WEST BENGAL MEDICAL SERVICES CORPORATION LTD.

(Wholly owned by the Government of West Bengal)

Swasthya Sathi, GN-29, Sector-V, Salt Lake, Kolkata-700 091.

ADDENDUM – I

TO

BIDDING DOCUMENTS

FOR

Planning, Design and Construction of 2 Government Medical Colleges and Hospitals in the State of West Bengal on Turnkey Basis

Bid Reference No.: WBMSCL/NIT- 220/2020

Dated – 12.11.2020

SECTION 5.8

SCOPE OF WORK OF MEDICAL GAS PIPELINE SYSTEM (MGPS) FOR HOSPITAL

Section -5.8

SCOPE OF WORK OF MEDICAL GAS PIPELINE SYSTEM (MGPS)FOR HOSPITAL

Scope of Works, Standards, Safety, System, Installation including Operation and Maintenance

Survey, Inspection of the site, Plan, Design, Supply, Installation, Testing and Commissioning, Operation & Maintenance of Medical Gases Manifold& Plant room and Pipeline Distribution System as a turnkey work and providing of free spare parts, consumables and service during 3 year operation and comprehensive maintenance from the date of commissioning and handing over.

1. The system should comprise of

1.1 Source Equipment:

a. Fully Automatic Oxygen Control panel, Oxygen Manifold and Emergency Manifold

b. Fully Automatic Nitrous oxide Control Panel, Nitrous Oxide Manifold and Emergency manifold.

c. Vacuum (suction) supply system complete with Filters and Silencers including bacteria filters.

d. Compressed air system with air Filtration system and pressure reducing station for Medical Air-4 bar and Surgical Air-7 bar.

e. Combined Electrical Control Panel for Air Compressors & Vacuum Pumps.

1.2 Distribution piping complete with accessories

1.3 Outlets

1.4 Alarm Systems

1.5 Area Valve Service System

1.6 Ceiling Pendants for Operation Theatres (OT)

1.7 Horizontal Bed Head Panels (provision only)

1.8 High pressure tube for O_2, N_2O, Compressed Air, Vacuum

1.9 Oxygen flow meter with humidifier complete with accessories

1.10 Ward vacuum units complete with accessories

1.11 Theatre Suction units complete with accessories

1.12 Unit wise Service Required:

Sl. No.	Name of the Unit	Medical Gas Services Required	Remarks
1	Operation Thatre (OT)	Oxygen, Nitrous Oxide, Medical Air 4 bar, Surgical Air 7 bar and Vacuum	Pendent (Surgeon Pendant and Anesthetist Pendant)
2	ICU/HDU/ICCU/ITU /Pre OP./Post OP./ Recovery/SNCU/PICU /NICU (All Critical Care Unit)	Oxygen, Medical Air 4 bar, and Vacuum	Bed Head Panel
3	Wards	Oxygen and Vacuum	On Wall Outlet

1.13 Specification of the Plant cum Manifold Room:

a. Plant cum Manifold room size should be 13 Meter Width x 15 Meter Length with Bath room facility.

b. Approach road should be present in front of Plant cum Manifold room for direct cylinder loading and unloading from Trucks at the platform of the Manifold room.

c. 2 meter width cylinder loading unloading platform should be provided in front of Manifold room.

d. Beside the Plant cum Manifold room a 9 Meter x 16.5 Meter free space should be kept with proper road access for future provision of Liquid Medical Oxygen tank installation.

e. All inside wall will be flush type without any projection

f. All ventilators (louver) should be above 3500 mm from the floor level of manifold & plant room. Ventilator Size should be 1.2 Meter X 0.6 Meter

g. Thickness of the wall should be 250 mm minimum

h. Each room should have sufficient number of 450 mm exhaust fans (4 nos. for each room) above 3000 mm center height from floor level

i. Flooring of Manifold and plant room including loading unloading platform should have Kota stone finish.

j. Electric power requirement with emergency backup for plant room : 90 KW 3 phase and Manifold Room: 5 KW Single phase

k. Fan Light as required to be provided

l. Rolling shutter having (WxH) 2000 mm X 2100mm (perforated in the middle 1200mm to 1800mm) should be provided for the doors

m. Ceiling height of the building would be 4.5 meter and plinth height +1 meter from road level

n. All the pipeline run through surface of ceiling or surface of walls

2. Standards:

The Contractor should execute the installation work complying with the standards like HTM02-01/ NFPA99C; should use equipment and materials having any of the standards like CE/ISO/BIS unless specified otherwise in the specifications of the equipment and copper pipes should have third party inspection certification by Lloyds'. Compliance with standards like HTM02-01 / NFPA99C would be verified during checks prior to commissioning.

3. Scope of work:

3.1 The bidders are required to survey the site before submitting the quotes. Drawing of pipe routing should be submitted for approval of WBMSCL before starting of execution work.

3.2 Electrical Control Panel for Vacuum and Air plant system to be supplied by the Contractor. All required electrical connection for installation of entire system including alarm panel/ bed head panel/ pendant/ control panel should be tapped from the nearest available points and remains in the Scope of Work of the Contractor. Further distribution and wiring is to be carried out by the Contractor to make the system functional. Technical Specifications will be as per the bidding documents. Prior approval of electrical panel drawings shall be taken from the Corporation before manufacture.

3.3 All the required consumables, gases, cylinders etc. for installation, testing, calibration, quality control tests, commissioning etc. remains in the Scope of Work of the Contractor.

3.4 The Contractorshall be responsible for the complete works including the submission of working drawings, detailed work schedule and materials. The Contractorwill have to take prior approval from the Corporation for the materials to be delivered at the site for taking up the installation work of MGPS.

3.5 The Contractorshall be responsible for coordination with Liquid Medical Gas system supplier for maintenance and day to day operation and Reporting to hospital authority. Training of the staff will be arranged by WBMSCL with the LMO vendor.

3.6 The hospital authority / Corporation will arrange for D type Oxygen/ Nitrous cylinders for the Manifold Room for the regular supply of Gases for the patient use at a later stage. Bidders need not have to consider prices of D type Cylinder in their Bid for operation of the installed system. However cylinders required for installation, testing and commissioning of the pipeline system will have to be arranged by the Contractor.

3.7 Electricity required for commissioning the system will be provided by the hospital free of Cost, if available. Otherwise, commissioning of the installed MGPS followed by operation of the system should be carried out by the emergency DG set to be installed at each hospital by the selected bidder.

3.8 The Contractorshould submit technical data sheets, Product catalogs, Drawings, samples etc for approval. The Corporation or its appointed consultant will provide approval as per the specification in the Bidding Documents.

3.9 The Contractorshould supply complete set of part manuals, service manuals and user manuals for all the systems and subsystems to be supplied.

3.10 The Contractorshould demonstrate pressure and flow rate at each outlet point at the time of commissioning.The Contractoris required to demonstrate and Document all safety features incorporated in the system as per HTM02-01 / NFPA 99C Standards.

3.11 All material used for Installation, Testing and Commissioning the system should have required quality certification.

3.12 All supporting material like saddles, cable tray, channels, joints/ connectors, trenches/ bridges for pipe laying as required from manifold room to hospital building,minor civil works including foundation &modification of manifold/plant room as required, making holes in the wall & repairing after installation of copper piping, electrical works, etc. are a part of MGPS work.

3.13 The Contractorshould display maintenance Log, Normal values etc in the manifold room as prescribed by Corporation or its consultant. Daily/Periodical maintenance chart/log should be maintained. This maintenance chart will be provided by the Corporation.

3.14 Final electrical safety test, system test and calibration should be done by the bidder by authorized persons using calibrated test equipment as per standards. For operation and maintenance of the installed system, the Contractorshould post necessary trained experienced technicians / helpers in shifts (at least 1 technician and 1 helper in each shift) that should be available at site 24hrs. X 365 days.

3.15 Earthing arrangements for all the equipment shall be completed by the bidder as per standard practice.

3.16 The Contractor is required to put up signages, as are applicable inside and outside of the manifold/ plant room and at the places specified by the Corporation, in the manner as given hereinbelow:

List of signage along with technical specifications:

A. List of signage :

1. To be installed in wards and corridors:

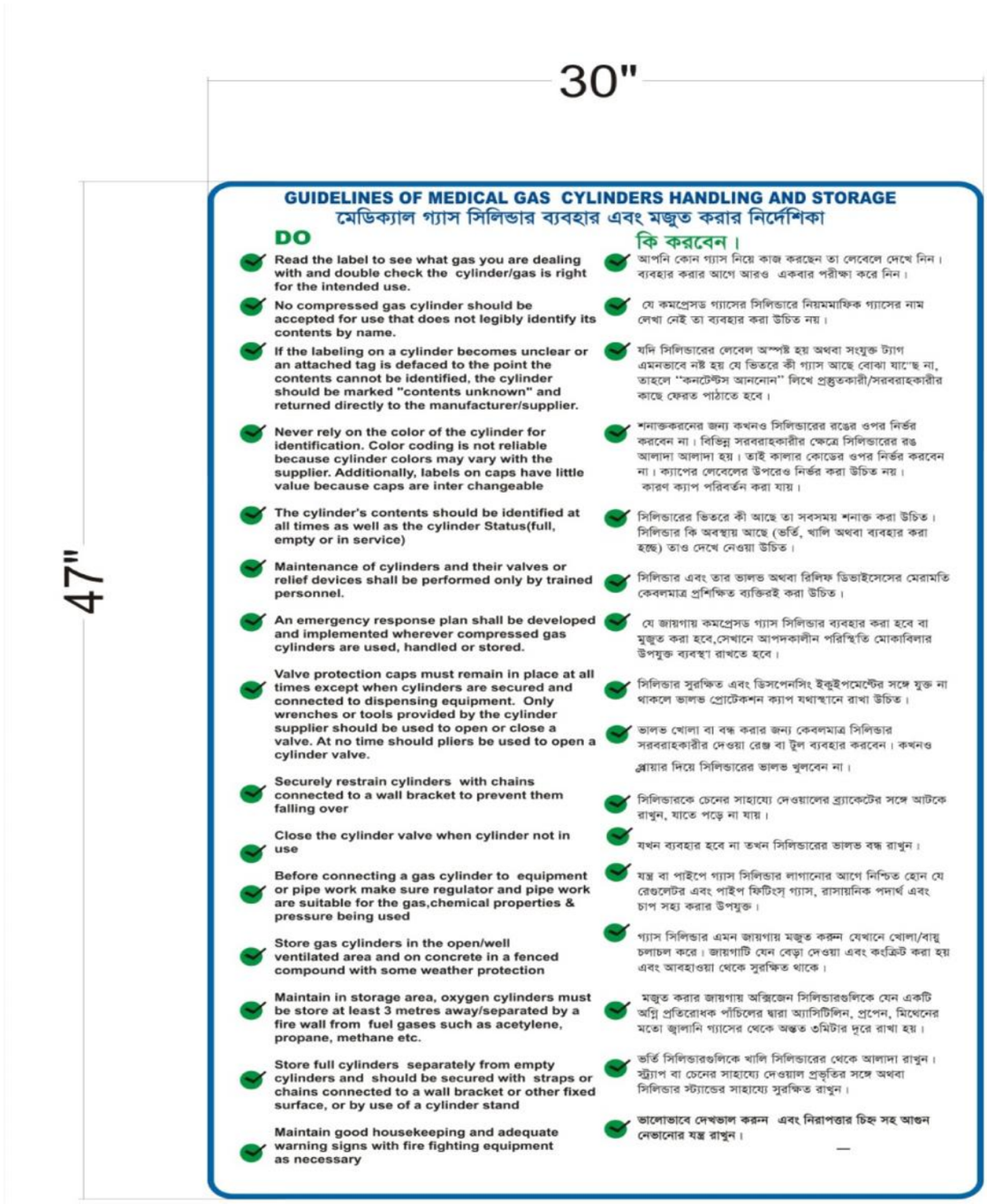
2. To be installed inside plant and manifold room :

3. To be installed inside plant room and manifold room :

4. To be installed outside plant and manifold room :

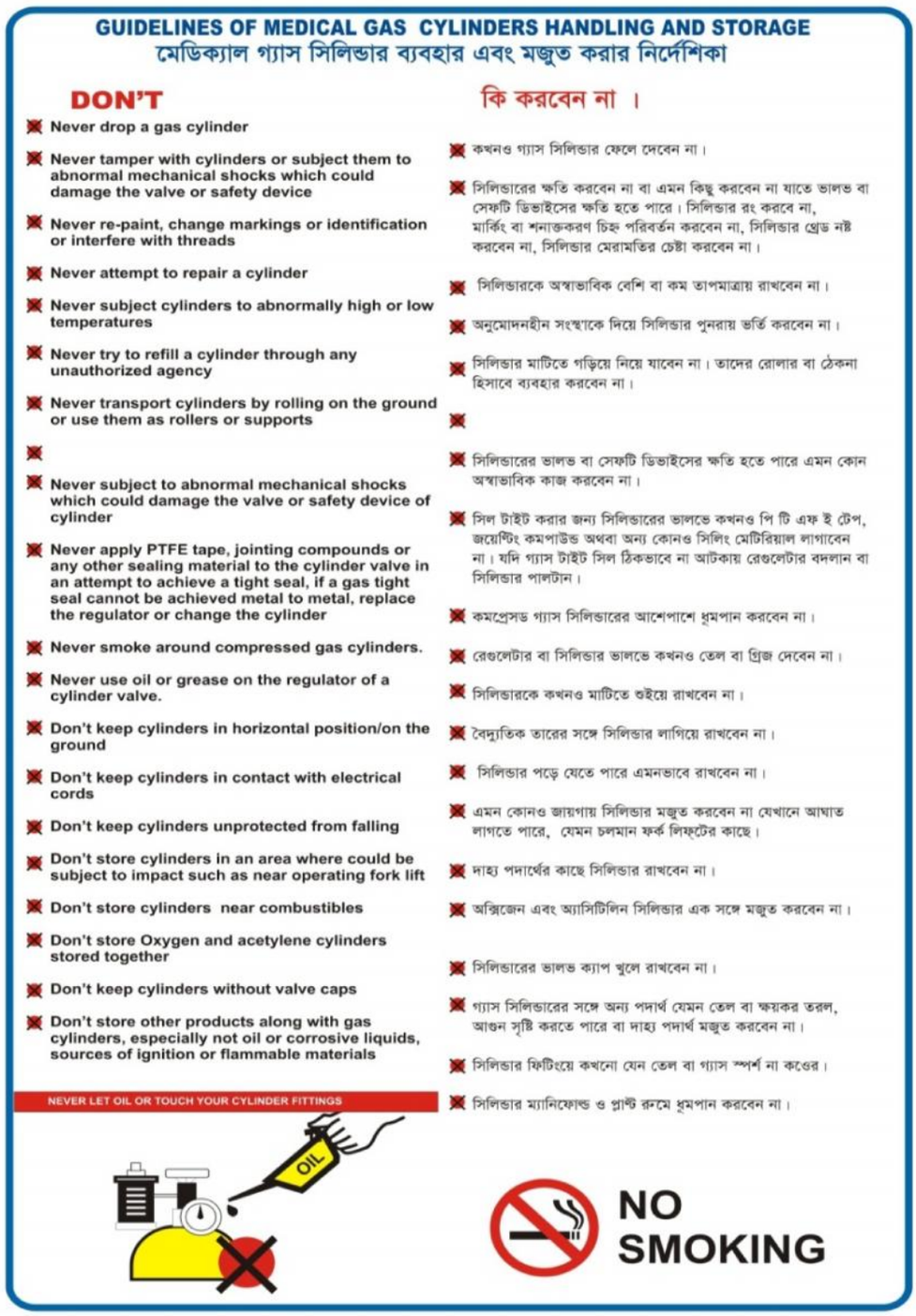
5. To be installed inside manifold room :

6. To be installed inside manifold room :



7. To be installed inside manifold room:

(Dimension as same as Sl. no.6)



B. Technical Specifications :

Sl.no.	Description of work	Unit
1	**Caution Signage-1 (18″ X 12″)**	Each
	i) CNC cut ACP- 3mm indoor quality	
	ii) Electro Cut Vinyl	
	iii) VHP Tape/Stud	
2	**Caution Signage-2 (24″ X 18″)**	Each
	i) CNC cut ACP- 3mm indoor quality	
	ii) Electro Cut Vinyl	
	iii) VHP Tape/Stud	
3	**Do/Don't's Signage (30'' x47″)**	Each
	i) CNC cut ACP- 3mm indoor quality	
	ii) Digital Print on self adhesive vinyl with matt lamination	
	iii) VHP Tape/Stud	

Note :

The signage quantity will depend on actual site conditions.

3.17 In case any inspected or tested equipment fail to conform to the specifications, the Corporation may reject them and the Contractor shall either replace the rejected equipment or make all alterations necessary to meet specification requirements free of cost to the Corporation.

3.18 Leaflets, as-built drawings, equipment operating and maintenance manuals (hard copy, Compact Disk, DVD etc.) and literature should be attached for ready references along with complete documentation of all the measurements conducted during installation period which shall be submitted by the Contractor for future reference.

3.19 Acceptance Test at site shall be conducted of individual equipment and complete system to ensure that individual equipment and complete system meets the technical specifications and other operational and technical requirements as contained in the Bidding Documents.

3.20 The Corporation shall have the right to reject any individual equipment or complete system, if in its opinion the same does not meet technical specifications, operational or technical requirements. The decision of the Corporation in this regard shall be final.

3.21 The delivery, installation or commissioning shall not be deemed to have been completed unless all the equipment and systems are accepted by the Corporation.

3.22 If it is found that to meet the performance criteria, any extra equipmentas have been specified in the Price Schedule is required, the same will be provided free of cost by the Contractor.

3.23 Accessories from gas/vacuum outlets to patients including high pressure and low pressure tubing with connectors, face mask/canula, catheter, etc. will be under the scope of supply of the Contractor.However, the Contractor shall be required to make one time supply of consumables like face mask/ canula, catheter, connector and low pressure tubing, for all oxygen flow meters, ward vacuum units and theatre vacuum units.

3.24 Before the starting of installation work, pipe routing drawing should be prepared and submitted by the Contractor to the Corporation for approval.

3.25 Exposed riser pipelines, if any should be installed vertically upward along the wall, for which protective ACP cover over MS angle frame should be provided by the Contractor to safeguard the pipelines from any damage/theft.

3.26 Bidder should arrange from a licensed Third party, the quality certification for theentire MGPS System that the system meets the Design, quality and safety standard.For this purpose bidders should propose three licensed parties with their credentials.WBMSCL will approve the party based on their credentials and work experience.

Part A

TECHNICAL SPECIFICATIONS OF MGPS FOR HOSPITAL

1.0 OXYGEN SYSTEM

1.1 Oxygen Manifold: Main with Middle Frames

Indigenous

Oxygen Manifold: Emergency with Middle Frames

Indigenous

The Oxygen Manifold will be configured as 2 x 20 Cylinder Manifold is suitable to withstand a pressure of 145 Kg/cm2, along with high-pressure copper annealed tail pipes with end Brass adapter suitable for Oxygen Cylinders and manifold.

Top frame comprising of high pressure copper pipes of size 1/2″ NB x 15swg with high pressure brass fittings made of high tensile brass and connections through non-return valves; high pressure copper tail pipes, made of high pressure copper pipe of size 1/4″ NB x 15 swg. The design of middle and bottom frames should be provided to fit both round and flat bottom cylinders safely. The manifold should be tested (hydraulically) at 3500 psig and necessary test certificates should be submitted along with the supply.

The Emergency Oxygen Manifold will be configured as 2 x 10 Cylinder Manifold is suitable to withstand a pressure of 145 Kg/cm2, along with high-pressure copper annealed tail pipes with end Brass adapter suitable for Oxygen Cylinders and manifold.

To reduce the risk of medical oxygen system from contamination due to ignition of fluorinated polymer materials, only Non Halogenated Polymer materials should be used in the Non Return Valves and high pressure side of the Pressure Regulators of the manifold system.

In case of supply pressure failure from the main manifold system, there should be arrangement of automatic switchover of supply of oxygen from main to emergency manifold with audio-visual alarm. Again with the restoration of pressure of the main manifold, supply of oxygen should change automatically from emergency to main manifold.**A scope of bypass pipeline of 28 mm should be installed from the main line with an isolation valve for connection of Liquid Medical Oxygen System.**

1.2 Fully Automatic Oxygen Control Panel with audio visual indicator Imported

The Oxygen Control Panel should fully comply and meets latest NFPA-99/HTM 02-01 standards and UL Listed. Country of origin certificate must be submitted.

The Manifold Control Panel is Digital, fully automatic type and switches from "Bank in Use" to "Reserve" bank without fluctuation in delivery supply line pressure and without the need for external power. After the switch-over, the "Reserve" bank then becomes the "Bank in Use" and the "Bank in Use" becomes the "Reserve" bank. The manifold control panel should have a microprocessor based digital display panel.

The control panel should have incorporated with three large, red, illuminated LED displays for the Left Bank, the Right Bank and for the Supply Pressure. The control panel should also have six LED's, two Green for "Bank in Use", two Amber for "Bank Ready" and two Red for "Bank Empty".

Features:

- Fully automatic self-contained shuttle-valve with no electrical power required for switching
- Input power 240 VAC, 50 HZ
- Microprocessor based control panel incorporates six LED's and illuminated LED display readable even in poor lighting conditions
- Audio-visual alarm indicating changeover from one bank to other bank
- Units of measure switchable (psi/kPa/BAR)
- Two limit switches for positive indication of bank in use
- Dual line pressure regulators
- Delivery flow capacity : 2000 L/min or above at 4.2 bar pressure

2.0 NITROUS OXIDE SYSTEM

2.1 Nitrous Oxide Manifold: Main with Middle Frames

Indigenous

Nitrous Manifold: Emergency with Middle Frames

Indigenous

The Nitrous Oxide Manifold will be configured as 2 x 4 Cylinder Manifold is suitable to withstand a pressure of 145 Kg/cm2, along with high-pressure copper annealed tail pipes with end Brass adapter suitable for Nitrous Oxide Cylinders and manifold

Top frame comprising of high pressure copper pipes of size 1/2" NB x 15swg with high pressure brass fittings made of high tensile brass and connections through non-

return valves; high pressure copper tail pipes, made of high pressure copper pipe of size 1/4" NB x 15 swg. The design of middle frames should be provided to fit both round and flat bottom cylinders safely. The manifold should be tested (hydraulically) at 3500 psig and necessary test certificates is accompany along with the supply.

A High Pressure Double Stage Regulatorwith gauges indicating cylinder pressure and delivery line pressure should be mounted on the 2-cylinder Emergency Manifold System suitable to withstand a pressure of 145 Kg/cm2, along with high-pressure copper annealed tail pipes with end Brass adapter suitable for Nitrous Oxide Cylinders and manifold.

2.2 Fully Automatic Nitrous Oxide Control Panel with audio visual indicatorImported

The Nitrous Oxide Control Panel should fully comply and meets latest NFPA-99/HTM 02-01 standards and UL Listed. Country of origin certificate must be submitted.

The Manifold Control Panel is digital, fully automatic type and switches from "Bank in Use" to "Reserve" bank without fluctuation in delivery supply line pressure and without the need for external power. After the switch-over, the "Reserve" bank then becomes the "Bank in Use" and the "Bank in Use" becomes the "Reserve" bank. The manifold control panel should have a microprocessor based digital display panel.

The control panel should be incorporated with three large, red, illuminated LED displays for the Left Bank, the Right Bank and for the Supply Pressure. The control panel should also have six LED's, two Green for "Bank in Use", two Amber for "Bank Ready" and two Red for "Bank Empty".

Features:

- Fully automatic self-contained shuttle-valve with no electrical power required for switching
- Input power 240 VAC, 50 HZ
- Microprocessor based control panel incorporates six LED's and illuminated LED display readable even in poor lighting conditions
- Audio-visual alarm indicating changeover from one bank to other bank
- Units of measure switchable (psi/kPa/BAR)
- Two limit switches for positive indication of bank in use
- Dual line pressure regulators
- Delivery flow capacity : 1000 L/min or above at 4.2 bar pressure

3.0 COMPRESSED AIR SYSTEM

3.1 Compressed Air System Indigenous

Medical compressed air system comprising of **triplex**System Air Compressors, base mounted, each having required capacity with suitable Motor and Filter, Non-Return Valve, Isolation Valves along with2 (two) nos. of Receiver Tanks of 1500 litres, 2 nos. of Air Dryers and 2 Pressure Reducing Station along with interconnecting piping to take care of the requirement of desired no. of air outlets.

Type of Compressor :

Air Cooled, totally Oil Free Reciprocating Compressors along with TEFC squirrel cage induction motors (V-belt driven). The Compressed Air System will have **3 nos. of identical Air Compressors.**

Sequence of Operation: The compressors shall run in cascading phenomenon.

Initially 1st and 2nd will run according to the demand, the 3rd will remain as standby; simultaneously, the2nd and 3rd will run according to the demand, whereas the 1st will remain as standby. In case, if two compressors are not capable of achieving the required pressure, the other oneshall start automatically after 3 minutes). The compressors shall run on rotational basis during auto mode. In manual mode, every compressor shall run maintaining the required higher (8.5 kg/cm^2) and lower cut-off pressure (7.5 kg/cm^2).

Specifications of each Air Compressor:

Make	: Anest Iwata /FS Curtis/ Ingersoll Rand India
Type of Compressor Reciprocating Air Compressor	: Base mounted Air Cooled, **100% Oil Free**
Type of Motor	:15 HP, 3-phase, T.E.F.C, foot mounted
` Piston Displacement	: 50 CFM or above at 8.5 Kg/Cm2
Pressure Switch Cut in Pressure	: 7.5 Kg /Cm2
Pressure Switch Cut out Pressure	: 8.5 Kg /Cm2
Type of Starter	: Star Delta
Type of Suction Filter	: Dry Type Filter (Polyester)
Type of drive	: V-belt

Air Receivers:2 nos., each of 1500 litrescapacity should comply with IS 2825/ BS EN 286 for maximum working pressure of 200PSI. Each air receiver shall be equipped

with a suitable pressure gauge, safety relief valve, 3-way by pass and automatic electronic tank drain with manual override.

Air Dryer Type: Heatless Desiccant Type – 2 nos., each dryer should be suitable for above compressor system (i.e. each dryer should be suitable to take the total load of 4compressors). Each Dryer should be supplied with suitable inlet filter.

Duplex Air Dryer, desiccant type, each having full capacity of plant flow with a minimumaccuracy of ±3°C in a range from -20°C to 60°C atmospheric dew- point, with a set point of -46°C. It should be equipped with moisture separator, auto drain valve.

Pressure Reducing System:

For Medical Air : The System will have **2 sets** of Pressure Regulators (one in working & one stand-by) with isolation valves to reduce air pressure to required 4.2 Kg./ cm2 for Medical Air pipeline.

For Surgical Air : The System will have **2 sets** of Pressure Regulators (one in working & one stand-by) with isolation valves to reduce air pressure to required 7 Kg./ cm2 for Surgical Air pipeline.

Automatic drainage traps:

Electrically operated automatic drainage traps should be provided at the bottom of the receivers along with manual drainage facility with isolation valves. The discharge from these drainage traps should be piped outside the room at a suitable place.

4-Stage Breathing Air Filters:

The breathing air filters should have maximum contaminant removal efficiency with minimum pressure drop. The filtration system should conform to breathing air filtration as per ISO 8573, Ch – I Standard. Two sets of 4-stage filters will be provided; while one set will be working, the other set will remain as standby.

Stage-1 & 2: Coalescing filters (Water separator & Oil filter) upstream of the desiccant dryer forgeneral purpose protection, removing liquid water and oil aerosol to 0.1mg, cum (0.1 ppm)and particles down to 1 micron.

Stage-3: Active carbon filter after the desiccant dryer for removal of oil vapors andhydrocarbon odors with maximum remaining oil content of 0.003 mg/cum.(0.003 ppm) willbe installed after stage 3 filter.

Stage-4: Bacteria filter for particle removal.

4.0 VACUUM SYSTEM

4.1 Vacuum System

Indigenous

To design, fabricate, test & install medical vacuum system comprising of **Triplex** System of Lubricated, Air-cooled, Reciprocating vacuum pump /Rotary vane Lubricated vacuum pump may also be offered. Vacuum Pumps each having desired capacity with suitable Motor and interconnecting piping with Filter, Silencer, Non-Return Valve, Isolation Valves, etc. alongwith 2nos. Receiver Tanks, 2 nos. of Bacteria Filters, Auto Switch Gear to set minimum & maximum operating vacuum to 450 mm Hg and 650mmHg respectively to take care of the requirements of desired no. of vacuum outlets.

Sequence of Operation: The vacuum pumps shall run in cascading phenomenon.

Initially 1st and 2nd will run according to the demand, the 3rd& 4th will remain as standby; simultaneously, the 3rd and 4th will run according to the demand, whereas the 1st and 2nd will remain as standby. In case, if two pumps are not capable of achieving the required pressure, the other two shall start automatically after 3 minutes). The vacuum pumpsshall run on rotational basis during auto mode. In manual mode, every compressor shall run maintaining the required higher (-650 mm Hg) and lower cut-off pressure (-450 mmHg).

Each Vacuum Pump will be complete with Base Plate, Belt Guard, V-Belts, Motor and Starter. The system will be of Automatic Start and Stop Type. The Pumps will be connected to 1 nos. vertical receiver of 3000 litres capacity. Receiver will have a drain valve at the bottom.

Specifications of each Vacuum Pump:

Vacuum pump	**: 3 nos.**
Make	**: Ingersoll Rand India/Anest Iwata/Busch**
Piston displacement	: 4235 LPM (149.6 CFM at 29")
Cooling	: Air cooled
Starting	: Unloaded
Drive Data	**: 3 nos. –**
Type	: TEFC Induction Motor
Drive	: Belt drive
Electric supply	: 440 V, 50 Hz, 3Ph.
Vacuum Receiver	**: Two nos.**
Capacity	: 2000 Ltrs.
Design Pressure	: 7 Kg/cm2 (+ve) Pressure

Type : Vertical type and vacuum receiver shall comply with IS: 2825/ BS EN: 286 for a vacuum pressure of 760mm of mercury, made of steel plate as per IS:2062 and fitted with suitable fittings and accessories. The Pumps should be connected to common receiver. The receiver shall havea drain valve and vacuum gauge. The inside of the tank should be coated for rust protection with a double component coating which should provide a hard, durable lining.

Vacuum plant exhaust:

The position of the termination point should be carefully chosen outside the plant room to be clear of windows, ventilation intakes and the intake of air compressors and other equipment.

To reduce noise from the exhaust, a silencer should be fitted in the exhaust pipe of each pump.

The termination point should be turned down and provided with wire mesh protection to reduce the effect of wind pressure and prevent the ingress of rain, snow, insects or animals.

Bacteria Filters:

The Duplex bacteria filters should be designed for critical applications involving the removal of liquid, solid and bacterial contamination from the suction side of vacuum pump systems, each filter is designed and sized to carry the full plant design flow and pressure. Bacteria filters shall have efficiency at least 99.999% when tested by the sodium flame method in accordance with BS 3928:1969 utilizing particles in the 0.02 to 2 micron size range. Bacteria filters shall be marked with the legend 'Bio-Hazard'. Bacteria filter shall be provided with a transparent sterilisable collection jar to collect condensate. It should be internally and externally epoxy coated, easily removable.

5.0 COPPER PIPE

Indigenous

Solid drawn, seamless, de-oxidized, non-arsenical, half-hard, tempered and de-greased copperpipe conforming to BS EN 13348: 2008 shall be used for the installation of pipelines. All copper pipes should be de-greased & to be delivered capped at both ends. The pipes should be accompanied with manufacturers test certificate for the physical properties & chemical composition. Copper pipes should have reputed third party inspection certificate from **Lloyds' Register of Services.**

The Pipe Sizes to be used as mentioned below:

Pipe OD (in mm)	Thickness (in mm)	Maximum interval between supports (Horizontal and Vertical) (in Meters)
12	0.7	1.5
15	0.9	1.5
22	0.9	2
28	0.9	2
42	1.2	2.5
54	1.2	2.5
76	1.5	3.0
108	1.5	3.0

Copper fittings has been made of copper and suitable for a steam working Pressure of 17 bars and especially made for brazed socket type connections. All copper fittings should comply with EN 1254-1:1998 and factory degreased. Each size of fittings should be individually packed for medical use.

Pipe preparation

Pipe ends should be cut with the pipe axis, using sharp wheel cutters whenever possible, and be cleaned to get rid of any cuttings or burrs.

When brazing copper-to-copper joints:

a. The brazed joints should be made using a silver copper- phosphorus brazing alloy and no flux should be used;

b. Brazing should be carried out using oxygen-free dry nitrogen as an internal inert gas shield to prevent the formation of oxides inside the surface of the pipes and fittings.

c. Ensure adequate protection of adjacent pipe runs and other services.

Capping

Sections of pipeline should be capped as soon as they are completed so as to prevent the ingress of debris and other impurities.

Pipe supports

The pipeline should be adequately supported at sufficient intervals to prevent sagging or distortion. Supports for surface mounted pipe work should provide clearance to permit painting of the surface. Where it is essential for pipes to cross electric cables or conduit, they should be supported at intervals on either side of the crossing to prevent them from touching the cables or conduit. Supports should be of suitable material or suitably treated to minimize corrosion.

The spacing of supports shall be as per the latest HTM standard. Suitable sleeves shall be provided wherever pipes cross through walls / slabs. All pipe clamps shall be non-reactive to copper. Metallic pipe clamps must be separated from copper pipes by insulating materials.

INSTALLATION & TESTING

Installation of piping is carried out with utmost cleanliness. Only pipes, fittings and valves which has been degreased and brought in polythene sealed bags should be used at site. Pipe fixing clamps of nonferrous or non-deteriorating plastic suitable for the lower diameter of the pipe (max. upto 42mm OD). For pipe size of over 42mm, metallic clamps may be used by separating the copper pipe by insulating materials.

All pipe joints should be made using flux less brazing method. All joints of copper to copper should be brazed by silver brazing filler material without flux.

After erection, the pipes should be flushed with dry nitrogen gas and then pressure tested with dry nitrogen/ Medical Air at a pressure equal to twice the working pressure (or 10.5 kg/cm2 whichever is higher) for a period of not less than 24 hours. All leaks and joints revealed during testing should be rectified and re-tested till the pressure in pipes stands for at least 24 hours.

Finally, before use of the system, each pipeline should be flushed with working gas.

All the piping system shall be finally tested in the presence of the authorized representative of WBMSCL for final approval and Certification.

PAINTING

Allexposedpipesshouldbe paintedwithtwocoatsofsynthetic enamelpaint andcolourcodification should be as per IS: 2379 of 1990.

Besides pipelines, colour band identification should be applied near to valves, junctions, walls etc. A label applied every 3mtr.bearing 6mm size letters should identify each gas. Self-adhesive plastic labels with direction of flow should be used for this purpose. A band 150 mm wide is usually adequate.

6.0 ISOLATION VALVES

The **isolation valves** should be Non Lubricated Ball type, **suitable for oxygen service**. Necessary certificate should be provided from the manufacturer on this matter. Allvalves should be pneumaticallytestedfortwice theworking pressure and**factory de-greased**formedicalgasservicebeforesupply.

7.0 Alarm Valve Service Unit

7.1 Valve Box Assembly:

Indigenous

Valve Box is made of Powder Coated M.S. Material.

Valve Box Assembly consists of the following:

- Lever operated quarter turn valve (i.e.90 degree shut off ball valve, factory degreased and suitable for oxygen service) with brass body and chrome plated brass ball.
- Brass fittings (Nut, Nipples and extruded brass Adapter) KE Type Seat Brass Block forpressuregauge.
- 2" Dial gauges (0 - 10 kg/cm2,0 - 760mm Hg)
- Nylon Bush for copper pipes holding with the valve box
- Beading for box lead
- Lockable cover with breakable glass so that during normal operation access has been by key. But during emergency operation, access by breaking the glass panel.

8.0 AREA ALARM SYSTEM

8.1 Line Pressure Alarm (DIGITAL)

Indigenous

The area line pressure alarm is micro-processor based which monitor the pressures of medical gases like oxygen and vacuum levels at a specific area of piped gas system in any hospital. The electronic circuitry has been such that if the pressure/ vacuum in the gas pipeline drops below the present limit, the equipment is give an audio-visual alarm. Visual alarm remains active even after pressing of “Mute” button.But it comes to normal condition when gas pressure/ vacuum return to normal level.

The equipment should have following features:

- Digital Display of Line Pressure for all the services (both for Pneumatic & Vacuum Services) with factory calibrated pressure sensors.
- Color coded LED Display of Line pressure status (High – Caution – Normal – Caution– Low)
- Audible Alarm for High & Low pressure condition.
- Test and Alarm Acknowledge (Mute) facility.
- Should be of light weight and with small and compact design.
- Highly sensitive gas pressure sensors of reputed make should be used.
- Mounted on a powder coated MS box.

- Nut & Nipples to be provided for connection with Pneumatic supply line.
- Low voltage internal operation with input power supply of 220V AC.
- Wall mounting facility.
- Gas/vacuum inlet of alarm should be equipped with isolation valves considering ease of maintenance.

9.0 Bed Head Panels (Horizontal/ Vertical)

- Efficient, Safe & Robust design in extruded aluminium section.
- Smooth curved surfaces, and choice of base colour and fascia plates.
- The headwall system should be constructed of aluminium extrusions joined together toform a carcass to suit the particular application. Unit should be factory assembled forelectrical and mechanical components.
- Front fascia plate should be removable individually to access for respective service.
- Length of horizontal/ vertical Bed Head Panel shall be 900 mm.
- Bed head should have provision for Facility per unit as under:
  - Oxygen – 2
  - Medical Air-2
  - Vacuum – 2

10.0 Combined Electrical Control Panel for Compressor & Vacuum System

Common Electrical Control Panel for Air-Compressors and Vacuum Pumps, cubicle type, complete with Mains Incomer, Bus Bar arrangement, Voltmeter with VSS, Phase indicating lights, Phase loss or Phase Reversal indicating light, individual MCBs for all starters, individual Ammetersforall motors, Single Phasing Preventer, Contactors, Overload Relays, Control Circuit MCB, Start/Stop Push buttons, Auto/Manual switches, Pump "ON" & Pump "TRIP" indicatinglights, sequencing Relays (Separate for Air Compressors and Vacuum pumps) with overriding feature. The Control Panel should facilitate synchronize operation of Vacuum Pump and Compressor.Electrical control panel is made of MS Sheet having thickness 16 SWG and should be epoxy powder coated. The electrical control panel would be equipped with auto manual selector, Star-Delta starters 55 each compatible to motors for compressors and DOL starter's compatible to each electric motor for Vacuum pumps.The electrical control panel would be further equipped for triplex/quadruplex and cascade system for vacuum pumps & Air Compressors and also be equipped with safety equipment for the air compressors. Safety equipment for air compressors would include temperature controller temperature indicator.All terminals, switches and lights must be duly marked. Internal wiring

must be duly ferruled. Incomer shall be of adequate size so that it is suitable for the total load of the system

The panel shall be provided with am-meter, power control for Star-Delta (for compressor system) and DOL (for vacuum pump system) Starter, Indication Lamp indicating all three phases, indication lamp indicating compressor 1 on, compressor 1 off, compressor 2 on, compressor 2 off,compressor 3 on, compressor 3 off, vacuum Pump 1 on, vacuum pump 1off, vacuum pump 2 on, vacuum pump 2 off, vacuum pump 3 on,vacuum pump 3 off.

The panel shall also be provided with Hour meter, stop, start and test, switch for control supply on and off, duty selecting switch (auto / manual), indicators for overload.

The panel is designed to trip off the system in case of overload by giving an audio and visual alarm. If the first compressor/Vacuum Pump fails due to any fault, the second compressor/vacuum pump will automatically start without giving any drop in pressure at the outlet point.

Duty selector switch can be used in auto or manual.

Electrical Control Panel will have following features:

- Incoming -MCCBwithaluminum Bus Barandcompletemetering (i.e. Ammeter &Volt meter) with R-Y-B selector switches
- R-Y-B phase indicating lamps (LED type).
- Individual MCCB and Ammeter for Air compressors with Connector &over Load having Single Phase Preventer.
- Individual MCB for vacuum pumps with Connector &over Load having Single Phase Preventer.
- Individual start & stop push buttons with ON/OFF indicating lamps.
- Appropriate relay and programming for changing and running Air compressors & Vacuum pumps according to the mentioned sequence of operation.
- The panel should be provided with prominent engraved identification plates.
- In case of electrical power failure, both compressor and vacuum system should be re-started automatically with restoration of power.
- Individual Auto-Manual switches for Vacuum Pumps & Compressors.
- Tripping for abnormal operating conditions like earth fault, over current etc.
- Panel earthing of 2 nos. 50mm GI pipe electrode to be provided.
- Spare feeder of each type of feeder to be provided.

- The panel should be IEC 61439/1&2 and type test certificate should be in the name of the OEM.
- The vendor should submit drawings and approval to be taken for the same from WBMSCL before manufacturing of panel.
- Approved Spares of Electrical Control Panel

Sl. No.	**Item**	**Manufacture's Name**
1	Motor Protection Circuit Breaker (MPCB)	L&T/ Siemens/ Schneider/ ABB/ Legrand
2	Power Contactor (AC3 duty)	L&T/ Siemens/ Schneider/ ABB/ Legrand
3	Overlay Relay with Single Phase Preventer	L&T/ Siemens/ ABB/ Legrand
4	Change Over Switch	L&T/ Havells/ ABB/ Legrand
5	HRC Fuse & Switch Disconnector Fuse	L&T/ Siemens/ ABB/ Legrand
6	Digital Ammeter/Voltmeter/Multifunctional meter/ tri-vector meter	Secure/ L&T/ Conzerve/ AE
7	LT XLPE Cable	Gloster/ Havells/ Polycab/ Crystal
8	Protection Relays	Alstom/ L&T/ Siemens/ Schneider
9	Timer	L&T/ Siemens/ Havells/ ABB/ Legrand
10	Indicator Lamp (LED Cluster type), Actuator, Push Button	L&T/ Kaycee/ BCH/ Siemens
11	Terminal Block	Elemex/ Wego
12	Lugs	Dowells/ Commet
13	BrassCable Glands	Commet/ Beliga
14	Current Transformer	AE/Kappa/L&T/ Schneider
15	PT	AE/Kappa/L&T/ Schneider
16	Cable/ Wire (Copper, flexible, 1.1 kV PVC insulated FRLS up to 10 sq. mm.)	Havells/ Crystal/ Polycab/ KEI/ RR Cable

17	MCB/RCCB/RCBO/Isolators	L&T/ Siemens/ Havells/ ABB/ Legrand/Schneider
18	Distribution Board (should be design verified as per IEC61439/4)	L&T/ Siemens/Schneider/ Legrand
19	Rechargeable Batteries	Exide/ Amaron/ Quanta

Special feature- If running compressor trips by any cause of trips mentioned, the other compressor should start immediately, by-passing timer switch.

11.0 Double Lock Gas / Vacuum Outlet Points with Adapter (BS type) Indigenous

Outlets should be manufactured with a 165 mm long Copper inlet pipe stub which is silver brazed to the outlet body. Body should be of one piece brass construction. For positive pressure gas services, the outlet should be equipped with a primary and secondary check valve and the secondary check valve should be rated at minimum 200 psi in the event the primary check valve is removed for maintenance.

The outlet assembly must have separate colour coding for each service and should accept only corresponding gas specific adapters.

All outlets must be cleaned and de-greased for medical gas service, factory assembled and tested.

The medical gas outlets should be of quick connecting and wall mounted modular type.

13.0 Single Arm Ceiling Pendants Indigenous

The heavy-duty pendant will be mounted on ceiling and the column length to be fabricated for the specified ceiling height. Each pendant head will have following features:

Number of Gas/Vacuum Outlets-

Oxygen (O_2)	-	2 nos.
Nitrous Oxide (N_2O)	-	1 no.
Compressed Air (4 bar)	-	1 no.
Compressed Air (7 bar)	-	1 no.
Vacuum	-	2 no.
Arm length (horizontal)	-	800 mm (horizontal - centre to centre).
Rotation of Arm	-	330 degree

Material of construction- Gas box -Aluminum PU coatedVertical & horizontal arm, bearing housing - MS.

PU coated Fasteners - SS.

Equipment Carrier - Equipment carrier is mounted at the base of the gas box fittedwith **two nos.** stainless steel tray each of size 700 mm x 400 mm. The position of the tray can be continuously adjusted on the vertical SS rails.

Load bearing capacity - 150 kg.

IV hook - 2 nos.

Interface Plate for gas connection.

14.0 ACCESSORIES FOR PIPELINE SYSTEM

Indigenous

14.1 BPC Flow meter with Humidifier (including accessories up to patient's bed):

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

- Control within a range of 0 – 15 lpm, out of which 0-5 lpm should be with expanded scale.
- It meets strict precision and durability standard.
- The flow meter body is made of brass chrome plated materials.
- The flow tube and shroud components are made of clear, impact resistant polycarbonate.
- Flow Tube has large and expanded 0 – 5 lpm range for improved readability at low flows.
- Inlet filter of stainless steel wire mesh to prevent entry of foreign particles.
- The humidifier bottle is made of unbreakable polycarbonate material and autoclave able at 121°C temperature.

14.2 Ward Vacuum Unit (including accessories up to patient):

Ward Vacuum Unit will be light weight and compact.

The unit will consist of-

- Aregulator,
- A 600 ml.reusablecollectionjar,madeofunbreakablepoly carbonatematerial andfullyautoclave ableat121°C temperature.
- Awallbracketformountingthe jarassemblyonthewall.
- Thevacuumregulator withinstantON / OFFswitchshould be infinitelyadjustableandthevacuumgaugewill indicatesuctionsuppliedbythe regulator.Safety trap should be provided inside the jar to safeguard the regulator from overflowing.

14.3 Theater Vacuum Units (including accessories up to patient):

Theunitwill be consistingoftworeusable2000 mlshatterresistantbottle,eachmade upofpoly carbonatematerialandfullyautoclave ableat 121°C temperature. Thevacuumregulator withinstantON / OFFswitch will be infinitelyadjustableandthevacuumgaugewillindicatesuctionsuppliedbythe regulator.Safety trap should be provided inside the jar to safeguard the regulator from overflowing.There should be athreewayselectorswitchwithanoptiontooperateeither - Left, Right or Both.

Alltheaboveitems should be mountedonanAluminum Trolleyhavingfreemovingcastorwheels.

14.4 High pressure tube for O_2, N_2O, Compressed Air & Vacuum

It should be color coded for individual services i.e. white for Oxygen, Blue for Nitrous Oxide, Yellowfor Vacuum, and Black for air. Antistatic rubber tube should be as per ISO standards.

15. Warranty and CMC

The Contractor is to assure uninterrupted Operation and Maintenance service for 3 (three) year from the date of commissioning of the complete pipeline system.

Complete system should have comprehensive onsite warranty (including labour&spares) for 3(three) year commencing from the date of issue of installation & commissioning certificate by the Hospital/Corporation.

- If the performance of any individual equipment or system is not satisfactory, the same shall be replaced by the Contractor free of cost.
- If it is found that to meet the performance criteria of MGPS, any extra equipment is required the same will be provided free of cost by the Contractor.
- All faults appearing and their rectification shall be periodically advised to the hospital, the period being not more than a month.
- No conditional warranty and CMC will be acceptable.

a) Warranty as well as Comprehensive Maintenance contract will be inclusive of all accessories and consumables for the total turnkey MGPS work and it will also cover the following wherever applicable:-

- Any kind of motor.
- Oil for the vacuum pumps
- Molecular sieves for the air dryers

- Filter cartridges
- Plastic & Glass Parts against any manufacturing defects.
- All kind of sensors, electrical/electronic parts
- All kind of coils, probes and transducers.

b) Replacement and repair will be under taken for the defective goods. Proper marking has to be made for all spares for identification like printing of installation and repair dates.

18. Upon receipt of such notice, the Contractor shall, within 8 hours on a 24(hrs) X 365 (days) basis respond to take action to repair or replace the defective goods or parts thereof, free of cost, at the ultimate destination. The Contractor shall take over the replaced parts / goods after providing their replacements and no claim, whatsoever shall lie on the Corporation for such replaced parts/goods thereafter. The penalty clause for non-rectification will be applicable as per the GCC.

19. In the event of any rectification of a defect or replacement of any defective goods during the warranty period, the warranty for the rectified/replaced goods shall be extended till the completion of the original warranty period of the main equipment.

If the Contractor, having been notified, fails to respond to take action to repair or replace the defect(s) within 8 hours on a 24(hrs) X 365 (days) basis, the Corporation may proceed to take such remedial action(s) as deemed fit by the Corporation, at the risk and expense of the Contractor and without prejudice to other contractual rights and remedies, which the Corporation may have against the Contractor.

During Warranty & CMC, the supplier of Compressor, Air Dryer, Vacuum Pump and Manifold Control Panel is required to visit at consignee's site at least once in 6 months or earlier as required, commencing from the date of the installation for preventive maintenance of the equipment.

Part B

Approved makes or Equivalent Components

Equipment description	**Approved makes**
Manifold	Activ/MR Engineering/MDD/ BS Medical International/IPS
Automatic Oxygen / Nitrous Control panel	BeaconMeades/ Amico/ Allied Medical/ Ohio Medical
Vacuum Pumps	Ingersoll Rand India/Anest Iwata India/ Busch

Air Compressors	Anest Iwata India/ FS Curtis/ Ingersoll Rand India
Breathing Air Filter	Dominick hunter (Perker) / Trident / Summit
Isolation Valve	RB - 5940 or RB – 6674/ (equivalent Medical Grade)
Copper pipes	Lloyds' Certified Medical Grade Copper Pipes Manufacturers in India
Copper Fittings / Joints	IBP Connex/Mex flow Mehta Tubes
Flow meter	Activ/ Aneer engineers/ MR engineering/MDD/ BS Medical
Ward Vacuum Unit	Active/ Aneer engineers/ MR engineering/ BS Medical/ MDD/ IPS
Suction unit	Active/Aneer engineers/ MR engineering/ BS Medical/ MDD/ IPS
Theatre Vacuum Unit	Active/ Aneer engineers/ MR engineering/ BS Medical/ MDD/ IPS
Valve Box & Alarm Panel	Activ/MR Engineering/ MDD/ IPS/ BS Medical International
Gas Outlets (B S Type)	Activ/ MR Engineering/ MPS/ PES/ MDD/ IPS/ BS Medical International
Combined Electrical Panel	Smith/ Jog Electric
Air Drier	Trident/ Summits
Air Receiver Tank	UD Marketing / Hydro Pneumatic/ Premier
MGPS Installation agency along with Operation and Maintenance Service	Linde India/Air Water/MDD Medical System (India) Pvt Ltd / Ellenbarrie Industrial Gasses Limited/SytcoInc /Medical Product Service

Selected bidder will have to arrange for demonstration of the components at WBMSCL office, if felt necessary by the tender committee for approval. All "equivalent" items must be used, subject to prior approval from WBMSCL. Wherever necessary the approved make should have CE / ISO / BIS Certification. QA / QC Test / Electrical safety test certification should be provided.

Sl. No.	Description of Work	Unit	Quantity
1	**OXYGEN SYSTEM**		
1.1	**2 x 20 size Main manifold** complete with middle frame with chain for individual cylinder along with Tail Pipe and Non Return Valve for every cylinder and Isolation Valve, Safety Valve, etc. as required for the complete manifold system as per standards	Set	1
1.2	**2 x 10 size emergency manifold complete** with middle frame with chain for individual cylinder along with Tail Pipe and Non Return Valve for every cylinder and Isolation Valve, Safety Valve, etc. as required for the complete manifold system as per standards	Set	1
1.3	**Fully Automatic control panel Imported** for Oxygen Having a constant delivery flow capacity of 2000 lpm or above at 4.2 bar pressure as per Standards	Set	2
1.4	**Surface/panel/pendant mounted front loading double lock Oxygen outlets** with matching Adapters (BS type) as per standards	Nos.	As required
1.5	**Oxygen Flow meter& Humidifier Bottle:** Back Pressure Compensated Flow meter within a range of 0-15 LPM where 0-5 LPM should be with expanded scale. Humidifier bottle should be made of unbreakable polycarbonate materials and autoclave able at 121 degree Centigrade (to be supplied along with required low pressure tubing and face mask) as per standards	Nos.	As required
1.6	**H.P. tubing** having anti static core white color 5mtrs with kit conversion for Oxygen	Set	As required
2	**NITROUS OXIDE SYSTEM**		
2.1	**2 x 4 size manifold** (Primary & Secondary supply) complete with middle frame with chain for individual cylinder along with Non Return Valves for every cylinder, Safety Valve, etc. as required for the complete manifold system as per standards.	Set	1
2.2	**Fully Automatic control panel Imported** for Nitrous Oxide Having a constant delivery flow capacity of 1000 lpm or above at 4.2 bar pressure as per Standards	Set	1

2.3	2 cylinder Emergency Nitrous oxide arrangement using a high flow double stage Regulator with gauges complete with middle frame with chain for individual cylinder along with Non Return Valves for every cylinder as per standards	Set	1
2.4	**Surface/panel/pendant mounted front loading double lock Nitrous Oxide** outlets with matching Adapters (BS type) as per standards	Nos.	As required
2.5	**H.P. tubing** having antistatic core Blue color 5 mtrs. with Kit conversion for Nitrous Oxide as per ISO Standards	Set	As required
3	**MEDICAL AIR SYSTEM**		
3.1	Compressed Air System complete with 3 **nos.** of non-lubricated, Reciprocating each of 15 HP Motor with 57 cfm capacity at 8.5Kg/cm2 pressure with Isolation Valve for each compressor, 2 nos. Air dryer with by-pass valve arrangement, Duplex Pressure Reducing Unit each for Air 4 bar and Air-7 bar valve arrangementFlexible High pressure SS Hose for each compressor NRV for each compressor, 2 nos. Air Receiver of 1500 litre capacity with Safety Valve and interconnecting pipelines, Pressure Gauge with Valve Arrangement in the Air Receiver Valve – Upstreamof Air ReceiverAutomatic Drain Arrangement for air receivers Air Compressor By pass line Pressure Gauge with Valve arrangement in Main line Isolation Valve in the main line	Set	1
3.2	Supply, Installation, Testing and commissioning of **4-stage air filtration system (suitable for 15 HP Compressor) as per ISO 8573**.1.	Set	2
3.3	**Surface/panel/pendant mounted front loading double lock Medical Air-4 bar Outlets** with matching Adapters (BS type)	Nos.	As required
3.4	**Surface/panel/pendant mounted front loading double lock Surgical Air-7 bar Outlets** with matching Adapters (BS type) as per standards	Nos.	As required
3.5	**HP colour** coded black Tubing having anti static core as per ISO Standards	Mtr	As required

4	**VACUUM SYSTEM**		
4.1	**Vacuum Central System** Complete with 3 **nos.** Vacuum Pumps each having 149 cfm PD with 10 HP motor Filter, interconnecting pipes, NRV, auto switch gear assy., exhaust silencer And Receiver – 2 No. 2000 liters, 2 nos. Bactria Filters, oil trap filter, etc.NRV for each Vacuum Pump Isolation Valve for each Vacuum Pump Valve - Upstream of Vacuum Receiver Vacuum Drain valve with flask arrangement Filters for each vacuum pump Silencer for each vacuum pump.	Set	1
4.2	**Surface/panel/pendant mounted front loading double lock Vacuum Outlets** with matching Adapters	Nos.	As required
4.3	**Ward vacuum Unit :** It shall include vacuum regulator along with 0-760 mm of Hg vacuum gauge,600 ml capacity reusable poly carbonate collection bottle with overflow safety trap and autoclave able at 121 degree Centigrade with plastic slide wall mounted type (to be supplied along with required low pressure tubing with catheter).	Nos.	As required
4.4	**Theatre Vacuum Unit:** It shall be trolley mounted. The unit shall include one regulator along with 0-760 mm of Hg vacuum gauge mounted on the trolley stand, having two reusable collection bottles each of 2000 ml capacity and made of unbreakable polycarbonate materials, autoclave able at 121° Centigrade, having over flow safety trap, mounted on the base of trolley unit made of aluminum along with castor wheels and connected with regulator & low pressure tube inter-connections (along with required low pressure tubing with catheter).	Nos.	As required
4.5	**High Pressure** color coded yellow Tubing having anti static core as per ISO Standards	Mtr	As required
4.6	**Low Pressure** Tubing having anti static core as per ISO Standards	Mtr	As required
5	**ELECTRICAL CONTROL PANEL FOR COMPRESSOR & VACUUM SYSTEM**		

5.1	Supply, Installation, Testing and commissioning of Combined Electrical Control Panel for Vacuum System (10HP each) & Compressed Air system (15HP each) with Duplex/ Cascading/ Sequencing facilities and complete with plant Room wiring .	Set	1
6	**PIPELINE DISTRIBUTION SYSTEM**		
6.1	Supply, Installation, Testing and commissioning of **copper piping with Lloyds' Certified Copper Pipes as** per BS EN 13348: 2008. Pipe sizes will be as follows:		
6.1.1	12 mm OD x 0.7 mm thick	Mtr	As required
6.1.2	15 mm OD x 0.9 mm thick	Mtr	As required
6.1.3	22 mm OD x 0.9 mm thick	Mtr	As required
6.1.4	28 mm OD x 0.9 mm thick	Mtr	As required
6.1.5	42 mm OD x 1.2 mm thick	Mtr	As required
6.1.6	54 mm OD x 1.2 mm thick	Mtr	As required
6.1.7	76 mm OD x 1.5 mm thick	Mtr	As required
6.2	**Isolation Valve (factory-degreased) with brass adapters**		
6.2.1	15 mm	Nos.	As required
6.2.2	22 mm	Nos.	As required
6.2.3	28 mm	Nos.	As required
6.2.4	42 mm	Nos.	As required
6.2.5	54 mm	Nos.	As required
6.2.6	76 mm	Nos.	As required
6.3	**VALVE BOX with** NIST connectors for oxygen with lockable arrangement and breakable glass cover.		
6.3.1	2 valve configuration with size 15 O2, 22 VAC	Nos.	As required
6.3.2	3 valve configuration with size 15 O2, 15 MA4, 22 VAC	Nos.	As required
6.3.3	4 valve configuration with size 15 O2, 15 N2O, 15 MA4, 22 VAC	Nos.	As required
6.3.4	5 valve configuration with size 15 O2, 15 N2O, 15 MA4, 15 SA7, 22 VAC	Nos.	As required

6.4	**ALARM SYSTEM** : Providing and fixing digital alarm system for Medical gas system complete consisting of pressure sensors, panel and the control cabling, all wiring shall be within 1mm sq multi core data cable, PVC pipe for data cable. Panel shall be self-contained low voltage (less than 24 V)		
6.4.1	2 service alarm configuration for O2 and VAC	Nos.	As required
6.4.2	3 service alarm configuration for O2, MA4, VAC	Nos.	As required
6.4.3	4 service alarm configuration for O2, N2O, MA4, VAC	Nos.	As required
6.4.4	5 service alarm configuration for O2, N2O, MA4, SA7, VAC	Nos.	As required
7	**CEILING PENDANTS**		
7.1	**Ceiling Anesthetist Pendants for OT :** Supply, Installation, Testing and commissioning of Rigid Ceiling Pendant with 7 nos. of Gas & Vacuum Outlets (2-Oxygen, 1-N2O, 1-Air 4 bar, 2-Vac)	Nos.	As required
7.2	**Ceiling Surgeon Pendants for OT :** Supply, Installation, Testing and commissioning of Rigid Ceiling Pendant with 7 nos. of Gas & Vacuum Outlets (2-Oxygen, 1-N2O, 1-Air 4 bar, 1 Air 7 bar & 2-Vac)	Nos.	As required
8	**BED HEAD PANELS**		
8.1	**Bed Head Panels** having a length of 900 mm (provision for 2 oxygen, 2 med air and 2 suction outlets)	Nos.	As required
Total for Design, Supply, Installation and Commissioning of MGPS			
Operation & Comprehensive Maintenance charges for the 1st Year			
Operation & Comprehensive Maintenance charges for the 2nd Year			
Operation & Comprehensive Maintenance charges for the 3rd Year			

Part C

OPERATION AND MAINTENANCE OF MEDICAL GAS SYSTEM

Scope of Work

The primary objective of the bidder is to ensure safe and reliable MGPS and their efficient operation and use as per **HTM - 2022/NFPA 99 C standards**. The Contractor will be responsible for operational management and maintenance of

- Medical Oxygen System -Manifold and Control panels
- Nitrous Oxide System - Manifold and Control Panel
- Medical Air System - Compressor systems, Control panel, Dryers, Reservoir, Filters, etc.
- Medical Vacuum System - Vacuum pumps, Control panel, Reservoir, Filters etc.
- Copper pipelines
- Area Valve Service Units
- Isolation Valves
- Area Alarm panels and Master/ Main alarm panels
- Gas Outlets with Adapters and Accessories
- Ceiling Pendants/ Bed Head Panels

Staff responsible for plant operation should be aware of the activities necessary to ensure the continued safe operation of the system and what action should be taken in an emergency. The authorized person (MGPS) in particular should take a lead in explaining to users the function of the system and will have to be adequately trained and informed about the system. The Contractor will be responsible for safe cylinder handling including loading, unloading and storage. Any work involving alterations, extensions or maintenance work on the system should be subject to the permit-to-work procedure as per HTM standards.

Operation of Medical Gas

The Contractor should provide skilled manpower to operate the plant and manifold system throughout 24 hrs x 365 days in a year.

The Contractor, during operation should ensure a trouble free supply at the outlets at the required pressure and flow. It shall monitor the consumption of O_2& N_2O on hourly basis and submit a consolidated report weekly. Timely intimation of gas cylinders refill due date, and other service maintenance has to be done by the Contractor. The Contractor shall place indent upon the hospital authority for supply of cylinders. Hospital authority will be responsible to take back the empty cylinders and supply the filled cylinders. It shall be the duty of the Contractor to assist in the loading and/ or unloading of empty/ filled cylinders to and from the trucks.

The Contractor, while undertaking operation, shall be fully aware of the safety regulations applicable for Medical Gas System. It is the mandatory responsibility of the Contractor to conduct training sessions of adequate level to the workforce to keep them fit for handling the plants and associated systems. All tests to be conducted by authorized persons, competent persons, quality controller etc have to be arranged by the contractor additionally as required. The Contractor may refer to relevant part of HTM for details like responsibilities.

Operational Policy

Refer Section: 5, HTM - 2022 Part B (Operational Management)

Routine Activity

1) Manifold (Oxygen and Nitrous Oxide)

- Inspection of Liquid Medical Oxygen level in the LMO tank
- Working andreserved cylinder pressure
- Checking for leakage
- Checking inlet and outlet pressure
- Checking the change over
- Loading the cylinder as required
- Replacement of defective parts
- Notifying breakdown logging details

2) Compressed Air

- Checking the operation of compressors (sound, vibration, etc.)
- Checking change over
- Checking delivery pressure
- Checking the dryer and change over
- Checking the receiver
- Checking the filter
- Functioning of auto drain of receiver

3) Medical Vacuum system

- Checking vacuum pump operation
- Checking delivery vacuum level
- Checking vacuum controls in receiver
- Checking change over
- Checking for drop in vacuum level

Section- 5.6

28. Digital Communication facilities of Teaching Groups:

DIGITALLY CONNECTED TEACHING GROUPS: Demo Room, Laboratory Room, Museum, Medical Education, Teaching Room, Student Practical Room and All the Laboratories.		
SL. NO.	**Technical Specification**	
Interactive Flat Pannel 86 inches (Ekin/Cisco/promotion/Smart)		
1	Active Screen Size ("inch)	86"
	Display Backlight	DLED
	Display Area	1893*1069mm
	Display Ratio	16 : 9
	Resolution	3840*2160 or better
	Display Colors	10 bit or better
	LCD Brightness	>450cd/m2 or better
	Contrast Ratio (Typical)	15000:1 or better
	Response Time (Typical)	4ms or better
	Viewing Angle	178◦
	Life time (working hours)	>50,000 hours or better
	Display Orientation	Landscape
	Reference Frequency	120Hz
	Speakers	Shout be SEAMLESSLY build-in the display
	Max.Power Output	2x15 Watts or above
	Speaker Position	Seamlessly mounted in lower side of the display. Front facing, Forward through
	Rated Impedance	8Ω
	Freq.Response	180Hz-20kHz
	Output S.P.L.	84 ± 3dB
	Touch Technology Deployment	Touch feature should be seamlessly build-in the display and NO overlay is allowed
	Touch Sensor	Advanced IR
	Surface material of touch surface	Anti-Glare & Anti-Finger Print Glass
	Protection	3M antigalre
	Haze	2%~5%
	Touch Screen Writing Tools	Nano Pen (>3mm width) included or Finger
	TOUCH Response time	≤4ms or better
	Positioning Accuracy	±1mm or better
	Transmission Range	5M
	Transparency	>88% or better

	Surface Hardness	H7 or More than H7
	Glass thickness	4 mm
	HID Support	Must have a provision to connect with any external sources
	Touch Points in Windows	Must have a touch capability of MINIMUM 20 points
	Touch Points in Embedded OS	Must have a touch capability of MINIMUM 10 points
	Writing Tool	Shall use with Nano Pen (>3mm width) included or Finger
	Scan Speed	133Hz or better
	Communication Interface	inbuilt - USB-A type
	Requirement of Front access ports with flip	For the purpose of ease access the display must have the following ports in the front side and must have flip cover to close when not in use
	Minimum required Input ports at Front side of the display	1 x HDMI(1.4 , 4K@30Hz):- To connect with any resources 1 x Exclusive USB1 for Touch :- To connect with any resources and operate 2 x Exclusive USB for Media Play function:- To directly view the contents from USB 1 x Microphone(3.5mm):- To connect any external microphone
	Minimum Requirement of AV Inputs at rear side	HDMIx1(2.0,4K@60Hz) + USB for Touch Port 1 while using HDMI port HDMIx2 (2.0,4K@60Hz)+ USB for Touch Port 2 while using HDMI port DPx1 (4K@60Hz)+ USB for Touch Port 3 while using Display port VGAx1 (1920x1080@60Hz) + USB for Touch Port 4 while using VGA port
	Minimum requirement of AV Outputs at rear side	HDMIx1(4K@60Hz)- Transmit the signal to other display with equipment with High definition 3.5mm Line out x 1 DC Out (5V 2A) x1 SPDIF out x 1
	Minimum Requirements for other ports at rear side	USB 2.0 x2 : - To directly view the contents from USB RS232 x1 :- Device Controlled by any third party controller RJ45 x1 :- Input port of Local area network RJ45 x1 :- Output port of Local area network USB 3.0 x1 :- To connect external USB camera OPS Slot (4K@60Hz):- To connect OPS PC for windows function
	Multimedia File Formats Supported	Support all major types of multi-media files
	GUI - Graphic User Interface	The display must have GUI for ease access of resources, functions and shortcuts. This GUI shall be any proprietary OS but must be computable with Android coding.
	Discussion / White Board	Build-in white board (seamless writing) with inbuilt browser
	newline cast	A wireless presentation software comes with inbuilt for inroom presentation Maximum connectivity of BYOD devices - 4 / 6 users (Android 4 user / Win 6 user) **Control** - The setup should be in such a way that the presenter should have

		control of the GUI of this Remote Interactive Presentation Kit from the Touch Interactive Flat Panel Display **Display capability** - Equipment should have capability to display 4 /6 sources at a time system Supported - Win/Mac/ios/Android
	newline Display Management	CENTRALLY MANAGE ALL YOUR INTERACTIVE DISPLAYS: Easily manage and deploy apps, configure display settings, add licences, use digital signage features or broadcast emergency messages to all Newline interactive displays, without ever having to leave your desk.
	newline Broadcast	SHARE CONTENT TO AUDIENCES OF ANY SIZE HASSLE-FREE BROADCASTING Joining the broadcast is simple: Access the Broadcast webpage and Share your screen in real-time from your Newline display to any participant connected. Easily invite up to 200 participants to connect their own device from the meeting room, classroom, lecture theater or any other place in the world with a network connection.
	Other features	The onboard system supports….Annotation, saving and send email of annotation files and selecting the inputs and changing the volume , Scheduling function for meeting room schedules , Buildin wifi(2.4G/5G) and so on
	File Commander	Helps to easily open your USB drive and access your documents / files . **Additional features in File commander** : **Add Cloud** : Cloud Based file storage services are availbale . User can directly download their docummets or files and access during presentation. **FTP** : File Transfer Protocol (FTP) is the commonly used protocol for exchanging files over the Internet **Local Area Network** : A local area network (LAN) is a group of computers and associated devices that share a common communications line or wireless link to a server.
	Email support	Pre loaded Aqua mail - you can easily email your whiteboard content to anyone
	Business calendar	A pre loaded business calenser is available you can set schedules and synchronize with Google calendar for meeting room schedules
	Customized GUI	User can easily customized their own background and logo's.
	Multimedia File Formats Supported	Support all major types of multi-media files
	Object Regonisation	This product supports object recognition and produces different effects according to the diameter and size of the input objects. ● Fist/palm: identified as an eraser (100 pt). ● Fine Pen (3mm): suggested to use while writing. ● Thick Pen (≥ 8 mm)/ finger: suggested to use when you want to

		highlight
	OTA (Over-the-Air) Update	Upgrade the latest firmware for your displays through our OTA Update support and keep them running smoothly at all times
	Smart Eye production	Smart Eye Protact keep your eye vision safe from IFPD's light
	Blue light filter	Blue light contributes to digital eye strain; IFPD's glasses that block blue light may increase comfort for users
	Chipset	MTK8386 or higher
	CPU	ARMv8 A73*2+A53*2 (A53 : 1.05-1.3GHz; A73 : 1.15-1.5GHz) or higher
	GPU	Mali-G51MP2 650 MHz or higher
	RAM	3GB or higher
	ROM	16GB build in or higher
	External Memory	32GB TF card (build in) or higher
	Total In-built Memeory	48GB (Inbuilt TF Card slot support max 64GB) or higher
	Android Version	8.0.0 or higher
	Android resolution	4K
	Storage Temperature/Humidity	-15℃~55℃/20～90%RH(Non coagulation)
	Working Temperature/Humidity	0℃-40℃/20～80%RH(Non coagulation)
	Mounting Capabilities	Display must have facility to mount on floor stand or wall brackets
	Local Office for Bidder	The Bidder mush have their office Kolkata
	Brand	Brand should be Indian
	Manufacturer's authorization	The bidder must submit the authorization certification
Wall Mount Kit for Pannel(Ebco/MX/Ekin)		
2	Suitable for TV size:65"-98"	
	Including a precision bubble lever to assure proper mounting angle.	
	Fits most flat panel plasma and LCD TV, safe and easy to install.	
	Surface: powder coated.	
	Compliant to VESA standard: 200*200mm.	
	Max load capacity: 85 kg.	
OPS (i5 7th gen,8 GB Ram,128 GB SSD,1TB HDD)(/Cisco/promotion/Ekin/Smart)		
3	CPU	Intel® Core™ i5 7200U
	RAM	8GB
	Storage	256G SSD and 1 TB HDD
	TPM	2
	I/O Ports	3.5 mm MIC x 1
	HDMI (1.4 4K@24HZ)	x 1

	3.5 mm line out	x 1
	USB 2.0	x 2
	USB 3.0	x 2
	RJ45	x 1
	HDMI (1.4 4K@24HZ)	x 1
	3.5 mm line out	x 1
	USB 2.0	x 2
	USB 3.0	x 2
	RJ45	x 1
	RS232 Controls	N.A
	Built-in Wi-Fi	2.4G/5G
	OPS Interface	TX24A Supports 4K@60HZ
PTZ Camera 10X with USB Extender 3G Cable (Ekin/Cisco/Polycom)		
4	Optical Zoom	10x, f=4.7—47mm
	Video format	ST/HD Video format: 1080P60/50/30/25/59.94/29.97
	View Angle	6.43degree (tele)—60.9degree wide.
	Iris	F1.8 – F2.4
	Sensor	½.8 inch high quality HD CMONS Sensor
	Effective Pixels	10:9 2.07MP
	Digital Zoom	10X
	Minimum Illumination	0.5Lux (f1.8, AGC ON)
	DNR	2D & 3D DNR
	White Balance	Auto/Manual/One Push/3000K /4000K/ 5000K/ 6500K
	Focus/Iris/Electronic Shutter	Auto/Manual
	BLC	On/Off
	WDR	OFF/Dynamic level adjustment
	Video Adjustment	Brightness, color, Saturation, Contrast, Sharpness. B/W mode, Gamma curve
	SNR	>55dB
	Video Interfaces	USB, LAN, RS232, Audio-In
	Video Compression format	H.264, H.265, Dual stream output
	Control Protocol	VISCA/Pelco-D/Pelco-p;Baud Rate:115200/9600/4800/2400bps
	Audio Input Interface	Double track 3.5mm linear input
	Audio Compression format	AAC/MP3 Audio compression
	LAN Port	100M IP Port(100Base-TX); Support VISCA protocol control through IP Port.
	Network Protocol	RTSP,TRMP, ONVIF, GB/T28181
	Power Interface	HEC3800 outlet (DC12V)
	Pan/Tilt Rotation	+-170 degree, -30 degree--+90 degree
	Pan Control Speed	0.1—60 degree/sec
	Tilt Control Speed	0.1—30 degree/sec
	Preset Speed	Pan:60 degree/sec, Tilt 30 degree/sec

	Preset number	255 presets (10 presets by remote controller)
	Power Adapter	AC110V-AC220V to DC12V/1.5A
	Dimension	150mmX150mmX167.5mm
	Weight	1.4Kg
	Remote Operation (IP)	Remote Upgrade, Reboot and Reset
PA SYSTEM 1. 4 pcs Speaker @ 20 Watts. 2. Amplifiers 140 watt for communication for multiple sound device ie.Laple or collar mike. (Ekin/Bose/Studio Master)		
5	**Amplifier with Mixture**	
	Power Output	10% THD – 160W RMS
		5% THD – 150W RMS
		1% THD – 120W RMS
		Max – 200W
	Outputs Speakers	min 4 Ω, 8 Ω, 16 Ω, 70V, 100V
	Line Out	1V/600 Ω
	Pre Out	1V/600 Ω
	Input 1–4	Mic 1.5 mV/1.1kΩ 300mV/14kΩ; XLR, balanced 300mV/50kΩ; RCA, unbalanced
	AUX	300mV/50kΩ; RCA, unbalanced
	Frequency Range	80 –15000Hz, ±3dB
	S/N ratio	> 75dB
	Bass	+6dB/-10dB/100Hz
	Treble	±10dB/10Hz
	Power Supply	240V~/50Hz
	External DC Supply	24V/9A
	Dimensions (W x D x H)mm	482 x 305 x 95 (2U)
	Wireless Mic For Teacher.	
	Type:	Condenser
	Impedance:	1-1.9KΩ
	Sensitivity:	-44±2dB RL=800Ω VS=1.5V (1KHz 0dB=1V/Pa)
	Frequency Response:	50-16KHz
	Direction:	Uni-direction
	S/N Ratio:	More Than 58dB
	Frequency:	672.5-684.5MHz
	Radio Frequency Power	10dBM/10MV
	On-off Control:	Physical Switch
	Power Supply Voltage:	2*AA Batteries
	Frequency:	672.5-684.5MHz
	Sensitivity:	-95db
	S/N Ratio:	More than 58dB
	Frequency Response:	40Hz-15KHz
	Power Supply:	USB,5V

	Wireless Mic For Student	
	Receiver	Dual Channel Non-Diversity
	Frequency Response	40Hz-16kHz
	Polar Pattern (Hand mic)	Cardioid
	Output	Individual Channel: XLR Mix out: ¼" Jack
	Power Req. (Hand mic)	2 x 1.5V AA
	Receiver	240V AC 50Hz for AC Adaptor Supplied with the set
	Speaker	
	Speaker Type	Wall Mount
	Speaker Units	3" Woofer & 1" Tweeter
	Rated Power	20W
	Power Tap Selection	20W / 10W / 5W / 2.5W/8 Ω
	Frequency Response	90Hz-20KHz
	Input Voltage (Max)	100V
	Sensitivity	85±3dB (1W,1M)
	Cabinet Material	ABS
6	**Cable and Accessories (Ekin/Aten/Kramer/Xtron/Best-net)**	
	6U Rack	
	Rack Standard	Conforms to DIN 41494 or equivalent standard
	Construction	Welded
	Front Door	Lockable Toughened Glass Door
	Basic Frame	Steel
	Equipment Mounting	DIN Standard Slots
	Mounting Angle	19" Mounting angles made of formed steel
	Standard Finish	Powder Coated
	Top and Bottom Cover	Welded to Frame, Vented and Field Cable entry exit cut outs
	Standard Color	Grey or Black
	Static Load	10-15 kgs.
	HDMI Spliter(1X4)	
	HDMI Source input port	1
	Display Device output port	2
	Source port connector	19pin HDMI
	Display device port connector	19pin HDMI
	HDCP compliant	Yes
	Signal link range	1920x1080p@60Hz
	Bandwidth	up to 225MHz
	Signal Speed	Up to 6.75Gbps
	Deep colour	30/36 Bit
	HDMI version	HDMI 1.4v
	The cable standard	26awg
	Vertical frequency range	60Hz
	Power consmption (max)	5 Watts

	Working voltage	DC5V
	Operation temperature	-15°C to 40°C
	The Length of input cable	≤10M
	The Length of Output cable	≤20M
	HDMI Splitter Extender 1x4	
	Length of CAT-6 cable between Rx and TX up to	60m
	HDMI Input	24/50/60fs/1080p/1080i/720p/ 576p/576i/480p/480i
	Support audio format input/ output	DTS-HD/Dolby-trueHD/LPCM7.1/ DTS/Dolby-AC3/DSD
	HDMI Output	24/50/60fs/1080p/1080i/720p/ 576p/576i/480p/480i
	Max bandwidth	22.5MHz
	Max baud rate	6.75Gbps
	Input Video signal	0.5~1.5Volts p-p
	Output DDC signal	5Volts p-p (TT1L)
	Input HDMI cable distance	AWG24≤5m, AWG26≤5m
	Output HDMI cable distance	AWG24≤5m, AWG26≤5m
	Max working current(TX)	2000mA
	Max working current(RX)	600mA
	Power adapter format(TX)	Input:AC (50HZ, 60HZ) 100V-240V; Output: DC5V/3A
	Power adapter format(RX)	Input:AC (50HZ, 60HZ) 100V-240V; Output: DC5V/1A
	Operating Temperature range	(0 to +40°C)
	Operating Humidity range	5 to 90%RH (No Condensation)
	Patch Coard	
	Material	CAT.6 CCA Patch Cord
	Cable Color	Red, Yellow, Blue, Gray, Black
	Characteristic Impedence	100±150 @ 1 ~ 250MHz
	Conductor Construction	Copper Coated Aluminum
	Conductor Resistance	93.80/km/20°C max
	Conductor Size	24AWG x 4pairs
	Connector Type	50 micron gold-plated connector
	Dielectric Strength	AC 1.75kV/0.15sec
	Flame Retardant Test	CM
	Operating Temperature	20ºC ~ 85ºC
	Storage Temperature	40ºC ~ 60ºC
	Insulation Material	HDPE
	Jacket Diameter	5.9±0.15mm
	Jacket Material	PVC
	Mutual Capacitance	56pF/m max
	Propagation Delay	536nS/100m max @ 550MHz
	Rating	75°C, 300V
	Spark Test	2.5kV
	Standards Compliance	ISO/IEC 11801; TIA/EIA-568-B.2

	Plug	CAT 6 Plug 03MU"
	PVC	70P
	Cable Tie	"C" MM
	Color	Transparent White
	HDMI Cable	
	Conductor	Bare copper
	Jacket	PVC
	Connector	HDMI Plug 19P, Durable 24K gold plated
	Housing	PVC moulded with metal shell
	Shielding	Aluminum foil and Braiding
	Color	Black
	Ferrite core	Yes
	Application	widely used in HDTV, EVD, HDVD, AMP, Home Theater, DVD player, projector, PS3, Xbox360, set-top boxes, Video wall etc.
	PPT Presenter	
	Wireless Laser Presenter Powerpoint PPT Presenter Slide Changer Controller with USB Receiver Battery Indicator	
7	**65" Pannel/TV with Mounting Kit (Ekin/LG/Samsung/Sony)**	
	Product Dimensions	145.6 x 26.4 x 89.8 cm; 18.5 Kilograms
	Memory Storage Capacity	16 GB
	Ram Memory Installed Size	2 GB
	Operating System	Android
	Hardware Interface	USB, HDMI
	Graphics Coprocessor	Mali470x3 600MHz-800MHz
	Response Time	8 Milliseconds
	Resolution	4K
	Special Features	Smart TV Features: 4K Android TV (Android 9.0) plus HDR | AI-Google assistant | Google cast plus T-cast | Bluetooth
	Mounting Hardware	1 LED TV, 1 Table Top Stand, 1 Wall Mount Bracket, 1 User Manual, 1 Warranty Card, 1 Remote Control
	Remote Control Description	Comes with navigation keys on the remote for better functions
	Remote Control Type	IR, Bluetooth
	Display Technology	LED
	Standing screen display size	65 Inches
	Display Type	A+
	Viewing Angle	178 Degrees
	Image Aspect Ratio	0.672916667
	Image Brightness	High brightness
	Image Contrast Ratio	208.3340278
	Supported Image Type	PNG, JPEG
	Screen Resolution	3840 x 2160 pixels
	Resolution	3840x2160 Pixels
	Supported Audio Format	Mp3_audio, Wma

	Speaker Surround Sound Channel Configuration	AI Sound Engine | Dolby Audio
	Audio Wattage	20 Watts
	Power Source	AC
	Batteries Included	No
	Batteries Required	No
	Refresh Rate	60 Hz
	Total Usb Ports	2
	Connector Type	USB, Built-in Wi-fi, HDMI
	Maximum Operating Distance	8 Feet
	Mounting Type	Wall Mount
	Media Format	AVI, MPEG
	Remote Control Included?	Yes
8	**OFFLINE UPS 2KVA with 10 min backup (Microtech/Numeric/APC)**	
	Input Voltage	110 V
	Input Frequency	40Hz ~ 70 Hz
	Output Voltage	240 V
	Output Frequency	50 Hz ± 0.25 Hz or 60Hz ± 0.3 Hz
	Output Power Wattage	750 W
	Efficiency	88% / 86% %
	Output Waveform	Pure Sineweave
	Transfer Time	3 ms
	Number of Outlet Plugs	3
9	**Interactive Software (Zoom/Google Meet/Ekin)**	
	Simple Online Meetings	
	High quality desktop and application sharing	
	Personal meeting ID and URL name	
	Instant or scheduled meetings	
	MP4 or M4A recording	
	Virtual backgrounds	
	Host controls	
	Raise hand	
	Cloud Video Conferencing	
	HD video	
	HD Voice with dynamic voice detection	
	Full screen and gallery view	
	Dual stream for dual screen	
	Feature-rich mobile apps for iOS and Android	
	Join as view-only attendee	
	Group Collaboration	
	Mac, Windows, Linux, Chromebooks, iOS and Android	

	Group messaging
	Screen share documents, photos and video clips
	Simultaneous screen sharing
	iPhone/iPad screen share with iOS mirror
	Annotation and co-annotation
	Keyboard and mouse control
	Whiteboarding