

**MINISTRY OF EXTERNAL AFFAIRS  
(GOVT. OF INDIA)**

**YANGON CHILDREN HOSPITAL  
&  
SITTWE GENERAL HOSPITAL  
MYANMAR**

**Tender**

**For**

**Supply, Installation and testing of**

**Oxygen Concentrator Module & Medical Gas Manifold System at  
Yangon Children Hospital at Myanmar**

**&**

**Oxygen Concentrator Module with Medical Pipeline System for  
4 OTs at Sittwe General Hospital at Myanmar**

**VOLUME – IV**

**TECHNICAL SPECIFICATION**

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**Tender No. HSCC/PUR/MEA-MYANMAR/OCM/2012**

# Technical Specification Oxygen Concentrator Module & Medical Gas Manifold System at Yangon Children Hospital at Myanmar

## Scope of Work-

Supply, installation, testing and commissioning of Micro-processor based Oxygen Concentrator Plant and Medical Gas Pipeline System along with Digitally controlled fully automatic Voltage Stabilizer for supply of constant input voltage, Vacuum unit for providing vacuum and non-lubricated type Air Compressor skid mounted Air Receiver, Refrigerated Air Dryer, Oxygen Storage Tank, **for generation of Oxygen and direct supply of Oxygen to the outlets in the Wards** and also refilling of Oxygen cylinders in the Manifold system with High pressure Booster in the Manifold Room. Attachment of automatic changeover in the system of Oxygen Concentrator and Oxygen Manifold system for automatic change from one system to other system for **seamless supply of Oxygen to the outlets.**

### 1. Oxygen Concentrator Module

- i. Fully Automated system Microprocessor based Oxygen Concentrator Module **(Imported), Duplex System with PSA technology.**
- ii. Each Module should be to produce 350 LPM or 21 Nm<sup>3</sup>/hr (Cubic Meter Per hour) with purity of 94% ±1%. The Oxygen should be medical grade and shall be supplied through oxygen outlet at 4 Bar pressure. The Oxygen Concentrator system shall supply to the outlet points directly and fill cylinders by using High Pressure Booster.
- iii. The Oxygen Concentrator system shall have **PSA** sieve beds with **Touch screen** size of 6x6 screen for display of Real Time trending, curves of Oxygen pressure, Process Overview with Valve Operation and Analogue values and Display of Purity of Oxygen flow, **Alarm facility** for process cycle failure, low oxygen pressure and for any other malfunction. In case of the valve malfunctioning, panel shall have diagnostic tool to pinpoint exact valves in question for fast service.
- iv. The Oxygen concentrator should have built-in Zirconium sensor with **Oxygen Analyzer** with digital display.
- v. Oxygen Concentrator module should be CE marked, meeting ISO-10083 standards and should be in accordance with Medical Device Directives 93/42/EC for Medical use.

#### 1.1 Oxygen Surge Tank

The Oxygen concentrator should be supplied with Oxygen Surge Tank having capacity of 1500 litres, fabricated out of thick MS sheet pressure tested 3 times the normal working pressure and should be fitted with requisite pressure gauges to display pressure for Oxygen Surge tank.

1.2 **Compressed air system consisting of Screw type Compressor and Refrigerated Air Dryer.**

The Oxygen Concentrator should be supplied with **Air Compressor** (Screw type) system to meet the peak atmospheric air and pressure requirement. The Compressed air system with **Refrigerated Air Dryer** offered shall meet the peak load atmospheric air and pressure requirement. The compressor is non-lubricant type rated 18.5 KW skid mounted fitted with 30 KW/40 HP electric, 3 phase 440volts 50 Hz motor. The screw type compressor should be microprocessor based its own **digital display** and completely compatible with the Oxygen Concentrator Module. The desired working pressure of compressed dry air should be 7 - 7.5 Kg/cm<sup>2</sup>.

1.3 **Filtration system for the compressed Air**

Feed air quality of the oxygen concentrator should be conforming to ISO8573 class 4 and is of filtration grade of 0.01 Micron. The ambient temperatures of compressed air shall 10 degree Centigrade to 40 degree centigrade and shall have maximum dew point of + 3 degree centigrade.

1.4 **Air Receiver**

The system should be provided with an Air Receiver having the capacity of 3000 litres and should be designed in such a way to sustain pressure of 7 kg/cm sq. The air receiver should be fitted with 2 Nos. auto drain-out moisture.

The system should be provided with all interconnected piping NRVs, Control switches, Flow Metres, Insulation of piping, Nuts and Bolts etc. All other items required for the generation of pure Medical grade oxygen required but not reflected above shall be deemed to have been included above and shall fall within the scope of the work with no extra cost.

2.0 **High Pressure Booster (HPB)**

The high pressure booster oxygen compressor for refilling the various type of Oxygen cylinder having the following specifications:

- i. HPB should be compact mounted on a Mild Steel frame fitted with electric motor 3-phase, 1420 RPM, 4KW, 50 Hz. And should be able to run on the incoming voltage of 380 Volts.
- ii. HPB System should be provided with stainless steel diaphragm type of compressor, 2-stage, coolant (1:1 ratio) cooled using close loop for re-circulation of coolant with an output capacity of 9 Nm<sup>3</sup>/hr (cubic metre/hr) and should be capable of filling cylinders at a pressure gauge visible on the top front.
- iii. The HPB should have Pressure Gauge and visible on the top front.
- iv. The HPB system should be provided with all interconnected piping from oxygen concentrator and should have a system so as to connect easily with oxygen

refilling manifold of 2x10 cylinders. The system should have pressure cut off valves to cut the supply from HPB as soon as the desired pressure of 140 bar is achieved.

All the above equipment should be integrated and controlled through single control.

### 3.0 **Digitally Controlled Fully Automatic Servo Voltage Stabilizer**

The Voltage Stabiliser of 30 KVA capacity should work on minimum input voltage of 340V with output voltage of  $440\pm 5\%$ . The Voltage stabilizer should be 3 phase, oil cooled, 50hz. and should be supplied with a control panel having by-pass switch, MCCB's selector switch with input and output voltage and current indicating meters. Transformer oil required for voltage stabilizer should be provided by the contractor.

### 4.0 **Oxygen System**

#### 4.1 **Oxygen Manifold**

- a) The oxygen 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 8 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.
- b) The manifold should be so designed that it shall suit easy cylinder changing and positioning.
- c) The cylinder should be placed with the help of cylinder brackets and fixing chains which should be zinc plated.
- d) The manifold should be suitable to withstand a pressure of 145 Kg/cm<sup>2</sup>. The manifold should be tested (hydraulically) at 3500 psig pressure and to be supplied along with necessary test certificate.

#### 4.2 **Fully Automatic Oxygen Control Panel (Imported)**

- a) 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.
- b) 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. The unit shall be compact and enclosed in NEMA 3 enclosure.

- c) 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.
- d) 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.
- e) 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.
- f) 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.
- g) The Control Panel should be made to provide Heavy Duty with a Flow Capacity of over 1000 lpm at 60 psig.

#### 4.3 **Emergency Oxygen System:**

It will have emergency arrangement of one set of three-cylinder configuration, 3 cylinder 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.

#### 4.4 **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/CM<sup>2</sup>  
Test Pressure : 250 KGF/CM<sup>2</sup>  
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, Mfr. : 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:

## **5.0 Vacuum (suction) System**

- 5.1 Vacuum system shall be **Triplex (Two working & One Standby) stack mounted 110 cfm capacity at 19" Hg** (i.e One pump produces vacuum of 110 cfm capacity at 19" Hg.)

Medical vacuum system comprising of 3 nos. of System of Lubricated, Air-cooled, Reciprocating Vacuum Pumps each having 7.5 HP Motor, common 2000 litres Receiver Tank, Filter, Non-Return Valve, Isolation Valves, Auto Switch Gear to set minimum & maximum operating vacuum and interconnecting piping to take care of the requirements of desired no. of vacuum outlets.

### **Type of Vacuum Pumps**

Lubricated, Air-cooled, Reciprocating Vacuum Pumps along with TEFC squirrel cage induction motors (V-belt driven) The Vacuum System has **3 identical Vacuum Pumps** (while one vacuum pump will run, the other one remains as stand by).

Each Vacuum Pump are complete with Base Plate, Belt Guard, V-Belts, Motor and Starter. The system is of Automatic Start and Stop Type. The Pumps are connected to a common vertical receiver of suitable capacity. The receiver has a drain valve at the bottom. Make- Ingersollrand/Anest Iwata

## **5.2 Vacuum Bacterial filtration**

Medical Vacuum filters are used for removal of bacteria & other contamination from the suction side of vacuum pumps, preventing infection of pump and the atmosphere.

These elements are pleated construction giving a high surface area and long operational life. The efficiency exceeds the 0.005% penetration specified in HTM2022 for infectious disease unit.- i.e. complete bacterial removal.

Element is fitted in an aluminum housing suitable for various capacities. These are internally protected against corrosion by an alchrom treatment. The inner & outer surfaces of the housing are epoxy coated. Complete assembly is fitted with a sterilisable drain flask with isolation valve for removal of liquid if any. Differential pressure indicators are provided to monitor the status of element.

### 5.3 **Electric Control Panel for Vacuum**

Supply, Installation, testing and commissioning of Electrical Control Panel for the Vacuum system complete with Single Phase Preventors, Starters, Controls, Voltmeters, Ammeters, Gauges, Hour Meter, Fuses, Switchgears, MCCB and Main switch etc. The panel shall be complete in all respects and as per specifications.

### 6.0 **Distribution piping (indigenous)**

Solid drawn, seamless, de-oxidized, non-arsenical, half-hard, tempered and de-greased medical graded copper pipe conforming to BS : 6017, 1981, Table 2 ( Cu - DHP) and manufactured as per BS : 2871, 1971 Part I, Table X (or as per BSEN 1057). All copper pipes are de-greased & delivered capped at both ends. The pipes are accompanied with manufacturers test certificate for the physical properties & chemical composition. Copper pipe also has third party inspection certificate from **Lloyds'** Register Services.

The Pipe Sizes used are from among as under :

<b>Pipe OD ( in mm )</b>	<b>Thickness ( in mm )</b>
12	0.7
15	0.9
22	0.9
28	0.9
54	1.2

**Copper fittings** has been made of copper and suitable for a steam working Pressure of 17 bar and especially made for brazed socket type connections. All copper fittings are conform to BS 864/EN 1254.

Installation and testing of pipe :

- 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.

## 7.0 **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.
- 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.

#### 8.0 **Gas Outlets (No. as per table annexed) (Imported)**

- a) 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.
- b) 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.
- c) There should be a push button release mechanism for disconnecting apparatus accessible from top, bottom and side of outlets.
- d) A large color-coded front plate shall be used for ease of gas identification and aesthetic appeal.
- e) With the back rough in mounted the outlet shall adjust up to 25 mm variation in wall thickness.
- f) The latch valve assembly should accept only corresponding gas specific adaptors.
- e) All outlets shall be cleaned and degreased for medical gas service, factory assembled and tested.
- f) Outlets should conform to BS EN 737-1 : 1998 and probes to BS5682 :1984.

#### 9.0 **High pressure tube for O2, Vacuum**

It should be imported colour coded for individual services i.e white for Oxygen. Yellow for Vacuum, antistatic rubber tube as per medical devices directive and CE marked with CE no. to be specified.

#### 10.0 **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).

## 11.0 **Isolation Valves**

All valves will be suitable for the pipe diameter and should be non lubricated 90 degree turn lever imported ball valves with PTFE seat, having opening by quarter turn of handle sizes should be appropriate for copper pipes with screw threaded ends. All valves will be

pneumatically tested for twice the working pressure and degreased for medical gas service before supply.

## 12.0 **Bed Head Panel**

- Has been made of High Strength Anodised Aluminium Extrusions with inbuilt single railing.
- The chamber of Medical Gas Outlets has been made of anodized aluminium
- Has been powder coated as per the customer's choice.
- The panel has been designed to have provision to accommodate the following:
  - a). Gas Outlets,
  - b) Electrical Sockets / Switches
  - c). Audio Unit
  - d). Room Lighting
- The railing has been designed to have provision to accommodate the following accessories:
  - a). I V Pole
  - b). Infusion pump / Syringe pump stand
  - c). I V Bottle holder
  - d). Medicine / disposable tray
  - e). Examination lamp
  - f). Reading lamp

## 13.0 **Accessories**

### 13.1 **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 134 degree centigrade.
- h) The unit should be CE marked with CE no.

### 14.0 **Ward Vacuum Units (Imported)**

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 2000ml 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 1000 ml shatter resistant bottle, each made up of Polysulphone/Polycarbonate material and fully autoclavable at 134 degree centigrade. The unit should be CE marked with CE no.

**IN ADDITION TO THE ABOVE, FOLLOWING TURNKEY WORKS FOR INSTALLATION AND COMMISSIONING OF OXYGEN CONCENTRATOR MODULE AND MEDICAL GAS PIPELINE SYSTEM FOR YANGON HOSPITAL, MYANMAR IS 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 equipment/system is to be considered a package in itself and contractor to execute the order package on a “turn key basis”.
- Laying of **GI water pipe line** with necessary taps, joints, elbows, Unions, Tees and valves of GI made and IS-1239 standard (Latest version) to various supply points in the Plant Room from single point supply(Provided by the hospital).
- Providing fixing of **Electrical Gadgets** like ELCB, MCB, Light Points, Power points, etc in the Oxygen Concentrator Module and Medical Gas Pipeline System.
- Installation and commissioning of **Electric distribution panel** with all switchgears, wiring and controls etc of L&T/ Siemens/ ABB/GE or Schneider make ) for distribution of power supply to various load points in the Plant Room from single point power supply(Provided by the hospital).
- Installation of MCB, ACB, ELCB & OCB of Havell/Siemens/L&T/Schneider etc for Control Panel for Oxygen Concentrator Module and 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 Oxygen Concentrator Module and Medical Gas Pipeline System and other electrical instrument and accessories in the Medical Gas Pipeline System as per standard guidelines of BIS.
- All the items supplied should be reputed make as approved by engineer.

## Terminal Outlets disposition for Yangon Children Hospital, Myanmar

	Oxygen	Vacuum
<b>Level 1</b>		
Ward	24	24
Suite	3	3
Treatment	1	1
<b>Level 2</b>		
Ward	22	22
Suite	1	1
Post Op. OT	8	8
<b>Level 3</b>		
Ward	34	34
Suite	1	1
<b>Level 4</b>		
Ward	30	30
Treatment	1	1
Suite	1	1
Burn Unit	8	8
<b>Total Outlets</b>	<b>134</b>	<b>134</b>

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# Technical Specification for Oxygen Concentrator Module with Medical Pipeline System for 4 OTs at Sittwe General Hospital at Myanmar

## Scope of Work-

Supply, installation, testing and commissioning of Micro-processor based Oxygen Concentrator Plant with Pipeline System along with non-lubricated type Air Compressor skid mounted Air Receiver, Refrigerated Air Dryer, Oxygen Storage Tank, Digitally controlled fully automatic Voltage Stabilizer, for generation and supply of oxygen to the outlets at Operation Theatres-4 Nos. of the hospital directly.

## 2. Oxygen Concentrator Module

- vi. Fully Automated system Microprocessor based Oxygen Concentrator Module **(Imported), Simplex System with PSA technology.**
- vii. Each Module should be to produce 100 LPM or 6 Cubic Meter Per hour to the extent of maximum Oxygen flow 7 Cubic m/hr. with purity of 94%  $\pm$ 1%. The Oxygen should be medical grade and shall be supplied through oxygen outlet at 4 Bar pressure.
- viii. The Oxygen Concentrator system shall have **PSA** sieve beds with **Touch screen** size of 6" screen for display of Real Time trending, curves of Oxygen pressure, Process Overview with Valve Operation and Analogue values and Display of Purity of Oxygen flow, **Alarm facility** for process cycle failure, low oxygen pressure and for any other malfunction. In case of the valve malfunctioning, panel shall have diagnostic tool to pinpoint exact valves in question for fast service.
- ix. The Oxygen concentrator should have Zirconium sensor with **Oxygen Analyzer.**
- x. Oxygen Concentrator module should be CE marked, meeting ISO-10083 standards and should be in accordance with Appendix V and VII of Medical Device Directives 93/42/EC for Medical use.

### 1.1 Oxygen Surge Tank

The Oxygen concentrator should be supplied with Oxygen Surge Tank having capacity of 1500 litres, fabricated out of thick MS sheet pressure tested 3 times the normal working pressure and should be fitted with requisite pressure gauges to display pressure for Oxygen Surge tank.

### 1.2 Compressed air system consisting of Screw type Compressor and Refrigerated Air Dryer.

The Oxygen Concentrator should be supplied with **Air Compressor** (Screw type) system to meet the peak atmospheric air and pressure requirement. The Compressed

air system with **Refrigerated Air Dryer** offered shall meet the peak load atmospheric air and pressure requirement. The compressor is non-lubricant type skid mounted fitted with 11 KW/, 3 phase 440volts 50 Hz motor. The screw type compressor should be microprocessor based its own digital display and completely compatible with the Oxygen Concentrator Module. The desired working pressure of compressed dry air should be 7 - 7.5 Kg/cm<sup>2</sup>.

### 1.3 **Filtration system for the compressed Air**

Feed air quality of the oxygen concentrator should be conforming to ISO8573 class 4 and is of filtration grade of 0.01 Micron. The ambient temperatures of compressed air shall 10 degree Centigrade to 40 degree centigrade and shall have maximum dew point of + 3 degree centigrade.

### 1.4 **Air Receiver**

The system should be provided with an Air Receiver having the capacity of 500 litres and should be designed in such a way to sustain pressure of 7 kg/cm sq. The air receiver should be fitted with 2 Nos. auto drain-out moisture.

The system should be provided with all interconnected piping NRVs, Control switches, Flow Metres, Insulation of piping, Nuts and Bolts etc. All other items required for the generation of pure Medical grade oxygen required but not reflected above shall be deemed to have been included above and shall fall within the scope of the work with no extra cost.

## 2.0 **Digitally Controlled Fully Automatic Voltage Stabilizer**

The Voltage Stabiliser of 15 KVA capacity should work on minimum input voltage of 340V with output voltage of 440±5%. The Voltage stabilizer should be 3 phase, oil cooled, 50hz. and should be supplied with a control panel having by-pass switch, MCCB's selector switch with input and output voltage and current indicting meters. Transformer oil required for voltage stabilizer should be provided by the contractor.

## 3.0 **Distribution piping (indigenous)**

Solid drawn, seamless, de-oxidized, non-arsenical, half-hard, tempered and de-greased medical graded copper pipe conforming to BS : 6017, 1981, Table 2 ( Cu - DHP) and manufactured as per BS : 2871, 1971 Part I, Table X (or as per BSEN 1057). All copper pipes are de-greased & delivered capped at both ends. The pipes are accompanied with manufacturers test certificate for the physical properties & chemical composition. Copper pipe also has third party inspection certificate from **Lloyds'** Register Services.



The Pipe Sizes used are from among as under :

Pipe OD ( in mm )	Thickness ( in mm )
28	0.9
15	0.9

**Copper fittings** has been made of copper and suitable for a steam working Pressure of 17 bar and especially made for brazed socket type connections. All copper fittings are conform to BS 864/EN 1254.

Installation and testing of pipe :

- 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 on-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.

#### 4.0 **Gas Outlets (No. as per table annexed) (Imported)**

- a) 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.
- b) 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.

- c) There should be a push button release mechanism for disconnecting apparatus accessible from top, bottom and side of outlets.
- d) A large color-coded front plate shall be used for ease of gas identification and aesthetic appeal.
- e) With the back rough in mounted the outlet shall adjust up to 25 mm variation in wall thickness.
- f) The latch valve assembly should accept only corresponding gas specific adaptors.
- g) All outlets shall be cleaned and degreased for medical gas service, factory assembled and tested.
- h) Outlets should conform to BS EN 737-1 : 1998 and probes to BS5682 :1984.

#### 5.0 **High pressure tube for O<sub>2</sub>**

It should be imported colour coded for individual services i.e white for Oxygen. antistatic rubber tube as per medical devices directive and CE marked with CE no. to be specified.

#### 6.0 **Alarm System (Imported)**

- a. The 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.
- 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.

#### 6.0 **Theatre Vacuum Units (Imported)**

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 1800 to 2000 ml shatter resistant bottle, each made up of Polycarbonate/Polysulphone 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 aluminium Trolley having free moving castor wheels. The unit should be CE marked with CE no.

- All of the above equipments must be from ISO certified Company
- Manufacturer’s Authorisation certificate as per tender format in favour of the bidder for laundry equipment should be attached with the offer.
- The sizes are approximate. Minor variations in sizes shall be acceptable subject to prior approval of the Engineer.

**IN ADDITION TO THE ABOVE, FOLLOWING TURNKEY WORKS FOR INSTALLATION AND COMMISSIONING OF OXYGEN CONCENTRATOR MODULE AND MEDICAL GAS PIPELINE SYSTEM FOR SITTWE HOSPITAL, MYANMAR IS 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 equipment/system is to be considered a package in itself and contractor to execute the order package on a “turn key basis”.
- Laying of **GI water pipe line** with necessary taps, joints, elbows, Unions, Tees and valves of GI made and IS-1239 standard (Latest version) to various supply points in the Plant Room from single point supply(Provided by the hospital).
- Providing fixing of **Electrical Gadgets** like ELCB, MCB, Light Points, Power points, etc in the Oxygen Concentrator Module and Medical Gas Pipeline System.
- Installation and commissioning of **Electric distribution panel** with all switchgears, wiring and controls etc of L&T/ Siemens/ ABB/GE or Schneider make ) for distribution of power supply to various load points in the Plant Room from single point power supply(Provided by the hospital).
- Installation of MCB, ACB, ELCB & OCB of Havell/Siemens/L&T/Schneider etc for Control Panel for Oxygen Concentrator Module and 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 Oxygen Concentrator Module and Medical Gas Pipeline System and other electrical instrument and accessories in the Medical Gas Pipeline System as per standard guidelines of BIS.
- All the items supplied should be reputed make as approved by engineer.

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