

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

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

Tender

for

**Supply, Installation, Testing & Commissioning of Medical Gas
Manifold System at existing Hospital and at Superspeciality Block
at Dr. Rajendra Prasad Govt. Medical College , Tanda (Kangra).**

VOLUME – IV

TECHNICAL SPECIFICATION

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(Consultants & Engineers for Mega Hospitals & Laboratories)
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Tender No. HSCC/PG-III/SSB-Tanda/MGMS/2013

TECHNICAL SPECIFICATION OF CENTRALIZED MEDICAL GAS MANIFOLD SYSTEM

Scope of work **Design, supply, installation, testing, commissioning and handing over of Medical Gases Manifold and Distribution System including turnkey work and providing of free spare parts and service during One (1) year Defect Liability Period.**

The system shall comprise of:

A. Source Equipments

Fully Automatic Oxygen manifold & control panel
Fully Automatic N2O manifold & control panel
Vacuum (suction) supply system
Medical Compressed Air System
Anesthesia Gas scavenging system

B. Distribution pipes.

C. Outlets and bed head panel for Wards etc. with accessories.

D. Complete Alarm system.

E Horizontal Bed Head Panel

F. Accessories

Oxygen flow meter with humidifier
Ward vacuum units
Theatre Suction units.

Standards

The design & selection of all imported items should be of international standard like NFPA 99(latest version) standard and UL listed or EN737(latest version) standard and CE marked or HTM 02 01 (latest version) standard and CE marked. The imported products should be of one standard only. All indigenous items should be of high quality to meet the international standard and compatible to the main system. This supersedes single/multiple standards mentioned at any other places in the tender specification involving item/system/capacity etc.

1.0 **Oxygen System**

Oxygen System Shall consists of the followings:-

- a) Oxygen Manifold System
- b) Fully Automatic Oxygen Control Panel
- c) Oxygen Emergency supply system

1. a **Oxygen Manifold**

- *The oxygen manifold shall be of size 20+20 bulk cylinders.* Manifold shall consist of two high-pressure header bar assemblies to facilitate connection of primary and secondary cylinder supplies. Each header bar shall be provided with 20 numbers of cylinder pigtail connections to suit cylinder valves as per IS 3224 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.
- The manifold should be so designed that it shall suit easy cylinder changing and positioning.
- The cylinder should be placed with the help of cylinder brackets and fixing chains which should be zinc plated.
- The manifold should be suitable to withstand a pressure of 145 Kg/cm². The manifold should be tested (hydraulically) at 3500 psig pressure and to be supplied along with necessary test certificate.
- *The Oxygen Manifold System shall be compatible to allow integration with the Liquid Oxygen Tank.*

1. b **Fully Automatic Oxygen Control Panel (Imported):**

- The Oxygen Control Panel shall be of microprocessor based and preferably Digital Display Type. Pressure reduction shall be in two stages. Panel shall be integrated with pressure gauges inside panel on downstream of pressure regulator. Panel shall be fitted with standby line regulator. Line regulators shall have pressure relief mechanism for testing and servicing purpose.

- Panel shall be Fully Automatic and shall switch over from “Bank in Use” to ‘Reserve Bank’ without fluctuation in delivery line pressure and without the need of external electrical power. After the switch-over, the “Reserve Bank” shall become the “Bank in Use” and the “Bank in Use” shall become the “Reserve Bank”. The Control Panel will be powered by a microprocessor.
- A Microprocessor circuit board assembly shall provide a relay output to give indication when or just before the manifold switches from one bank of cylinders to another. The switch over shall be mechanically controlled, not electrically.
- To avoid excess pressure being supplied to the distribution system, a pneumatically relief valve for the line regulator shall be incorporated. An intermediate pressure relief valve shall be installed between the high-pressure regulators and the line delivery regulators.
- The control panel incorporates six coloured LED’s, three for the Left Bank and three for the Right Bank: Green for Bank in use, Amber for Bank ready and Red for Bank empty. Both the Left and Right bank pressures and the main line pressure should be displayed on the front door of the cabinet by means of LED's. All pressure transducers, micro switches, and display LED’s shall be pre-wired to an internal microprocessor circuit board.
- All components inside the Control Panel like Pressure Regulators, piping and control switching equipment shall be cleaned for Oxygen Service and installed inside the cabinet to minimize tampering with the regulators or switch settings.
- The Control Panel should be made to provide Heavy Duty with a Delivery Flow Capacity of over **2000 lpm at 55-60 psig.**

1.c **Emergency Oxygen System:**

It will have emergency arrangement of 10-cylinder configuration, with Copper tail pipes, Non Return Valves & high flow regulator with pressure gauges for Cylinder & line pressure and safety valve. Pressure regulator shall be detachable from the manifold.

1d. **Terminal outlets with probes/adapters**

As per Sl. No.-15

1e. **Oxygen cylinders (D type):**

- Gas : Medical Oxygen
- Capacity of Gas : 7.00 CUM
- Capacity of Water: 46.7 ltrs.
- Standard : one to IS : 7285, BS : 1045
- Working Pressure : 150 KGF/CM²
- Test Pressure : 250 KGF/CM²
- Outside Diameter : 232 mm
- Wall Thickness : 5.5 mm
- Length : 1370 mm
- Tear Weight: 54 kg. (approx.)

- The valves fitted to these cylinders should confirm to specification IS:3224 & IS:3745
- The Cylinder being offered should be manufactured within the country or imported from abroad and should conform to IS Specification 7285 and BS 5045 Part I respectively
- They should also have approval of the Chief Controller of Explosives, Govt. of India, Nagpur
- Each Cylinder Shoulders should be stamped with GG : Symbol for Gas, Mfgr. : Identification Mark, MMY Y : Month & Year of Hyd. Test, XYZ : Serial No. of Cylinder, IS 7285: B.I.S. Specification, TW : Tear Weight, TP : Test Pressure FP:

1f **Liquid Medical Oxygen 10KL capacity**

- Should be certified for medical use as per IP (Indian Pharmacopoeia).
- Should not contain less than 99.6% V/V of oxygen
- Should not contain more than 5 ppm V/V of carbon monoxide
- Should not contain more than 30 ppm V/V of carbon dioxide
- Should be free of halogens
- Should be free of oxidizing agents
- Should be free of water
- Regular maintenance & *supply of liquid Oxygen in to the liquid tank is firms responsibility.
- The vessel should be maintained in such a way so that the natural evaporation rate should be less than 1%.
- All formalities for installation of the tank like CCE clearance, third party clearance & any other formality is contractor's responsibility.
- Manufacturing facility should have ISO 9001:2000 / EN ISO 9001:2000 / ASQC 9001:2000.
- All necessary/ suitable certificates must be provided by the bidder to ensure compliance of the above-mentioned parameters
- The LMO storage tank shall be of suitable capacity to fulfill our requirement it is going to supply oxygen to, with Vaporizer of appropriate size, having safety features as per International standards. The tank shall be connected to manifold / central oxygen pipeline.
- Liquid oxygen will be the primary (main) supply source and the oxygen manifold will work as stand by. In case of failure in liquid oxygen, manifold will work as supply source. In case of failure in liquid oxygen supply, it should automatically switch over to oxygen manifold.
- The unit shall consist of a double walled vertical vessel (made of stainless steel and carbon steel) for outdoor installation capacity as per consumption of the institute.
- It should be fitted with standard accessories as minimum and should have undergone standard inspection requirement. A certificate in that respect to be submitted. Liquid Oxygen tank shall be of **10000 Ltrs** capacity

*Cost for regular supply of Liquid Oxygen is not included in the estimated cost and it will be paid separately by the Hospital authority. Separate contract agreement shall be made between the contractor and the Hospital authority.

- 1g. High Pressure tubing flexible having Antistatic core as per ISO with proper colour coded complete as per specifications.

2.0 **Nitrous- oxide system**

Nitrous Oxide system shall consist of the followings :

- a Nitrous Oxide main manifolds supply system
- b Fully automatic Nitrous Oxide control panel
- c Nitrous-oxide emergency supply system

2.a **Nitrous Oxide Manifold**

- ***The Nitrous Oxide manifold shall be of size 8+8 bulk cylinders.*** Manifold shall consist of two high-pressure header bar assemblies to facilitate connection of primary and secondary cylinder supplies. Each header bar shall be provided with 6 numbers of cylinder pigtail connections to suit cylinder valves as per IS 3224 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.
- The manifold should be so designed that it shall suit easy cylinder changing and positioning.
- The cylinder should be placed with the help of cylinder brackets and fixing chains which should be zinc plated.
- ***The manifold should be suitable to withstand a pressure of 145 Kg/cm². The manifold should be tested (hydraulically) at 3500 psig pressure and to be supplied along with necessary test certificate.***

2.b **Fully Automatic Nitrous Oxide Control Panel (Imported)**

- The Nitrous Oxide Control Panel shall be of microprocessor based and preferably Digital Display type. Pressure reduction shall be in two stages. Panel shall be integrated with pressure gauges inside panel on downstream of pressure regulator. Panel shall be fitted

with standby line regulator. Line regulators shall have pressure relief mechanism for testing and servicing purpose.

- Panel shall be Fully Automatic and shall switch over from “Bank in Use” to ‘Reserve Bank’ without fluctuation in delivery line pressure and without the need of external electrical power. After the switch-over, the “Reserve Bank” shall become the “Bank in Use” and the “Bank in Use” shall become the “Reserve Bank”. The Control Panel will be powered by a microprocessor.
- A Microprocessor circuit board assembly shall provide a relay output to give indication when or just before the manifold switches from one bank of cylinders to another. The switch over shall be mechanically controlled, not electrically.
- To avoid excess pressure being supplied to the distribution system, a pneumatically relief valve for the line regulator shall be incorporated. An intermediate pressure relief valve shall be installed between the high-pressure regulators and the line delivery regulators.
- The control panel incorporates six coloured LED’s, three for the Left Bank and three for the Right Bank: Green for Bank in use, Amber for Bank ready and Red for Bank empty. Both the Left and Right bank pressures and the main line pressure should be displayed on the front door of the cabinet by means of LED's. All pressure transducers, micro switches, and display LED’s shall be pre-wired to an internal microprocessor circuit board.
- All components inside the Control Panel like Pressure Regulators, piping and control switching equipment shall be cleaned for Oxygen Service and installed inside the cabinet to minimize tampering with the regulators or switch settings.
- The Control Panel will have heaters to prevent ice formation on the regulators at high flow rates.
- The Control Panel should be made to provide Heavy Duty with a Flow Capacity of over **1000 lpm at 55-60 psig.**

2.c **Emergency Nitrous Oxide System:**

Emergency system shall have arrangement of One set of Three Cylinder configuration with Copper tail pipes, Non Return Valves & high flow regulator with pressure gauges for Cylinder & line pressure and safety valve. Pressure regulator shall be detachable from the manifold.

2d. **Terminal outlets with probes/adapters**

As per Sl. No.-15

2e Nitrous Oxide cylinders (D type):

- Gas : Nitrous Oxide
- Capacity of Gas : 30.0 Kg
- Capacity of Water: 46.7 ltrs.
- Standard : one to IS : 7285, BS : 1045
- Working Pressure : 150 KGF/CM²
- Test Pressure : 250 KGF/CM²
- Outside Diameter : 232 mm
- Wall Thickness : 5.5 mm
- Length : 1380 mm
- Tear Weight: 53 kg. (approx.)

- The valves fitted to these cylinders should confirm to specification IS:3224 & IS:3745
- The Cylinder being offered should be manufactured within the country or imported from abroad and should conform to IS Specification 7285 and BS 5045 Part I respectively
- They should also have approval of the Chief Controller of Explosives, Govt. of India, Nagpur
- Each Cylinder Shoulders should be stamped with GG : Symbol for Gas, Mfgr. : Identification Mark, MMY : Month & Year of Hyd. Test, XYZ : Serial No. of Cylinder, IS 7285: B.I.S. Specification, TW : Tear Weight, TP : Test Pressure FP:

2f. High Pressure tubing flexible having Antistatic core as per ISO with proper colour coded complete as per specifications.

3.0 Vacuum (Suction) System (Imported)

3a. Vacuum system shall be **Triplex (Two working & One Standby) 228 cfm capacity (i.e Two pumps together produce vacuum of 228 cfm capacity.)**

- The system shall be of consisting of lubricated rotary vane vacuum pumps with Control Panel equipment and one tank.
- This system shall be capable of removing 99.9% of oil and smoke particles from the exhaust.
- Each vacuum pump shall be driven by a suitable HP motor. Each pump shall have a capacity of **114 cfm at 19 “ HG.**
- The system shall include the following accessories for each pump: inlet check valve, inlet isolation valve, vacuum control switch, oil temperature gauge, thermal malfunction switch and vacuum control switch. Provide flexible connectors on inlet and exhaust of each pump, exhaust tee with union, cock valve as well as copper tubing with shut-off cock for gauge and vacuum switches. The system shall include vacuum storage tank of

suitable capacity. The inside of the tank shall be coated for rust protection with a two component coating which provides a hard, durable lining.

- Provide vibration mounting as per NFPA 99/HTM2022/EN737.
- The system shall have UL listed/CE marked control panel
- Provide the panel with a programmable controller with removable terminals to allow quick and easy replacement in the field. The system should be designed to function even if the programmable controller fails. The system shall be equipped with a flashing light pump failure alarm/shutdown at any of the following conditions: motor overload tripped, main disconnect is off, blown fuse, control transformer failure, starter coil failure, Selector Switch is off. The central control unit shall incorporate a colour display with LED indicators and have easy access to system operational information.
- Provide audible and visual local alarm (complete with indicating lights and individual sets of auxiliary contacts wired to the terminal strip for remote alarm indication) for the following: vacuum pump thermal malfunction and reserve vacuum pump in use. Provide manual reset for thermal malfunction shut-down. All control and alarm functions shall remain energized while any vacuum pump in the system remains electrically on-line.
- The bacteria filtration system shall incorporate high efficiency filter elements. A differential vacuum indicator shall be installed across the filter to indicate blockage. Each filter shall be designed and sized to carry the full plant design flow capacity with minimum drop. Bacteria filter elements shall have penetration levels not exceeding 0.005% when tested and utilizing particles 0.02 to 2 micron size range.

3b. Terminal outlets with probes/adapters

As per Sl. No.-15

- 3c. Flexible tubing having Antistatic core as per ISO with proper colour coded complete as per specifications.

4.0 Air Compressors (Imported)

- The system shall be consisting of **one set i.e Quadruplex (Three working and one standby) capacity of approx. 150 scfm(When three compressors are working) at 8.5bar** air compressors, allied equipment, suitable tank and control panel.
- The medical air compressors shall be of the totally oil-less reciprocating air-cooled design/ Screw/Scroll. Each compressor shall be belt driven by a suitable HP, 3 phase, 50 cycle, 415volt, motor.
- Each air compressor shall have a capacity of **50 scfm at 8.5bar**.
- The system shall be equipped with filters.
- The system shall have UL listed/CE marked control panel.
- Dual air dryers, dual 0.5 micron pre-filters, dual 0.5 micron after-filters, line pressure regulating valves, dew point monitor, CO monitor and other accessories required to

meet and exceed the current code requirements shall be mounted on the compressor system base.

- All components shall be completely single-point service connections as per latest international standards.
- There shall be two identical banks of air treatment equipment, piped in parallel and provided with valves to by-pass either filter set for element replacement, maintenance and repair work on one of the sets while still treating medical compressed air through the other set without any sacrifice in air quality. Each bank should consist of three stages of treatment.
- The first stage shall be a prime efficiency come together with particles removal down to 0.5 micron with 99.9999% retention. This filter removes aerosols and solid particles.
- The second stage shall be desiccant heatless air dryer equipped with purge control. Built-in purge saver control shall automatically minimize and adjust the amount of purge air to match the variable airflow. The dry compressed air is discharged from the on-line tower into the third stage.
- The third stage shall be a prime efficiency particulate after filter with particle removal down to 0.5 micron. The after filter element shall be provided high particles retention, low pressure drop and long element life.
- Downstream pressure regulators shall maintain constant discharge pressure of 55 to 60 PSIG (field adjustable).
- Digital dew point and CO monitors with alarm set points at +39 °F and 10 PPM are provided with dry contacts for connection to remote alarm panels. A “demand check” for maintenance should as per current code requirements of latest international standards.
- Besides meeting the requirements of the relevant standard, filtration of medical compressed air shall conform to ISO 8573.1 Class 1.3.1 of medical breathing air.

4b. & 4c Terminal outlets with probes/adapters

As per Sl. No.-15

- 4d. High Pressure tubing flexible having Antistatic core as per ISO with proper colour coded complete as per specifications.

5.0 Distribution piping (Indigenous)

- Medical graded Copper pipes shall be solid drawn, tempered, seamless, phosphorous deoxidized, non-arsenic and degreased for oxygen service. The chemical composition shall be as per BS-6017: 1981 Table 2, Cu-DHP grade. Distribution Copper Pipe manufactured as per BSEN:13348

- The supply of pipes shall accompany with manufacturers test certificates for physical properties and chemical composition. The supply of pipes shall be further substantiated with inspection certificates from third party inspectors like LLOYDS.
- Each pipe shall be capped at both ends before supply.
- The contractor shall use the following sizes:

<u>Outer Dia.</u>	<u>Thickness</u>	
1. 12mm		0.7mm
2. 15mm		0.9mm
3. 22mm		0.9mm
4. 28mm		0.9mm
5. 42mm		1.2mm
6. 54mm		1.2mm
7. 76.1mm		1.5mm
8. 108mm		1.5 mm

Copper to Copper joints shall be made on site using silver-copper-phosphorous brazing alloy to BS-1845. Copper to brass or gunmetal joints shall not be made on site. Except for mechanical joints used for components, all metallic pipeline joints shall be brazed or welded. All pipelines shall be routed in such a way that their not exposed to a temperature less than 5 deg Celsius above the dew point of the gas distribution pressure. Pipeline shall be supported at interval to prevent sagging.

- Installation and testing
 - i) Installation of piping shall be carried out with utmost cleanliness. Only pipes, fittings and valves that have been degreased and fittings brought in polythene sealed bags will be used at site. Pipes fixing clamps shall be of non-ferrous and non-deteriorating plastic suitable for the diameter of the pipe.
 - ii) All pipe joints shall be made using inert gas using flux less silver brazing method (silver brazing). Continuous purging with oil-free nitrogen to be carried out while brazing is done.
 - iii) Adequate supports shall 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.

- iv) After erection, the pipes will 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 period of not less than 24 hours.
- v) All the piping system shall be tested in the presence of the site-engineer or his authorized representative.

vi) Painting :

All exposed pipes should be painted with two coats of synthetic enamel paint and color codification should be as per IS:2379 of 1963.

6.0 Alarm System (Imported)

- a. The master and area alarms as per required locations.
- b. Alarm shall be microprocessor based with individual microprocessors on each area display and sensor board. The sensors shall be capable of local or remote mounting. Each area display module/sensor unit shall be gas specific. With an error message display for an incorrect connection.
- c. The alarms shall be field expandable with the addition of extra modules. Upto six services can be accommodated per standard box
- d. Each specific service shall be provided with an LED digital read out comprising of 0-250 psi for positive pressure and 0-30 inch Hg for vacuum. The digital readout shall provide a constant indication of each service being measured. A bar graph trend indicator shall be provided for each service indicating a green "NORMAL", yellow "CAUTION" and a red "HIGH" or "LOW" alarm condition. Under normal operation the bar graph display shall move up and down in the green range depending on service usage. If an alarm occurs, the "RED" alarm light will flash and the audible alarm will sound. Pushing the "ALARM SILENCE" button will cancel the audible alarm but the unit will remain in the alarm condition until the problem is rectified.
- e. The default set points shall be +/- 20% variation from normal condition.
- f. In the calibration mode the following parameters shall be field adjustable:
 - i) High/Low set points
 - ii) Imperial/Metric Units
 - iii) Repeat alarm enable/disable

- g. Set points shall be adjustable by two on board push buttons.
- h. In addition “PUSH TO TEST” & “ALARM SILENCE” buttons shall be easily accessible to operate and test the unit.
- i. Combination master/area alarms shall have no moving parts and shall require no maintenance after initial installation.

Alternately

Alarm System (Imported)

Alarm system should have microbial coating labels for touch control and capability of monitoring of installed gas services by means of sensors that detect deviations from the normal operating limits. The medical gas area alarm shall fully comply with requirements of BSEN 60601-1 and BS EN 60601-1-2 and BS EN ISO 7396-1. The cover, back box and bezel (if required) shall be polyester powder. A single tamper proof fastener shall be used to gain access to the hinged door. The hinge shall operate through a minimum of 120° to provide adequate access. It should have each gas service shall be displayed by cored LED 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. Failure indicators shall be displayed by flashing lights and normal indications shall be steady. Each LED block indicator shall be a plug-in component with individual long life LED connected in parallel in two banks to provide duplex circuits. 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 15 minutes (approx.) or shall operate simultaneously should a further alarm condition occur. A Mute switch shall be provided inside the panel for use during any maintenance resulting in 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, LED and audible warning. The alarm panel shall incorporate a volt free normally closed relay to allow for interconnection to either a medical gas central alarm system or an event recording circuit of a building management system. Each Alarm shall provide a green LED to indicate that electrical power is available at the panel and a red LED to indicate ‘System Alarm’. In the event of an electrical power supply failure the ‘System Alarm’ LED shall illuminate (flashing) and the audible warning shall be delayed for 30 seconds to enable standby generator tests. Line continuity monitoring circuits shall be provided to constantly monitor the integrity of the input sensors and interconnecting wiring . In the event of any fault the line continuity monitoring circuits shall initiate the specific gas service failure indication, a System alarm indication and an audible warning. Further aids to fault diagnosis shall be provided to allow connection of up to 5 repeater panels, enabling the visual and audible alarm signals to be repeated at other locations within department.

It should be connected through Pressure and Vacuum Switches. Pressure and Vacuum switches shall be manufactured with brass wetted parts and house a PCBA with line continuity monitoring resistors. Electrical connectors shall be designed for frequent disassembly (Spade connectors are not acceptable). Pressure switches shall include both high and low pressure settings in the same switch, using only a single 1/4" BSP threaded pipeline connection to minimize number of sealed joints. The body and housing of the Pressure switch shall be manufactured from impact resistance, rigid and inherently corrosion proof materials. (Coating or plating of Mild Steel is not acceptable). Pressure Switches shall connect directly to the Area Alarm Panel. (It is not acceptable to fit a separate connection Box to convert switch signals to data signal.)

7.0 Horizontal Bed Head Panels (HBHP) 1800mm long (Imported) for ICUs

- Efficient, safe &. Robust design in extruded aluminum 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 aluminum extrusions joined together to form a carcass to suit the particular application. Unit shall be factory assembled for electrical and mechanical components.
- Segregation of services i.e. Low voltage supplies, High Voltage supply and Medical gases shall be maintained throughout.
- Front fascia plate should be removable individually to access for respective service.
- Bed space management system with optional equipment rail.
- With all Equipment Rail mount Accessories.
- All Down drops shall be installed at one end preferably & Vertical drop installed at one end should be covered with Aluminium boxing with matching color.
- Entire pipe line shall run in continuous horizontal panels with no break for each unit & length as per area where it has to be installed
- Provision Medical gas pipe line outlets (Oxygen-2 Nos, Vacuum-2 Nos & Medical air-1No)
- Facility per unit as under;
 - i) 6/15 Amp Modular Electrical Sockets with switches = 6 sets
 - ii) IV Pole = 2nos
 - iii) Vacuum slide = 1no.
 - iv) Sliding blocks = 2nos.
 - v) Nurse call system module = 1No.

vi)) Infusion Pump Mounts	= 1 No
vii) Monitor Tray with Slider	= 1 No.
viii) Utility Basket	= 1 No.

8.0 Valve Boxes

A Each recessed zone valve box shall consist of the following components: A steel valve box which can house single or multiple shut-off ball valves with tube extensions, A three piece design Valve, an aluminium frame, and a pull-out removable window.

B The valve box shall be constructed of 18 gauge steel complete with a baked enamel finish.

The doorframe assembly shall be constructed of anodised aluminium and shall be mounted to the back box assembly by screws as provided. The removable front shall consist of a clear window with a pullout ring pre-mounted to the centre of the window.

C Access to the zone shut-off valves shall be by merely pulling the ring assembly to remove the window from the doorframe. The window can be reinstalled without the use of tools only after the valve handles have been returned to the open position.

D The window shall be marked with the following :-

"CAUTION: MEDICAL GAS CONTROL VALVE

CLOSE ONLY IN EMERGENCY"

E Valves shall be a 4-bolt design, bronze body, double seal, union ball-type, with Teflon (TFE) seats and Viton seals, "O" ring packing, and ball which seals in both directions, blow-out proof stem, with a pressure rating of 2760 kPa (400 psig). Valves shall be operated by a lever-type handle requiring only a quarter turn from a fully open position to a fully closed position. All valves shall be equipped with type "K" washed and degreased copper pipe stub extensions of sufficient length to protrude beyond the sides of the box.

F The entire valve body and pipe stubs shall be plated to a minimum of 25 mm (1") beyond the sides of the back box, but in no instance shall the plating be extended to the ends of the pipe stubs. All pipe stub extensions shall be supplied with suitable plugs or caps to prevent contamination of the assembly prior to installation.

- G Each valve shall be supplied with an identification bracket bolted directly onto the valve body for the purpose of applying an approved medical gas identification label. A package of labels shall be supplied with each valve box assembly for application by the installer.
- H Valves shall be available with line pressure gauges, as required. Gauges shall be 51 mm (2") diameter, with metal case and ring.
- I Pressure gauges shall read 0-700 kPa (0-100 psig) for all gases except nitrogen, which shall read 0-2000 kPa (0-300 psig), and vacuum, which shall read -100-0 kPa (0-30" Hg).

9. **Anesthesia Pendant**

- Should be double Arm Pendant horizontal movement
- One swivel arm of 800 mm and another of 600 mm.
- Both arms should have electromagnetic/pneumatic brake.
- Swiveling angle should be 330°
- The swivel arms move only horizontally and the length in fully stretched position is
- (800+600) = 1400mm
- Anesthesia pendant should have provision of oxygen outlets X 2, Air(4 bar) X 2, Air (7 bar) X 1, Nitrous oxide X2 and Vacuum outlet X 2, AGSS outlet X 1
- Pendant should have eight 5A/15A combined electrical socket. Electrical socket should be of reputed make. One electrical socket should be connected with central UPS and should of different colors for easy identification.
- Pendant should have two open shelves to keep Monitors/ESUs etc
- Should have provision RJ 45 /cat 5 for telephone communication.
- Should have provision RJ 45 /cat 6 for data communication.

10.0 **Anesthesia Gas Scavenging System (Imported) :-**

The Duplex Medical Vacuum System must be fully compliant with the latest edition of NFPA 99/HTM02-01/EN737/DIN Standard and should be suitable for anaesthetic gas scavenging for 21 nos. Operation Theatres, and 1 No. MRI Room, One pump will be standby with the other in operation.

The package should consist of two 'oil-less' rotary vane vacuum pumps, a control panel and a receiver all mounted on a common base frame.

Vacuum Pump :

Each vacuum pump shall operate completely dry and shall be equipped with self-lubricating carbon/graphite vanes.

Bearings shall be permanently lubricated and sealed

No oil shall be permitted in any pump

Each pump should be completely air cooled and have absolutely no water requirements

Each pump should have a 5 micron inlet filter and should be equipped with a vacuum relief valve, check valve to prevent back-flow through off-cycle units, flexible connector, isolation valve and vibration isolators at each mounting location

The receiver should be rated for a minimum 150 psig design pressure and have a three valve bypass system to allow for draining of the receiver without interrupting the vacuum service.

Control System :

The duplex control system should be U.L. labelled/CE marked

The control system should provide automatic lead/lag sequencing with circuit breaker disconnects for each vacuum pump with external operators, full voltage motor starters with overload protection, control circuit transformers, visual and audible reserve unit alarm with isolated contacts for remote alarm, hand-off-auto lighted selector switches and runtime hour meters.

A programmable logic controller (PLC) should control the automatic alteration of both vacuum pumps with provision for simultaneous operation if required, and automatic activation of reserve unit if required.

Terminal outlets with probes/adapters

As per Sl. No.-15

Hose Assembly

11.0 Electrical Distribution Panel (Indigenous):-

Panel shall be wall mounted and fabricated from 16/14 SWG CRCA Sheet duly powder coated. Panel shall incorporate isolators for the following equipments.

- I. Isolator for Medical Compressed air system.
- II. Isolator for Medical Vacuum System
- III. Isolator for AGSS System.

Panel shall have following instrumentations for easy monitoring purpose.:-

- a. Incoming power supply indications of each Phase
- b. Mains indication for mains supply on for each Phase.
- c. Mains shall have digital metering.
- d. Each circuit shall have digital meter.
- e. Mains and each circuit shall be with MCCB only.

12.0 Accessories

12.1 **Flow meter with Humidifier (Imported)**

Back Pressure Compensated flow meter will be of accurate gas flow measurement with following features:

- A Control within a range of 0 – 15 Lpm.
- B It will 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 of polycarbonate material and autoclavable at 121 degree centigrade.

12.2 **Ward Vacuum Units**

Ward vacuum Unit shall be wall mounted and shall consists of followings with same make :-

- Suction Controller/ Regulator (Digital/Analogue type- easy view)
- Collection bottle 600 and 1800ml with mounting arrangement.

The vacuum regulator will be step-less adjustable and have large vacuum gauge providing digital/analogue indication of the suction supplied by the regulator.

Safety trap shall be provided inside the jar to safeguard the regulator from overflowing. Different color options should be available.

The unit will be consisting of reusable 600 to 1800 ml shatter resistant bottle, each made up of Polycarbonate material and fully autoclavable at 121 degree centigrade.

12.3 Theatre Vacuum Units

The vacuum regulator will be step-less adjustable and have large vacuum gauge providing Digital/Analogue indication of the suction supplied by the regulator. Safety trap will be provided inside the jar to safeguard the regulator from overflowing. Different color options should be available.

The unit will be consisting of two reusable 2000 ml each shatter resistant bottle, each made up of Polycarbonate material and fully autoclavable at 121 degree centigrade.

A 3-way valve will select the collection jars : Left, Right or Both.

All the above items should be mounted on aluminum Trolley having free moving castor wheels.

13. Civil construction of Plant Room and Manifold Room

Construction of Manifold room (40'x30') and Plant Room (25'x30') complete including, foundations, brick works, reinforced concrete work, Kota Flooring, plastering, Painting, aluminium frame and flush shutters 30mm thick for doors, aluminium frame and shutter with 4mm thick clear float glass and aluminium grill for windows, painting, roofing in Powder coated CGI sheets over truss and purlins, water supply and Toilet, internal electrical installations, power and telephone conduit and wiring, external service connection etc complete as per standard CPWD Specifications.

14. Construction of Liquid Oxygen area

Liquid Oxygen Area (15mtr x 9 mtr) surrounded with industrial typed Fencing of height 2mtrs. fabricated from Angle posts and 10 swg Diamond Mesh welded into MS frame from ISA 75x75x8 And Double leaf Gate 5mtr x 2mtrs of same material of Fencing. Gate should have lock and key arrangement from outside and should be opened outside. A 9Kg DCP Fire Extinguisher and sand Bucket should be provided at one corner of the installed area. Electrical Earthing Point and Electrical Power socket and proper lighting should be provided. A Hard Stand with Anti Crash Barrier of 1.2mtr height-3 Nos of area 9.5mtr x 5.0 mtrs should be provided in the Liquid Oxygen Area. RCC Hard Stand should be suitable for 40 MT Tank. Thickness of Concrete 150mm and the slope 1:200. Size of Concrete Plinth should be suitable to 10KL LMOTank . Proper signages should be fitted at the proper location. 1/2" water Tap with 6m Hose shall be provided at the installed area.

15.0 Gas Outlets (No. as per table annexed)_ (Imported)

- Outlets shall be manufactured with a 165 mm long Copper inlet pipe stub which is silver brazed to the outlet body. The inlet pipe should be capable of swiveling by 360 degrees for enabling the same to be connected to the pipeline system.
- Outlet shall be equipped with a primary and secondary check valve and the secondary check valve shall be rated at minimum pressure of 200 p s i. In the event the primary check valve is removed for maintenance there should not be any leakage (on-line maintenance should be possible w/o disrupting the functioning of other outlets). Outlet bodies shall be gas specific by indexing each gas service to a gas specific dual pin indexing arrangement on the respective identification module.
- There should be a push button release mechanism for disconnecting apparatus accessible from top, bottom and side of outlets.
- A large color-coded front plate shall be used for ease of gas identification and aesthetic appeal.
- With the back rough in mounted the outlet shall adjust up to 25 mm variation in wall thickness.
- The latch valve assembly should accept only corresponding gas specific adaptors.
- All outlets shall be cleaned and degreased for medical gas service, factory assembled and tested.

Alternately

Gas Outlet (Imported)

- Shall have gas indexing geometry to BS 5682:1998. Terminal unit front fascia should be metal and it should be hundred percent metal. Gas specific components comprising the terminal unit second fix shall be manufactured from die cast Zinc alloy or similar hard wearing metal. Plastic Components should not be acceptable. Terminal units socket shall be permanently coated with a low friction fluoropolymer for maximum reliability and service life.
- The terminal unit socket die-casting shall incorporate a gas indexing pin to overcome the risk of loosening due to rough handling/mishandling. The second fix socket shall incorporate a sheer plane to safeguard the first fix and pipeline in the event of accidental damage or bed jacking. Gas specific components shall incorporate the gas identity marking permanently stamped or cast into the component surface. The first fix

shall all metal construction with a brass base block and copper stub pipe. The first fix shall incorporate an integral check valve to enable servicing of the second fix and valve seals without isolation of the gas supply. Probe roller pins shall be manufactured from stainless steel. Wall mounted terminal units shall be Provided with white ABS mounting Box with matching fascia. The mounting box shall have smooth rounded corners to avoid the possibility of injury. A bezel shall be available to cover the plaster edge, provide a neat and easily to clean finish.

IN ADDITION TO THE ABOVE, FOLLOWING TURNKEY WORKS FOR INSTALLATION AND COMMISSIONING OF MEDICAL GAS MANIFOLD SYSTEM ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR:

- Bidder must take into consideration in its bid, costs to be incurred for any additional work pertaining to Civil, Electrical, Mechanical and any other protections relevant as per State/Central Govt. regulation/local authority, Servo stabilisers, U.P.S. etc. required for successful installation testing and commissioning of the system and the offered price should include all such costs, each Schedule is to be considered a package in itself and contractor to execute the order package on a “turn key basis”.
- Providing fixing of **Electrical Gadgets** like ELCB, MCB, Light Points, Power points, etc in the Medical Gas Pipeline System.
- Installation of MCB, ACB, ELCB & OCB of Havell/Siemens/L&T/Schneider etc for **Control Panel** for Medical Gas Pipeline System.
- Installation of all **electrical cabling** must be of IS: 1554 (As per latest amendment) standard and wiring as per IS: 732 standard and proper earthing of all Medical Gas Pipeline System and other electrical instrument and accessories in the Medical Gas Pipeline System as per standard guidelines of BIS.
- Ventilation of Plant Room and Manifold Room of the MGMS and exhaustion of suctioned gases/air from the Vacuum unit.
- Arrangement for requisite **Fire Extinguishing** for the entire effective zones in the Manifold and Plant Room

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

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

APPROVED MAKES

1. Air Blower

SWAM/ EVEREST/ KAY/Beta

2.	Cable	GLOSTER/UNIVERSAL/NATIONAL/ KALINGA
3.	Control Panel	L & T/ SIEMENS/ SCHNEIDER
4.	PVC Pipe Class III with Fitting	FINOLEX/ SUPREME/ PRINCE/ ORI-PLAST
5.	G.I. / M.S. Pipe Heavy Class	TATA/ JINDAL/SAIL /SURYA PRAKASH/HSL/ITC
6.	MCCB/Contactor/Relay	L&T/ABB/SIEMENS/SCHNEIDER
7.	Pressure Gauges	H.GURU /FIEBIG
8.	Stainless steel	TATA/SALEM/JINDAL/MUKUND/ BHAYANDER/ AMBICA
9.	Aluminium Sheet	BALCO/NALCO/HINDALCO
10.	Grilles/Diffusers	RAVISTAR/CARYAIRE/ MAPRO/DYNACRAFT
11.	Copper Pipe-	MAXFLOW/RAJCO/PRECISION

Note :

- **The bidder should attach Technical Compliance item wise with respect to the above technical specifications and turnkey work along with Printed catalogues**
- **Manufacturer's Authorization incase the bidder is not manufacturer.**
- **The contractor shall be responsible for the complete works including submission of working drawing.**
- **Bidder should provide complete parts manual/Service manuals for all systems and subsystems.**
- **Final electrical safety test, system test and calibration should be done by authorized person with test instruments.**
- **All electrical accessories like cable wire, electrical outlets, switches etc, should be fire proof of reputed make, certified for electrical safety.**
- **Wherever makes have not been specified for certain items, the same shall be as per BIS and as per approval of HSCC.**
- **The contractor should provide test certificate for all materials and equipments used for MGMS**
- **Training of personnel of the Institute should be 30 days at least**
- **The contractor should prepare and submit to HSCC the layout plan for Gas Pipeline system (Copper piping including Valve Box and Alarm System) of the building from Plant and Manifold Room, Electrical Wiring, EDP, Fire Fighting System in the and Ventilation of Plant Room and Manifold Room for approval before beginning of supply and installation and provide As-built drawing after installation and commissioning at site.**
- **Bidder should quote Operation of MGMS for One Year which shall be considered for ranking purpose in tender evaluation. Bid shall be rejected if the cost of one (1) year operation during one year Defect liability period is not quoted by the bidder.**
- **Bidder should quote Cost of CMC for five (5) years which shall be considered for ranking purpose in tender evaluation. Bid shall be rejected if the cost of Post-DLP CMC is not quoted by the bidder.**
- **Third party quality certification of the MGMS equipment from SGS/TUV/Lloyds should be submitted as "Certifies that the MGMS equipment meets the technical specification and BOQ of the tender document".**

