

Subhead-11

Medical Gas & Vacuum Pipe Line System (MGVPS)

Item No.	Description of items	Unit	Unit rate	Unit rate	Unit rate	Unit rate
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11.1

**MEDICAL GAS OUTLETS**

Supply & installation of medical gas and vacuum outlets conform to the following standards: Terminal units shall be gas specific only to accept correct medical gas probe. For positive pressure gas services, the outlet should be equipped with a primary, and secondary check valve. The secondary check valve should be rated at a minimum of 1379 kPa if the primary check valve is removed for maintenance. Outlet bodies should be gas-specific by indexing each gas service to a gas-specific dual pin indexing arrangement on the respective identification module. Gas-specific components within a terminal unit shall be pin indexed to ensure that a correct gas-specific assemble is achieved. Each terminal unit shall incorporate a maintenance valve, designed to shut off the gas flow when the terminal unit is removed for maintenance purposes. The units shall be capable of single-handed insertion and removal/push type. A color-coded front plate should be used for ease of gas identification and aesthetic appeal. A one-piece fascia plate should frame the outlet. The units should be suitable for concealed installation and should be complete in all respect including chromed fascia. First fix assembly, second fix assembly, fascia plates, fixing screws, etc. distance between outlets must conform to a recommended minimum, and the facial plate shall be sized accordingly. All outlets shall be a 360-degree swivel inlet pipe for easy installation. All outlets shall be cleaned, degreased, and covered with anti-bacterial film for medical gas service and factory assembled and tested.

Standard : HTM-02-01/ HTM-2022/NFPA 99/ DIN / JIS or equivalent

*[Handwritten signatures and initials in blue ink, including names like 'Sam', 'A.', 'S', 'Rohit', 'Sul', 'A.', 'R.S.', and 'A.A.']*

Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of minimum 20 (twenty) years including predecessor company's experience (if any) .

11.1.1 Country of origin : USA / CANADA /UK / EU / JAPAN

11.1.1.1	Outlets for Oxygen (345kpa-500 kpa)	Set	Tk.	7,092.00 Tk.	7,092.00 Tk.	7,092.00 Tk.	7,092.00
11.1.1.2	Outlets for Nitrous Oxide (345kpa-500 kpa)	Set	Tk.	7,092.00 Tk.	7,092.00 Tk.	7,092.00 Tk.	7,092.00
11.1.1.3	Outlets for Medical Air (345kpa-500 kpa)	Set	Tk.	7,092.00 Tk.	7,092.00 Tk.	7,092.00 Tk.	7,092.00
11.1.1.4	Outlets for Nitrogen / Surgical Air (700 kpa-800kpa).	Set	Tk.	7,092.00 Tk.	7,092.00 Tk.	7,092.00 Tk.	7,092.00
11.1.1.5	Outlets for Medical Vacuum	Set	Tk.	7,092.00 Tk.	7,092.00 Tk.	7,092.00 Tk.	7,092.00
11.1.1.6	Medical Vacuum slides	Set	Tk.	2,135.00 Tk.	2,135.00 Tk.	2,135.00 Tk.	2,135.00

11.1.2 Country of origin : TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM

11.1.2.1	Outlets for Oxygen (345kpa-500 kpa)	Set	Tk.	5,005.00 Tk.	5,005.00 Tk.	5,005.00 Tk.	5,005.00
11.1.2.2	Outlets for Nitrous Oxide (345kpa-500 kpa)	Set	Tk.	5,005.00 Tk.	5,005.00 Tk.	5,005.00 Tk.	5,005.00
11.1.2.3	Outlets for Medical Air (345kpa-500 kpa)	Set	Tk.	5,005.00 Tk.	5,005.00 Tk.	5,005.00 Tk.	5,005.00
11.1.2.4	Outlets for Nitrogen / Surgical Air (700 kpa-800kpa).	Set	Tk.	5,005.00 Tk.	5,005.00 Tk.	5,005.00 Tk.	5,005.00
11.1.2.5	Outlets for Medical Vacuum	Set	Tk.	5,005.00 Tk.	5,005.00 Tk.	5,005.00 Tk.	5,005.00
11.1.2.6	Medical Vacuum slides	Set	Tk.	1,535.00 Tk.	1,535.00 Tk.	1,535.00 Tk.	1,535.00

11.2 GAS LINE VALVES

Supply & installation of medical gas line ball valve shall be constructed of nickel-plated brass body, approved type seal, and a chrome-plated ball. The valves shall be operated by a manual operating level selected through 90 degrees and by a lever-type handle requiring only a quarter turn from a fully open position to a fully closed position. Ball valves shall be equipped with washed and degreased copper pipe stub extension at both the inlet and the outlet sides of the valve port to facilitate installation. Valves should be designed so that they can be swung out during installation to prevent damage due to heat transfer during the brazing operation. Each valve assembly shall be washed and degreased for medical gas service.

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- A signature in the center-left.
- A signature in the center.
- A signature on the right side.
- A signature on the far right.

Pipe stub extension shall be capped at both ends. The valve shall be supplied in a sealed plastic bag to prevent contamination before installation.

All ball valves shall provide a full bore flowing be properly cleaned and tested. The valves shall be complete with the necessary adapter, bonded seals, sockets, and other accessories.

Standard: HTM-02-01/ HTM-2022/NFPA 99/ DIN / JIS or equivalent

Country Of Manufacture: USA/ CANADA/UK/EU/JAPAN

The manufacturer must have valid ISO-9001, ISO-13485, and manufacturing experience of a minimum of 20 (twenty) years including the predecessor company's experience (if any ).

11.2.1	15 mm dia	No.	Tk.	7,129.00 Tk.	7,129.00 Tk.	7,129.00 Tk.	7,129.00
11.2.2	22 mm dia	No.	Tk.	8,602.00 Tk.	8,602.00 Tk.	8,602.00 Tk.	8,602.00
11.2.3	28 mm dia	No.	Tk.	10,350.00 Tk.	10,350.00 Tk.	10,350.00 Tk.	10,350.00
11.2.4	35 mm dia	No.	Tk.	14,790.00 Tk.	14,790.00 Tk.	14,790.00 Tk.	14,790.00
11.2.5	42 mm dia	No.	Tk.	18,694.00 Tk.	18,694.00 Tk.	18,694.00 Tk.	18,694.00
11.2.6	54 mm dia	No.	Tk.	25,964.00 Tk.	25,964.00 Tk.	25,964.00 Tk.	25,964.00

11.3 **COPPER PIPE WORKS**

Supply & installation of degreased and non-arsenic medical graded copper pipe complete with all necessary pipe fittings such as bends, tees, reducers, sockets, etc. as per drawing and direction. The concealed pipes shall be covered with PVC pipe and shall be installed with proper hangers, supports, clamp as per site condition and complying standard. Pipework shall be of fluxless brazing with inert gas purging. Pipework shall be tested unto the recommendation and direction of the consultant and Engineer in charge.

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Tubes shall be marked at repeated distances along their length of not greater than 600mm, with at least the following;

- a) Manufacturing standard mark (such as EN 13348 or equivalent ),
- b). nominal cross-sectional dimensions: outside diameter x wall thickness
- c). identification for R250 (half-hard) temper by the following symbol: I-I-I;
- d). Manufacturer's identification mark,
- e). date of production.

Working Pressure Tolerance : Minimum 20 Bar

Tensile Strength : Minimum 250 N/mm -Sq

Standard: Manufactured to BS EN 13348 or equivalent .

Country Of Manufacture: USA/ CANADA/UK/EU/JAPAN

The manufacturer must have valid ISO-9001, ISO-13485, and manufacturing experience of a minimum of 20 (twenty) years including the predecessor company's experience (if any ).

11.3.1	12 mm dia. (Outer), thickness 0.6 mm -----	Meter	Tk.	547.00 Tk.	547.00 Tk.	547.00 Tk.	547.00
11.3.2	15 mm dia. (Outer), thickness 0.7 mm -----	Meter	Tk.	866.00 Tk.	866.00 Tk.	866.00 Tk.	866.00
11.3.3	22 mm dia. (Outer), thickness 0.9 mm -----	Meter	Tk.	1,075.00 Tk.	1,075.00 Tk.	1,075.00 Tk.	1,075.00
11.3.4	28 mm dia. (Outer), thickness 0.9 mm -----	Metef	Tk.	1,412.00 Tk.	1,412.00 Tk.	1,412.00 Tk.	1,412.00
11.3.5	35 mm dia. (Outer), thickness 1.2 mm -----	Meter	Tk.	2,701.00 Tk.	2,701.00 Tk.	2,701.00 Tk.	2,701.00
11.3.6	42 mm dia.. (Outer), thickness 1.2 mm -----	Meter	Tk.	3,308.00 Tk.	3,308.00 Tk.	3,308.00 Tk.	3,308.00
11.3.7	54 mm dia.. (Outer), thickness 1.2 mm -----	Meter	Tk.	4,781.00 Tk.	4,781.00 Tk.	4,781.00 Tk.	4,781.00

11.4 AREA VALVE SERVICE UNIT (AVSU) / ZONE SERVICE UNIT (ZSU)

*[Handwritten signatures and marks in black and blue ink, including a large signature and several initials.]*

Supply & installation of Area Valve Service Unit (AVSU) / Zone Service Unit (ZSU) shall confirm the following standard: The AVSU / ZSU shall be suitable for concealed/surface installation. The unit shall provide a zone isolation facility for use either in an emergency or for maintenance purposes. The AVSU / ZSU shall be fully gas-specific, permanently labeled to identify the medical gas service and incorporate gas-specific NIST connections to the international standard on each side of the line valve. Pressure gas service NIST connections shall include self-sealing valves, which are normally held closed by gas pressure.

Standard :HTM-02-01/ HTM-2022/NFPA 99/ DIN / JIS or equivalent

The manufacturer must have valid ISO-9001, ISO-13485, and manufacturing experience of a minimum of 20 (twenty) years, including the predecessor company's experience (if any).

<b>11.4.1</b>	<b>Country of origin : USA / CANADA /UK / EU / JAPAN</b>					
11.4.1.1	AVSU / ZSU for Oxygen	No.	Tk.	31,115.00 Tk.	31,115.00 Tk.	31,115.00 Tk.
11.4.1.2	AVSU / ZSU for Nitrous Oxide	No.	Tk.	31,115.00 Tk.	31,115.00 Tk.	31,115.00 Tk.
11.4.1.3	AVSU / ZSU for Medical Air((345 kpa-500kpa.)	No.	Tk.	31,115.00 Tk.	31,115.00 Tk.	31,115.00 Tk.
11.4.1.4	AVSU / ZSU for Nitrogen / Surgical Air(700kpa-800kpa)	No.	Tk.	31,115.00 Tk.	31,115.00 Tk.	31,115.00 Tk.
11.4.1.5	AVSU / ZSU for vacuum	No.	Tk.	31,115.00 Tk.	31,115.00 Tk.	31,115.00 Tk.
<b>11.4.2</b>	<b>Country of origin : TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM</b>					
11.4.2.1	AVSU / ZSU for Oxygen	No.	Tk.	21,862.00 Tk.	21,862.00 Tk.	21,862.00 Tk.
11.4.2.2	AVSU / ZSU for Nitrous Oxide	No.	Tk.	21,862.00 Tk.	21,862.00 Tk.	21,862.00 Tk.
11.4.2.3	AVSU / ZSU for Medical Air((345 kpa-500kpa.)	No.	Tk.	21,862.00 Tk.	21,862.00 Tk.	21,862.00 Tk.
11.4.2.4	AVSU / ZSU for Nitrogen / Surgical Air(700kpa-800kpa)	No.	Tk.	21,862.00 Tk.	21,862.00 Tk.	21,862.00 Tk.
11.4.2.5	AVSU / ZSU for vacuum	No.	Tk.	21,862.00 Tk.	21,862.00 Tk.	21,862.00 Tk.

**11.5 PENDANT FOR OT**  
**11.5.1 Rigid pendant**

Handwritten signatures and initials in blue ink, including names like 'Raj', 'Sudhakar', and others, along with various scribbles and marks.

Supply & installation of Rigid Pendants will be ceiling-mounted service columns that can provide up to eight medical gas and vacuum services, 8 x Electrical sockets, 4 x Earthing nodes, & 1 x Monitor stand. The casing shall be a steel-powder coated unit with a stainless steel bottom plate. Terminal units are gas-specific. Special features: The second fix comprises a pendant shall hose and terminal unit. The ceiling column should be supplied with 2 x Oxygen, 2 x vacuum, 2 x Nitrous Oxide, 1 x Medical Air (345kpa-500kpa), 1 x Surgical Air/ Nitrogen (700kpa-800kpa), 2 x I.V Pole or any other combination of medical gases as per requirement. The length of the pendant would be as per customer requirements. Electrical socket supply available.

Standard: HTM-02-01/ HTM-2022/NFPA 99/ DIN / JIS or equivalent

Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of a minimum of 20 (twenty) years, including the predecessor company's experience (if any).

11.5.1.1	Manufactured in USA/ CANADA/UK /EU/JAPAN.	Set	Tk.	4,20,406.00 Tk.	4,20,406.00 Tk.	4,20,406.00 Tk.	4,20,406.00
11.5.1.2	Manufactured in TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM.	Set	Tk.	2,95,499.00 Tk.	2,95,499.00 Tk.	2,95,499.00 Tk.	2,95,499.00

11.5.2 Flexible pendent

A collection of handwritten signatures and initials in black and blue ink. The most prominent signature is 'Ramesh' written in black ink. Other initials include 'AK', 'SR', 'DL', 'R', 'N', 'S', 'P', and 'Z', some written in blue ink. There are also some scribbles and marks scattered across the bottom of the page.

Supply & installation of Flexible Pendant. The Flexible Pendant shall comprise color-coded flexible hoses, with medical service terminal units suspended from gas-specific first-fix assemblies. Terminal units and first-fix assemblies will be protected by white decorative covers. The terminal units shall comply with the following standard. Color-coded hose assemblies shall be manufactured with non-interchangeable male and female terminations permanently attached. Hose lengths will be suited to specific site requirements. First-fix connectors shall be manufactured from machined brass with copper stub pipes for easy installation and incorporate check valves to allow the removal of hoses without disrupting the gas supply.

Standard: HTM-02-01/ HTM-2022/NFPA 99/ DIN / JIS or equivalent

Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of a minimum of 20 (twenty) years, including the predecessor company's experience (if any).

**11.5.2.1 Country of origin : USA / CANADA /UK / EU / JAPAN**

11.5.2.1.1	For 2 gas outlets -----	Set	Tk.	98,625.00 Tk.	98,625.00 Tk.	98,625.00 Tk.	98,625.00
11.5.2.1.2	For 3 gas outlets -----	Set	Tk.	1,06,356.00 Tk.	1,06,356.00 Tk.	1,06,356.00 Tk.	1,06,356.00
11.5.2.1.3	For 4 gas outlets -----	Set	Tk.	1,21,408.00 Tk.	1,21,408.00 Tk.	1,21,408.00 Tk.	1,21,408.00
11.5.2.1.4	For 5 gas outlets -----	Set	Tk.	1,36,471.00 Tk.	1,36,471.00 Tk.	1,36,471.00 Tk.	1,36,471.00

**11.5.2.2 Country of origin : TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM**

11.5.2.2.1	For 2 gas outlets -----	Set	Tk.	70,252.00 Tk.	70,252.00 Tk.	70,252.00 Tk.	70,252.00
11.5.2.2.2	For 3 gas outlets -----	Set	Tk.	75,664.00 Tk.	75,664.00 Tk.	75,664.00 Tk.	75,664.00

*[Handwritten signatures and initials are present at the bottom of the page, including names like 'tu', 'B', and various scribbles.]*

11.5.2.2.3	For 4 gas outlets -----	Set	Tk.	86,200.00 Tk.	86,200.00 Tk.	86,200.00 Tk.	86,200.00
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11.5.2.2.4	For 5 gas outlets -----	Set	Tk.	96,745.00 Tk.	96,745.00 Tk.	96,745.00 Tk.	96,745.00
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**11.6 BEDHEAD TRUNKING**

**11.6.1 BEDHEAD TRUNKING FOR ICU**

Supply & installation of following Horizontal type bedhead trunking system used in ICU. The system consists of the following :

The main materials will be aluminum extrusion profile

- 2 x Oxygen outlet
- 2 x vacuum outlet
- 2 x compressed air (3.45 bar - 5 bar)
- 4 x electric socket (3 pin flat)
- 1 x provision for LAN
- 1 x light
- 1 x provision for LAN
- 4 x Earthing node
- 1 x equipment rail
- 1 X monitor tray

Standard: HTM-02-01/ HTM-2022/NFPA 99/ DIN / JIS or equivalent

Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of a minimum of 20 (twenty) years, including the predecessor company's experience (if any)

11.6.1.1	Manufactured in <b>USA/ CANADA/UK /EU/JAPAN.</b>	Set	Tk.	2,81,301.00 Tk.	2,81,301.00 Tk.	2,81,301.00 Tk.	2,81,301.00
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11.6.1.2	Manufactured in <b>TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM.</b>	Set	Tk.	1,97,923.00 Tk.	1,97,923.00 Tk.	1,97,923.00 Tk.	1,97,923.00
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**11.6.2 BEDHEAD TRUNKING FOR CABIN**

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Supply & installation of following Horizontal type bed head trunking system used in cabin/ward. The system consists of the following :

The main materials will be aluminum extrusion profile

- 1 x Oxygen outlet
- 1 x vacuum Outlet
- 1 x compressed air (3.45 bar - 5 bar)
- 2 x electric socket (3 pin flat)
- 4 x 2 Pin electric socket
- 1 x direct LED Light
- 1 x indirect LED Light
- 1 x provision for nurse call system
- 1 x provision for telephone
- 1 x provision for LAN
- 1 x equipment rail

Standard:HTM-02-01/ HTM-2022/NFPA 99/ DIN / JIS or equivalent

Country Of Manufacture: USA/ CANADA/UK/EU/JAPAN

Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of a minimum of 20 (twenty) years, including the predecessor company's experience (if any)

11.6.2.1	Manufactured in <b>USA/ CANADA/UK /EU/JAPAN.</b>	Set	Tk.	1,57,062.00 Tk.	1,57,062.00 Tk.	1,57,062.00 Tk.	1,57,062.00
11.6.2.2	Manufactured in <b>TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM.</b>	Set	Tk.	1,10,753.00 Tk.	1,10,753.00 Tk.	1,10,753.00 Tk.	1,10,753.00

11.7 MANIFOLD CONTROL SYSTEM

*[Handwritten signatures and initials in blue and black ink, including 'tee', 'x', 'gop', 'd.', 'm', and 'AA']*

Supply & installation of manifold control system (MCS) shall supply medical gas from both left and right-hand manifold banks. The operation and performance criteria shall fully satisfy the requirements of the following standard. The MCS shall operate at a maximum inlet pressure of 20,000 kPa and provide a distribution system pressure of 345 kPa-800 kPa. Either the left or right-hand manifold bank may be designated "duty" or the MCS shall manual type change over to supply the distribution system from the "stand by" bank when the pressure in the duty bank falls to 800-2000 kPa. High-pressure gauges/digital display shall indicate gas contents in the respective manifold cylinder bank, and a supply pressure gauge/digital display shall indicate -distribution pressure. The supply system shall be protected by a 25-micron filter with replaceable elements, and a pair of matching pressure relief valves shall be provided.

High and low line pressure switches shall sense distribution system pressure and operate local and remote alarm indications. Local indications shall be utilized colored long life high-intensity LEDs on the control panel to indicate the bank used for high and low-pressure supply conditions. Selector switches shall provide a manual change over and operate test circuits to prove LED integrity. A volt-free terminal shall be provided for connection to a remote alarm system. Design of manifold control system shall replace any component in the control and monitoring system in possible uninterrupted supply. It should be Halogen polymers free & adiabatic test passed.

Control Panel flow capacity will be minimum 2500 ltr/min at 4 to 7 bar

Standard: HTM-02-01/ HTM-2022/NFPA 99/ DIN / JIS or equivalent .

Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of a minimum of 20 (twenty) years, including the predecessor company's experience (if any)

*[Handwritten signatures and initials in black and blue ink, including 'SP', 'R', 'S', 'K', 'J', 'M', 'N', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', 'AA', 'AB', 'AC', 'AD', 'AE', 'AF', 'AG', 'AH', 'AI', 'AJ', 'AK', 'AL', 'AM', 'AN', 'AO', 'AP', 'AQ', 'AR', 'AS', 'AT', 'AU', 'AV', 'AW', 'AX', 'AY', 'AZ', 'BA', 'BB', 'BC', 'BD', 'BE', 'BF', 'BG', 'BH', 'BI', 'BJ', 'BK', 'BL', 'BM', 'BN', 'BO', 'BP', 'BQ', 'BR', 'BS', 'BT', 'BU', 'BV', 'BW', 'BX', 'BY', 'BZ', 'CA', 'CB', 'CC', 'CD', 'CE', 'CF', 'CG', 'CH', 'CI', 'CJ', 'CK', 'CL', 'CM', 'CN', 'CO', 'CP', 'CQ', 'CR', 'CS', 'CT', 'CU', 'CV', 'CW', 'CX', 'CY', 'CZ', 'DA', 'DB', 'DC', 'DD', 'DE', 'DF', 'DG', 'DH', 'DI', 'DJ', 'DK', 'DL', 'DM', 'DN', 'DO', 'DP', 'DQ', 'DR', 'DS', 'DT', 'DU', 'DV', 'DW', 'DX', 'DY', 'DZ', 'EA', 'EB', 'EC', 'ED', 'EE', 'EF', 'EG', 'EH', 'EI', 'EJ', 'EK', 'EL', 'EM', 'EN', 'EO', 'EP', 'EQ', 'ER', 'ES', 'ET', 'EU', 'EV', 'EW', 'EX', 'EY', 'EZ', 'FA', 'FB', 'FC', 'FD', 'FE', 'FF', 'FG', 'FH', 'FI', 'FJ', 'FK', 'FL', 'FM', 'FN', 'FO', 'FP', 'FQ', 'FR', 'FS', 'FT', 'FU', 'FV', 'FW', 'FX', 'FY', 'FZ', 'GA', 'GB', 'GC', 'GD', 'GE', 'GF', 'GG', 'GH', 'GI', 'GJ', 'GK', 'GL', 'GM', 'GN', 'GO', 'GP', 'GQ', 'GR', 'GS', 'GT', 'GU', 'GV', 'GW', 'GX', 'GY', 'GZ', 'HA', 'HB', 'HC', 'HD', 'HE', 'HF', 'HG', 'HH', 'HI', 'HJ', 'HK', 'HL', 'HM', 'HN', 'HO', 'HP', 'HQ', 'HR', 'HS', 'HT', 'HU', 'HV', 'HW', 'HX', 'HY', 'HZ', 'IA', 'IB', 'IC', 'ID', 'IE', 'IF', 'IG', 'IH', 'II', 'IJ', 'IK', 'IL', 'IM', 'IN', 'IO', 'IP', 'IQ', 'IR', 'IS', 'IT', 'IU', 'IV', 'IW', 'IX', 'IY', 'IZ', 'JA', 'JB', 'JC', 'JD', 'JE', 'JF', 'JG', 'JH', 'JI', 'JJ', 'JK', 'JL', 'JM', 'JN', 'JO', 'JP', 'JQ', 'JR', 'JS', 'JT', 'JU', 'JV', 'JW', 'JX', 'JY', 'JZ', 'KA', 'KB', 'KC', 'KD', 'KE', 'KF', 'KG', 'KH', 'KI', 'KJ', 'KK', 'KL', 'KM', 'KN', 'KO', 'KP', 'KQ', 'KR', 'KS', 'KT', 'KU', 'KV', 'KW', 'KX', 'KY', 'KZ', 'LA', 'LB', 'LC', 'LD', 'LE', 'LF', 'LG', 'LH', 'LI', 'LJ', 'LK', 'LL', 'LM', 'LN', 'LO', 'LP', 'LQ', 'LR', 'LS', 'LT', 'LU', 'LV', 'LW', 'LX', 'LY', 'LZ', 'MA', 'MB', 'MC', 'MD', 'ME', 'MF', 'MG', 'MH', 'MI', 'MJ', 'MK', 'ML', 'MM', 'MN', 'MO', 'MP', 'MQ', 'MR', 'MS', 'MT', 'MU', 'MV', 'MW', 'MX', 'MY', 'MZ', 'NA', 'NB', 'NC', 'ND', 'NE', 'NF', 'NG', 'NH', 'NI', 'NJ', 'NK', 'NL', 'NM', 'NN', 'NO', 'NP', 'NQ', 'NR', 'NS', 'NT', 'NU', 'NV', 'NW', 'NX', 'NY', 'NZ', 'OA', 'OB', 'OC', 'OD', 'OE', 'OF', 'OG', 'OH', 'OI', 'OJ', 'OK', 'OL', 'OM', 'ON', 'OO', 'OP', 'OQ', 'OR', 'OS', 'OT', 'OU', 'OV', 'OW', 'OX', 'OY', 'OZ', 'PA', 'PB', 'PC', 'PD', 'PE', 'PF', 'PG', 'PH', 'PI', 'PJ', 'PK', 'PL', 'PM', 'PN', 'PO', 'PP', 'PQ', 'PR', 'PS', 'PT', 'PU', 'PV', 'PW', 'PX', 'PY', 'PZ', 'QA', 'QB', 'QC', 'QD', 'QE', 'QF', 'QG', 'QH', 'QI', 'QJ', 'QK', 'QL', 'QM', 'QN', 'QO', 'QP', 'QQ', 'QR', 'QS', 'QT', 'QU', 'QV', 'QW', 'QX', 'QY', 'QZ', 'RA', 'RB', 'RC', 'RD', 'RE', 'RF', 'RG', 'RH', 'RI', 'RJ', 'RK', 'RL', 'RM', 'RN', 'RO', 'RP', 'RQ', 'RR', 'RS', 'RT', 'RU', 'RV', 'RW', 'RX', 'RY', 'RZ', 'SA', 'SB', 'SC', 'SD', 'SE', 'SF', 'SG', 'SH', 'SI', 'SJ', 'SK', 'SL', 'SM', 'SN', 'SO', 'SP', 'SQ', 'SR', 'SS', 'ST', 'SU', 'SV', 'SW', 'SX', 'SY', 'SZ', 'TA', 'TB', 'TC', 'TD', 'TE', 'TF', 'TG', 'TH', 'TI', 'TJ', 'TK', 'TL', 'TM', 'TN', 'TO', 'TP', 'TQ', 'TR', 'TS', 'TT', 'TU', 'TV', 'TW', 'TX', 'TY', 'TZ', 'UA', 'UB', 'UC', 'UD', 'UE', 'UF', 'UG', 'UH', 'UI', 'UJ', 'UK', 'UL', 'UM', 'UN', 'UO', 'UP', 'UQ', 'UR', 'US', 'UT', 'UU', 'UV', 'UW', 'UX', 'UY', 'UZ', 'VA', 'VB', 'VC', 'VD', 'VE', 'VF', 'VG', 'VH', 'VI', 'VJ', 'VK', 'VL', 'VM', 'VN', 'VO', 'VP', 'VQ', 'VR', 'VS', 'VT', 'VU', 'VV', 'VW', 'VX', 'VY', 'VZ', 'WA', 'WB', 'WC', 'WD', 'WE', 'WF', 'WG', 'WH', 'WI', 'WJ', 'WK', 'WL', 'WM', 'WN', 'WO', 'WP', 'WQ', 'WR', 'WS', 'WT', 'WU', 'WV', 'WW', 'WX', 'WY', 'WZ', 'XA', 'XB', 'XC', 'XD', 'XE', 'XF', 'XG', 'XH', 'XI', 'XJ', 'XK', 'XL', 'XM', 'XN', 'XO', 'XP', 'XQ', 'XR', 'XS', 'XT', 'XU', 'XV', 'XW', 'XX', 'XY', 'XZ', 'YA', 'YB', 'YC', 'YD', 'YE', 'YF', 'YG', 'YH', 'YI', 'YJ', 'YK', 'YL', 'YM', 'YN', 'YO', 'YP', 'YQ', 'YR', 'YS', 'YT', 'YU', 'YV', 'YW', 'YX', 'YZ', 'ZA', 'ZB', 'ZC', 'ZD', 'ZE', 'ZF', 'ZG', 'ZH', 'ZI', 'ZJ', 'ZK', 'ZL', 'ZM', 'ZN', 'ZO', 'ZP', 'ZQ', 'ZR', 'ZS', 'ZT', 'ZU', 'ZV', 'ZW', 'ZX', 'ZY', 'ZZ']*

11.7.1 Country of origin : USA / CANADA /UK / EU / JAPAN							
11.7.1.1	Automatic manifold control system with 2x4 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	6,40,826.00 Tk.	6,40,495.00 Tk.	6,39,243.00 Tk.	6,39,243.00
11.7.1.2	Automatic manifold control system with 2x6 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	7,18,007.00 Tk.	7,17,676.00 Tk.	7,16,425.00 Tk.	7,16,425.00
11.7.1.3	Automatic manifold control system with 2x8 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	7,95,189.00 Tk.	7,94,857.00 Tk.	7,93,606.00 Tk.	7,93,606.00
11.7.1.4	Automatic manifold control system with 2x10 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	8,38,626.00 Tk.	8,38,295.00 Tk.	8,37,043.00 Tk.	8,37,043.00
11.7.1.5	Automatic manifold control system with 2x12 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	8,87,708.00 Tk.	8,87,377.00 Tk.	8,86,125.00 Tk.	8,86,125.00
11.7.1.6	Manual manifold control system with 2x1 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	1,70,008.00 Tk.	1,69,787.00 Tk.	1,68,952.00 Tk.	1,68,952.00
11.7.1.7	Manual manifold control system with 2x2 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	2,00,929.00 Tk.	2,00,708.00 Tk.	1,99,874.00 Tk.	1,99,874.00
11.7.1.8	Manual manifold control system with 2x3 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	2,31,851.00 Tk.	2,31,630.00 Tk.	2,30,796.00 Tk.	2,30,796.00
11.7.1.9	Manual manifold control system with 2x4 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen. (emergency)	Set	Tk.	2,62,650.00 Tk.	2,62,429.00 Tk.	2,61,594.00 Tk.	2,61,594.00
11.7.1.10	Manual manifold control system with 2x6 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.(emergency)	Set	Tk.	3,24,493.00 Tk.	3,24,272.00 Tk.	3,23,438.00 Tk.	3,23,438.00
11.7.2	Country of origin : TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM						

11.7.2.1	Automatic manifold control system with 2x4 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	4,55,517.00 Tk.	4,55,186.00 Tk.	4,53,934.00 Tk.	4,53,934.00
11.7.2.2	Automatic manifold control system with 2x6 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	5,09,544.00 Tk.	5,09,213.00 Tk.	5,07,961.00 Tk.	5,07,961.00
11.7.2.3	Automatic manifold control system with 2x8 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	5,63,571.00 Tk.	5,63,240.00 Tk.	5,61,988.00 Tk.	5,61,988.00
11.7.2.4	Automatic manifold control system with 2x10 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	5,93,977.00 Tk.	5,93,646.00 Tk.	5,92,394.00 Tk.	5,92,394.00
11.7.2.5	Automatic manifold control system with 2x12 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	6,28,335.00 Tk.	6,28,003.00 Tk.	6,26,752.00 Tk.	6,26,752.00
11.7.2.6	Manual manifold control system with 2x1 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	1,23,699.00 Tk.	1,23,478.00 Tk.	1,22,643.00 Tk.	1,22,643.00
11.7.2.7	Manual manifold control system with 2x2 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	1,45,344.00 Tk.	1,45,123.00 Tk.	1,44,289.00 Tk.	1,44,289.00
11.7.2.8	Manual manifold control system with 2x3 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.	Set	Tk.	1,66,989.00 Tk.	1,66,768.00 Tk.	1,65,934.00 Tk.	1,65,934.00
11.7.2.9	Manual manifold control system with 2x4 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen. (emergency)	Set	Tk.	1,88,548.00 Tk.	1,88,327.00 Tk.	1,87,493.00 Tk.	1,87,493.00
11.7.2.10	Manual manifold control system with 2x6 cylinder ramp for Oxygen / Nitrous Oxide / Medical Air / Surgical Air or Nitrogen.(emergency)	Set	Tk.	2,31,839.00 Tk.	2,31,618.00 Tk.	2,30,783.00 Tk.	2,30,783.00

11.8 GAS ALARM  
 11.8.1 MASTER ALARM

Supplying and installing of Master medical gas alarm that shall be capable of monitoring the following services utilizing pressure switches that sense deviations from the normal operating limit of either pressure or vacuum. Each gas service shall be displayed by colored LED's/ LCD to show normal, change the cylinder, change immediate, pressure fault, plant emergency, plant fault condition, or low and high-pressure conditions only.

Each module should be microprocessor-based and field adjustable. A maintenance mode should, when enabled, latch the alarms, requiring a reset after the alarm condition has been rectified. This is to assist in tracking down wiring problems or faulty field devices. The master alarm shall identify the last alarm condition by flashing, while the already acknowledged alarm shows a continuous red signal. The system shall have an audible warning which shall operate simultaneously with any failure indication, and a mute facility shall be provided. When enabled, a repeat alarm function shall be capable of turning on the buzzer again, after a preset time, if the fault condition has not been rectified.

Master alarms should be modular in construction and shall be capable of adding extra modules in the field. A "RED" alarm LED light shall illuminate if an alarm occurs, and the audible alarm shall sound. Pushing the "ALARM MUTE" button should silence the audible alarm, but the unit will remain in alarm condition until the problem is rectified. Identify the last alarm condition by flashing, while the already acknowledged alarm shows a continuous red signal.

The Alarm system should be a closed circuit self-monitoring type. A green "POWER" light should indicate that the unit energizes. In addition "TEST" and "ALARM MUTE" buttons should be easily accessible to operate and test the unit. The gas failure alarm system shall be installed at the location shown in the drawing with necessary service failure sensors compatible with the gas alarm system and sensor cable and shall be complete with all necessary accessories.

*[Handwritten signatures and initials in black and blue ink, including a large signature in blue ink.]*

Standard : HTM-02-01/ HTM-2022/NFPA 99/ DIN / JIS or equivalent

Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of a minimum of 20 (twenty) years including predecessor company's experience (if any) .

11.8.1.1	Master Alarm for 5 Services (4 gas +1 vacuum) manufactured in USA/ CANADA/UK /EU/JAPAN.	No.	Tk.	2,30,384.00 Tk.	2,30,164.00 Tk.	2,29,329.00 Tk.	2,29,329.00
11.8.1.2	Master Alarm for 5 Services (4 gas +1 vacuum) manufactured in TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM.	No.	Tk.	1,65,963.00 Tk.	1,65,742.00 Tk.	1,64,907.00 Tk.	1,64,907.00

11.8.2 AREA ALARM

Supplying and installing area alarm, which shall be microprocessor-based with individual microprocessors on each display and sensor board. The sensors should be capable of local (in box) or remote mounting. Each sensor and display unit shall be gas specific, displaying an error message for an incorrect connection.

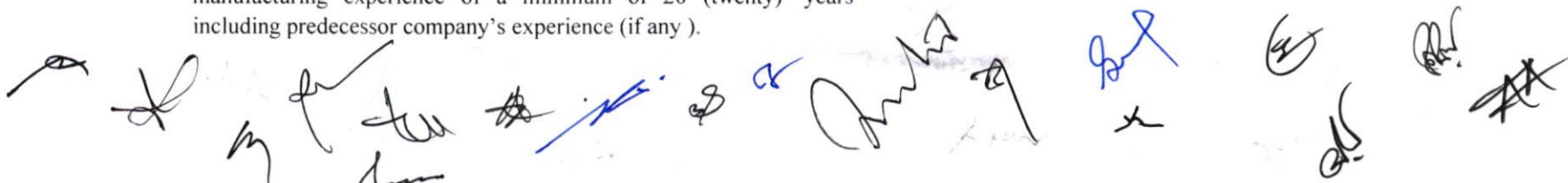
*[Handwritten signatures and initials in black and blue ink, including 'or', 'AA', and various illegible marks.]*

The area alarms shall be of modular construction and field expandable with the addition of extra modules. Up to six services (LED) / eight services (LCD) can be accommodated as per the standard box. The alarm system shall have an audible warning which shall operate simultaneously with any failure indication and a mute facility shall be provided. Each specific service shall be provided with an LED digital / LCD read-out comprising of 0-250 psi [0-1724 kPa] for pressure and 0-30"Hg [-100-0 kPa] for vacuum. The digital read-out should provide a constant indication of each service being measured. Each gas service shall be displayed by colored LEDs, to show normal, low, and high-pressure conditions only. Failure indicators shall be displayed by flashing light and the normal indications shall be steady. A bar graph trend indicator shall be provided for each service indicating a green "NORMAL", yellow "CAUTION" and a red "HIGH" or "LOW" alarm condition. Under normal operation, the bar graph display should move up and down in the "GREEN" range depending on service usage. If an alarm occurs, the "RED" alarm light shall flash and the audible alarm shall sound. Pushing the "ALARM MUTE" button shall cancel the audible alarm, but the unit shall remain in the alarm condition until the problem is rectified. In addition, the "TEST" & "ALARM MUTE" buttons shall be easily accessible to operate and test the unit.

The system shall satisfy the following standard. The gas failure alarm system shall be installed at the location shown in the drawing with necessary service failure sensors compatible with the gas alarm system, sensor cable and shall be complete with all necessary accessories.

Standard:HTM-02-01/ HTM-2022/NFPA 99/ DIN / JIS or equivalent

Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of a minimum of 20 (twenty) years including predecessor company's experience (if any ).



**11.8.2.1 Country of origin : USA / CANADA /UK / EU / JAPAN**

11.8.2.1.1	Area alarm for 2 services (1 gas + 1 vacuum)	No.	Tk.	1,17,951.00 Tk.	1,17,730.00 Tk.	1,16,896.00 Tk.	1,16,896.00
11.8.2.1.2	Area alarm for 3 services (2 gas + 1 vacuum)	No.	Tk.	1,55,543.00 Tk.	1,55,322.00 Tk.	1,54,488.00 Tk.	1,54,488.00
11.8.2.1.3	Area alarm for 4 services (3 gas + 1 vacuum)	No.	Tk.	1,93,146.00 Tk.	1,92,925.00 Tk.	1,92,091.00 Tk.	1,92,091.00
11.8.2.1.4	Area alarm for 5 services (4 gas + 1 vacuum)	No.	Tk.	2,11,973.00 Tk.	2,11,752.00 Tk.	2,10,917.00 Tk.	2,10,917.00

**11.8.2.2 Country of origin : TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM**

11.8.2.2.1	Area alarm for 2 services (1 gas + 1 vacuum)	No.	Tk.	87,259.00 Tk.	87,038.00 Tk.	86,204.00 Tk.	86,204.00
11.8.2.2.2	Area alarm for 3 services (2 gas + 1 vacuum)	No.	Tk.	1,13,574.00 Tk.	1,13,353.00 Tk.	1,12,518.00 Tk.	1,12,518.00
11.8.2.2.3	Area alarm for 4 services (3 gas + 1 vacuum)	No.	Tk.	1,39,896.00 Tk.	1,39,675.00 Tk.	1,38,840.00 Tk.	1,38,840.00
11.8.2.2.4	Area alarm for 5 services (4 gas + 1 vacuum)	No.	Tk.	1,53,074.00 Tk.	1,52,853.00 Tk.	1,52,019.00 Tk.	1,52,019.00

**11.8.3 COMBO UNIT**

Supply & installation of Each AVCU (Alarm Valve Combo Unit) shall consist of the following components: An 18 gauge steel valve box complete with a baked white enamel finish which can house one to six shut-off ball valves with tube extensions, gas specific sensor (DISS nut and nipple connection), extra port for optional pressure gauge, and a hinged gas specific compact alarm with illuminated LED digital display, with an error message for an incorrect connection, an aluminum frame, and a pull-out removable opaque window.

Affixed to the opposing sides of the box will be two adjustable steel brackets to mount the box to the structural support. The steel brackets shall accommodate various finished wall thicknesses between 3/8" [9.5mm] and 1-3/16" [30mm] and shall be field adjustable. The frame assembly shall be constructed of anodized aluminum and mounted to the backbox assembly by standard number 6-3/8" tapping screws as provided.

*[Handwritten signatures and initials in blue ink at the bottom of the page]*



The digital alarm shall read from 0-250 psi [0-1724kPa] for pressure and 0-30"Hg [-100-0 Hg kPa] for vacuum. The digital read-out shall provide a constant indication of each service being measured. It will indicate a green "NORMAL" and a red "HIGH" or "LOW" alarm condition. If an alarm occurs, the "RED" alarm light shall flash, and the audible alarm (exceeds 90 decibels) will sound. Pushing the "ALARM MUTE" button will cancel the audible alarm, but the unit will remain in the alarm condition until the problem is rectified. When enabled on the compact alarm module, a repeat alarm function shall be capable of turning on the buzzer again (after a preset time) if the fault condition has not been rectified.

Access to the shut-off valves shall be by merely pulling the ring assembly to remove the window from the frame. The window can be reinstalled without the use of tools only after the valve handles have been returned to the open position. The window shall be marked to prohibit unauthorized persons from tampering with the valves with the following silk-screen caution:

"Medical Gas Control Valves with Alarms"  
 "Close Valves only in emergency"

The valves shall be a three-piece ball-type design with a bronze body and chrome-plated brass ball for sizes 1/2" to 1-1/2". Seats shall be Teflon (TFE) and seals Viton for 1/2" to 1-1/2". A blow-out-proof stem shall be used and the valves shall have a maximum pressure rating of 600 psi [4137 kPa]. Valves shall be operated by a lever-type handle requiring only a quarter turn from a fully open position to a fully closed position. All valves shall be equipped with washed and degreased copper pipe stub extensions to protrude 6" beyond the sides of the box. Each valve will be identified for gas specification as indicated on the hinged alarm label. In addition, each copper pipe shall be provided with stickers for identification.

All AVCU shall be cleaned and degreased for medical gas service, factory assembled, and tested. The system shall satisfy the following standard.

*[Handwritten signatures and initials in blue and black ink, including names like 'R. White', 'A. S. P.', 'E.', 'R.S.', and 'A.A.']*

The combo unit system shall be installed at the location shown in the drawing with service failure sensors compatible with the gas alarm system, sensor cable and shall be completed with all necessary accessories.

Standard:HTM-02-01/ HTM-2022/NFPA 99/ DIN / JIS or equivalent

Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of a minimum of 20 (twenty) years including predecessor company's experience (if any ).

**11.8.3.1 Country of origin : USA / CANADA /UK / EU / JAPAN**

11.8.3.1.1	2 services (1 gas + 1 vacuum) alarm valve combo unit	No.	Tk.	1,55,598.00 Tk.	1,55,377.00 Tk.	1,54,543.00 Tk.	1,54,543.00
11.8.3.1.2	3 services (2 gas + 1 vacuum) alarm valve combo unit	No.	Tk.	1,93,190.00 Tk.	1,92,969.00 Tk.	1,92,135.00 Tk.	1,92,135.00
11.8.3.1.3	4 services (3 gas + 1 vacuum) alarm valve combo unit	No.	Tk.	2,11,964.00 Tk.	2,11,743.00 Tk.	2,10,909.00 Tk.	2,10,909.00
11.8.3.1.4	5 services (4 gas + 1 vacuum) alarm valve combo unit	No.	Tk.	2,30,793.00 Tk.	2,30,572.00 Tk.	2,29,738.00 Tk.	2,29,738.00

**11.8.3.2 Country of origin : TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM**

11.8.3.2.1	2 services (1 gas + 1 vacuum) alarm valve combo unit	No.	Tk.	1,13,612.00 Tk.	1,13,391.00 Tk.	1,12,557.00 Tk.	1,12,557.00
11.8.3.2.2	3 services (2 gas + 1 vacuum) alarm valve combo unit	No.	Tk.	1,39,927.00 Tk.	1,39,706.00 Tk.	1,38,871.00 Tk.	1,38,871.00
11.8.3.2.3	4 services (3 gas + 1 vacuum) alarm valve combo unit	No.	Tk.	1,53,068.00 Tk.	1,52,847.00 Tk.	1,52,013.00 Tk.	1,52,013.00
11.8.3.2.4	5 services (4 gas + 1 vacuum) alarm valve combo unit	No.	Tk.	1,66,249.00 Tk.	1,66,028.00 Tk.	1,65,193.00 Tk.	1,65,193.00

**11.9 VACUUM PLANT**

11.9.1 Supply & installation of **duplex** vacuum plant that shall be in package configuration and shall incorporate the following features: All major plant components with the exception of the receiver tank shall be duplex to conform to the requirements of the following standard:

(i) Vacuum pump and associated pipework to incorporate non-return valves.

*[Handwritten signatures and initials in blue and black ink, including 'AK', 'PWS', 'AA', and others, are present at the bottom of the page.]*

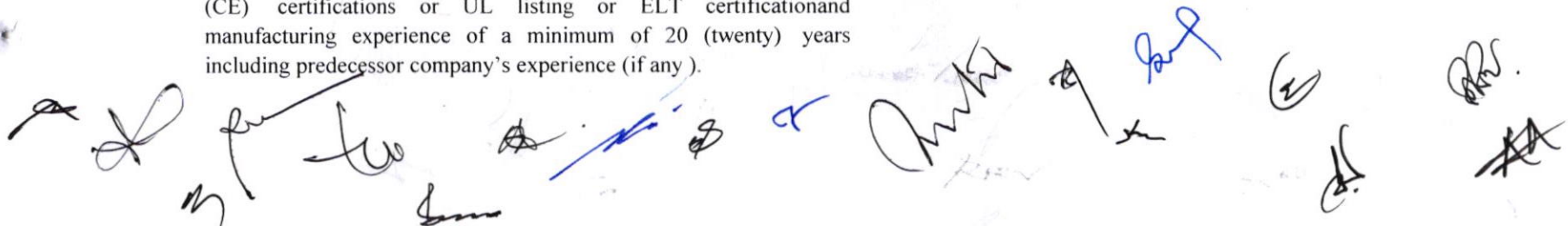
(ii) The duty vacuum pump to be rated at 75% of the design flow rate, the stand by vacuum pump to automatically operate during periods of peak demand or in the event of duty pump failure. The Medical Vacuum pumps should be continuous duty rotary vane air-cooled type equipped with non-asbestos vanes, having a minimum life of 30,000 to 50,000 hours. The pumps are to be provided with fully recirculated oil supply. The oil separation should be integral and consists of four stages of internally installed oil and smoke eliminators. This system should be capable of removing 99.9+% of oil and smoke particles from the exhaust.

Also included as standard equipment for each vacuum pump are: inlet check valve, inlet isolation valve, built in anti-suck-back valve, inlet filter screen, sight gauge to indicate oil level, pump drain valve, high exhaust pressure gauge, vacuum control switch, bronze or stainless steel flexible connectors on inlet and discharge lines as well as copper tubing with shut-off cock for gauge and vacuum switches.

(iii) The vacuum pump shall be designated to enable isolation of anyone component for maintenance purposes without interrupting the system operation. This includes pumps, filters, and receivers. The vacuum pump shall be of proven reliability, and the pump shall be driven by electric motors insulated **class F**. The receiver vessel shall be constructed and tested as per the following standards. The control panel and electrical installation shall conform to IEEE regulations. The starters to bacterial filter elements shall have a penetration level not exceeding 0.05% when tested by a sodium flame. Drainage trap bowels fitted to both the exhaust drain legs and bacterial filter bowels shall be suitable for sterilizations.

Standard: HTM-2022/NFPA 99/ DIN / JIS or equivalent

Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of a minimum of 20 (twenty) years including predecessor company's experience (if any).



11.9.1.1 Country of origin : USA / CANADA / UK / EU / JAPAN

11.9.1.1.1	Vacuum plant capacity minimum 425 LPM at 400 mm Hg.	Set	Tk.	18,89,653.00 Tk.	18,89,046.00 Tk.	18,86,751.00 Tk.	18,86,751.00
11.9.1.1.2	Vacuum plant capacity minimum 625 LPM at 400 mm Hg .	Set	Tk.	25,47,567.00 Tk.	25,46,960.00 Tk.	25,44,665.00 Tk.	25,44,665.00
11.9.1.1.3	Vacuum plant capacity minimum 900 LPM at 400 mm Hg.	Set	Tk.	30,18,850.00 Tk.	30,18,160.00 Tk.	30,15,553.00 Tk.	30,15,553.00
11.9.1.1.4	Vacuum plant capacity minimum 1100 LPM at 400 mm Hg.	Set	Tk.	32,08,129.00 Tk.	32,07,356.00 Tk.	32,04,436.00 Tk.	32,04,436.00
11.9.1.1.5	Vacuum plant capacity minimum 1500 LPM at 400 mm Hg.	Set	Tk.	35,84,081.00 Tk.	35,83,308.00 Tk.	35,80,388.00 Tk.	35,80,388.00
11.9.1.1.6	Vacuum plant capacity minimum 1800 LPM at 400 mm Hg.	Set	Tk.	39,60,951.00 Tk.	39,60,122.00 Tk.	39,56,993.00 Tk.	39,56,993.00
11.9.1.1.7	Vacuum plant capacity minimum 2500 LPM at 400 mm Hg.	Set	Tk.	46,18,863.00 Tk.	46,18,035.00 Tk.	46,14,906.00 Tk.	46,14,906.00
11.9.1.1.8	Vacuum plant capacity minimum 2750 LPM at 400 mm Hg.	Set	Tk.	55,56,581.00 Tk.	55,55,753.00 Tk.	55,52,624.00 Tk.	55,52,624.00
11.9.1.1.9	Vacuum plant capacity minimum 3350 LPM at 400 mm Hg.	Set	Tk.	65,77,240.00 Tk.	65,76,335.00 Tk.	65,72,914.00 Tk.	65,72,914.00
11.9.1.1.10	Vacuum plant capacity minimum 4900 LPM at 400 mm Hg.	Set	Tk.	90,61,400.00 Tk.	90,60,494.00 Tk.	90,57,073.00 Tk.	90,57,073.00

11.9.1.2 Country of origin : TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM

11.9.1.2.1	Vacuum plant capacity minimum 425 LPM at 400 mm Hg.	Set	Tk.	13,34,702.00 Tk.	13,34,095.00 Tk.	13,31,800.00 Tk.	13,31,800.00
11.9.1.2.2	Vacuum plant capacity minimum 625 LPM at 400 mm Hg .	Set	Tk.	17,95,242.00 Tk.	17,94,635.00 Tk.	17,92,340.00 Tk.	17,92,340.00
11.9.1.2.3	Vacuum plant capacity minimum 900 LPM at 400 mm Hg.	Set	Tk.	21,26,723.00 Tk.	21,26,033.00 Tk.	21,23,426.00 Tk.	21,23,426.00
11.9.1.2.4	Vacuum plant capacity minimum 1100 LPM at 400 mm Hg.	Set	Tk.	22,60,801.00 Tk.	22,60,028.00 Tk.	22,57,108.00 Tk.	22,57,108.00
11.9.1.2.5	Vacuum plant capacity minimum 1500 LPM at 400 mm Hg.	Set	Tk.	25,23,968.00 Tk.	25,23,195.00 Tk.	25,20,274.00 Tk.	25,20,274.00
11.9.1.2.6	Vacuum plant capacity minimum 1800 LPM at 400 mm Hg.	Set	Tk.	27,88,900.00 Tk.	27,88,071.00 Tk.	27,84,942.00 Tk.	27,84,942.00
11.9.1.2.7	Vacuum plant capacity minimum 2500 LPM at 400 mm Hg.	Set	Tk.	32,49,439.00 Tk.	32,48,611.00 Tk.	32,45,482.00 Tk.	32,45,482.00
11.9.1.2.8	Vacuum plant capacity minimum 2750 LPM at 400 mm Hg.	Set	Tk.	39,06,061.00 Tk.	39,05,233.00 Tk.	39,02,104.00 Tk.	39,02,104.00
11.9.1.2.9	Vacuum plant capacity minimum 3350 LPM at 400 mm Hg.	Set	Tk.	46,21,921.00 Tk.	46,21,016.00 Tk.	46,17,595.00 Tk.	46,17,595.00
11.9.1.2.10	Vacuum plant capacity minimum 4900 LPM at 400 mm Hg.	Set	Tk.	63,61,017.00 Tk.	63,60,111.00 Tk.	63,56,690.00 Tk.	63,56,690.00

11.9.2 Supply & installation of minimum triplex (in accordance with relevant standard) vacuum plant that shall be in package configuration and shall incorporate the following features: All major plant components with the exception of the receiver tank shall be minimum triplex to conform to the requirements of the following standard:

(i) Vacuum pump and associated pipework to incorporate non-return valves.

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(ii) The duty vacuum pump will be rated at 75% of the design flow rate. The stand-by vacuum pump will automatically operate during periods of peak demand or in the event of duty pump failure. The Medical Vacuum pumps should be continuous-duty rotary vane air-cooled type equipped with non-asbestos vanes, having a minimum life of 30,000 to 50,000 hours. The pumps are to be provided with a fully recirculated oil supply. The oil separation should be integral and consists of four stages of internally installed oil and smoke eliminators. This system should be capable of removing 99.9+% of oil and smoke particles from the exhaust.

Also included as standard equipment for each vacuum pump are: inlet check valve, inlet isolation valve, built-in anti-suck-back valve, inlet filter screen, sight gauge to indicate oil level, pump drain valve, high exhaust pressure gauge, vacuum control switch, bronze or stainless steel flexible connectors on inlet and discharge lines as well as copper tubing with shut-off cock for gauge and vacuum switches.

(iii) The vacuum pump shall be designated to enable isolation of anyone component for maintenance purposes without interrupting the system operation. This includes pumps, filters, and receivers. The vacuum pump shall be of proven reliability, and the pump shall be driven by electric motors insulated **class F**. The receiver vessel shall be constructed and tested by the following standards. The control panel and electrical installation shall conform to IEEE regulations. The starters to bacterial filter elements shall have a penetration level not exceeding 0.05% when tested by a sodium flame. Drainage trap bowels fitted to both the exhaust drain legs and bacterial filter bowels shall be suitable for sterilizations.

Standard:HTM-02-01/ NFPA 99/ DIN / JIS or equivalent  
 Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certificationand manufacturing experience of a minimum of 20 (twenty) years including predecessor company's experience (if any ).

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**11.9.2.1 Country of origin : USA / CANADA / UK / EU / JAPAN**

11.9.2.1.1	Vacuum plant capacity minimum 425 LPM at 400 mm Hg.	Set	Tk. 29,09,892.00 Tk.	29,09,229.00 Tk.	29,06,726.00 Tk.	29,06,726.00
11.9.2.1.2	Vacuum plant capacity minimum 625 LPM at 400 mm Hg .	Set	Tk. 39,26,904.00 Tk.	39,26,241.00 Tk.	39,23,738.00 Tk.	39,23,738.00
11.9.2.1.3	Vacuum plant capacity minimum 900 LPM at 400 mm Hg.	Set	Tk. 45,00,429.00 Tk.	44,99,678.00 Tk.	44,96,841.00 Tk.	44,96,841.00
11.9.2.1.4	Vacuum plant capacity minimum 1100 LPM at 400 mm Hg.	Set	Tk. 47,71,398.00 Tk.	47,70,536.00 Tk.	47,67,282.00 Tk.	47,67,282.00
11.9.2.1.5	Vacuum plant capacity minimum 1500 LPM at 400 mm Hg.	Set	Tk. 53,00,943.00 Tk.	53,00,059.00 Tk.	52,96,722.00 Tk.	52,96,722.00
11.9.2.1.6	Vacuum plant capacity minimum 1800 LPM at 400 mm Hg.	Set	Tk. 55,68,231.00 Tk.	55,67,303.00 Tk.	55,63,799.00 Tk.	55,63,799.00
11.9.2.1.7	Vacuum plant capacity minimum 2500 LPM at 400 mm Hg.	Set	Tk. 64,92,787.00 Tk.	64,91,860.00 Tk.	64,88,355.00 Tk.	64,88,355.00
11.9.2.1.8	Vacuum plant capacity minimum 2750 LPM at 400 mm Hg.	Set	Tk. 72,12,623.00 Tk.	72,11,695.00 Tk.	72,08,191.00 Tk.	72,08,191.00
11.9.2.1.9	Vacuum plant capacity minimum 3350 LPM at 400 mm Hg.	Set	Tk. 85,35,013.00 Tk.	85,34,063.00 Tk.	85,30,476.00 Tk.	85,30,476.00
11.9.2.1.10	Vacuum plant capacity minimum 4900 LPM at 400 mm Hg.	Set	Tk. 1,13,14,172.00 Tk.	1,13,13,223.00 Tk.	1,13,09,635.00 Tk.	1,13,09,635.00

**11.9.2.2 Country of origin : TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM**

11.9.2.2.1	Vacuum plant capacity minimum 425 LPM at 400 mm Hg.	Set	Tk. 20,49,789.00 Tk.	20,49,127.00 Tk.	20,46,624.00 Tk.	20,46,624.00
11.9.2.2.2	Vacuum plant capacity minimum 625 LPM at 400 mm Hg .	Set	Tk. 27,61,698.00 Tk.	27,61,036.00 Tk.	27,58,533.00 Tk.	27,58,533.00
11.9.2.2.3	Vacuum plant capacity minimum 900 LPM at 400 mm Hg.	Set	Tk. 31,64,840.00 Tk.	31,64,089.00 Tk.	31,61,252.00 Tk.	31,61,252.00
11.9.2.2.4	Vacuum plant capacity minimum 1100 LPM at 400 mm Hg.	Set	Tk. 33,56,562.00 Tk.	33,55,700.00 Tk.	33,52,446.00 Tk.	33,52,446.00
11.9.2.2.5	Vacuum plant capacity minimum 1500 LPM at 400 mm Hg.	Set	Tk. 37,27,611.00 Tk.	37,26,728.00 Tk.	37,23,390.00 Tk.	37,23,390.00
11.9.2.2.6	Vacuum plant capacity minimum 1800 LPM at 400 mm Hg.	Set	Tk. 39,15,652.00 Tk.	39,14,724.00 Tk.	39,11,220.00 Tk.	39,11,220.00
11.9.2.2.7	Vacuum plant capacity minimum 2500 LPM at 400 mm Hg.	Set	Tk. 45,62,841.00 Tk.	45,61,914.00 Tk.	45,58,409.00 Tk.	45,58,409.00
11.9.2.2.8	Vacuum plant capacity minimum 2750 LPM at 400 mm Hg.	Set	Tk. 50,66,947.00 Tk.	50,66,019.00 Tk.	50,62,515.00 Tk.	50,62,515.00
11.9.2.2.9	Vacuum plant capacity minimum 3350 LPM at 400 mm Hg.	Set	Tk. 59,93,099.00 Tk.	59,92,149.00 Tk.	59,88,561.00 Tk.	59,88,561.00
11.9.2.2.10	Vacuum plant capacity minimum 4900 LPM at 400 mm Hg.	Set	Tk. 79,38,695.00 Tk.	79,37,745.00 Tk.	79,34,157.00 Tk.	79,34,157.00

**11.10 DOWN STREAM EQUIPMENT****11.10.1 Oxygen flow meter**

Supply & installation of direct probe Oxygen flow meter complete with a high precision metering valve, high impact polycarbonate flow tubes, black glass float, and reusable steam autoclavable bubble humidifier, face mask, nipple tubing, etc. and flow rate shall be 0 to 15 liter/min and inlet pressure 4 bar  $\pm$  10%.

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Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of a minimum of 20 (twenty) years including predecessor company's experience (if any ).

11.10.1.1	Manufactured in USA/ CANADA/UK /EU/JAPAN.	Set	Tk.	5,476.00 Tk.	5,469.00 Tk.	5,443.00 Tk.	5,443.00
11.10.1.2	Manufactured in TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM.	Set	Tk.	3,968.00 Tk.	3,962.00 Tk.	3,936.00 Tk.	3,936.00

**11.10.2 Up down suction unit**

Supplying of direct probe suction control complete with regulator filter, 2-liter capacity auto cleavable jar, tapper, hose, etc.

High Suction : 0 - 100 kpa, Low Suction - 0 - 20 kpa  
 Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of a minimum of 20 (twenty) years including predecessor company's experience (if any ).

11.10.2.1	Manufactured in USA/ CANADA/UK /EU/JAPAN.	Set	Tk.	23,823.00 Tk.	23,796.00 Tk.	23,692.00 Tk.	23,692.00
11.10.2.2	Manufactured in TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM.	Set	Tk.	17,197.00 Tk.	17,170.00 Tk.	17,066.00 Tk.	17,066.00

**11.10.3 Theatre suction**

Supply & installation of floor mobile theater suction unit complete with remote probe, 2 parallel brackets 2 nos autoclavable 2-liter Jar, regulator filter, etc.

Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of a minimum of 20 (twenty) years including predecessor company's experience (if any ).

11.10.3.1	Manufactured in USA/ CANADA/UK /EU/JAPAN.	Set	Tk.	46,899.00 Tk.	46,817.00 Tk.	46,504.00 Tk.	46,504.00
11.10.3.2	Manufactured in TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM.	Set	Tk.	34,412.00 Tk.	34,330.00 Tk.	34,017.00 Tk.	34,017.00

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**11.11 MEDICAL AIR PLANT**

Supply & installation of continuous duty duplex medical air system which is a completely packaged assembly featuring 100% oil-less air compressors, electrical control cabinet, receiver and the necessary accessories required to meet and exceed the current code requirements. The compressed air supply regulated to give a distribution pressure up to 4 bar (50 psi) / 7 bar (100 psi). All major plant components with the exception of the air receiver shall be duplex to conform to the requirements of following standard: Each air compressor shall be driven by an electric motor. Under normal conditions, operation of a single air (duty) compressor shall generate the design pressure within the air receiver. In the event of a duty air compressor failure, or during periods of excessive demand, the standby air compressor failure, the first stage of a remote alarm shall be activated.

All components are pre-piped and prewired to single-point service connections. The only field connections are air intake, air discharge and power connection at the control panel. All interconnecting copper / brass piping as well as wiring shall be completed and operationally tested prior to shipment. Liquid tight conduit, fittings and junction boxes shall be provided for all control and power wiring.

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Compressors shall be oil injected/oil-less screw compressors. The compressor shall be directly driven by an electric motor and incorporate an air filter and silencer. Each compressor shall be fitted with inter-coolers, aftercoolers, and auto / manual drains. The compressor electric motor shall be suitable for 415 VAC 3 phase 50 Hz. supply. The Medical Air compressors should be of the oil-less air-cooled design. The air compressor's features shall be a cast iron crankcase, Teflon-composite compression, rider rings, lubricated and sealed bearings, stainless steel reed valves, non-asbestos gaskets. No oil is used in the operation of the compressors, so the discharge air is 100% oil-free. A fan-type compressor pulley shall provide cooling with an air shroud.

The system includes a pressure storage tank of standard rating. The tank shall be equipped with a pressure gauge, safety relief valve, 3-way by-pass, gauge glass, and automatic tank drain with manual override.

It also includes standard equipment like compressor discharge check valves of bronze construction, safety relief valves, bronze intake and discharges flexible connectors; solenoid unloads for reliable no-load starting, isolation valves, high discharge temperature shut-down switches, pressure control switches as well as copper tubing with shut-off cock for gauge and switches. A minimum duplex or above set of similar air compressors shall be used.

The system should include a UL/CE labeled control panel in a suitable enclosure. The panel should include/(consist of) the following standard accessories for each pump: Externally operable circuit breaker with a door interlock, control circuit transformer with fused primary and secondary coils, H-O-A switch, run light, hour meter, and magnetic starter with three-leg overload protection and reset switch. The panel should be equipped with a multiple position selector switch for (selection of) normal operation (automatic alternation) or manual selection of lead and lag pumps if one of the pumps is taken out of service due to scheduled maintenance.

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Local audible and visual alarms are to be provided as per the following standard for compressor thermal malfunction and "Backup in use." The alarms should include indicating lights as well as the horn. In addition, the thermal malfunction shut-down is to be provided with a manual reset. The audible alarm should be acknowledged with the "Silence" button. The visual alarm will remain energized until the problem has been corrected. Each alarm function should include a set of dry contacts for connection to the master alarm. All control and alarm functions will remain energized while any compressor in the system remains electrically online.

Field adjustable control switches shall be provided to pre-set to operate the lead compressor between 100 PSIG and 125 PSIG. The lag compressor will automatically start at 95 PSIG if the lead compressor fails to operate.

The duplexed filter and dryer module shall incorporate high-efficiency oil coalescing filters, heatless regenerative desiccant dryers, impregnated activated carbon filters, and bacterial filters. The performance of the filters shall be according to the below specifications:

- Oil coalescing high-efficiency filter: mass efficiency of min 99%, tested according to ISO 8573-2 & ISO 12500-1;
- Activated carbon filter: max remaining total oil content of 0,003 mg/m<sup>3</sup>, tested according to ISO 8573-5 & ISO12500-2;
- Bacterial filter: particle count efficiency of 99% at MPPS=0.06µm, tested according to ISO 12500-3.

• Contaminants in the delivered air downstream of the bacteria filters shall be maintained at levels below those shown in the table below: Each dryer tower shall have the water concentration in the delivered air continuously monitored by a dedicated sensor providing an alarm indication for high dew point on the respective dryer as a backup to the alarm provided by the hygrometer with digital display. The outlet air pressure shall be regulated through a duplex arrangement of non-relieving pressure regulators and protected from over-pressure by duplex pressure safety valves.

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Each unit should be consist of two identical banks of air treatment equipment, piped in parallel and provided with valves to the by-pass either filter set for element replacement, maintenance, and repair work on one of the sets while still treating compressed medical air through the other set without any sacrifice in air quality.

0.5-micron after-filters should be excellent efficiency coalesces with particle removal down to 0.5 microns.

Digital dew point and CO monitors with alarm set points at 39°F and 10 PPM are to be provided with dry contacts for connection to remote alarm panels. A "demand check" for maintenance is to be included as per the following standards:

Tank specification : painted ASME tank  
Power supply : 380 volts 50 Hz 3 phase

The quality of Medical Air must be in compliant with British/European/American Pharmacopeia

Contaminant	Threshold
H <sub>2</sub> O	67ppm v/v (-46°C atm. dp)
CO	5 ppm v/v
CO <sub>2</sub>	500 ppm v/v
SO <sub>2</sub>	1 ppm v/v
NO	2 ppm v/v
NO <sub>2</sub>	2 ppm v/v

Dry particulates ISO 8573-1 particle purity Class 2

Oil (droplet or mist) 0.1 mg/m<sup>3</sup>

Standard: HTM-02-01/ HTM-2022/ NFPA 99/DIN / JIS or equivalent.

Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of a minimum of 20 (twenty) years including predecessor company's experience (if any ).

**Pressure: 4 bar; Additional 7 bar supply must be available for surgical air**

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**11.11.1 Country of origin : USA / CANADA / UK / EU / JAPAN**

11.11.1.1	Plant capacity: minimum 500 LPM	No.	Tk.	30,74,493.00 Tk.	30,74,419.00 Tk.	30,74,143.00 Tk.	30,74,143.00
11.11.1.2	Plant capacity: minimum 700 LPM	No.	Tk.	37,20,555.00 Tk.	37,20,477.00 Tk.	37,20,185.00 Tk.	37,20,185.00
11.11.1.3	Plant capacity: minimum 900 LPM	No.	Tk.	42,71,131.00 Tk.	42,71,027.00 Tk.	42,70,631.00 Tk.	42,70,631.00
11.11.1.4	Plant capacity: minimum 1100 LPM	No.	Tk.	50,84,505.00 Tk.	50,84,394.00 Tk.	50,83,977.00 Tk.	50,83,977.00
11.11.1.5	Plant capacity: minimum 1440 LPM	No.	Tk.	55,12,722.00 Tk.	55,12,606.00 Tk.	55,12,173.00 Tk.	55,12,173.00
11.11.1.6	Plant capacity: minimum 2000 LPM	No.	Tk.	65,37,125.00 Tk.	65,37,006.00 Tk.	65,36,556.00 Tk.	65,36,556.00
11.11.1.7	Plant capacity: minimum 3000 LPM	No.	Tk.	79,49,542.00 Tk.	79,49,407.00 Tk.	79,48,897.00 Tk.	79,48,897.00
11.11.1.8	Plant capacity: minimum 4000 LPM	No.	Tk.	88,61,491.00 Tk.	88,61,357.00 Tk.	88,60,847.00 Tk.	88,60,847.00

**11.11.2 Country of origin : TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM**

11.11.2.1	Plant capacity: minimum 500 LPM	No.	Tk.	21,53,770.00 Tk.	21,53,696.00 Tk.	21,53,420.00 Tk.	21,53,420.00
11.11.2.2	Plant capacity: minimum 700 LPM	No.	Tk.	26,06,284.00 Tk.	26,06,207.00 Tk.	26,05,915.00 Tk.	26,05,915.00
11.11.2.3	Plant capacity: minimum 900 LPM	No.	Tk.	29,92,269.00 Tk.	29,92,165.00 Tk.	29,91,769.00 Tk.	29,91,769.00
11.11.2.4	Plant capacity: minimum 1100 LPM	No.	Tk.	35,61,804.00 Tk.	35,61,694.00 Tk.	35,61,276.00 Tk.	35,61,276.00
11.11.2.5	Plant capacity: minimum 1440 LPM	No.	Tk.	38,61,630.00 Tk.	38,61,514.00 Tk.	38,61,081.00 Tk.	38,61,081.00
11.11.2.6	Plant capacity: minimum 2000 LPM	No.	Tk.	45,78,785.00 Tk.	45,78,666.00 Tk.	45,78,216.00 Tk.	45,78,216.00
11.11.2.7	Plant capacity: minimum 3000 LPM	No.	Tk.	55,67,734.00 Tk.	55,67,599.00 Tk.	55,67,090.00 Tk.	55,67,090.00
11.11.2.8	Plant capacity: minimum 4000 LPM	No.	Tk.	62,06,100.00 Tk.	62,05,965.00 Tk.	62,05,455.00 Tk.	62,05,455.00

**11.12 AGSS PLANT**

**ACTIVE WASTE ANESTHETIC GAS SCAVENGING SYSTEM**

Supply & installation of an active waste anesthetic gas scavenging system shall be duplex/triplex/ quadruplet pump unit with main control panel.

Anesthetic gas scavenging system shall be an active system that removes excess anesthetic gas purged from a semi-re-circulating anesthesia machine and scavenges it out of operating theaters and recovery areas, thereby eliminating the possible long term health hazards to exposed medical staff.

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AGSS blower system uses a blower pump unit for low suction scavenging source, the main control panel, remote control panels, and blower type flow control units for which compressed air supply is unnecessary. The Blower Pump Unit in a plant room is activated by the main Control Panel and operated by remote control panels, which can be installed at any convenient location either in or close by theaters and recovery areas.

The duplex/triplex/quadruplet pump unit provides increased reliability, prolonged pump life, and larger system capacity, covering 20 terminal flow control units.

The Carrier tube connected to the anesthesia machine carries excess gas to the corrugated Interface, where excess gas is held once and sucked into a braided scavenging tube. To keep moderate suction in the interface, room air shall be drawn from the bottom of the Interface. A scavenging tube with a specific adapter is plugged into the outlet port of the flow.

control unit.

Duplex blower pump unit, 385 VAC, 50 Hz, 3 Phase. Capacity: 580 LPM

Standard:HTM-02-01/ HTM-2022/NFPA 99/ DIN / JIS or equivalent

Manufacturer must have valid ISO-9001, ISO-13485, 93/42/EEC (CE) certifications or UL listing or ELT certification and manufacturing experience of a minimum of 20 (twenty) years including predecessor company's experience (if any ).

**11.12.1 Country Of Manufacture: USA/ CANADA/UK/EU/JAPAN**

11.12.1.1	Duplex blower pump, 01 unit per hospital	No.	Tk.	10,76,674.00 Tk.	10,76,618.00 Tk.	10,76,410.00 Tk.	10,76,410.00
11.12.1.2	Main control panel, 01 unit per hospital	No.	Tk.	2,74,552.00 Tk.	2,74,497.00 Tk.	2,74,288.00 Tk.	2,74,288.00
11.12.1.3	Remote control unit (recessed type), 01 unit per OT	No.	Tk.	72,647.00 Tk.	72,639.00 Tk.	72,608.00 Tk.	72,608.00
11.12.1.4	Blower type flow control unit (recessed type), 01 unit per OT	No.	Tk.	99,949.00 Tk.	99,947.00 Tk.	99,936.00 Tk.	99,936.00
11.12.1.5	Scavenging tube set per OT, 01 unit per OT	No.	Tk.	63,138.00 Tk.	63,135.00 Tk.	63,124.00 Tk.	63,124.00

**11.12.2 Country of origin : TURKEY/ SOUTH KOREA/ MALAYSIA/ THAILAND/ VIETNAM**

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11.12.2.1	Duplex blower pump, 01 unit per hospital	No.	Tk.	7,56,414.00 Tk.	7,56,359.00 Tk.	7,56,150.00 Tk.	7,56,150.00
11.12.2.2	Main control panel, 01 unit per hospital	No.	Tk.	1,93,309.00 Tk.	1,93,254.00 Tk.	1,93,045.00 Tk.	1,93,045.00
11.12.2.3	Remote control unit (recessed type), 01 unit per OT	No.	Tk.	51,113.00 Tk.	51,104.00 Tk.	51,073.00 Tk.	51,073.00
11.12.2.4	Blower type flow control unit (recessed type), 01 unit per OT	No.	Tk.	70,132.00 Tk.	70,130.00 Tk.	70,118.00 Tk.	70,118.00
11.12.2.5	Scavenging tube set per OT, 01 unit per OT	No.	Tk.	44,364.00 Tk.	44,361.00 Tk.	44,350.00 Tk.	44,350.00

11.13 Installation of the total system including marking, color coding, copper jointing, all related civil/electrical works, testing & commissioning, and 1-year operation, maintenance servicing of the system and providing as-built drawings (4 sets), etc. all complete as required and as per the direction of Engineer.

11.13.1	Up to 100 bed	Job	Tk.	5,10,820.00 Tk.	5,01,626.00 Tk.	4,66,890.00 Tk.	4,66,890.00
11.13.2	Above 100 bed and up to 300 bed	Job	Tk.	7,15,150.00 Tk.	7,02,277.00 Tk.	6,53,646.00 Tk.	6,53,646.00
11.13.3	Above 300 bed	Job	Tk.	10,21,641.00 Tk.	10,03,251.00 Tk.	9,33,779.00 Tk.	9,33,779.00

#### 11.14 MEDICAL GAS , GAS CYLINDER AND VIE

##### 11.14.1 GAS CYLINDER

Supply & installation of a high-pressure gas cylinder (without gas). The working pressure should be 2000-2200psi and the rupturing pressure shall be within 3600-4000psi. The cylinder is approved by the Explosive Department of Bangladesh or competent authority.

i. Principal element:

Test pressure: 250 kgf/cm<sup>2</sup>

Filling pressure: 150 kgf/cm<sup>2</sup>

ii. Material of Construction: Intermediate Manganese Steel

iii. Construction: By hot spinning of seamless steel tube

iv. Minimum wall thickness: 4.2 mm

v. Safety Factor: 2.26

vi. Cylinder Dimension:

Length: 1360 mm (approx.)/775mm (approx.)

Body Diameter: 232 mm (approx.)/139 mm (approx.)

Quality Standard: BS/DOT/ISO Certificate must be submitted with the offer.

11.14.1.1	Oxygen Cylinder 6-7 cubic meter	No.	Tk.	20,252.00 Tk.	20,252.00 Tk.	20,252.00 Tk.	20,252.00
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11.14.1.2	Oxygen Cylinder 9-10 cubic meter	No.	Tk.	30,376.00 Tk.	30,376.00 Tk.	30,376.00 Tk.	30,376.00
11.14.1.3	Nitrous Oxide 5 - 7 cubic meter	No.	Tk.	20,252.00 Tk.	20,252.00 Tk.	20,252.00 Tk.	20,252.00
11.14.1.4	Compressed Air 6-7 cubic meter	No.	Tk.	20,252.00 Tk.	20,252.00 Tk.	20,252.00 Tk.	20,252.00
11.14.1.5	Compressed Air 9-10 cubic meter	No.	Tk.	30,376.00 Tk.	30,376.00 Tk.	30,376.00 Tk.	30,376.00
11.14.2	<b>MEDICAL GAS</b>						
	Supply of medical graded oxygen, compressed air, and nitrous oxide gas. The gas supplier shall be approved by the Drug Authority of Bangladesh						
11.14.2.1	Medical Oxygen	Cubic meter	Tk.	65.00 Tk.	65.00 Tk.	65.00 Tk.	65.00
11.14.2.2	Compressed Medical Air	Cubic meter	Tk.	58.00 Tk.	58.00 Tk.	58.00 Tk.	58.00
11.14.2.3	Medical Nitrous Oxide	Cubic meter	Tk.	967.00 Tk.	967.00 Tk.	967.00 Tk.	967.00
11.14.3	<b>VACUUM INSULATED EVAPORATOR (VIE)</b>						
	Installation, testing, commissioning for Liquid Medical Oxygen Storage Tank/VIE (Capacity- up to 20KL) without the cost of storage tank /VIE, including a license from Department of Explosive with RCC VIE Foundation ( 18' x 16' X 2') & inside site development to VIE Fencing ( 18' x 16' x 6' ) , entrance door of 2 spans each 3' wide & 3' wide emergency exit door with fittings; liquid Oxygen spillage pit, Earthing and Lightning Arrestor as necessary, Piping, safety valve, etc. (VIE to Vaporizer to Control Panel), DATA ONLINE cable & fittings, Fittings and connector for level gauge, Vaporizer fitting and fixing, VIE Control Panel fitting and fixing, VIE Transportation and Shifting. VIE & fencing should be properly painted. Safety Instruction Sign and symbol must be installed appropriately.						
11.14.4	Liquid Medical Oxygen	Job Liter	Tk.	12,12,287.00 Tk. 44.50 Tk.	11,96,099.00 Tk. 44.50 Tk.	11,34,940.00 Tk. 44.50 Tk.	11,34,940.00 44.50

**ANNEXURE – 11****Special Terms & Conditions for Medical Gas and Vacuum Pipe Line System (MGVPS) Works.  
(It will be the part and parcel of (standard tender document) of STD)****A. ELIGIBILITY OF TENDERER :**

- 1 The tenderer shall have the construction experience of satisfactory completion of the MGVPS work of a minimum value under a single or multiple numbers of contracts over a period, as specified in the TDS.
- 2 The tenderer must have the technical personnel having minimum 5 years of experience and training on installation and maintenance on medical gas pipeline system. At least one technical person must hold international certification on medical gas pipeline system as medical gas inspector or trained from the manufacturer & getting certifications on MGVPS. List of requisite personnel's CV shall have to be attached with the tender.
- 3 The tenderer shall be the sole local agent / distributor of the proposed brand equipment. In this regard documents shall have to be submitted along with the tender.
- 4 The tenderer shall have to possess an independent full-fledged workshop for maintenance of MGVPS.

**B. BID PREPARATION :**

- 1 The tenderer / bidder shall mention the standard, brand, manufacturer's name, model & country of origin of their proposed / offered equipment of medical gas and vacuum pipe line system (MGVPS) along with technical offer and marking in the original catalogues with seal and signed.
- 2 Certificate of authentication in this respect of the work should have to be furnished by the tenderer / bidder along with the tender document in the following manner as applicable.
  - (a) In case of work done under PWD, the certifying and authenticating authority shall be executive Engineer under whom the work has been executed.
  - (b) In case of work done under any govt. / semi-govt. / autonomous organization other than PWD, the certifying authority shall be the officer of the organization (not below the ranks of executive Engineer) and the same should be duly authenticated by the concerned executive Engineer of PWD of that area under whose jurisdiction the work has been executed.
  - (c) In case of work done under a private organization, certificate is to be obtained from the chairman / CEO / managing director of the organization about the type and nature of work up to date payment made to the builder and the same is to be duly verified by the concerned executive Engineer of PWD of that area under whose jurisdiction the work has been executed.
  - (d) In case of work done under a private organization, prescribe work under eligibility of tenderer (original or duly attested by the competent authority) for the work should be enclosed along with tender documents.
  - (e) In case of work done under a private organization, payment certificate and certificate of deposit is to be obtained from the banker and is to be enclosed along with tender document in ITT.
- 3 The tenderer shall have to submit the guarantee certificate regarding supply of spare parts at least for next 10 years by the manufacturer.
- 4 The company profile of the bidder, principal supplier / manufacturer, with their detailed address, telephone no, fax no, web-site address and e-mail address shall have to be submitted by the tenderer along with the tender document.



- 5 The tenderer shall have to submit all the certificates / documents / drawings / all papers etc. in detail and correctly. If any false declaration is given by a tenderer, the tender shall be rejected and the tenderer shall be debarred from participating in all other tenders of PWD.
- 6 The tenderer shall have to visit the working site & then prepare all related documents for tender.
- 7 The Tenderer must submit a detail list of minimum 10 (ten) exporting countries with project locations by the concerned manufacturer where the products of proposed brand have been installed.
- 8 The Tenderer must submit a detail list of minimum 5 (five) nos Govt./ Private hospitals in Bangladesh duly verified by concerned Executive Engineer of PWD where the products of proposed brand are installed .
- 9 The Tenderer must submit a prior approval/ certification issued by concerned authority of PWD for proposed brand regarding Product Quality and Factory Assessment Test.

**C. MGVPS PROJECT ASSUMPTION :**

- 1 Work under this section shall include furnishing, installing, testing, commissioning and certification of a complete medical gas piping system for the following medical gases : Oxygen (O2), Nitrous Oxide (N2O), Medical Air, Nitrogen (N2), Medical Vacuum (VAC), AGSS etc.
- 2 System shall be completed in every respect and ready to put into operation. All materials used shall be new and of the best grade and quality obtainable and first class workmanship shall be in every respect.
- 3 Standard should comply as follows: Medical gas outlets, gas line valves, area valve service unit / zonal Service unit, alarm valve combo unit, pendant, bed head trunking, manifold control system, master alarm, area alarm, computerized information management system for medical gas alarm devices, vacuum plant, air plant, AGSS, downstream equipment, copper tubes, copper fittings etc. shall comply with the requirements of current version of HTM-02-01/HTM-2022 / NFPA-99 / DIN / JIS or equivalent standard. Bidder shall have to offer the above MGVPS equipment / material of only one standard.
- 4 All piping materials and their accessories shall comply with BS EN 13348 (which replace BS 2871) / BS EN 1057 or equivalent standard.
- 5 The MGVPS will be on turnkey basis.

**D. MATERIALS SUPPLY :**

**General Terms**

- 1 The tenderer shall have to supply the MGVPS equipment from the same manufacturer having brand name and logo.
- 2 Copper pipes and related accessories to be used in the MGVPS must conform the standard and specification as mentioned in the tender schedule. In this regard test certificates (with result) by the internationally accepted third party agencies and shall have to be submitted by the successful bidder during supply of the materials.
- 3 The successful tenderer shall have to submit the packing list along with pro forma invoice having seal and sign by the manufacturer minimum seven (7) working days of shipment to the concerned executive Engineer. The detail description of the equipment / materials must be mentioned in the packing list as per work order. The manufacturer shall have to certify that all MGVPS equipment and piping materials have been supplied by them. All the equipment / materials related to work order will be in a single packing list with the project name.

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- 4 Quality assurance tests of the products as per standards will have to be carried out by the at least two Engineers. Such tests will be carried out at manufacturer primes. All cost related to Engineers' travel, food, accommodation, pocket allowance etc. will be borne by supplier. For special reasons if inspection is not performed by the Engineers of the PWD, then quality assurance tests will be carried out by govt. approved / internationally accepted inspection agencies (home and abroad). The expenditure for this will incorporate by the bidder at the time of participation.
- 5 All the imported materials of the work order shall have to bring directly at the working site after the clearance of the port authority.
- 6 The gas services outlets shall be sequentially arranged and located as shown on the plans with a minimum center line spacing of 4.5 to 5 inches between outlets
- 7 All items shall be factory pre-cleaned and prepared for medical gas and vacuum service in accordance with current version of HTM-02-01 HTM-2022/ NFPA-99 / DIN / JIS or equivalent standard
- 8 In case of gas line ball valve, bronze body may also be accepted.
- 9 Desiccant dryer is preferable for air treatment.
- 10 Capacity of the air plant & vacuum plant (HP, KW, Flow rates) may vary as per the design of the MGVPs.
- 11 AGSS plant can be installed according to hospital's requirement.
- 12 Other related work, if any, for making the manifold functional will be executed by the vendor.
- 13 Any combination of cylinder ramp can be arranged in manifold system according to hospital's requirement.
- 14 All materials used in the system shall be suitable for use in tropical country like BANGLADESH.

#### **Bulk Oxygen (Third Party Works)**

- 15 If bulk liquid Oxygen supply plant system is installed then clearance from explosive department shall have to be furnished by the supplier before commissioning. The design of foundation structure of the bulk liquid Oxygen supply plant shall have to be vetted from the structural wing of PWD.
- 16 Liquid Oxygen supply system shall automatically shift to secondary source in case of fault of primary. The unit shall be of latest version fitted with standard accessories as minimum and shall have undergone standard inspection requirement.
- 17 Oxygen supplier (LINDE / approved medical gas supplier / manufacturer approved by Ministry of Health & Family Welfare of BANGLADESH) will make all final tie-ins after the contractor provides all piping to the liquid Oxygen tank.
- 18 Oxygen supplier (LINDE / approved medical gas supplier / manufacturer approved by Ministry of Health & Family Welfare of BANGLADESH) under a separate contract will provide bulk Oxygen storage and control equipment (liquid and cylinder) with the owner / user.
- 19 Cylinders for Oxygen, Nitrous Oxide, Nitrogen etc. will be provided by gas supplier (LINDE / approved medical gas supplier / manufacturer approved by Ministry of Health & Family Welfare of BANGLADESH) under separate contract with the owner / user .

**E. INSTALLATION :****I) Civil Works**

- 1 Facilities required for keeping the gas cylinders, foundation, fencing etc. will be constructed by the vendor.
- 2 Making holes in the slab, walls, removing false ceiling and placing back, if any, etc. will be the responsibility of the vendor and the same will be made good by them. Related waste will be removed by the vendor and will be disposed in the dumping yard as decided by the Engineer- in – charge.
- 3 All related civil / electrical work will be carried out as per PWD specifications / BNBC.

**II) Electrical Works**

- 4 All MGVPS equipment & copper pipe lines shall be bonded to an earth terminal as near as possible to the point at which the pipeline enters the building as per PWD specifications / BNBC. All electrical works shall be carried out as per BNBC.

**III) Installation of Equipment's**

- 5 All pipelines for medical gases shall be routed in such way that they are not exposed to a temperature less than 5°C above the dew point of the gas distribution pressure.
- 6 If pipeline placed underground they shall be placed in duct or tunnels. The duct and tunnels shall be provided with adequate drainage to prevent water accumulation.
- 7 Valves, fittings and other piping components shall be cleaned for Oxygen service by the manufacturer. No onsite cleaning shall be permitted.

**IV) Copper Jointing**

- 8 Copper to copper joints shall be brazed without flux. Brazing material shall be a copper-phosphorous or copper-phosphorus-silver filler metal, without flux. Except for mechanical joints used for components, all metallic pipeline joints shall be brazed or welded.
- 9 Dissimilar metals, such as copper and bronze or brass, shall be brazed using an appropriate flux with a silver bag series brazing filler metal. Dissimilar metal brazing with flux must be done on the bench, so that any flux residue can be washed from the joint area before installation onto the pipeline.

**V) Testing**

- 10 All testing shall be carried in presence of users & procuring entity's representative after installation of the whole work.

**VI) Marking**

- 11 Marking & color coding : Pipeline shall be marked with the name and/or symbol adjacent to shut-off valves, at the junctions and the changes of direction, before and after walls and partitions, etc. at the intervals not more than 6-10 meter and adjacent to terminal units. Marking and labeling identification shall be consistent with current version of HTM-0201/HTM-2022 / NFPA-99 / DIN / JIS or equivalent standard.

**VII) Commissioning**

- 12 All commissioning shall be carried in presence of users & procuring entity's representative after installation of the whole work.

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**F. HANDOVER :**

**Warranty:**

1 As per tender document.

**Expansion of MPGS**

2 In case of extension and modification of job, tenderer has to provide all necessary probes / adaptors quantity as specified by Engineering in charge to run existing downstream equipment (anesthesia equipment, ventilator equipment etc.) properly in designated locations (OT, ICU, CCU) with tenderer's supplied outlets .

**Documentation**

3 The successful tenderer shall have to submit shop drawings within 7 days after receiving the work order and duly approved by the Engineer in charge. After completion of the work the successful bidder shall have to submit 4 (four) sets of as built drawing within a month of handover the job.

4 The installer shall furnish documentation certifying that all installed piping materials comply with the requirements of current version of HTM-0201/HTM-2022 / NFPA-99 / DIN / JIS or equivalent standard.

**Training**

5 After completion of the work, the contractor will arrange an exclusive mandatory training program for 5 - 10 nominated persons as decided by the authority & PWD concern regarding operation and maintenance of the system for one month.

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**CERTIFICATE OF SATISFACTORY COMPLETION OF MEDICAL GAS PIPE LINE SYSTEM (MGVPS) WORKS.**

1. Name of contractor / firm with full address :
2. Name of the work done during last five years :
3. Name of the hospital under / in which the work was / were done :
4. Location of the installation :
5. Attested copy of work order (schedule of items of works should be enclosed) :
6. Cost of the work done in taka :
7. Completion date of the work as per work order :
8. Actual date of completion of the work as per work order :
9. Reason for delay in completion of the work (if any) :
10. Present condition of the installation :
11. Brand & country of origin of the relevant equipment :

**Signature seal of the  
certifying authority**

This is to certify that I have verified and found that the above information's are true. A Photostat copy of the same has been kept in this office file for record.

**Signature of tenderer  
with seal & address**

**Signature & seal of the  
authenticating officer.**

**N.B:**

1. In case of the work was done under PWD the above certifying and authenticating authority shall be the concerned Executive Engineer.
2. In case of the work was done under any govt. / semi govt. / autonomous bodies/ organization other than PWD certifying authority shall be an officer not below the rank of executive Engineer and the same have to be authenticated by the executive Engineer of PWD of the concerned area of installation.
3. In case of the work was done under / private organization / building, the certifying authority shall be owner / client / user and the same shall have to be authenticated by the executive Engineer of PWD of concerned area of installation.
4. Separate similar sheet may be enclosed for more than one work.

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**Manufacturer's Authorization Letter (Form G - 5)**

[This letter of authorization should be on the letterhead of the manufacturer and should be signed by the person with the proper authority to sign documents that are binding on the manufacturer]

Invitation for Tender No:

Date:

Tender Package No:

To:

Executive Engineer

PWD Division.....

WHEREAS, we [name and address of manufacturer] are reputable manufacturers having factories at [list of places of factories].

THEREFORE, we do hereby:

1. Authorize [name of Tenderer] to submit a Tender in response to the Invitation for Tenders indicated above, the purpose of which is to provide the following Goods, [description of goods], manufactured by us, and to subsequently sign the Contract for the supply of such Goods; and,

2. Extend our full guarantee and warranty in accordance with GCC Clause 32, with respect to the Goods offered in the Tender.

Signed

In the capacity of:

Duly authorized to sign the authorization for and on behalf of

[name of manufacturer]

Date: