

PART 1 - GENERAL

1.1 Scope

- .1 Oxygen System
- .2 Nitrous Oxide System
- .3 Nitrogen System
- .4 Medical Compressed Air System
- .5 Medical Vacuum System
- .6 Carbon Dioxide System
- .7 Waste Anaesthetic Gas Disposal System

1.2 Related Work

- .1 Section 15XXX
- .2 Section 15XXX
- .3 Section 15XXX
- .4 Division 16XXX

1.3 General Requirements

- .1 Include supply, installation and testing of complete medical gas piping system.
- .2 Components shall include but shall not be limited to:
 - .1 Pipe, fittings, valves, valve boxes, alarms and sensing devices, and medical gas outlets.
 - .2 Vacuum pumps, motors, control panels and accessories.
 - .3 Air compressors, motors, control panels, dryers, filters and accessories.
 - .4 Manifold and accessories.
 - .5 Gas control panels (for Nitrogen and Air service).
 - .6 Installation of service piping and connection to owner supplied bulk medical gas system.
- .3 Medical gas purity and cross-contamination testing will be completed by a certified testing agency hired directly by the owner. Include for all costs associated with co-ordination and assistance required during purity testing of the medical gas systems.
- .4 Submit sets of shop drawings to clearly indicate:
 - .1 Compliance to codes and standards.
 - .2 Equipment dimensions and performance (where applicable).
 - .3 Wiring and controls (where applicable).

- .5 Provide maintenance data for incorporation into maintenance manual. This data shall include:
 - .1 Equipment list identifying all components used in each system.
 - .2 Equipment manufacturers names and addresses.
 - .3 Wiring diagrams of all alarms and electrical components.
 - .4 Detailed drawings of all equipment and components.
 - .5 Manufacturers service manuals for all equipment.
 - .6 Valve schedule listing all valves in the system with location.
 - .7 Completed test result report form.

1.4 Quality Assurance

- .1 All piping equipment, installation and testing shall conform to the latest editions (including changes and revisions) of the following Codes and Standards:
 - .1 NFPA 99 Health Care Facility (1999).
 - .2 NFPA 70 National Electrical Code.
 - .3 NFPA 50 Bulk O2 Systems at Consumer Sites.
 - .4 CSA Z305.1-1992 Non-flammable Medical Gas Piping Systems.
 - .5 ASTM B819 Standard Specification for Seamless Copper Tube for Medical Gas Systems.
 - .6 AWS A5.8 Brazing Filler Metal.
 - .7 CGA G-4.1 Cleaning Equipment for Oxygen Service.
 - .8 CGA V-1 Compressed Gas Cylinder Valve Outlet and Inlet Connections.
 - .9 CGA V-5 Diameter Indexing Safety System.
- .2 Comply with Federal, State and Local Codes applicable to this installation.

1.5 Manufacturer

- .1 One manufacturer shall supply the medical gas systems equipment, including the sources of supply. This manufacturer shall have a product specialist available to periodically check with the contractor during initial installation of the pipeline systems equipment. The equipment manufacturer's representative shall train the hospital personnel in the use of the piping system and related equipment, which is operated from those systems.

- .2 Manufacturers wishing to submit alternates on the equipment as specified must make application to the consultant at least two weeks prior to tender closing. Such alternates must meet or exceed the specification as set forth. All submissions will be complete with both sales brochures and technical information supporting the request for acceptance as an alternate.

PART 2 - PRODUCTS

2.1 Pipe, Fittings and Joints

- .1 Piping: All distribution system piping except for the "passive" waste anaesthetic gas evacuation system shall be Type "K" washed and degreased, seamless copper tubing, provided with protective caps at both ends. Where concealed it shall be soft temper and where exposed it shall be hard temper.
- .2 Fittings: All fittings except for the "passive" gas evacuation system shall be of wrought copper, brass or bronze, designed expressly for brazed silver solder connections.
- .3 Brazing Alloy: Fittings shall be assembled using a silver brazing alloy conforming to AWS classification BCuP-5. This requirement does not apply to any part of the medical gas system that is located outdoors, including storage vessels.

2.2 Shut-Off Valves

- .1 Valves shall be a 4-bolt design, bronze body, double seal, full port, union ball-type with teflon (TFE) seats and Viton seals, "O" ring packing, bronze ball which seals in both directions, blow-out proof stem, having a pressure rating of 4137 kPa (600 psig).
- .2 Valves shall be operated by a lever handle requiring only a quarter turn from a fully open position to a fully closed position. All valves shall be equipped with type "K" washed and degreased copper pipe stub extensions at both the inlet and outlet sides of the valve port to facilitate installation.
- .3 Valves shall be designed so that it can be "swung-out" during installation to prevent damage due to heat transfer during the brazing operation. A label showing the appropriate gas services and pressure rating shall be attached to each valve.
- .4 Each valve assembly shall be provided washed and degreased for oxygen service and pipe stub extensions shall be capped at both ends. The valve shall be supplied in a sealed plastic bag to prevent contamination prior to installation.
- .5 Valves shall be Amico VV-ISO-GXXX Series or approved alternate.

2.3 Zone Valve Boxes

- .1 Each recessed zone valve box shall consist of the following components: A steel valve box which can house single or multiple shut-off ball valves with tube extensions, an aluminium frame, and a pull-out removable window.
- .2 The valve box shall be constructed of 18 gauge steel complete with a baked enamel finish. Affixed to the opposing sides of the box will be two adjustable steel brackets for the purpose of mounting to structural support. The steel brackets shall accommodate various finished wall thicknesses of between 6 mm (1/4") and 13 mm (1/2") and shall be field adjustable.
- .3 The doorframe assembly shall be constructed of anodised aluminium and shall be mounted to the back box assembly by screws as provided. The removable front shall consist of a clear window with a pullout ring pre-mounted to the centre of the window.
- .4 Access to the zone shut-off valves shall be by merely pulling the ring assembly to remove the window from the doorframe. The window can be reinstalled without the use of tools only after the valve handles have been returned to the open position.
- .5 The window shall be marked with the following silk-screen:

"CAUTION: MEDICAL GAS CONTROL VALVE
CLOSE ONLY IN EMERGENCY"

- .6 Valves shall be a 4-bolt design, bronze body, double seal, union ball-type, with Teflon (TFE) seats and Viton seals, "O" ring packing, and ball which seals in both directions, blow-out proof stem, with a pressure rating of 2760 kPa (400 psig). Valves shall be operated by a lever-type handle requiring only a quarter turn from a fully open position to a fully closed position. All valves shall be equipped with type "K" washed and degreased copper pipe stub extensions of sufficient length to protrude beyond the sides of the box.
- .7 The entire valve body and pipe stubs shall be plated to a minimum of 25 mm (1") beyond the sides of the back box, but in no instance shall the plating be extended to the ends of the pipe stubs. All pipe stub extensions shall be supplied with suitable plugs or caps to prevent contamination of the assembly prior to installation.
- .8 Each valve shall be supplied with an identification bracket bolted directly onto the valve body for the purpose of applying an approved medical gas identification label. A package of labels shall be supplied with each valve box assembly for application by the installer.
- .9 Valves shall be available with or without line pressure gauges, as required. Gauges, when supplied, shall be 51 mm (2") diameter, with metal case and ring, and a 3 mm (1/8") MNPT brass stud at the back of the gauge for the purpose of mounting onto pipe stub extension. The pipe stub extension shall be complete with a soldered gauge holder. Gauge holders shall be sealed with a brass plug to prevent contamination prior to mounting gauges.
- .10 Pressure gauges shall read 0-700 kPa (0-100 psig) for all gases except nitrogen, which shall read 0-2000 kPa (0-300 psig), and vacuum, which shall read -100-0 kPa (0-30" Hg).

- .11 Zone valve boxes shall be Amico VBE-MXXX Series or approved alternate.

2.4 **MEDICAL GAS OUTLETS**

2.4a Medical Gas Outlets AMICO ("Ohmeda Compatible") Quick-Connect

- .1 Medical gas outlets shall be Amico "Ohmeda" Compatible Quick-Connect recessed wall outlets designed for concealed piping. Multiple outlets shall have a centre line spacing of 127 mm (5") between gas services.
- .2 Each quick-connect outlet shall have a large colour coded front plate for ease of gas identification and aesthetic appeal. The front plate assembly shall contain indexing pins for safety keying the gas specific cover plate to the appropriate steel rough-in mounting plate.
- .3 A one piece chromed fascia plate shall cover the outlet. With the backbox rough-in mounted, the outlet shall adjust from 10 mm (3/8") to 32 mm (1-1/4") variation in wall thickness.
- .4 The outlets shall be of modular design and include a gas specific 1.6 mm (16 ga.) steel mounting plate designed to permit on-site ganging of multiple outlets, in any order, on 127 mm (5") spacing.
- .5 Each rough-in box shall consist of a type "K", 6.4 mm (1/4") inside diameter copper inlet pipe stub, which is silver brazed to the outlet body. Body shall be 32 mm (1-1/4") diameter one piece, brass construction. For positive pressure gas services, the outlet shall be equipped with a primary and secondary check valve. The secondary check valve shall be rated at a minimum 1379 KPa (200 psi) in the event the primary check valve is removed for maintenance.
- .6 The latch/valve assembly shall be Ohmeda Quick Disconnect compatible and accept only corresponding Ohmeda type gas specific adapters.
- .7 All outlets shall be UL listed, CSA approved, factory assembled, tested, cleaned for oxygen service, and supplied with temporary protective covers and packages to protect outlet during handling and installation at the job site.
- .8 Medical gas outlets shall be Amico O-QDWAL-L-XXX Series, or approved alternate.

2.4b Medical Gas Outlets AMICO ("Chemetron Compatible") Quick-Connect

- .1 Medical gas outlets shall be Amico "Chemetron" Compatible Quick-Connect recessed wall outlets designed for concealed piping. Multiple outlets shall have a centre line spacing of 127 mm (5") between gas services.
- .2 Each quick-connect outlet shall have a large colour coded front plate for ease of gas identification and aesthetic appeal. The front plate assembly shall contain indexing pins for safety keying the gas specific cover plate to the appropriate steel rough-in mounting plate.

- .3 A one piece chromed fascia plate shall cover the outlet. With the backbox rough-in mounted, the outlet shall adjust from 10 mm (3/8") to 32 mm (1-1/4") variation in wall thickness.
- .4 The outlets shall be of modular design and include a gas specific 1.6 mm (16 ga.) steel mounting plate designed to permit on-site ganging of multiple outlets, in any order, on 127 mm (5") spacing.
- .5 Each rough-in box shall consist of a type "K", 6.4 mm (1/4") inside diameter copper inlet pipe stub, which is silver brazed to the outlet body. Body shall be 32 mm (1-1/4") diameter one piece, brass construction. For positive pressure gas services, the outlet shall be equipped with a primary and secondary check valve. The secondary check valve shall be rated at a minimum 1379 KPa (200 psi) in the event the primary check valve is removed for maintenance.
- .6 The latch/valve assembly shall be Chemetron Quick Disconnect compatible and accept only corresponding Chemetron type gas specific adapters.
- .7 All outlets shall be UL listed, CSA approved, factory assembled, tested, cleaned for oxygen service, and supplied with temporary protective covers and packages to protect outlet during handling and installation at the job site.
- .8 Medical gas outlets shall be Amico O-CHWAL-L-XXX Series, or approved alternate.

2.4c Medical Gas Outlets AMICO ("Puritan-Bennett" Compatible) Quick-Connect

- .1 Medical gas outlets shall be Amico "Puritan-Bennett" Compatible Quick-Connect recessed wall outlets designed for concealed piping. Multiple outlets shall have a centre line spacing of 127 mm (5") between gas services.
- .2 Each quick-connect outlet shall have a large colour coded front plate for ease of gas identification and aesthetic appeal. The front plate assembly shall contain indexing pins for safety keying the gas specific cover plate to the appropriate steel rough-in mounting plate.
- .3 A one piece chromed fascia plate shall cover the outlet. With the backbox rough-in mounted, the outlet shall adjust from 10 mm (3/8") to 32 mm (1-1/4") variation in wall thickness.
- .4 The outlets shall be of modular design and include a gas specific 1.6 mm (16 ga.) steel mounting plate designed to permit on-site ganging of multiple outlets, in any order, on 127 mm (5") spacing.
- .5 Each rough-in box shall consist of a type "K", 6.4 mm (1/4") inside diameter copper inlet pipe stub, which is silver brazed to the outlet body. Body shall be 32 mm (1-1/4") diameter one piece, brass construction. For positive pressure gas services, the outlet shall be equipped with a primary and secondary check valve. The secondary check valve shall be rated at a minimum 1379 KPa (200 psi) in the event the primary check valve is removed for maintenance.
- .6 The latch/valve assembly shall be Puritan-Bennett Quick Disconnect compatible and accept only corresponding Puritan-Bennett type gas specific adapters.

- .7 All outlets shall be UL listed, CSA approved, factory assembled, tested, cleaned for oxygen service, and supplied with temporary protective covers and packages to protect outlet during handling and installation at the job site.
- .8 Medical gas outlets shall be Amico O-PBWAL-L-XXX Series, or approved alternate.

2.4d Medical Gas Outlets AMICO DISS

- .1 Medical gas outlets shall be Diameter Index Safety System (DISS) recessed wall outlets designed for concealed piping.
- .2 Each DISS outlet shall have a large colour coded front plate for ease of gas identification and aesthetic appeal. The front plate assembly shall contain indexing pins for safety keying the gas specific cover plate to the appropriate steel rough-in mounting plate.
- .3 A one piece chromed fascia plate shall cover the outlet. With the backbox rough-in mounted, the outlet shall adjust from 10 mm (3/8") to 32 mm (1-1/4") variation in wall thickness.
- .4 The outlets shall be of modular design and include a gas specific 1.6 mm (16 ga.) steel mounting plate designed to permit on-site ganging of multiple outlets, in any order, on 127 mm (5") spacing.
- .5 Each rough-in box shall consist of a type "K", 6.4 mm (1/4") inside diameter copper inlet pipe stub, which is silver brazed to the outlet body. Body shall be 32 mm (1-1/4") diameter one piece, brass construction. For positive pressure gas services, the outlet shall be equipped with a primary and secondary check valve. The secondary check valve shall be rated at a minimum 1379 KPa (200 psi) in the event the primary check valve is removed for maintenance.
- .6 The latch/valve assembly shall be DISS type and only accept corresponding DISS type gas specific adapters.
- .7 All outlets shall be UL listed, CSA approved, factory assembled, tested, cleaned for oxygen service, and supplied with temporary protective covers and packages to protect outlet during handling and installation at the job site.
- .8 Medical gas outlets shall be Amico O-DISWAL-L-XXX Series, or approved alternate.

2.5 Area Alarm Panel (Digital) AMICO Alert-2

- .1 Each area alarm shall be microprocessor based with individual microprocessors on each display and sensor board. The sensors shall be capable of local (within alarm box) or remote mounting on

pipeline utilising twisted pair wiring - up to 1,524 m (5,000 ft.). Each sensor and display unit shall be gas specific; i.e. gas specific sensor with DISS nut & nipple, and display module with an error message display for an incorrect sensor/display connection.

- .2 Each area alarm shall consist of: an 18 gauge (1.3 mm) steel back box with mounting brackets adjustable up to 13 mm (½") wall thickness and 6.4 mm (¼") I.D. type "K" copper tubing for connection to the gas service line. The area alarms shall be of modular construction and shall be field expandable with the addition of extra modules. Up to six services can be accommodated per standard box. All modules shall be mounted on a hinged frame for easy accessibility.
- .3 Each specific service shall be continuously monitored by a microprocessor based sensor. The pressure or vacuum shall be displayed by a red digital LED. For pressure services the readout shall be 0-1724 kPa (0-250 psig). For vacuum the readout shall be -100-0 kPa (0-30" Hg). The digital readout shall provide a constant indication of each service being measured. A bar graph trend indicator shall be provided for each service displaying a green "NORMAL", yellow "CAUTION" and a red "HIGH" or "LOW" alarm condition. Under normal operations the bar graph display shall move up and down in the "GREEN" range depending on service usage. If a deviation of ±20% from the factory pre-set normal condition occurs, a "RED" alarm light shall flash and an audible buzzer in excess of 90 decibels will sound. Pushing the "ALARM SILENCE" button will cancel the audible buzzer, but the unit will remain in alarm condition until the problem is rectified.
- .4 The alarm shall have field adjustable parameters; High/Low set points, Imperial/Metric units and Repeat alarm Enable (1 to 60 minutes)/Disable function. These parameters can be accessed within the calibration mode function of the alarm. Set-points shall be adjustable by two on board push buttons. Alarm shall be self-diagnostic with error message display for ease of maintenance.
- .5 Each gas service shall be labelled with ISO or USA colour coded label, and alarm signals shall be visible from a distance of 12 m (40 ft.) and shall be visible if other lights in the room are off.
- .6 Each gas service display module shall have dry contacts for remote monitoring of the High and Low alarms. The area alarm shall also be capable of interfacing with the optional hospital Amico Information Management System (AIMS).
- .7 Area alarms shall be closed circuit and shall be CSA certified and UL listed. A green "power on" light shall indicate that the alarm is energised. Alarms shall be complete with a "push to test" and "alarm silence" buttons. Area alarms shall have no moving parts and shall require no maintenance after initial installation.
- .8 Area alarms shall be Amico A2AL-L-XXX Series, or approved alternate.

2.6 Master Alarm Panel AMICO Alert-2

- .1 Each master alarm shall be microprocessor based with individual microprocessors on each master module. Each master alarm module is capable of handling up to 10 operating functions.

- .2 Each master alarm shall consist of: an 18 gauge (1.3 mm) steel back box with mounting brackets adjustable up to 13 mm (½") wall thickness. The master alarms shall be of modular construction and shall be field expandable with the addition of extra modules. Up to six, ten signal, master alarm modules can be accommodated per standard box for a total of 60 signals. All modules shall be mounted on a hinged frame for easy accessibility.
- .3 The master alarm shall be a closed circuit self-monitoring type. A green "POWER" light shall provide indication that the alarm is energised. In addition "PUSH TO TEST" and "ALARM SILENCE" buttons shall be easily accessible to operate and test the unit. If an alarm condition occurs, a "RED" alarm LED shall illuminate and an audible buzzer in excess of 90 decibels will sound. Pushing the "ALARM SILENCE" button will cancel the audible buzzer, but a repeat alarm function shall, when enabled, be capable of turning on the buzzer again, after a pre-set time, if the fault condition has not been rectified.
- .4 The master alarm shall have field adjustable functions. For the master module: A maintenance mode shall, when enabled, latch the source (master) alarm conditions, requiring a reset after the alarm condition has been rectified. This is to assist in tracking down wiring problems or faulty source equipment devices. A repeat alarm function shall, when enabled, be capable of turning on the buzzer again, after a pre-set time, if the fault condition has not been rectified.
- .5 Each master alarm shall be CSA certified and UL listed.
- .6 Every master module shall be field upgradable to allow for interfacing to a building management system with the addition of add-on, piggyback circuit board. The master alarm shall also be capable of interfacing with the optional hospital Amico Information Management System (AIMS), as provided by the manufacturer.
- .7 The following source (remote) conditions shall be monitored by the master display modules (10 signals/module):
 1. Oxygen Liquid Supply
 1. Oxygen Primary Liquid Level Low
 2. Oxygen Secondary Liquid Supply In Use
 3. Oxygen Secondary Liquid Low Head Pressure
 4. Oxygen Secondary Liquid Level Low
 5. Oxygen Emergency Reserve Cylinders In Use
 6. Oxygen Emergency Reserve Cylinders Low
 7. Oxygen Line Pressure Low
 8. Oxygen Line Pressure High
 2. Oxygen Concentrator
 1. Oxygen Concentrator Malfunction
 2. Oxygen Concentrator Secondary Supply Low
 3. Oxygen Concentrator Emerg. Res. Supply In Use
 4. Oxygen Concentrator Emerg. Res. Supply Low
 5. Oxygen Line Pressure Low
 6. Oxygen Line Pressure High
 3. Oxygen Cylinder Supply

1. Oxygen Reserve Cylinders In Use
2. Oxygen Line Pressure Low
3. Oxygen Line Pressure High

4. Nitrogen Cylinder Supply
 1. Nitrogen Reserve Cylinders In Use
 2. Nitrogen Line Pressure Low
 3. Nitrogen Line Pressure High

5. Nitrous Oxide Cylinder Supply
 1. Nitrous Oxide Reserve Cylinders In Use
 2. Nitrous Oxide Line Pressure Low
 3. Nitrous Oxide Line Pressure High

6. Medical Air Compressor (Liquid Ring)
 1. Medical Air Lag Compressor in Use
 2. Medical Air High Water Level in Receiver
 3. Medical Air Receiver Flooded
 4. Medical Air Compressor Low Water Shutdown
 5. Medical Air Reserve Cylinders In Use
 6. Medical Air Reserve Cylinders Low
 7. Medical Air High Dew Point
 8. Medical Air Line Pressure Low
 9. Medical Air Line Pressure High

7. Medical Air Compressor (Oil-less)
 1. Medical Air Lag Compressor in Use
 2. Medical Air Compressor High Temperature Shutdown
 3. Medical Air Compressors Maintenance Required
 4. Medical Air Reserve Cylinders In Use
 5. Medical Air Reserve Cylinders Low
 6. Medical Air High Dew Point
 7. Medical Air Line Pressure Low
 8. Medical Air Line Pressure High

8. Medical Air Dryer (Desiccant)
 1. Desiccant Dryer Switching Failure
 2. Desiccant Dryer Low Outlet Pressure

9. Medical Air Dryer (Refrigerated)
 1. Refrigerated Dryer High Temperature
 2. Refrigerated Dryer Power Failure

10. Medical Vacuum System (Liquid Ring)
 1. Vacuum Pumps Low Water Shutdown
 2. Vacuum Lag Pump In Use
 3. Vacuum Low

11. Medical Vacuum System (Oil Lubricated)

1. Vacuum Pumps Low Oil Shutdown
2. Vacuum Pumps High Temperature Shutdown
3. Vacuum Pumps Maintenance Required
4. Vacuum Lag Pump In Use
5. Vacuum Low

- .8 Master alarms shall have no moving parts and shall require no maintenance after initial installation.
- .9 Master alarm shall be Amico A2M-L-XX Series, or approved alternate.

2.7 Master/Area Alarm Combination Panel AMICO Alert-2

- .1 Each master/area alarm shall be microprocessor based with individual microprocessors on each area display module/sensor board and each master module. The area sensors shall be capable of local (within alarm box) or remote mounting on pipeline utilising twisted pair wiring - up to 1,524m (5,000 ft.). Each area display module/sensor unit shall be gas specific; i.e. gas specific sensor with DISS nut & nipple, and display module with an error message display for an incorrect sensor/display connection. Each master alarm module is capable of handling up to 10 operating functions.
- .2 Each combination master/area alarm shall consist of: an 18 gauge (1.3 mm) steel back box with mounting brackets adjustable up to 13 mm (½") wall thickness and 6.4 mm (¼") I.D. type "K" copper tubing for connection to the gas service line (required for the area sensor). The combination master/area alarms shall be of modular construction and shall be field expandable with the addition of extra modules. Up to six services (combination of area and/or master modules) can be accommodated per standard box. All modules shall be mounted on a hinged frame for easy accessibility.
- .3 Each area alarm specific gas service shall be continuously monitored by a microprocessor based sensor. The pressure or vacuum shall be displayed by a red digital LED. For pressure services the readout shall be 0-1724 kPa (0-250 psig). For vacuum the readout shall be -100-0 kPa (0-30" Hg). The digital readout shall provide a constant indication of each service being measured. A bar graph trend indicator shall be provided for each service displaying a green "NORMAL", yellow "CAUTION" and a red "HIGH" or "LOW" alarm condition. Under normal operations the bar graph display shall move up and down in the "GREEN" range depending on service usage. If a deviation of ±20% from the factory pre-set normal condition occurs, a "RED" alarm LED light shall flash and an audible buzzer in excess of 90 decibels will sound. Pushing the "ALARM SILENCE" button will cancel the audible buzzer, but the unit will remain in alarm condition until the problem is rectified.
- .4 The combination master/area alarm shall have field adjustable parameters. For the area modules: High/Low set-points, Imperial/Metric units and Repeat alarm Enable (1 to 60 minutes)/Disable function. These parameters can be accessed within the calibration mode function of the alarm. Set-points shall be adjustable by two on board push buttons. Alarm shall be self-diagnostic with error message display for ease of maintenance. For the master module: a maintenance mode shall, when enabled, latch the source (master) alarm conditions, requiring a reset after the alarm condition has been rectified. This is to assist in tracking down wiring problems or faulty source

equipment devices. A repeat alarm function shall, when enabled, be capable of turning on the buzzer again, after a pre-set time, if the fault condition has not been rectified.

- .5 Each area gas service shall be labelled with an ISO/USA colour coded label, and alarm signals shall be visible from a distance of 12 m (40 ft.) and shall be visible if other lights in the room are off.
- .6 Each area gas service display module shall have dry contacts for remote monitoring of the High and Low alarms. Every master module shall be field upgradable to allow for interfacing to a building management system with the addition of add-on, piggyback circuit board. The master/area alarm shall also be capable of interfacing with the optional hospital Amico Information Management System (AIMS), as provided by the manufacturer.
- .7 Master/Area alarms shall be closed circuit and shall be CSA certified and UL listed. A green "power on" light shall indicate that the alarm is energised. Alarms shall be complete with a "push to test" and "alarm silence" buttons. Area alarms shall have no moving parts and shall require no maintenance after initial installation.
- .8 Combination master/area alarms shall have no moving parts and shall require no maintenance after initial installation.
- .9 Combination master/area alarms shall be Amico A2AL-L-XM Series, or approved alternate.

2.8 Amico Information Management System (AIMS)

- .1 The Amico Information Management System (AIMS) shall be Amico Alert-2 series.
- .2 AIMS shall be a microprocessor based medical device polling network running on Microsoft Windows. It shall continuously scan all medical devices such as: Area alarms, Master alarms, Manifolds, Air compressors, Vacuum pumps and Bulk Tanks. AIMS will display the topology of the pipeline by medical device and a clone image of each medical device on a centrally located P.C.
- .3 Alarm conditions shall be immediately shown on the P.C. as they occur by displaying a graphic image of the device at fault and it's error condition.
- .4 The AIMS System consists of a Network Interface Module in each medical device. A Gateway module will be installed into the P.C.
- .5 The system shall accommodate up to 256 medical devices and connect each device in series with a two wire, twisted pair cable (up to 5,000 ft.).
- .6 The AIMS System shall enable the user to have logging capability, by event, interval, or alarm condition.
- .7 The AIMS System shall have paging and e-mail capability with user selectable conditions.

- .8 Individual alarm conditions shall be monitored on Vacuum and Air systems (i.e.: Lag Pump in Use, HIGH Dewpoint Level, Dryer Malfunction and High Temperature).
- .9 The AIMS System shall monitor the number of hours that a pump/compressor has been in service.
- .10 The AIMS System shall have the ability to set-up a Maintenance schedule for servicing pumps and compressors.
- .11 The AIMS system will allow the owner to generate custom reports on the P.C. from the logged data using a standard report generator (i.e.: Excel).

2.9 Gas Control Panel for Nitrogen and Air Service

- .1 Each Gas Control Panel shall be supplied with an integral 2069 kPa (300 psig) shut-off valve. Valve shall require a quarter turn from fully open position to fully closed position. A 0-2000 kPa (0-300 psig) inlet pressure gauge shall be mounted prior to the shut-off valve to monitor the degree of line pressure being provided to the unit.
- .2 An adjustable, self-relieving, pressure regulator with an operating range of 0-1724 kPa (0-250 psig) shall be positioned on the "outlet" side of the control valve. A "push/pull" safety lock shall be incorporated in the regulator to avoid inadvertent resetting during usage.
- .3 Mounted on the low-pressure side of the regulator shall be a 0-2000 kPa (0-300 psig) pressure gauge to ensure that the proper operating pressure has been achieved and is being maintained.
- .4 A DISS nitrogen or air outlet shall be supplied for connection to pneumatic tools. All components shall be conveniently mounted to an anodised aluminium fascia assembly. The entire assembly shall be housed in a 1.5 mm (0.060") steel back box with supports to secure the unit within the wall or partition. Two type "K" washed and degreased copper inlet/outlet connections shall be provided for direct connection to main distribution and for remotely located nitrogen or air outlets.
- .5 Unit shall be suitably packaged to prevent contamination prior to installation. Contractor shall exercise care in storing units to ensure cleanliness.
- .6 Gas Control Panel shall be UL listed.
- .7 Gas Control Panel shall be Amico N-CONP-L Series, or approved alternate.

2.10 Pressure Switches

- .1 High-Low pressure switches for oxygen, nitrous oxide, medical air, and carbon dioxide shall be pre-set to alarm at 276 kPa (40 psig) decreasing pressure and at 414 kPa (60 psig) increasing pressure.

- .2 Pressure switch shall have an adjustable range of 0-552 kPa (0-80 psig), proof pressure of 1103 kPa (160 psig). Electrical characteristics shall be: dual control with two single pole, double-throw snap action switches rated at 10 amps, 125 volts AC. All pressure switches may be wired to accommodate either a normally open or normally closed alarm circuit.
- .3 Switches shall be UL listed, CSA approved, and cleaned for oxygen service. Construction of the switch shall be weatherproof die cast aluminium and brass bellows sensing element. Pressure connection into the switch shall be 6 mm (¼") FNPT.
- .4 Pressure switches shall be Amico M-PRSW-GAS Series, or approved alternate.

2.11 High Pressure Cylinder Manifold (Primary Source of Supply)

- .1 Manifold shall consist of two high-pressure header bar assemblies to facilitate connection of primary and secondary cylinder supplies. Each header bar shall be provided with the appropriate number of CGA cylinder pigtail connections incorporating a check valve at the header connection. The high-pressure header bar shall be designed in such a manner that it can be extended to facilitate additional cylinder connections. Each header bar assembly shall be provided with a high-pressure shut-off valve. The manifold shall be fully automatic in operation and shall not require any levers or handles for resetting by maintenance staff.
- .2 Control equipment shall be made up of a series of regulators to reduce the cylinder pressure to line delivery pressure. The unit shall be capable of automatically changing over from a primary bank of cylinders to a secondary bank of cylinders without interruption or fluctuation in delivery pressure. The manifold shall be housed in a NEMA 1 enclosure.
- .3 A Microprocessor circuit board assembly shall provide a relay output to give indication when or just before the manifold switches from one bank of cylinders to another. The switch over shall be mechanically controlled. Manifolds using electrically controlled shuttling devices shall not be acceptable.
- .4 To avoid excess pressure being supplied to the distribution system, a pneumatically relief valve for the line regulator shall be incorporated. An intermediate pressure relief valve shall be installed between the high-pressure regulators and the line delivery regulators.
- .5 Gauges shall be installed within the enclosure downstream of each high-pressure regulator and also at the output end of the delivery pressure pipe. Gauges will indicate the regulated pressures of the left and right banks of the manifold.
- .6 The control panel incorporates six coloured LED's, three for the Left Bank and three for the Right Bank: Green for Bank in use, Amber for Bank ready and Red for Bank empty. Both the Left and Right bank pressures and the main line pressure are displayed on the front door of the cabinet by means of LED's. All pressure transducers, micro switches, and display LED's shall be pre-wired to an internal microprocessor circuit board. The manifold is capable of interfacing with the optional hospital Amico Interface Management System (AIMS), as provided by the manufacturer.
- .7 Manifold shall have provision for field selection of psi, kPa or BAR display.

- .8 Manifold shall have an auto-switching power supply, 90 – 240VAC.
- .9 Manifold shall be UL listed.
- .10 Gas Name: _____. Size ____ X _____. Delivery Pressure ____ kPa (____ psig).
- .11 Manifold shall be Amico M2HD-X-HH-L-GAS Series, or approved alternate.

2.12 Emergency Oxygen Inlet Station (Low Pressure)

- .1 The Emergency Gaseous Oxygen Inlet shall be housed in a weathertight enclosure.
- .2 A brass ball valve and a supply pressure gauge shall be used to introduce the oxygen into the oxygen pipeline.
- .3 The enclosure door shall be labelled “Emergency Gaseous Oxygen Inlet” and shall be equipped with a staple for padlocking to allow entry only by authorised personnel. A print pocket shall be included on the door interior for storage of instructions. A mounting frame shall extend completely around the enclosure to trim recessed mounting on an exterior wall.
- .4 The interior of the enclosure shall be clearly labelled with instructions for connection and operation of the emergency oxygen inlet.
- .5 Bronze body check valves with female pipe threads on each end shall be provided for installation in the main and emergency supply pipeline in accordance with NFPA-99.
- .6 A brass body relief valve with the relief pressure set @ 75 PSI shall be provided for installation in the emergency supply line. The relief valve shall be supplied factory cleaned for oxygen service and shall automatically reset after discharging to provide a positive seal.
- .7 Emergency Oxygen Inlet Station shall be Amico M-FILL-OXY-LP, or approved alternate.

2.13 Ceiling Mounted Service Column - Stationary (Rigid) and LITE

- .1 The rigid ceiling column is a ceiling mounted unit to dispense medical gas and electrical power from an overhead location. The rigid ceiling column consists of an upper column support mounting plate, a shell of #304 stainless steel with #4 finish (16 gauge), junction boxes with faceplates, stainless steel ceiling dollar and medical gas outlets and electrical devices as specified. The Stationary (Rigid) column shall be UL / CUL listed.
- .2 The upper column support mounting plate shall be furnished with 12 x 14.3mm (9/16”_ clearance holes. The heavy gauge steel mounting plate shall be attached to the above-ceiling support structure (furnished by others) by means of four 12.7mm (1/2”Ø threaded rods.

- .3 The rigid ceiling column shall mount between 1930mm (6'4") and 2083mm (6'10") above the finished floor. All external surfaces shall be 16 gauge, #304 stainless steel with a #4 finish. Standard dimensions are 305mm x 305mm (12" x 12") for the ceiling column shell and 357mm x 357mm (14" x 14") for the dispensing head. The rigid ceiling column shall have an access panel along one side of the shell for installation, inspection and access to the interior.
- .4 All medical gas outlets shall be AMICO. The outlets shall be furnished and installed with copper risers to a point 152mm (6") above the mounting plate in the plenum. All pipes shall have dust caps. Hospital grade, duplex electrical receptacles shall be factory installed in the tapered section of the dispensing head at the bottom of the column and mounted to face the user at an angle of 20 degrees for easy insertion of plugs.
- .5 The main electrical junction box is located 152mm (6") below the ceiling level within the shroud and is accessible through the access panel at any time. All electrical devices (as listed), required backboxes and metal raceways (EMT or flex) shall be factory installed and pre-wired to the main electrical junction box. Combination 12.7mm (1/2") and 19mm (3/4") knockouts for both high and low voltage compartments are to be furnished. The main junction box shall include a solid copper ground bus and include a minimum of 8 terminals to accept wire size #14 - #6 with a #10 pre-installed chassis ground. The electrical wiring shall be installed in accordance with both UL and CSA standards.
- .6 The optional nitrogen control system shall consist of a high-pressure nitrogen regulator (0-2758Kpa (0-400psig)), a master on/off valve, a pressure gauge indicating incoming line pressure (0-2068Kpa (0-300psig)), a pressure gauge indicating regulated user pressure (0-2068Kpa (0-300psig)), and a stainless steel faceplate with engraved instructions. The entire system shall be factory pre-installed and tested. A corresponding nitrogen outlet must be specified in the bottom of the column or remote location which will be pressure regulated by the nitrogen control system.
- .7 The rigid ceiling column shall be installed to a suggested minimum ceiling height of 2743mm (108"), and will accommodate the following accessories:
 - .1 Up to 12 gas service outlets in any desired sequence.
 - .2 Up to 6 hospital grade, duplex electrical receptacles on any of the four sides of the column.
 - .3 Any combination of ground jacks, computer outlets and communication devices can also be mounted on the side panels.
 - .4 4 I.V. hooks.
 - .5 Optional N2 control cabinet.
- .8 All coverplates shall be stainless steel to match ceiling column shell.
- .9 Ceiling Mounted Service Column - Stationary (Rigid) shall be AMICO Alert-1 series, or approved alternate.

2.14 Ceiling Mounted Service Columns - Manual Retractable
- Pneumatic Retractable

- .1 The Retractable Ceiling Mounted Service Column is a ceiling mounted unit to dispense medical gas and electrical power from an overhead location. The Manual/Pneumatic Retractable ceiling column shall be UL / CUL listed. The retractable ceiling column includes an upper rough-in mounting plate for attachment to the building structure and shall be furnished with copper riser pipes, 152mm (6") long x 9.5mm (3/8") diam. for each medical gas service. The riser pipes shall include integral male D.I.S.S. threaded connections (w/test caps and chains) to prevent cross-connection of interior hoses when lower column assembly is hung. All hoses are marked and colour coded, according to applicable codes. The mounting plate shall be furnished with 12 x 14.3mm (9/16") clearance holes. The heavy gauge steel mounting plate shall be attached to the above-ceiling support structure (furnished by others) by means of four 12.7mm (1/2") threaded rods.
- .2a The Manual Retractable Ceiling Column shall consist of an upper section shroud for rigid mounting at the ceiling level and a telescopic lower section shroud capable of being extended/retracted to a maximum of 457mm (18"). The retractable section of the column shall be activated by a coiled spring mechanism and can be manually lowered or raised to any position. The rotation of the handle shall allow the column to be motionless or mobile. The travel of the telescoping lower section shall be stabilised with an internal tracking system.
- .2b The Pneumatic Retractable Ceiling Column shall consist of an upper section shroud for rigid mounting at the ceiling level and a telescopic lower section shroud capable of being extended/retracted to a maximum of 457mm (18"). The pneumatic telescoping mechanism within the column shall consist of pneumatic cylinder powered by nitrogen or medical air of minimum 375Kpa (55psi) delivery pressure to extend/retract the lower (inner) shroud up to a maximum of 457mm (18"). The travel of the telescoping inner shell shall be stabilised with an internal tracking system. The telescoping mechanism shall be actuated from a non-electronic, pneumatic control box located within the head of the ceiling column. The upward and downward movement can be adjusted independently by means of control box speed controls and is field adjustable. Operation of the telescoping movement shall be controlled by an up/down switch located in the head of the column. Optional remote, up/down O.R. wall switches are available.
- .3 The retractable ceiling column shall mount between 1981mm (6'6") and 2134mm (7'0") above the finished floor in the retracted position. The column shall be made of 16 gauge, #304 stainless steel with a #4 finish, stainless steel ceiling trim and lower section shroud dispensing head with bottom mounted medical gas outlets and sloped sides for electrical boxes. Standard dimensions are 344mm x 344mm (13-9/16" x 13-9/16") for the upper section shroud, 305mm x 305mm (12" x 12") for the lower section shroud are 357mm x 357mm (14" x 14") for the dispensing head. Removable access panels shall be located along one side of the upper and lower shrouds for installation, inspection and access to the interior.
- .4 All medical gas outlets shall be AMICO. The outlets shall be furnished and installed. All hospital grade, duplex electrical receptacles shall be factory installed in the tapered section of the dispensing head at the bottom of the column and mounted to face the user at an angle of 20 degrees for easy insertion of plugs.
- .5 The main electrical junction box shall be located 152mm (6") below the ceiling level within the upper shroud and shall be accessible through the upper shroud access panel at any time. All electrical devices (as listed), required backboxes and metal raceways (EMT or flex) shall be

factory installed and pre-wired to the main electrical junction box. Combination 12.7mm (1/2") and 19mm (3/4") junction box. Combination 12.7mm (1/2") and 19mm (3/4") knockouts for both high and low voltage compartments are to be furnished. The main junction box shall include a solid copper ground bus and include a minimum of 8 terminals to accept wire size #14 - #6 with a #10 pre-installed chassis ground. The electrical wiring shall be installed in accordance with both UL and CSA standards.

- .6 The optional nitrogen control system shall consist of a high-pressure nitrogen regulator (0-2758Kpa (0-400psig)), a master on/off valve, a pressure gauge indicating incoming line pressure (0-2068Kpa (0-300 psig)), a pressure gauge indicating regulated user pressure (0-2068Kpa (0-300psig)), and a stainless steel faceplate with engraved instructions. The entire system shall be factory pre-installed and tested. A corresponding nitrogen outlet must be specified in the bottom of the column or remote location which will be pressure regulated by the nitrogen control system.
- .7 The retractable ceiling mounted service column shall be installed to a suggested minimum ceiling height of 2743mm (108"). The telescoping lower shroud and dispensing head shall travel between 1524mm (5"0") and 3070mm (6"6") above the finished floor and shall accommodate the following accessories:
 - .1 Up to 12 gas service outlets in any desired sequence.
 - .2 Up to 6 hospital grade, duplex electrical receptacles on any of the four sides of the column.
 - .3 Any combination of ground jacks, computer outlets and communication devices can also be mounted on the side panels.
 - .4 4 I.V. hooks.
 - .5 Optional N2 control cabinet.
- .8 All coverplates shall be stainless steel to match ceiling column shroud.
- .9 Ceiling Mounted Service Column - Pneumatic Retractable shall be Amico Alert-1 series, or approved alternate.

2.15 Console Units

1. The Console Unit shall be Amico Alert-1 series.
2. The Console Unit shall have a removable front assembly for ease of mounting to the back box.
3. The front fascia shall be made from extruded, clear anodized aluminium. The back box shall be made from galvanized steel, 0.060" (15.24mm) thick.
4. The medical gas terminal units piping shall terminate 5" above the back box.
5. The Console Unit shall be UL listed.

2.16 Floor Pedestal

1. The Floor Pedestal shall be Amico Alert-1 series.
2. The Floor Pedestal shall have a removable service access panel for ease of installation and serviceability of electrical, communication and medical devices.
3. The column shall be made of 16 gauge, #304 stainless steel with a #4 finish, stainless steel with top mounted medical gas outlets and electrical devices.
4. The Floor Pedestal shall be UL listed.