance certification after installation is to be done for the standard (HTM), followed by the authorised agency. The cost for the same will be borne by the bidder.

2.18 Bidder must have a satisfactory installation of complete MGPS as per any international standard as asked in RFP and a demo may be taken for the same.

2.19 Bidder will be provided after award either AutoCAD or PDF or hard Copy of building Layout drawing for preparation of MGPS drawings. The bidder has to submit the drawings within 20 days after NOA.

Bidder should be responsible for providing the details of heat dissipation and Air Conditioning as offered

2.20 MGPS plant requirement/recommendations from the Manufacturer and as per local Site conditions.

Gas outlet configuration location-wise :

2.21 As per the Design Matrix (Take off Sheet)

2.22 Bidder will be responsible for fully adhering to all the technical and safety compliance as per the HTM02-01/NFPA99/DIN and local authorities

2.23 Bidder must design the MGPS system as per the matrix and specification mentioned in the RFP, any clarification/suggestions regarding the design of the MGPS system should be submitted before the pre-bid meeting.

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

2.25 Zoning of MGPS should be done to meet the peak flow requirement with suitable backup arrangements for all services if required.

2.26 Interconnection to Manifolds with LMO Tank with necessary Automatic change over (by Appropriate Pressure differential panel) between LMO & Manifold will be the responsibility of bidder up to 100m distance.

2.27 All tanks (Air, Vac and AGSS (if applicable) should be installed inside/outside of the MGPS Plant room on the dedicated platform near the MGPS Plant room

2.28 Bidder should submit the MGPS Plant and Manifold equipment loading design with the footprint of all components as per their offered plant along with a bid within the area of 200 sq. m. bidder may keep the tanks inside, only when their offered plant and manifold are coming within the 200 sq. m area along with proper Site space for technicians, and cylinder storage space for filled and empty, also the height of tanks should be a maximum of 3.5m.

3 Responsibility of Consignee/ TIE:

3.1 The institute will provide an MGPS plant & manifold room (complete with plastering, painting & flooring, air conditioning and ventilation as per the approved drawing of the respective consignee/Institute)

3.2 The Institute will provide one point electrical, water and drain connection at the plant & manifold room

3.3 The Institute will provide a dedicated shaft for the MGPS riser

3.4 Institute will provide connecting trench from manifold/plant room to hospital building if MGPS plant/manifold room is not within the same hospital building.

3.5 Institute will provide temporary storage for storing of raw materials of MGPS system during installation period and the security of the store is the responsibility of the MGPS vendor.

3.6 Institute will provide a working electrical power supply for installation to MGPS vendor.

3.7 Institute will provide a switch/socket for MGPS Area alarms (Above false ceiling level) on the location as approved/required by the consignee.

3.8 Institute will provide power & Data input cables (if required) at all Bed Head Panel Locations at a height of 1250mm from FFL as per the approved plan of the consignee.

3.9 Platform for Tank, air compressor and Vacuum pump will be responsibility of the bidder with shed as per their requirement.

3.10 Consignee will be responsible for dedicated earthling (Chemical type) for MGPS Plant room (If required).

SCOPE AND TECHNICAL SPECIFICATION

4 Oxygen Supply System:

Cleaning: Degreasing for Oxygen Service and Pressurize with Nitrogen

4.1 Automatic changeover from LMO source to manifolds with a control panel. The Panel should be IMPORTED / INDIGENOUS WITH EU CE-certified Components. It should be able to handle to peak flow from the LMO tank. The panel should work as a pressure

4.2 Differential between the Liquid Medical oxygen and the Compressed Oxygen Cylinder Manifold

4.3 Alarm on indicating manifold in use in case the vessel is not in use

4.4 Alarm on low-pressure backup manifold cylinders

4.5 Fully Automatic Oxygen Control Panel:

4.5.1 Automatic control panel should be constructed in accordance with the requirements 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 US FDA / European CE Certified with 4 4-digit notified body number or American ETL/ American UL listed

4.5.2 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 is in service, and one should be ready for service in a standby mode. The Manifold control panel should have with digital display, a fully automatic type and switch 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

4.5.3 Indication for changing the cylinders should be clearly identified on the front of the control panel

4.5.4 All functional components should be enclosed in corrosion-resistant, robust material

4.5.5 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 minimise tampering with the regulators or switch settings

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

4.5.7 The heavy-duty control panel should be provided with a flow capacity of 1500 or more LPM at 50 to 60 psi

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

4.5.9 The Control panel should have an Alarm reset switch/Mute /an acknowledgement switch to control and monitor the alarm indications by the operator

4.5.10 To increase safety, the control system has an electronic warning signal to inform inform the user to perform regular maintenance. The warning should be reset once the maintenance is done

4.5.11 Manifold design shall ensure that the failure of any one component does not prevent the continued supply of gas to patients

4.5.12 The control system display has a 1024*768 resolution and indicates pressure in each bank of cylinders and line pressure

4.5.13 The manifold panel has automatically changed to supply the distribution system from the “Standby” bank when the pressure in the “Duty” bank falls to a predetermined level

4.5.14 The manifold automatically changes from the depleted primary supply bank to the secondary supply bank without fluctuation in line pressure. After replacement of the depleted cylinders, the manifold automatically indicates the replaced cylinder bank as the secondary supply

4.5.15 The control system supports RS-485 and BACnet communication networks.

4.6 Oxygen Manifold Supply System (without Cylinders):

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

4.6.2 Manifold shall consist of two high-pressure header bar assemblies to facilitate the connection of primary and secondary cylinder supplies. Each header bar shall be provided with the respective numbers of cylinder pigtail connections to suit cylinder valves as per IS.3224/ BS/ ASME, incorporating a check valve at the header connection.

4.7 Each header bar assembly shall be provided with a high-pressure shut-off valve. The oxygen Manifold should consist of 2 rows of a respective numbers of class D-type bulk oxygen cylinders. The manifold should be hydraulically tested to 3000 psig. The manifold should be so designed that it shall allow 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 galvanised

4.8 Each header bar assembly shall be provided with a high-pressure shut-off valve. The oxygen Manifold should consist of 2 rows of a respective numbers of class D-type bulk oxygen cylinders. The manifold should be hydraulically tested to 3000 psig. The manifold should be so designed that it shall allow 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 galvanised

4.9 Emergency Oxygen Manifold (without Cylinders):

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

4.9.2 Manifold shall consist of two high-pressure header bar assemblies to facilitate the connection of respective numbers of primary and secondary cylinder supplies. Each header bar shall be provided with the respective numbers of cylinder pigtail connections to suit cylinder valves as per IS.3224/ BS/ ASME, incorporating a check valve at the header connection. Each header bar assembly shall be provided with a high-pressure shut-off valve

4.9.3 Oxygen Manifold should consist of 2/1 rows of respective numbers of class D-type bulk oxygen cylinders. The manifold should be hydraulically tested to 3000 psig. The manifold should be so designed that it shall allow 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 galvanised

4.10 Oxygen Flow Meter with Humidifier Bottle:

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

4.10.1 Control within a range of 0-15 LPM

4.10.2 It should meet strict precision and durability standards

4.10.3 The flow meter body should be made of brass, chrome-plated materials

4.10.4 The flow tube and shroud components should be made of clear, impact-resistant polycarbonate

4.10.5 The flow tube should have a large and expanded 0-15 LPM range for improved readability at low flows

4.10.6 Inlet filter of stainless-steel wire mesh to prevent entry of foreign particles

4.10.7 The humidifier bottle is made of unbreakable & reusable polycarbonate /polysulfone material autoclavable at 121 degrees centigrade

4.10.8 Humidifier bottles should be covered under warranty & CMC

4.10.9 Should be BIS/CE certified/ UL Listed/CDSCO

5 Oxygen Supply System:

5.1 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 US FDA / European CE Certified with a 4-digit notified body number or American ETL/ American UL listed.

5.1.1 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 is in service, and one should be ready for service in a Standby mode. The Manifold control panel should be a digital, fully automatic type and switch 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 replacement of the depleted cylinders.

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

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

5.1.4 The Control Panel should be made to provide heavy-duty and have a flow capacity of 500 LPM or more at 50 to 60 psi

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

5.1.6 The control panel should have an Alarm reset switch/Mute/acknowledgement switch to control and monitor the alarm indications by the operator

5.1.7 To increase safety, the control system has an electronic warning signal to inform the user to perform regular maintenance. The warning should be reset once the maintenance is done

5.1.8 Manifold design shall ensure that the failure of any one component does not prevent the continued supply of gas to patients

5.1.9 The control system display has a 1024*768 resolution and indicates pressure in each bank of cylinders and line pressure

5.1.10 The manifold panel has automatically changed to supply the distribution system from the “Standby” bank when the pressure in the “Duty” bank falls to a predetermined level

5.1.11 The manifold automatically changes from the depleted primary supply bank to the secondary supply bank without fluctuation in line pressure. After replacement of the depleted cylinders, the manifold automatically indicates the replaced cylinder bank as the secondary supply.

5.1.12 The control system supports RS-485 and BACnet communication networks.

5.2 Nitrous Oxide Manifold (Without Cylinders)

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

5.2.2 Manifold shall consist of two high-pressure header bar assemblies to facilitate the connection of primary and secondary cylinder supplies. Each header bar shall be provided with a respective number of cylinder pigtail connections to suit cylinder valves as perIS.3224/ BS/ ASME incorporating a check valve at the header connection. Each header bar assembly shall be provided with a high pressure shut off valve. The manifold should be hydraulically tested to 3000 psig. 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.

5.3 Emergency N2O Manifold (Without Cylinders)

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

5.3.2 Manifold shall consist of two high-pressure header bar assemblies to facilitate the connection of primary and secondary cylinder supplies. Each 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. Each header bar assembly shall be provided with a high pressure shut off valve. The nitrous oxide manifold should consist of 2 rows of respective numbers of cylinders.

5.3.3 The manifold should be hydraulically tested to 3000 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 galvanised.

6 Medical and Surgical Air System:

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

6.1 Air Compressor

6.1.1 It should be Oil-Less/Oil-free Reciprocating to produce the plant output of {minimum Litres Per Minute (LPM) Plant capacity} as mentioned in the BOQ of the respective institute as primary and same capacity as standby

6.1.2 Medical quality air shall be delivered at a nominal pressure of 400 kPa (4 bar) and 700kPa (7 bar) gauge for the supply of the hospital medical air and surgical air

6.1.3 Compressor plant should be designed in such a way that compressors will switch on in a sequential manner as per flow demand

6.1.4 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. The Drier should have automatic purge control and CO measurement. Duplex desiccant dryer and filtration modules shall be provided with three or more individual stages of filtration as follows:
Stage 1: Coalescing filter upstream of the desiccant dryer for removing liquid water particles down to 1 micron.
Stage 2: Particulate filter after the desiccant dryer for dust protection and remove particles down to 1 micron.
Stage 3: Bacteria filter for removing particles down to 0.01 microns.
Purity should be tested as per the American Pharmacopeia / European Pharmacopeia standard.

6.1.5 Pressure Reducing Station: For 4 bar and 7 bar should fully comply and meet with the requirements of the standard. A simplex pressure-reducing station shall comprise as in- line pressure regulator, with a 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 operates from fully open to fully closed position with a quarter turn of the handle. Complete pressure-reducing station with a base plate mounted for ease of installation.

6.1.6 Padlocks are available to allow locking of the valves in both open and closed positions and must have easy to read pressure gauges. Base plate mounted and supplied with copper stub pipes for ease of installation using inert jointing procedures.

6.2 The Air delivery system should have-

6.2.1 Intake filter Delivery pipe

6.2.2 Desiccant Air Dryer –. Duplex-02 Nos

6.2.3 4-Stage or more Breathing Air Filters

6.2.4 Outlet pressures for drills/equipment and ventilators should be a minimum of 7 bar and 4 bar, respectively.

6.3 Vertical Air Receiver-Indigenous

6.3.1 Total air receiver capacity (capacity as mentioned in the RFP) in 1 minute in terms of free air delivered at normal working pressure. Each air receiver shall be protected by a pressure relief valve, a fusible plug and include a pressure gauge with isolating valve and a drain cock

6.3.2 The corrosion-resistant coated receiver is to be equipped with a tested safety pressure relief valve, sight glass pressure gauge, automatic drain, three-valve by-pass and source isolation valve. Should be fabricated as per ISO/ASME/BS

6.4 Air Drier

6.4.1 The air dryer should be a Duplex type or desiccant type, each having the full capacity of the plant flow. It includes a dual filtration system and a dewpoint transmitter 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.

6.4.2 Dryers should be of heatless desiccant design and sized to provide for the peak calculated demand. The desiccant dryers should be equipped with a dew point-dependent switching feature to minimise the need for purging air. It should have integrated purge control.

6.4.3 The dual filtration system should remove liquid and particulate matter, consisting of 0.5-micron coalescing filters with differential pressure indicators and automatic drain, airline pressure regulators with gauges, a final pressure relief valve, and a sampling valve.

6.5 Each bank should consist of three stage treatment. The Drier should have an Integrated Digital dew point monitor and CO measurement is to be supplied with alarm contacts as per requirement of the standard. The system should be designed to function even if the programmable controller fails.

6.6 Accessories:

Accessories like air inlet filters, air filters (4 stages), and water coolers s 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 the warranty period and the CMC Period.

7 VACUUM SYSTEMS:

7.1 Vacuum Pump –Imported:

7.1.1 It should be Oil-Sealed Rotary Vane Type to produce the plant output of minimum Litres Per Minute (LPM), Plant capacity, as mentioned in the BOQ of the respective institute, as primary and same as standby.

7.1.2 Designed flow capacity should be a minimum of LPM capacity as mentioned in the BOQ of the respective institute. 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 500 mmHg and 660 mmHg.

7.1.3 Each vacuum pump shall be fitted with anti-vibration pads between the pump foot and the mounting frame. The plant shall be fitted with a duplex bacteria filter system.

7.1.4 Rotors shall be driven by IE3 efficiency electric motors. Pump inlets shall include an integral non-return valve to prevent oil suck back and pressure increases in the vacuum system. Each vacuum pump shall have an integral separator filter to ensure a virtually oil-free exhaust. Each pump shall be fitted with anti-vibration pads between the pump foot and the mounting frame. The pumps shall have mineral oil to ensure a long service interval. The factory-packaged and tested skid frame-mounted vacuum system consists of rotary vane vacuum pumps, duplex bacteria filtration, pre-wired control panel and interconnecting wiring and piping. The Medical Vacuum systems will be available as skid frame mounted, along with a vertical receiver.

7.2 Vacuum Receiver-Indigenous:

The vacuum receiver shall be made of rust-free corrosion-resistant steel and fabricated as per ASME/BS/ISO for a vacuum pressure of 760 mmHg. It should include bypass valves, manual drain valves, and vacuum gauges. Vacuum reservoir capacity as mentioned in the RFP.

7.3 Bacterial Filters-Imported:

The filters should be designed for the 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 a particulate filter dryer with the ability to remove particles as small as 1 micron.

Each individual filter shall have the capacity to deliver full design flow, such that one set is designated for duty and the other will be on standby. Bacteria filters shall have an efficiency of at least 99.999% when tested by the sodium flame method in accordance with BS 3928:1969, as per the required standard, utilising particles in the 0.02-to-2-micron size range. The pressure drops across each clean filter at 50% of the system design flow should not exceed 25 mm Hg (3 kPa) at a vacuum of 475mm of Hg (63 kPa). Bacteria filters shall be marked with the legend ‘Bio-Hazard’.

The duplex bacteria filter system shall incorporate high-efficiency filter elements. A differential vacuum indicator shall be installed across the filter to indicate blockage. Additional pressure sensors shall be installed at the inlet and outlet of the filter to measure the pressure drop across the filter. Bacteria Filter elements shall have penetration levels not exceeding 0.005% when tested by the sodium flame method in accordance with BS 3928:1969 and utilising particles in the 0.02-to-2-micron size range. Drain flasks shall be connected to each filter. Drain flasks shall be manufactured from transparent material with a polymer coating on the inner and outer surfaces to maintain a seal in the event of inadvertent breakage of the flask. All drain flasks shall be suitable for sterilisation and be connected via a manual isolating valve.

7.4 Each bacterial filter shall be provided with a transparent serializable 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.

7.5 Accessories:

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

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

8 Ward Vacuum Units:

It must consist of the following: -

8.1 1 no of Suction Regulator and 1 no of 1000 ml for ICU and 600 ml forwards (as per BOQ) polysulfone /polycarbonate collection jar.

8.2 Suction Regulator: The suction regulator should be supplied with a safety jar, including an antibacterial filter and an anti-overflow safety device. Should have a wide membrane, continuous suction controller

8.3 Should have vacuum levels: 0-750 mm Hg or more

8.4 Should have a vacuum gauge fitted with a protective bumper device.

8.5 Should have an on/off knob allowing for the quick restoration of a readjusted vacuum level.
Must have a central adjustment knob with colour coded for 0 to 750 mm Hg or more. Should have Polysulfone/ polycarbonate 100cc safety jar, autoclavable at 121ºc at 5mins, unbreakable, fitted with an anti-overflow safety device and equipped with an antibacterial filter. It should be totally transparent, to ensure perfect sucked liquid visibility.

8.6 Low flow ward vacuum unit - Should have vacuum levels: 0-250 mm of Hg +/-10%

9 Theatre Vacuum unit for OT-Indigenous:

It must consist of the following: -

9.1 Suction Regulator and 2nos. 1500ml or more polysulfone/ polycarbonate collection jar and both to be mounted on a trolley.

9.2 Suction Regulator: The suction regulator should be supplied with a safety jar, including an anti-bacterial filter and an anti-overflow safety device. Should have a wide membrane, continuous suction controller

9.3 Should have vacuum levels: 0-750 mm of Hg or more

9.4 Should have a vacuum gauge fitted with a protective bumper device.

9.5 Should have an on/off knob allowing for the quick restoration of a readjusted vacuum level. Must have central adjustment knob with a colour coded for 0-750 mm Hg or more. Should have polysulfone/ polycarbonate safety jar, autoclavable at 121ºc, unbreakable, fitted with an anti-overflow safety device and equipped with an antibacterial filter.

9.6 Collection jar should be totally transparent, to ensure perfect sucked liquid visibility.

10 AGSS (Anaesthetic Gas Scavenging System) Plant – Imported (Duplex):

10.1 Anaesthetic Gas Scavenging System (AGSS) of minimum 1500LPM as Primary & 1500 LPM as Standby, It should be US FDA / European CE Certified with 4 digital notified body number or American ETL/ American UL listed (In case of NFPA 99c the control panel of Plant must be UL/ETL Listed and Undertaking from the 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/ISO 7396-1./DIN

10.2 The package should consist of rotary vane/claw type/ Blower Type vacuum pumps (Dry/oilless only), a control panel, and be mounted on a common base frame

10.3 AGSS pump: The AGSS pump shall operate completely dry. Each pump should be completely air-cooled and have absolutely no water requirements. The suitable wiring from OTs to the AGSS plant for remote control/suitable reservoir (as applicable) is the responsibility of the bidder.

11

11.1 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 the 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 personnel. AGSS design should be dependent upon the 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 a synchronised manner after the connection of the workstation to the AGSS System.

Installation should be on a rooftop/suitable location. Piping, non-return valves (NRVs), and inlet nozzles should be suitably placed. Connecting hose suitable to fit with anaesthesia workstation should be provided.

12DISTRIBUTION PIPING:

12.1 Piping specifications

12.1.1 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.

12.1.2 Copper pipe must have a reputable third-party inspection certificate (Eg. Lloyd's

12.1.3 Fittings should be made of copper and suitable for a working pressure of up to 17 bar 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.

12.1.4 Copper fittings should comply with EN 1254:1 factory degreased, and brazing filler metals should comply with EN 1044. Fitting should be degreased, and individually packed for medical use.

12.1.5 The minimum thickness of copper pipes of 35mm and above outer diameter should be 1.2mm and the thickness of copper pipes less than 28mm outer diameter, should be 1mm, as mentioned in respective Institute's BOQ.

13Installation & Testing:

13.1 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 the Site. Pipe fixing clamps shall be of nonferrous or non-deteriorating plastic suitable for the diameter of the pipe.

The 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 phosphorus brazing alloy CP104. A total of 5 joints 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

the 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 the Site.

13.2 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.

13.3 After erection, the pipes are to be flushed with dry Nitrogen gas and then pressure tested with dry Nitrogen at a pressure equal to twice the working pressure or 150 psig, whichever is higher for a period of not less than 24 hours.

13.4 Length and quantity of individual items (Copper pipes, AVSUs, Alarm panels, Isolation valves, Outlets, pendants etc.) are mentioned. However, the quantity will be calculated and paid at actuals. Bidder should quote unit price for all the items as detailed

13.5 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)

14 Painting:

All the pipes from the manifold/plant up to 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.

15 GAS OUTLETS-Imported:

15.1 Terminal Units (Gas Outlets) with probes/Adaptors for O2, N2O, Compressed Air 4, Air 7, AGSS, Vacuum & CO2

15.2 The Medical gas outlets shall conform to HTM 02-01/ NFPA 99 C/EN/DIN/ ISO 7396-

15.2.1 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 are gas specific so that secondary devices cannot be “attached” to the wrong gas. When not in use, the gas is in a non-flowing state within the Outlet (Terminal unit) sealed by an “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 the following features:

15.2.1.1 Push-to-insert and press-to-release mechanism for probes.

15.2.1.2 Allows plugging of probes from the front.

15.2.1.3 Self-sealing valve on disengaging the probe (Quick disconnect)

15.2.1.4 Smooth, quite action.

15.2.1.5 non-return valve for online servicing/ repairing

15.2.1.6 Indexed to eliminate interchangeability of gas services

15.2.1.7 Colour-coded gas-specific front plate

15.2.1.8 Totally leakproof, safe & easy to operate

15.2.1.9 Configurations possible: surface, flush, & Bead-head

15.2.1.10 Outlets should be US FDA / European CE Certified with a 4-digit notified body number or American ETL/ American UL listed

15.2.1.11 All outlets should have respective labels (i.e.O2 / N2O / CO2 / Air4 / Air7/Vacuum/AGSS/etc) displayed accordingly.

16AREA VALVE SERVICE UNIT(Indigenous):

16.1 Area valve service units should fully comply and meet with HTM 02-01/NFPA 99c/EN/DIN/ISO7396-1. It should provide a zone isolation facility for use either in an emergency or for maintenance purposes. The Area Valve Service UNIT should incorporate a ball valve in a lockable box with emergency access. It should be reliable and easy to operate, easy to purge, sample & pressure testing and an emergency supply system.

16.2 Medical gas/vacuum services should be fixed copper, piped to and from their respective area valve service units. A colour-coded service identity label should be fitted behind the valve handle. The unit should provide a zone isolation facility. The Gas Flow direction should be indicated.

16.3 The box shall be made from extruded aluminium to prevent corrosion. 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 surfaces should be powder-coated.

16.4 The box shall be made from extruded aluminium to prevent corrosion. 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 surfaces should be powder-coated

16.5 Alarm Panel:

SITC of digital display Area Alarm Panels (EU CE Certified or American UL/ETL Listed) It should fully comply with and meet the requirements of HTM0201/NFPA99/ ISO 7396-1; It should be capable of monitoring up to 6 gas services by means of pressure sensors that detect deviations from the normal operating limits. It should have each gas service shall be displayed on an LCD to show 'Normal' (green), 'Low' and 'High' pressure (red) conditions. Medical vacuum systems shall be displayed in the 'Normal' (green) and 'Low' vacuum (red) conditions, along with pressure. Failure indicators shall be displayed by flashing lights, and normal indications shall be steady. An audible warning shall sound simultaneously with any failure indication, and a mute facility shall be provided. Following a mute selection, the audible will resound after approximately 3 minutes or shall operate simultaneously should a further alarm condition occur. A "Mute" on touch shall be provided inside the panel software for use during any maintenance resulting in a prolonged pipeline or plant shutdown. This facility shall automatically reset when the gas service returns to normal. The alarm panel shall have a 'Test' facility to prove the integrity of the internal circuits, The alarm panel shall incorporate a MODBUS TCP/IP protocol to allow for LAN connectivity for a medical gas central alarm system or an event recording circuit of a building management system.

17ALARM SYSTEM:

17.1 Master Alarm (Digital)-Imported

17.1.1 Should be US FDA / European CE Certified with 4 digital notified body numbers or American ETL/ American UL listed.

17.1.2 Complies with HTM 02-01 / NFPA 99c/EN/DIN/ ISO 7396-1 Standards.

17.1.3 Each Master Alarm should be modular in design and be fitted with the required number of master alarm modules. The master alarms should be capable of monitoring pressure of Liquid Oxygen, Primary and Secondary oxygen banks, and Emergency oxygen bank.

17.1.4 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 alarm should be actuated. A dry contact module should be available to interface with a building management system.

17.1.5 The box material should be of gauge steel of requisite thickness and equipped with mounting brackets. The emissions from alarms should conform with EMC standards.

17.1.6 The 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.

17.1.7 Each panel shall display and/or input up to forty-point alarms. The panel should be ready to use with the BMS system. All floor area alarms should be connected.

17.1.8 The master alarm must be able to monitor the following source alarm conditions.

17.1.9 Oxygen Source LMO Pressure Display with Fault Indication

17.1.10 Oxygen Cylinder Bank Pressure display with Empty/Fault Indication

17.1.11 Oxygen Emergency Bank Pressure display with Empty/Fault indication

17.1.12 Air Compressor pressures (both 4 bar and 7 bar) display with Empty / Fault display

17.1.13 Vacuum Pump pressure display with Faulty/Operational display

17.1.14 Vacuum Deficiency Vacuum Reservoir

17.1.15 N20 and CO2 pressure display with fault/empty, And Other MGPS Signals & Alarms

17.1.16 Bidder shall be responsible for all cabling from local alarm panels to master alarm panels

17.1.17 Master alarm should be integrated with BMS/HIS

18 Line Isolation Valves- Imported:

18.1 The medical gas central alarms should be capable of monitoring up to 5 medical gas services (As specified in the BOQ of the respective institute) by means of pressure sensors that detect deviations from the normal operating limits of either pressure or medical vacuum. The medical gas area alarm should fully satisfy the HTM 02-01/ NFPA 99 C/EN/DIN/ISO 7396-1 requirements and should be US FDA / European CE Certified with 4-digit notified body number or American ETL/ American UL listed.

18.2 An audible warning should sound simultaneously with any failure indication, and a mute facility should be provided.

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

19 Medical Gas Area Alarm (Imported):

The Lockable line valves must degreased and complete valve with stuffed pipe & fittings, factory tested and comply with HTM 02-01/ NFPA 99 C/EN/DIN/ISO 7396- 1 standard.

20 Supply of O2 Cylinders – Class D, C, B Type

Should be as per BIS/IS/ASME Standard

21 Supply of O2 Cylinders – Class D Type-Indigenous

Should be as per BIS/IS/ASME Standard

22 Horizontal/ Vertical Bed Head Panel- indigenous:

It shall conform to HTM 02-01/ NFPA 99 C/EN/DIN/ISO 7396-1. The design should be approved by the respective institute before installation, and it is the responsibility of the bidder after getting the order, they have to discuss with the respective institute and finalise the Bed Head Panel (Vertical/Horizontal) as per Site conditions. Vertical BHP should be up to False Ceiling Level, and all outlets and sockets should be located at a reachable height. Horizontal BHP should be a maximum of 1200mm for up to 4 outlets configuration and 1800mm for 6/8 Outlet configurations.

It should have the following features: -

22.1 Efficient, Safe & Robust design in extruded aluminium section.
22.2 Smooth curved surfaces, and choice of base colour and fascia plates.
22.3 UNIT should have an integrated rail system to mount accessories.
22.4 The headwall system should be constructed of aluminium extrusions joined together to form a carcass to suit the application. UNIT should be factory assembled for electrical and mechanical components.
22.5 Segregation of services i.e. Low voltage supplies, High Voltage supply and medical gases should be maintained with minimum 2 tier/2 channel arrangements.

22.6 The front fascia plate should be removable individually to access for respective service.

22.7 It should have one rail for mounting Accessories.

22.8 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 earthing arrangements). The sockets should have colour coding/identification marks for the UPS supply. The necessary factory cut-out for the nurse call system should be done. The dimensions for the cut-out will be shared with the nurse call vendor. Necessary cooperation is to be extended to the nurse call bidder to execute the installation smoothly. Switches/Sockets and data points to be supplied and installed by MGPS bidder.
Note: Gas Outlets quantities are already taken into consideration of quantities of respective outlets in the BOQ

23 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 tubes should be as per ISO standards. It should be CE marked/UL Listed. (The 200m Hose- Gas-wise requirement should be taken from the respective institute before supplying, total lengths should be 200m, inclusive of all types. If the institute requires more than the payment will be made on an actual basis as per the finalised BOQ rate.

24 Electrical Wiring with Electrical Panels –Indigenous:

All wiring inside the Manifold Room and Plant room is required for MGPS equipment and General electrification. The institute will provide a one-point supply only. Others are under the scope of the bidder. All the work should be as per BIS/CE standards and material used should be reputed make only. A combined control panel shall provide for compressors & vacuum pumps to house the isolating switch, starter, MCB, ammeter, hours run meter, lead compressor selector switch, pressure switch and alarm. Wiring should be done using proper cable trays and covers.

25 CARBON DIOXIDE SYSTEM:

25.1 The system should consist of a medical CO2 Manifold as per the Given BOQ of each site and control panel. The control panel of CO2 should be US FDA / European CE Certified with a 4-digit notified body number or American ETL/ American UL listed.

25.2 The Modular Manifold supply system shall provide a carbon dioxide piped distribution system.

25.3 The Modular Manifold system should be designed in such a way that it increases flexibility and allows easy enlargement of the manifold capacity in case of future expansion. Should comply with HTM 02-01/ NFPA 99 C/EN/DIN/ ISO 7396-1 standard.

25.4 It should be supplied by a high-flow double-stage Regulator.

25.5 To increase safety, the control system has an electronic warning signal to inform the user to perform regular maintenance. The warning should be reset once the maintenance is done.

25.6 Manifold design shall ensure that the failure of any one component does not prevent the continued supply of gas to patients.

25.7 The control system display has a 1024*768 resolution and indicates pressure in each bank of cylinders and line pressure.

25.8 The manifold panel has automatically changed to supply the distribution system from the “Standby” bank when the pressure in the “Duty” bank falls to a predetermined level.

25.9 The manifold automatically changes from the depleted primary supply bank to the secondary supply bank without fluctuation in line pressure. After replacement of the depleted cylinders, the manifold automatically indicates the replaced cylinder bank as the secondary supply.

25.10 The control system supports RS-485 and BACnet communication networks.

26 Interconnection to LMO Tank (Optional Price should be quoted):

26.1 Price should be quoted per meter basis for inclusive of all installation, material (Copper Pipes, fittings, etc), trenches and labour, etc. charges as per Site condition. The payment will be made on actual meter consumption for interconnection from the LMO tank to the Gas Manifold room after 100m.

26.2 Site Modification –

26.2.1 Bidder should be responsible for antistatic rubber flooring in the manifold room and thickness of flooring not less than 1inch.

Note:

26.2.1.1 Quantities mentioned in the Boq are indicative and may increase or decrease as per site requirements. Payment shall be made as per the actual quantity installed and measurements.

26.2.1.2 For indigenous items quoted with CDSCO licensed manufacturers, each Item must hold an individual CDSCO license for each item separately.

26.2.1.3 As-built drawings to be arranged (Both soft and Hard copies) during the project commissioning and Handover.