

SECTION 22 63 00
GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Central Healthcare Gas System: Consisting of oxygen service; complete, ready for operation, including all necessary piping, fittings, valves, cabinets, station outlets, rough-ins, gages, alarms including low voltage wiring, cylinder manifold, pressure regulators and all necessary parts, accessories, connections and equipment.
- B. Oxygen System: Ready for connection to cylinders, but not including cylinders.
- C. Healthcare gas system alarm wiring from equipment to alarm panels.
- D. A complete listing of all acronyms and abbreviations are included in Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 07 84 00, FIRESTOPPING: Sealing around pipe penetrations to maintain the integrity of time rated construction.
- D. Section 07 92 00, JOINT SEALANTS: Sealing around pipe penetrations through the floor to prevent moisture migration.
- E. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING: General requirements and items common to more than one section of Division 22.
- F. SECTION 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS: Requirements for commissioning, systems readiness checklist, and training.
- G. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Alarm interface with BAS.
- H. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Control wiring.
- I. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduit.
- J. Section 26 27 26, WIRING DEVICES: Electrical wiring and accessories.

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

- B. American Society of Mechanical Engineers (ASME):
- A13.1-2007 (R2013).....Scheme for the Identification of Piping Systems
 - B16.15-2013.....Cast Copper Alloy Threaded Fittings: Classes
125 and 250
 - B16.22-2013.....Wrought Copper and Copper Alloy Solder-Joint
Pressure Fittings
 - B16.50-2013.....Wrought Copper and Copper Alloy Braze-Joint
Pressure Fittings
 - B40.100-2013.....Pressure Gauges and Gauge Attachments
 - ASME Boiler and Pressure Vessel Code -
 - BPVC Section VIII-2015..Rules for Construction of Pressure Vessels,
Division I
 - BPVC Section IX-2015....Welding, Brazing, and Fusing Qualifications
- C. American Society of Sanitary Engineers (ASSE):
- 6000 Series-2012.....Professional Qualifications Standard for
Medical Gas Systems Personnel
- D. American Society for Testing and Materials (ASTM):
- B43-2014.....Standard Specification for Seamless Red Brass
Pipe, Standard Sizes
 - B687-1999 (2011).....Standard Specification for Brass, Copper, and
Chromium-Plated Pipe Nipples
 - B819-2000 (R2011).....Standard Specification for Seamless Copper Tube
for Medical Gas Systems
- E. American Welding Society (AWS):
- A5.8M/A5.8-2011.....Specification for Filler Metals for Brazing and
Braze Welding
 - B2.2/B2.2M-2010.....Specification for Brazing Procedure and
Performance Qualification
- F. Compressed Gas Association (CGA):
- C-9-2013.....Standard Color Marking of Compressed Gas
Containers for Medical Use
 - G-4.1-2009.....Cleaning Equipment for Oxygen Service
 - V-1-2013.....Standard for Compressed Gas Cylinder Valve
Outlet and Inlet Connections
- G. Manufacturing Standardization Society (MSS):
- SP-72-2010a.....Ball Valves With Flanged or Butt-Welding Ends
For General Service

SP-110-2010.....Ball Valves Threaded, Socket-Welding, Solder
Joint, Grooved and Flared Ends

H. National Electrical Manufacturers Association (NEMA):

ICS 6-1993 (R2001, R2006) Industrial Control and Systems Enclosures

I. National Fire Protection Association (NFPA):

99-2015.....Health Care Facilities Code

1.4 SUBMITTALS

A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Medical Gas Partnering and Quality Control Plan

1. Identifies all stakeholders early in the project to partner together and develop a communication strategy that is productive and effective.

2. Requires the 3 Phases of Quality Control

a. Preparatory Phase - review contract requirements and necessary communication before execution of each portion of work.

b. Initial Phase - Ensure the employees completing the work are qualified and executing as expected

c. Follow Up Phase - Check in on the work repeatedly to ensure continued compliance

3. Provides installer certifications for approval,

4. Provides Verifiers Credentials for approval

5. Provides Certifiers Credentials for approval

6. Includes all Quality control processes, procedures and daily documentation to be used during installation.

7. Outlines a process that clearly documents and demonstrates a nitrogen atmosphere is obtained and maintained within the piping throughout the installation process until final certification and activation.

8. Outlines post installation/precertification blowdown procedures to ensure a sufficient volume and velocity of gas is expelled to carry any particulate through the entire system during the blowdown/white rag test. This test shall be witnessed by the COR and appropriate stakeholders.

C. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES", with applicable paragraph identification.

- D. Manufacturer's Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.
1. Piping.
 2. Valves.
 3. Inlet and outlet cocks
 4. Valve cabinets.
 5. Gages.
 6. Station outlets and rough-in assemblies.
 7. Alarm controls and panels.
 8. Pressure Switches.
 9. Manifolds.
- E. Station Outlets: Submit letter from manufacturer stating that outlets are designed and manufactured to comply with NFPA 99. Outlet shall bear label of approval as an assembly, of Underwriters Laboratories, Inc., or Associated Factory Mutual Research Corporation.
- F. Certification: The completed systems have been installed, tested, purged, analyzed and verified in accordance with the requirements of this specification. Certification shall be submitted to COR.
- G. Completed System Readiness Checklist provided by the CxA and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.
- H. Submit one physical sample of a typical brazed joint for each approved installer to be compared against their installed work as a Quality assurance measure.
- I. Documentation of conditions while work is performed
1. Daily reports, photos, uncapped piping, nitrogen pressures, Oxygen concentrations and all preapproved Pipefitter's names and all locations brazed by that individual each workday etc.
 2. All copies of verification reports documenting compliance with NFPA99 during construction.
 3. Delivery tickets for nitrogen gas deliveries.
 4. Installation equipment calibration certificates.

1.5 QUALITY ASSURANCE

- A. Materials and Installation: In accordance with NFPA 99 and as specified.
- B. Equipment Installer: Show technical qualifications and previous experience in installing laboratory and healthcare equipment on three similar projects. Submit names, phone numbers, and addresses of referenced projects. Installers shall meet the qualifications of ASSE Standard Series 6000.
- C. Equipment Supplier: Provide evidence of equivalent product installed at three installations similar to this project that has been in satisfactory and efficient operation for three years. Submit names, phone numbers, and addresses where the product is installed.
- D. Laboratory and healthcare System Testing Organization: The testing shall be conducted by a party technically competent and experienced in the field of laboratory and healthcare pipeline testing. Testing and systems verification shall be performed by personnel meeting the qualifications of ASSE Standard Series 6000. Such testing shall be performed by a party other than the installing contractor.
- E. Provide the names of three projects where testing of medical or laboratory gases systems has been performed by the testing agency. Include the name of the project, names of such persons at that project who supervised the work for the project owner, or who accepted the report for the project owner, and a written statement that the projects listed required work of similar scope to that set forth in this specification.
- F. Submit the testing agency's detailed procedure which shall be followed in the testing of this project. Include details of the testing sequence, procedures for cross connection tests, outlet function tests, alarm tests, purity tests, etc., as required by this specification. For purity test procedures, include data on test methods, types of equipment to be used, calibration sources and method references.
- G. Certification: Provide COR documentation 10 working days prior to submitting request for final inspection to include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and certification that all results of tests were within limits allowed by this specification.

- H. "Hot taps" are prohibited for operating medical oxygen systems. Methods for connection and extension of active and pressurized medical gas systems without subsequent medical gas testing and verification are prohibited.
- I. Bio-Based Materials: For products designated by the USDA's Bio-Preferred Program, provide products that meet or exceed USDA recommendations for bio-based content, so long as products meet all performance requirements in this specifications section. For more information regarding the product categories covered by the Bio-Preferred Program, visit <http://www.biopreferred.gov>.

1.6 AS-BUILT DOCUMENTATION

- A. Submit manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- B. Submit operation and maintenance data updated to include submittal review comments, substitutions and construction revisions shall be in electronic version on compact disc or DVD inserted into a three ring binder. All aspects of system operation and maintenance procedures, including piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Notes on all special systems or devices such as damper and door closure interlocks shall be included. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished. Information explaining any special knowledge or tools the owner will be required to employ shall be inserted into the As-Built documentation.
- C. The installing contractor shall maintain as-built drawings of each completed phase for verification; and, shall provide the complete set at the time of final systems certification testing. As-built drawings are to be provided on compact disc or DVD. Should the installing contractor engage the testing company to provide as-built or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement.
- D. Certification documentation shall be provided to COR 10 working days prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing

work for the testing agency on this project, detailed procedures followed for all tests, and certification that all results of tests were within limits specified.

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

- A. Copper Tubing: Type "K", ASTM B819, seamless copper tube, hard drawn temper, with wrought copper fittings conforming to ASME B16.22 or brazing fittings complying with ASME B16.50. Size designated reflecting nominal inside diameter. All tubing and fittings shall be labeled "ACR/OXY", "OXY", "OXY/MED", "ACR/MED", or "MED".
- B. Brazing Alloy: AWS A5.8M/A5.8, Classification BCuP, greater than 538 degrees C (1000 degrees F) melting temperature. Flux is strictly prohibited for copper-to-copper connections.
- C. Threaded Joints: Polytetrafluoroethylene (Teflon) tape.
- E. Memory metal couplings: Temperature and pressure rating shall not be less than that of a brazed joint in accordance with NFPA 99, paragraph 5.1.10.6.1.
- F. Apply piping identification labels at the time of installation in accordance with NFPA 99. Apply supplementary color identification in accordance with CGA Pamphlet C-9.
- G. Special Fittings: The following special fittings shall be permitted to be used in lieu of brazed joints:
 - 1. Memory-metal couplings having temperature and pressure ratings joints not less than that of a brazed joint.
 - 2. Listed or approved metallic gas tube fittings that, when made up, provide a permanent joint having the mechanical, thermal, and sealing integrity of a brazed joint.
 - 3. Dielectric fittings where required by the manufacturer of special medical equipment to electrically isolate the equipment from the piping distribution system.
 - 4. Axially swaged, elastic strain preload fittings providing metal to metal seal having pressure and temperature ratings not less than that of a brazed joint and when complete are permanent and non-separable.

2.2 VALVES

- A. Ball: In-line, other than zone valves in cabinets:
 - 1. 75 mm (3 inches) and smaller: Bronze/ brass body, MSS SP-72, MSS SP-110, Type II, Class 150, Style 1, with tubing extensions for

brazed connections, full port, three-piece or double union end connections, Teflon seat seals, full flow, 4138 kPa (600 psig) WOG minimum working pressure, with locking type handle, cleaned for oxygen use and labeled for intended service.

B. Check:

1. 75 mm (3 inches) and smaller: Bronze/brass body, straight through design for minimum pressure drop, spring loaded, self-aligning with Teflon cone seat, vibration free, silent operation, supplied NPT female threads at each end with flow direction arrow permanently cast into, cleaned for oxygen use and labeled for intended service, 2758 kPa (400 psig) WOG minimum working pressure.

- C. Zone Valve in Cabinet:** Ball valve, bronze/ brass body, double seal, three piece or double union end connections, replaceable Teflon seat seals, Teflon stem seal, 4138 kPa (600 psig) WOG, cold, non-shock gas working pressure service to 100 kPa (29 inches Hg), cleaned for oxygen use and labeled for intended service, blowout proof stem, one quarter turn of handle to completely open or close. Provide tubing extensions factory brazed, and pressure tested. Provide 3.2 mm (1/8 inch) NPT gauge port for a 50 mm (2 inch) diameter monitoring gauge downstream of the shut off valve. Zone valves shall be securely attached to the cabinet and provided with type "K" copper tube extensions for making connection to system piping outside the cabinet. Zone valves shall be products of one manufacturer, and uniform throughout in pattern, overall size and appearance. Trim with color coded plastic inserts or color coded stick-on labels. Install valves in cabinets such that cover window cannot be in place when any valve is in the closed position. Color coding for identification plates and labels is as follows:

SERVICE LABEL	IDENTIFICATION COLORS	MFG. STD. CLR.
OXYGEN	White letters on green background	GREEN

2.3 VALVE CABINETS

- A. Flush mounted commercially available item for use with laboratory and healthcare services, not lighter than 1.3 mm (18 gage) steel or 1.9 mm (14 gage) extruded aluminum, rigidly assembled, of adequate size to accommodate valve(s) and fittings. Punch or drill sides to receive tubing. Provide anchors to secure cabinet to wall construction. Seal

openings in cabinet to be dust tight. Locate bottom of cabinet 1375 mm (4 feet 6 inches) above finished floor.

- B. Mount engraved rigid plastic identification plate on wall above or adjacent to cabinet. Color code identification plate to match gas identification colors as indicated above. Identification plate shall be clearly visible at all times. Provide inscriptions on plate to read in substance: "VALVE CONTROL SUPPLY TO ROOMS."
- C. Cover plate: Fabricate from 1.3 mm (18 gage) sheet metal with satin chromed finish, extruded anodized aluminum, or 0.85 mm (22 gage) stainless steel. Provide cover window of replaceable plastic, with a corrosion resistant device or lever secured to window for emergency window removal. Permanently paint or stencil on window: CAUTION-CLOSE ONLY IN EMERGENCY, SHUT-OFF VALVES FOR PIPED GASES", or equivalent wording. Configure such that it is not possible to install window with any valve in the closed position. Each valve shall have gauge upstream of valve inside valve box.
- D. Cabinets and isolation valves shall be located and piped as shown on drawings, and at a minimum, so as to allow the isolation of each smoke compartment separately. No cabinet shall serve more than one smoke compartment.

2.4 GAGES

- A. Pressure Gages: Includes gages temporarily supplied for testing purposes.
 - 1. For line pressure use adjacent to source equipment: ASME B40.1, pressure gage, single, size 115 mm (4-1/2 inches), for oxygen, accurate to within 2 percent, with metal case. Range shall be two times operating pressure. Dial graduations and figures shall be black on a white background, or white on a black background. Gage shall be cleaned for oxygen use, labeled for appropriate service, and marked "USE NO OIL". Install with gage cock.
 - 2. For all services downstream of main shutoff valve: Manufactured for oxygen use, labeled for the appropriate service and marked "USE NO OIL", 40 mm (1-1/2 inch) diameter gage with dial range 1 to 690 kPa (1 to 100 psig) for oxygen service.

2.5 STATION OUTLETS

- A. For all services: For designated service, consisting of a quick coupler and inlet supply tube. Provide coupler that is non-interchangeable with other services, and leak proof under three times the normal working

pressure. Equip each station outlet with an automatic valve and a secondary check valve to conform with NFPA 99. Equip each station inlet with an automatic valve to conform with NFPA 99. Place valves in the assembly to provide easy access after installation for servicing and replacement, and to facilitate line blow-out, purging, and testing. Fasten each outlet and inlet securely to rough-in to prevent floating and provide each with a capped stub length of 6 mm (1/4-inch) (10 mm outside diameter) (3/8-inch outside diameter) tubing for connection to supply. Identification of each gas service shall be permanently cast into the back plate and shall be visible through a transparent plastic guard. Label stub tubing for appropriate service. Install completion kits (valve body and face plate) for the remainder of required tests.

2.6 STATION OUTLETS

- A. For all services: Brass, stainless steel or chromed metal non-interchangeable DISS connections for appropriate service to conform with CGA V-5. Equip each station outlet with an automatic valve and a secondary check valve to conform with NFPA 99. Equip each station inlet with an automatic valve to conform with NFPA 99. Place valves in the assembly to provide easy access after installation, for servicing and replacement, and to facilitate line blow-out, purging, and testing. Fasten each outlet securely to outlet rough-in to prevent floating, and provide each outlet with a capped stub length of 6 mm (1/4-inch) (10 mm (3/8-inch) outside diameter) tubing for connection to supply. Label stub tubing for appropriate service. Adjustable to compensate for variations in plaster or cover thickness. Install outlet completion kits (valve body and face plate) for the remainder of required tests.

2.7 STATION OUTLET ROUGH-IN

- A. Anchor flush mounted rough-in securely to unit or wall construction.
- B. Modular Cover Plate: Die cast back plate, two-piece 0.85 mm (22 gage) stainless steel or 1.6 mm (16 gage) chromium plated metal, with mounting flanges on all four sides, secured to rough-in with stainless steel or chromium plated countersunk screws.
- C. Provide permanent, metal or plastic, identification plates securely fastened at each outlet and inlet opening, with inscription for appropriate service using color coded letters and background. Metal plates shall have letters embossed on baked-on enamel background. Color coding for identification plates is as follows:

SERVICE LABEL	IDENTIFICATION PLATE COLORS
OXYGEN	White letters on green background and vice versa

2.8 ALARMS

- A. Provide all low voltage control wiring, including wiring from alarm relay interface control cabinet to BAS, required for complete, proper functioning system, in conformance with Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES. Run wiring in conduit, in conformance with Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS.
- B. Master Alarm Functions: Provide the following individual alarms at the master alarm panel.
 1. Oxygen Alarms:
 - a. Liquid oxygen low level alarm: Functions when stored liquid oxygen reaches a predetermined minimum level.
 - b. Reserve switchover alarm: Functions when, or just before, reserve oxygen supply goes in operation.
 - c. Reserve low supply alarm: Functions when contents of cylinder reserve oxygen supply are reduced to one day's average supply; switch and contacts at the bulk tank control panel.
 - d. Reserve low pressure alarm: Functions when the gas pressure available in the liquid reserve oxygen supply is reduced below the pressure required to function properly.
 - e. Low pressure alarm: Functions when system pressure downstream of the main shutoff valve drops below 275 kPa (40 psig), ± 14 kPa (± 2 psig); operated by pressure switch or transmitters.
 - f. High pressure alarm: functions when system pressure downstream of main shutoff valve increases above 413 kPa (60 psig), ± 14 kPa (± 2 psig) set points; operated by pressure switches or transmitters.
 - g. Cylinder reserve pressure low: Functions when the content of a cylinder reserve header is reduced below one day's average supply.
- C. Alarm Functions:
 1. Oxygen alarms: Pressure alarms: Functions when pressure in branch drops below 275 kPa (40 psig), ± 14 kPa (± 2 psig) or increases above

414 kPa (60 psig), ± 14 kPa (± 2 psig) set points; operated by pressure switches or transmitters.

D. Alarm Panels:

1. General: Modular design, easily serviced and maintained; alarms operate on alternating current (AC) low voltage control circuit; provide required number of transformers for efficient functioning of complete system. Alarm panels shall be integral units, reporting oxygen services, as required.
2. Box: Flush mounted, sectional or one piece, corrosion resistant. Size box to accommodate required number of service functions for each location, and for one audible signal in each box. Anchor box securely. Provide spare capacity to accommodate 50 percent of the number of provided alarm points.
3. Cover plate: Designed to accommodate required number of signals, visual and audible, for each location, and containing adequate operating instructions within the operator's view. Bezel shall be extruded aluminum, chromium plated metal, or plastic. Secure to the box with chromium plated or stainless steel countersunk screws.
4. Service indicator lights: Red translucent plastic or LED with proper service identification inscribed thereon. Number of lights and service instruction shall be as required for each location. Provide each panel with a green test button of the same material, inscribed with "PUSH TO TEST" or similar message.
5. Audible signal: Provide one in each alarm panel and connect electrically with all service indicator light functions.
6. Controls:
 - a. Visual signal: When the condition occurs which any individual service indicator light is to report, button for particular service shall give a lighted visual signal which cannot be canceled until such condition is corrected.
 - b. Audible signal: Alarm shall give an audible signal upon circuit energization of any visual signal. Audible signal shall be continuous until silenced by pushing a button. This shall cancel and reset audible only, and not affect the visual signal. After silencing, subsequent alarms shall reactivate the audible alarm.
 - c. Signal tester: Test button or separate normal light shall be continuously lighted to indicate electrical circuit serving each individual alarm is energized. Pushing test button shall

temporarily activate all visual signals and sound audible signal, thereby providing desired indications of status of system.

- E. Alarm Relay Interface Control Cabinet: Design cabinet to transfer the closed circuit alarm signals through relays to a set of terminals for monitoring signals at the BAS without interrupting the closed circuit system. Constructed of 1.9 mm (14 gage) steel, conforming with NEMA ICS 6, Type 1, enclosures. Provide both normally open and normally closed contacts for output signals, with number of circuits required for full alarm capability at the BAS. Refer to Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC for compatibility.

2.9 PRESSURE SWITCHES

- A. General purpose, contact or mercury type, allowing both high and low pressure set points, with contact type provided with a protective dust cover; adjustable range; switches activate when indicated by alarm requirements. Use one orifice nipple (or DISS demand check valve) for each sensor or pressure switch.

2.10 CYLINDER GAS SUPPLY MANIFOLDS

- A. Non-ferrous metal manifold and fittings, valves, parts and connections, suitable for a regular working pressure of 21 kPa (3000 psig). Gas cylinders at manifold shall be individually chained to wall or floor with adequate support. Cylinders shall not be chained to portable or movable apparatus such as beds.
- B. Duplex arrangement, each bank having number of cylinder connections as required, high pressure copper cylinder connection pigtails with brazed fittings. Shutting of either bank shall not interrupt supply to system.
- C. Provide manifold with two (one for each bank) two-stage pressure regulators with gages and built-in safety valves, manifold header valves and check valves, service line connection valves, relief valves, tank connecting coils and handles, and all required equipment for a complete assembly. Enclose manifold controls in sheet metal cabinet.
- D. Supply pressure for oxygen is 379 kPa (55 psig).
- E. Switch-over to full reserve bank shall be automatic when one cylinder bank becomes exhausted, with no fluctuation in pressure, and not require resetting of regulators. After replacement of empty tank, resetting of controls shall be automatic or by single lever. Reserve

switch-over shall be actuated by pressure switch; alarm shall be part of manifold control.

2.11 PRESSURE REGULATORS

- A. For 690 kPa (100 psig) regulator, provide duplex in parallel, valve for maintenance shut-down without service interruption. For additional pressures, locate regulators remote from compressor near point of use, and provide with isolation valves and valve bypass.
- 1. For systems 5 L/s (10 SCFM) and below: Brass or bronze body and trim, reduced pressure range 170 to 850 kPa (25 to 123 psig) adjustable, spring type, diaphragm operated, relieving. Delivered pressure shall vary not more than 1.0 kPa (0.15 psig) for each 10 kPa (1.5 psig) variation in inlet pressure.

2.12 EMERGENCY LOW PRESSURE OXYGEN INLET

- A. The Low Pressure Emergency Oxygen Inlet provides an inlet for connecting a temporary auxiliary source of oxygen to the oxygen pipeline system for emergency or maintenance situations per NFPA 99.
- B. The inlet consist of a 25 mm (1 inch) ball valve, pressure gauge and a 15 mm x 25 mm (1/2 inch x 1 inch) NPTF connection housed in a weather tight enclosure. The enclosure is labeled "Emergency Low Pressure Gaseous Oxygen Inlet", and includes a padlock staple to prevent tampering or unauthorized access. The enclosure is suitable for recess mounting on the exterior of the building being served. The enclosure is 1.9 mm (14 gauge), cold rolled steel with a primer coat of paint. The Emergency Oxygen Inlet is connected at a point downstream of the main supply line shutoff valve.
- C. Check valves are provided for installation in the emergency supply line and in the main supply line between the main line shutoff valve and the emergency supply line connection per NFPA 99. Check valves have a cast bronze body and straight through design for minimum pressure drop.
- D. The check valves for sizes under 75 mm (3 inch) are soft seated, bubble tight, self-aligning, and spring loaded, and ball type check valves. Check valves shall be fast acting type.
- E. A relief valve is provided for installation in the emergency supply line per NFPA 99. The relief valve has a brass body, single seat design, and is cleaned for oxygen use. It automatically reseats to provide a "bubble tight" seal after discharging excess gas. Pre-set at 520 kPa (75 psig).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cast escutcheon with set screw at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.
- B. Open ends of tube shall be capped or plugged at all times or otherwise sealed until final assembly to prevent infiltration of any foreign matter.
- C. Cut piping square and accurately with a tube cutter (sawing is prohibited) to measurements determined at place of installation. Ream tube to remove burrs, being careful not to expand tube, and so no chips of copper remain in the tube. Work into place without springing or forcing. Bottom tube in socket so there are no gaps between tube and fitting. Exercise care in handling equipment and tools used in cutting or reaming of tube to prevent oil or grease being introduced into tubing. Where contamination has occurred, material is no longer suitable for oxygen service.
- D. Spacing of hangers: NFPA 99.
- E. Rigidly support valves and other equipment to prevent strain on tube or joints.
- F. While being brazed, joints shall be continuously purged with oil free nitrogen. The flow of purged gas shall be maintained until joint is cool to touch.
- G. Do not bend tubing. Use fittings.
- H. Install pressure switches, transmitter and gauges to be easily accessed, and provide access panel where installed above plaster ceiling. Install pressure switch and sensors with orifice nipple between the pipe line and switches/sensors.
- I. Apply pipe labeling during installation process and not after installation is completed. Size of legend letters shall be in accordance with ASME A13.1.
- J. After initial leakage testing is completed, allow piping to remain pressurized with testing gas until testing agency performs final tests.
- K. Penetrations:
 - 1. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoked partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING, with intumescent

materials only. Completely fill and seal clearances between raceways and openings with the fire stopping material.

L. Provide 40 mm (1-1/2 inch) diameter line pressure gage downstream of zone valve in cabinets.

M. Provide zone valves in cabinets where indicated.

3.2 STARTUP AND TESTING

A. Initial Tests: Blow down and high and low pressure leakage tests as required by NFPA 99 with documentation.

B. Laboratory and/or healthcare testing agency shall perform the following:

1. Perform and document all cross connection tests, labeling verification, supply system operation, and valve and alarm operation tests as required by, and in accordance with NFPA 99 and the procedures set forth in pre-qualification documentation.
2. Verify that the systems, as installed, meet or exceed the requirements of NFPA 99, this specification, and that the systems operate as required.
3. Piping purge test: For each positive pressure gas system, verify cleanliness of piping system. Filter a minimum of 1000 liters (35 cubic feet) of gas through a clean white 0.45 micron filter at a minimum velocity of 100 liters per minute (3.5 SCFM). Filter shall show no discoloration, and shall accrue no more than 0.1 mg (0.0000035 ounces) of matter. Test each zone at the outlet most remote from the source. Perform test with the use of an inert gas as described in CGA P-9.
4. Piping purity test: For each positive pressure system, verify purity of piping system. Test each zone at the most remote outlet for dew point, carbon monoxide, total hydrocarbons (as methane), and halogenated hydrocarbons, and compare with source gas. The two tests shall in no case exceed variation as specified in paragraph, "Maximum Allowable Variation". Perform test with the use of an inert gas as described in CGA P-9.
5. Outlet and inlet flow test:
 - a. Test all outlets for flow. Perform test with the use of an inert gas as described in CGA P-9.

- b. Oxygen outlets shall deliver 100 Lpm (3.5 SCFM) with a pressure drop of no more than 34 kPa (5 psig), and static pressure of 345 kPa (50 psig).
- 6. Source Contamination Test: Analyze each pressure gas source for concentration of contaminants, by volume.
- 7. Analysis Test:
 - a. Analyze each pressure gas source and outlet for concentration of gas, by volume.
 - b. Make analysis with instruments designed to measure the specific gas dispensed.
 - c. Allowable concentrations are within the following:

Oxygen	>=97% plus oxygen
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- C. The CxA will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the COR and CxA. Contractor shall provide a minimum of 10 working days prior to startup and testing.

3.3 COMMISSIONING

- A. Provide commissioning documentation in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.
- B. Components provided under this section of the specification will be tested as part of a larger system.

3.4 DEMONSTRATION AND TRAINING

- A. Provide services of manufacturer's technical representative for four hours to instruct VA Personnel in operation and maintenance of units.

- - - E N D - - -