VENTILATOR

Performance requirements

Microprocessor controlled systems based on volume cycled, pressure controlled and supported and individual selection of ventilation parameter. PRVC or equivalent, BIPAP or equivalent. Controlled, assisted control, synchronized intermittent mandatory ventilation (SIMV), pressure support mode of ventilation and Non Invasive Ventilation.

Inverse inspiratory: expiratory (I: E) ratio, positive end expiratory pressure (PEEP), Continuous positive airway pressure (CPAP)

Controls for tidal volume, rate, fraction concentration of inspired oxygen (Fio2), PEEP/CPAP, inspiratory flow or I: E ratio pressure support, sensitivity and pressure limit.

Monitor and display inbuilt colored 10 inch or more, air way pressure (Including peak and mean pressure) respiratory rate, I:E ratio and expired minute volume. Trending and loops (pressured & volume), Static and Dynamic compliance.

Audible and visual alarm for peak inspiratory pressure (low and high), low CPAP/PEEP, minute volume (low or low/high) respiratory rate (low or high) gas supply loss and power failure.

The medical air source from same principal brand/ manufacturer is to be supplied. Warranty of medical air source should be minimum 30000 hrs of operation.

Screen display of patient parameters including pressure and flow and volume waveforms

Nebulizaation: Ultrasonic reusable and of international standard for administration of drugs- Inspiration synchronized

Should have leak flow & compliance compensation.

Technical parameters:

Inspiratory rate: 5- 60 breaths/ minute

Tidal volume 50-1800 ml

Oxygen concentration 21- 100%

Trigger sensitivity: - Pressure sensitivity -10 to 0.1 cm H2O below PEEP, flow sensitivity; 1-10 liter/min.

PEEP/ CPAP: 0-30 Cms H2O

Pressure support- 0- 30 cm H2O

Inspiratory time: 0.1-5 sec or I:E Ratio : 1:8- 4:1

Inspiratory hold: should be present

Inspiratory pressure: 5- 80 cms H2O

Flow sensors, should be reusable, sterilizable (autoclavable) & long life.

There should be at least two reusable flow sensors and description of flow sensors should be given.

Oxygen cell should have life for 36 moths (3 years) or firm should replace if it expires before 3 years.

Main unit should have:

Humidifier should be temperature compensated with heater wire Digital breathing temperature monitoring in humidifier or ventilator. The humidifier should be servo controlled.
Patient breathing system silicon, autoclaveable for adult and pediatric (2 nos.)
Bacteria filters 50 nos.
Siliconized autoclavable face masks for adult & pediatric application (2 no.).
Built in battery, or online UPS allowing operation for at least 2 hours for ventilator with medical air source.
All standard accessories like hinge arm, non corrosive movable trolley with front brakes etc. (from the same country of origin as of Ventilator) should be provided.
The complete unit should have CE marked / USFDA approved.
Should submit relevant certificate of IEC safety standard.

Technical Specification of Bed Side Monitor

1- Should have the facility of monitoring ECG, RR, SPO2, NIBP, 2Temp , Dual independent IBP for Adult & Paediatric applications.
2- Should have minimum 6 channels with integrated multi colour TFT/LCD display of size 10" or more
3- Should have Arrhythmia detection with alarm facility.
4- Must use Nellcor or Masimo or equivalent pulse oximetry module with facility for display of Plethysmograph, Pulse strength & SpO2 values
5- Should have non – volatile Graphical & Tabular trend facility for at least 24 hrs
6- Should operate independently on both mains and battery
7- Battery backup for minimum 90 minutes should be provided as standard.
8- Should have excellent cable management with as minimum as possible cables at monitor & patient end for maximum comfort to patient as well as user.
9- Should have alarm limits with alarm levels and alarm indication(visual as well as audio)
10- Should be able to monitor single or two leads of ECG waveform simultaneously.
11- Should display 12 leads of ECG when required.
12- Monitor should have EtCO2 as standard .
13- Monitor should be supplied with thermal recorder.
14- Monitor should be compatible with Central Nurses station meant for connecting / monitoring simultaneously 12 or 16 monitors
15- Unit should be supplied with following accessories:
    a. 5 or 6 lead ECG cable with disposable electrodes – 100 nos of disposable electrodes
    b. Non-invasive continuous BP measurement kit (2 nos.) with different cuff sizes.
    c. Skin Temp. Probe -1 no.
    d. Temp. probe rectal or oesophageal- 1no.
    e. SPO2 Finger PROBE (reusable) with extension cable – Adult & Paediatric each.
    f. NIBP Hose – 2 no
    g. IBP reusable accessories for 2 IBP.

16- Monitor should have built in Electro Cautery & Defibrillator protection
17- Should work on 220 V AC$\pm$10%, 50 Hz
18- Must be CE MARKED / US FDA approved
19- Should submit relevant evidence of compliance to IEC 60601 series Safety standards.

Bi-Phasic Defibrillator

The unit should be portable, easy to use & lightweight.

The unit should be based on Bi – Phasic technology with energy selection at least up to 200 J.

The unit should have Manual Defibrillation facility with Synchronous and Asynchronous mode.

The unit should have both Adult and inbuilt Pediatric Paddles used in manual mode.

The charging time up to 200 j should be less than or equal to 10 sec.

The unit should have facility for 3/5 lead ECG monitoring.

The unit should have inbuilt printer/recorder.

The unit should be capable enough to deliver at least 50 shocks (200j each) on Battery and/or 120 minutes monitoring backup (There should be battery backup for 120 minutes).

The unit should be able to operate on 220 V AC $\pm$ 12.5%, 50 Hz and with an internal rechargeable battery.

The unit should be able to operate on AC mains in case of depleted/no battery.

It should have integrated high resolution color TFT/LCD display with facility for displaying waveforms.

The unit should have Automatic External Defibrillation (AED) mode as a standard.

It should have data storage for patient ECG & events (and other parameters) along with a data card / Pen Drive or equivalent for taking out data.

The unit should be upgradeable to Pulse Oximetery, Pacer mode, NIBP and EtCO2 at site.

Firm should give on site training to users as & when required during warranty period.

The unit should be supplied with complete accessories i.e. ECG cable, user's manual and 10 packets of ECG Electrodes.

The unit should meet all national/international recognized safety standard including IEC-60601-1-2. The unit should be CE marked / US FDA approved.

SYRINGE INFUSION PUMPS

Must have flow rate programmable from 0.1 to 999 ml/hr or more in steps of 0.1 ml/hr Volume Over Time (V/T) infusion mode must be available.

1. Bolus rate should be programmable to 999 ml/hr or more with infused volume display.
2. Display of Drug Names with a provision of memorizing about 25 to 30 names of commonly used drugs must be there.
3. Keep Vein Open (KVO) when selected volume is delivered must be available
4. Selectable Occlusion pressure trigger levels from 100 ~ 900 mmHg in at least 3-4 steps with a choice to select the default setting by the operator is must. Facility to display the actual pumping pressure in numeric as well as graphical form in the backlit display should be there.
5. Should have comprehensive alarm package including Occlusion limit exceed alarm, Near end of infusion pre-alarm and alarm, Volume limit pre-alarm & alarm, KVO rate flow, Low battery pre-alarm and alarm, AC power failure, Drive disengaged, preventive maintenance warning, pressure drop /increase alarm, etc.
6. Should work on standard disposable Syringes of 10,20 & 50/60 ml sizes of different makes. Wider choice (3~ 5 pre set syringe brands or more) will be preferred. Volumetric accuracy must be within +/-2 %. Syringe loading from front and not top loading type.
7. Should be stackable upto 02 pumps or more with locking facility available
8. Automatic detection of syringe size & proper fixing. Must provide alarm for wrong loading of syringe (flanges out of slot ; disengaged plunger or barrel not secured etc.).
9. Anti bolus system to reduce pressure on sudden release of bolus.
10. Rechargeable battery having at least 7~8 hrs backup for about 5ml/hr flow rate with 50ml syringes. Indication of residual battery life is must.
11. Programmable PAUSE upto 12 hours or more will be preferred & after selection of parameter key pad locking should be available for security purpose.
12. The unit should have ISI / CE marked / USFDA approved.

Technical Specifications of Central Medical Gas Pipeline System

Annexure - I

Bill of Quantity
For Medical Gases Pipeline System

S.No	Description	Unit	Qty.	Rate	Amount
				(In Rupees)	
A	**Oxygen System**				
1	4+4 size manifold extendable type complete with middle frame with chain for individual cylinder (bulk cylinder D-type) along with Non-Return Valves for every cylinder and copper tail pipes as per Technical Specifications enclosed.	Set	1		
2	Fully Automatic Gas Control Panel for Oxygen as per Technical Specifications enclosed	Set	1		
3	Single Cylinder Emergency Oxygen Manifold with two state High flow rate regulator with NRV for every cylinder and copper tail pipes as per Technical Specifications enclosed	Set	1		
4	Terminal Units (Gas Outlets) with probes/Adaptors as per NFPA, CSA UL Listed as per Technical Specification enclosed	Nos	10		
5	Oxygen Flowmeter with Humidifier Bottle as per Technical Specifications enclosed	Nos	10		
B	**Vacuum System**				

1	Vacuum System with Pumps as per enclosed technical specifications	Set	1		
2	Terminal Units (Gas Outlets) with probes/Adaptors as per NFPA, CSA UL Listed as per Technical Specification enclosed	Nos	10		
3	Ward Vacuum Unit with Regulator(Imported) , Collection Jar of 600 ml with bracket as per Technical Specification enclosed	Nos.	10		
C	Copper Piping as per Technical Specification enclosed (BS EN 13348 : 2001 standard).				
	28mm OD X 1 mm thk	Mtrs	1		
	22mm OD X 1 mm thk	Mtrs	1		
	15mm OD X 1 mm thk	Mtrs	1		
	12mm OD X 1 mm thk	Mtrs	1		
D	Valve Box as per Technical Specificaitons enlosed				
	3 Gas Services	Nos	1		
E	Medical Gas Area Alarm as per Technical Specifications enclosed.				
	3 Gas Services	Nos.	1		
F	Horizontal Bed Head Panel (Al Extruded) 5 ft. Long Provision for Gas Outlet, Electrical Switch & Socket, Nurse Call, etc as per Technical Specifications enclosed	Nos	10		

TECHNICAL SPECIFICATIONS FOR Central MEDICAL GAS Pipeline SYSTEM

PIPING

Copper Pipes used will be solid drawn, seamless, deoxidized, non arsenical, half hard, tempered and factory degreased, manufactured as per EN : 13348 : 2001 standard, and chemical composition as per CU DHP to 1190-1 and CW 024 A to EN 1412

Pipe sizes will be used as per latest BS EN 13348 standards

28mm OD X 1.0mm thk
22mm OD X 1.0 mm thk
15mm OD X 1.0 mm thk
12mm OD X 1.0 mm thk

Pipeline Installation: Before erection, all copper pipes, valves, fittings like bends, tees, reducers etc. will be cleaned for dirt, and Will be degreased.

Proper pipe cutters, and bending machine will be used during installation of copper pipes.

All copper pipes and fittings like bends, Tees, reducers and straight couplings Will be as per BS 864 and joined by silver brazing method for copper to copper. Inert gas welding technique Will be used by passing Nitrogen gas inside the copper pipes during silver brazing, in order to avoid carbon deposition inside the copper pipes. Copper pipes of the diameter up to 42mm OD Will be installed on the wall with the help of plastic saddles at the required span, as per HTM-2022 of U.K. and metallic white powder coated clamps Will be used for pipe sizes above 54mm OD. Wherever the pipes cross brick walls, it will be covered with plastic pipes. All pipes will be installed without springing or forcing. All pipes will be protected against mechanical injury in a manner satisfactory to authorities having jurisdiction.

TEST: After erection, all the pipes will be cleaned or purged with the help of dry nitrogen gas, & Will be tested with dry nitrogen at a pressure of 10 Bar for 48 hours.

PAINTING: All installed pipes will be painted with two coats of synthetic enamel paint & colour codification as per IS-2379 of 1963.

DEGREASING

All pipes, fittings and valves will be degreased steam cleaned internally, dried, shot blasted and blown through with medical quality air and individually capped at both ends after passing a visual internal inspection.

PIPE STORAGE

All pipes will be sealed at both ends, marked “medical gas pipes” and stored in a secure store at site to prevent exchange or misuse.

JOINTING (BRAZING)

For copper joints, brazing materials to be used will be Silver-Copper-Phosphorous alloy, which will be used without flux. For copper to brass joints 43% silver brazing with flux will be used. Brass brazing is not permitted. Brazing metal will not be borax or borax based compounds. Fluxed will be free from grease and agents, which promote corrosions. During jointing operation a running stream of Nitrogen or any other inert gases will be maintained through the pipe. Wherever required compression type screwed fittings or flanged joints will be used as per the site requirements with prior approval of the concerned engineer.

FITTINGS

Shut off valves be non-ferrous non-lubricated 90 degree turn lever FULL BORE SS ball valve with PTFE washer with engraved ON OFF position. Valves used must give clear indication of the direction of closing. All valves would be pneumatically tested for twice the working will pressure and degreased for medical gas service before supply. AH valves will conform to ISO standard.

INSTALLATION

Medical gas pipes be installed in utmost cleanliness and in a manner to prevent any mechanical & chemical damage exposure to excessive heat, splashing, dripping or permanent contact whit oils, greases etc. and proximity to electrical installations subject to sparks etc. only pipes, fittings and valves, which will be degreased and brought in polythene sealed bags, will be used on site. Pipe fixing brackets will be non-ferrous or non-deterioration plastic suitable for the diameter of the pipe. All screws used will be chromium-plated brass.

Wherever pipes are run in service ducts or voids we will ensure adequate ventilation for each area and prevention of concentration of gases in event of any leakage.

All pipes running vertically and horizontally will be adequately supported with plastic saddles fastened to wall in an approved manner. Where it is absolutely essential for pipes to cross electric cable or conduit they will be supported on both sides of the crossing and prevented from touching the cables or conduit. The recommended spacing for supports is;

Pipes Dai (MM)	Maximum intervals (M)	
	Vertical	Horizontal
12	1.2	1.0
15	1.8	1.2
22/28	2.4	1.8
35/42	3.0	2.4
54	3.0	2.7
76	3.6	3.0

Additional saddles and supports will be provided near bends, valves and other locations as warranted by site conditions.

All pipes, fittings and valves will be factory degreased and certificate of the same should be provided. Pipes and fitting will be plugged temporarily and sealed in polythene bags. Tools used in cutting or reaming will be free from oil or grease and whenever any contamination has occurred, the affected items will be rewashed and rinsed.

Pipes will be laid in the routes marked or approved. No pipe lying will be carried out without approved route and valve locations. A parallel clearance of 150 mm and transverse clearance of 25 mm will be maintained from other service bines. Obstructions like columns, wall protrusions will be negotiated by the use of long cold/hot bends rather than elbows. Pipes passing through walls and floors will be taken through PVC pipe sleeves one diameter higher and neatly capped on both sides. AH floor crossings, the sleeving will extend up to 1500 mm above floor and duly supported on the wall.

Where pipes are coming in contact with timer treated with fire resistant or flame retardant compound, the contact will be avoided by die use of impermeable non-metallic materials in the area where contact may occur. PVC spacers or PVC tapes will be used for this purpose. If spacers are used they will not be liable to drop out due to shrinkage or subsequent movement of the pipe or timer.

A full way drain cock will be provided at the bottom of each main vertical run on the compressed air and vacuum system. Such drain valves will be of the same quality, as the other valves on the distribution system arid will be sited carefully, so that no damage is likely to occur to them. Drain cocks will rarely be used only for cleaning up of compressed air and vacuum line and normally be locked in the closed position.

All pipes after lying will be painted in colors with proper hands in fixed distance (whether exposed or over false ceiling approved by the hospital authority.

CENTRAL OXYGEN MANIFOLD SUPPLY FACILITY

The central oxygen manifold supply facility will comprise of 4+4 cylinder banks which can accommodate the number of cylinders as shown in the bill of Quantities in each bank complete with copper tail pipe with bull nose fittings of R.H. external threading suitable for cylinder valves conforming to 1S: 3224 (Oxygen service) and cylinder support system.

The tail pipes will be fitted to individual non-return valves of the cylinder manifold for easy removal of cylinders without disturbance to system operation.

Threaded connections for each manifold block with non-return valve will be distantly separate for Oxygen and Nitrous Oxide so as to eliminate possibility of inadvertent interchange.

Each manifold will be provided with a terminal header and a MPT connection for automatic gas change over system (Automatic gas Control Panel).

The entire manifold will tested hydraulically at 225 Kg/ cm2 pressure duly degreased for Oxygen service and brought to site in sealed cover.

The cylinder will be supported with steel work against wall as per approval and chaining will be so made that the cylinders will be easy to install and remove.

AUTOMATIC OXYGEN GAS CHANGE OVER SYSTEM (AUTOMATIC CONTROL PANEL)

Automatic control panel should be constructed in accordance with the requirement of international standard .

The Control Panel should be **UL (Underwriters Laboratories) Listed** , should comply with **NFPA-99 (National Fire Protection Act -99),USA and CSA** approved

The manifold assembly should provide two stages of pressure regulation. A single stage primary regulator, one for each cylinder bank should be used to initially reduce cylinder pressure and two single stage pressure regulators should be provided in the control cabinet for final delivery pressure regulation. One delivery pressure regulator in service and one should be ready for service in a Stand –By mode.

The panel should automatically change over from the depleted "Primary" supply bank to the "Secondary " supply bank without fluctuation in the pressure. Changeover should be performed by electrically/pneumatically operated valves contained in the control cabinet. In the event of an electrical power failure the valves should automatically open to provide an uninterrupted gas flow. The manifold should not require any manual resetting or adjustments after the replacements of the depleted cylinders.

The automatic gas manifold control should include:

- 2 supply pressure gauges
- 1 delivery pressure gauge
- 2 Line pressure regulators with bypass valve
- 1 line pressure relief valve
- 2 green in service LED indicators, one for each supply bank
- 2 amber / yellow ready for service LED indicators, one for each supply valve.
- 2 red replace depleted cylinders LED indicators, one for each supply bank
- Instruction for changing the cylinders clearly identified on the front of the control cabinet.

- All functional components should be enclosed in fiber glass reinforced polyester weather protected cabinet. Suitable for (0 deg. – 140 deg. F)
- Rated capacity (Deliver) should not be less than 1100 litres per min. at 60 psig.

The manifold system should be provided with a separate power supply to convert 230 volts A.C to 24 volts A.C. The power supply should contain a 230/24 VAC transformer and a circuit board to isolate the manifold from remote alarm signals. Should have digital display of pressures.

The control panel should be as per codes and Standards as NFPA-99, CSA, NEC, Under writers laboratory (UL Listed) , INC Section 407, ANSI-B-57-1.

SINGLE CYLINDER EMERGENCY OXYGEN SYSTEM

Consist of high-pressure flow regulator showing inlet pressure. It will have provision of connecting 1 cylinder.

AREA ALARM PANELS

The medical gas alarms should comply with NFPA -99 standard and FCC part 15, and be UL listed. It should be capable of monitoring a maximum of 6 medical gas services by means of pressure sensors which detect deviations from the normal operating limits of either pressure or medical vacuum. The area alarm will have a digital display of pressures . The medical gas area alarm Will fully satisfy the international standard. Each gas service will be displayed by coloured LED's to show 'Normal' (green), 'Low' and 'High Pressure' (red) conditions. Medical vacuum systems Will be displayed in the 'Normal' (green) and 'Low Vacuum' (red) conditions only. Failure indicators Will be displayed by flashing lights and normal indications Will be steady. The box material should be 16 gauge steel

An audible warning will sound simultaneously with any failure indication and a mute Facility will be provided. Following a mute selection the audible Will resound after approximately 15 minutes, or will operate simultaneously will a further alarm condition occur. A maintenance 'Mute' switch Will be provided internally to the panel for use during maintenance which results in prolonged pipeline or plant shutdown. This facility will automatically reset when the gas service returns to normal.

The alarm panel will have a 'test' facility to prove the integrity of the internal circuits, LED's and audible warning. The alarm panel Will 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.

The alarm will be microprocessor based with individual microprocessor on each module. Will provide interface to Gas Delivery Management System.

MEDICAL GAS OUTLETS POINT

The outlets should be UL Listed, NFPA compliance, cleaned for medical gas service and be pressure tested. Each outlet should have less than 3 psi (21KPa) pressure drop through the outlet @ 120 1/min.and 50 psig (345KPa) inlet pressure. For outlets providing positive pressure gas, the outlet should be equipped with a primary and secondary check valve should be rated for 200 psi (1,379 KPa) allowing the primary check valve to be removed for services without isolating the entire zone.

The wall outlets should have a gas specific back body with steel mounting plate, which allows outlets to be ganged together with a center line spacing of 5" (127mm). Each back body should be equipped with a 6-1/2" (165mm) length type "K" copper pipe stub which is brazed to the outlet body. The outside diameter of the copper pipe stub should be 1/2" (12.7mm). The inlet pipe can be swiveled 360 degrees for ease of installation.

Outlet bodies should be gas specific by means of a gas assembly only with the specific matching gas back body, preventing interchangeability of gas services.

The latch-valve assembly, which by means of color coding and wording, should identify the specific medical gas service provided by the outlet and should accept PB type gas specific adapters.

For aesthetic appeal each outlet should include a one piece ivory trim plate. The trim plate should be constructed of high impact, flame retardant Cycoloy.

The wall outlet can accommodate various finished wall thickness from 3/8" (10mm) to
1-1/4" (32mm).

FEATURES:
Accepts P.B Type Gas Specific Adapters.

Pin indexed to prevent interchangeability of gas services.
Each outlet is cleaned for medical gas service and pressure tested.
Less than 3 psi (21KPa) pressure drop through the outlet @ 120 1/min and 50 psig (345KPa) inlet
pressure.
Inlet pipe can be swiveled 360 degrees for ease of installation.

Gas specific back bodies can accept either Quick connect or DISS front identification bodies.
Outlet can be adjusted up to 1 1/4" (32mm) wall thickness.

VALVE BOXES (Indigenous)

It will be ISO certified.
All valves installed in the system except in the manifold and plant room will be located in accessible position in suitable valve boxes with lockable arrangement and breakable glass cover.

Doors and windows will be gas specific to prevent confusion during installations.
Fitted with gas specific NIST connectors including check valve, blank cap and pressure and vacuum gauges.
NIST connections and pressure/vacuum gauges will be fitted downstream.

FLOWMETER & H.BOTTLE

Strong and reliable flow meter, offering the latest technical improvements for a precise measuring of the flow, with +- 5% accuracy. .Chrome plated brass body. Graduated flow tube and cover made of polycarbonate & unbreakable. Adjustable flow by needle valve (knob) with micrometrical regulation. Back pressure compensated. Standard flow 0-15 LPM.Inlet filter made of S.S. wire net. Humidifier bottle made of polycarbonate, transparent and unbreakable. Fully autoclavable at 134^{o} C.

WARD VACUUM UNIT (IMPORTED)

The Ward Vacuum Unit should be only Digital and color coded display type regulator having large, easy to read and should have no analogue mechanism. The unit should have 3-Mode High feature and equipped with push to set technology which should automatically establish vacuum limit with each vacuum level setting. A unique dual spring regulator module ensure precision in the critical care range (0-200 mmhg) while also providing unusually fast adjustment with in 2 turns of the knob up to full wall vacuum instantly facilitating regulated and continuous suction for tracheal and pharyngeal airway management, surgical procedure and continuous nasogastric drainage. The ward vacuum unit should be equipped with max mode features which should facilitate unrestricted full time vacuum for emergency providing range of 0-760mm hg). The unit should be equipped with Positive Pressure Relief Valve to protect patient and unit both in case if accidentally connected to pressurized gas (O2, Air etc.)

The unit should be made of rugged, shatter-resistant ABS case and corrosion & lubrication free having service fee back plate

The Unit should have following :

- High Three Mode Continuous

Modes I(On), O(Off), MAX
Gauge : High Vacuum (O-760mm Hg)
Regulated Vacuum 0-Full Vac
Instantaneous Full Wall Vacuum Mode
Recommended for OR/ER use

The Ward Vacuum Unit should conform to ISO 19979-3 and ASTM F 960.

Collection Jar -
Indigenous
The vacuum unit should include 600 ml capacity reusable plastic collection bottle with overflow safety trap with plastic slide wall mounted type.

THEATRE SUCTION TROLLEY

The Basic theatre trolley consists of a stand base mounted on five castor wheels made of plastic molded and pole incorporating two no's 2000 ml , jar (made of transparent & unbreakable polycarbonate) is of aluminum duly anodized an rust proof. 2 nos jar fitted in trolley are autoclavable at 134º C. Vacuum regulator fitted with TST, is made of aluminum duly anodized and cap is made of ABS. Regulator body which houses an ON/OFF knob, regulation knob, vacuum gauge graduated in mbar.

VACCUM SYSTEM

Consists of three parts:
1. Vacuum pumps with Motor and Automatics Switch gear Assembly.
2. Suction Vessel
3. Inter Connecting Piping

The vacuum in created & stored in the suction vessel which is connected to piping net work. All the time vacuum in the tank is maintained around 450 to 600 mm of HG. The electrical switch gear assembly is incorporated in the system in order to maintain the vacuum in the suction vessel between high & low limits.

Now depending on the requirement in the hospital when the vacuum comes down to lower limit the vacuum pump takes start automatically and when the higher limit is attained in the suction vessel the motor of the suction pumps trims/gets off automatically.

Make IR Model no V 235

2 Nos. Of vacuum pumps, air cooled type, model V235 x 1.5 HP (Ingersoll rand make) each having

- Piston displacement -21.60 cm (611lpm) free air delivery to suction – 70% of P. D. approx. max working pressure – 29" of Hg or 730mm of Hg. Single stage two

cylinder, fitted with MS channel frame complete with V-belt drive, belt guard etc along with the following:-

- 1.5 HP (2 nos.), 440 volts, 3 Ph, 50Hz, with TEFC electric motor- Siemens / Crompton
- 1" BSP stainless steel ball valve with PTEE seat with suitable brass adapters and non return valve with non ferrous filter element in housing (size 8.6" x 12" long)
- Silencer at discharge end projecting (Open to atmosphere) outside the plant room
- Copper Pipe interconnection up to receivers (500 liters of water capacity)

HORIZENTAL BED HEAD PANEL – UP TO 1. 8 METER LONG (Imported)

It will be ISO standard & CE certified / UL listed.

Providing and fixing bed-head panel (Length – upto 1.8m) will be made of aluminum extruded section duly powder coated modular design of required length having 3mm thickness provision for fixing of gas outlet points, electrical sockets and switches after cutting of the aluminum sheet (having 3mm thickness) to be fixed in the extruded section as per the requirement of the Deptt. and to the entire satisfaction of the Engineer-in-charge. The Bed-head panel will be easy to detach for maintenance and pipeline connection. The panel will have smooth surface and screws will not visible.

All units will contain integral, separate compartment for low voltage cabling, extra low voltage cabling and Medical Gas Pipeline work.

Bed Head Panel will include following accessories:

1. I.V. Hook with Aluminum Clamp (Aluminum Clamp will be made of Extruded section)
2. Monitor Tray with Rotational movement & Aluminum Clamp (Aluminum Clamp will be made of Extruded section)
3. Good quality Examination Lamp with Telescopic movement facility & Aluminum clamp (Aluminum Clamp will be made of Extruded section)
4. S.S. Basket
5. Suction Unit Clamp (Aluminum Clamp will be made of Extruded section)
6. Electrical 4Nos ON/ OFF Switch & 4Nos. Socket make Anchor Roma/ North-West.

HIGH PRESSURE & LOW PRESSURE TUBE

High pressure tube will be color coded antistatic as International Standard. The low pressure tube will be antistatic transparent tube.