SECTION 22 61 13.74
DENTAL COMPRESSED-AIR PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

This section describes the requirements for central dental compressed air piping, including all necessary piping, fittings, valves, cabinets, outlets, gages.

1.2 RELATED WORK

A. Section 07 84 00, FIRESTOPPING: Sealing around pipe penetrations to maintain the integrity of time rated construction.

B. Section 07 92 00, JOINT SEALANTS: Sealing around pipe penetrations through the floor to prevent moisture migration.

C. 05 13 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL EQUIPMENT: Seismic Restraint.

D. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING: General requirements and items common to more than one section of Division 22.

E. Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING: Exposed piping.

F. Section 22 61 19.74, DENTAL COMPRESSED AIR EQUIPMENT: Exposed piping.

G. Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES: Ceiling outlets, hose drops and valve cabinets.

H. Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.

1.3 QUALITY ASSURANCE

A. Installer qualifications shall meet those qualifications stated in ASSE standard #6010.

B. Medical Gas System Testing Organization:

1. The testing shall be conducted by a party technically competent and experienced in the field of medical gas pipeline testing. Such testing shall be performed by a party other than the installing contractor.
2. The testing personnel shall be qualified according to ASSE standard #6020 for inspectors and ASSE Standard #6030 for verifiers.
3. Names of three projects where testing of medical gas systems has been performed shall be submitted by the testing agency for review. The list of three references shall 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.

4. The testing agency's detailed procedure to be followed in the testing of this project shall be submitted. These procedures shall be in compliance with current NFPA and state adoption and shall include details of the testing sequence, procedures for cross connection tests, outlet function tests, alarm tests, and purity tests, as required by NFPA 99. Data on test methods, types of equipment to be used, and calibration sources and method references for purity tests procedures shall be submitted.

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, and a copy of them on Auto-Cad version (2004) provided on compact disk 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 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 a certification that all results of tests were within limits specified.

E. Brazing process and operators shall be qualified according to ASME Boiler and Pressure Vessel code: Section IX, “Welding and Brazing Qualifications,” or AWS B2.2, “Standard for Brazing Procedure and Performance Qualification.

F. The electrical devices and accessories shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency and marked for its intended use.

G. All work shall comply with NFPA 99, “Health Care Facilities”

1.4 SUBMITTAL

A. Submit as one package in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Piping and fittings

2. Valves.
3. Outlets.
4. Gages.
5. Switches (pressure).
6. Alarm components

C. Station Outlets and Inlets: A letter shall be submitted from manufacturer stating that outlets and inlets are designed, manufactured, and shall comply with NFPA 99. Outlets and inlets shall bear label of approval as assembly of Underwriters Laboratories, Inc. or Associated Factory Mutual Research Corporation. In lieu of above labels, certificate may be submitted by a nationally recognized independent testing laboratory, satisfactory to the Contracting Officer, certifying that materials, appliances and assemblies conform to published standards, including methods of tests, of above organizations.

D. Certification: The completed systems shall be certified having been installed, tested, purged and analyzed in accordance with the requirements of this specification.

E. Qualification data for the installer and testing agency/Verify shall be submitted.

1.5 APPLICABLE PUBLICATIONS

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

C. American National Standards Institute (ANSI):

A13.1-07.....Scheme for the Identification of Piping Systems
B16.3-98.....Malleable Iron Threaded Fittings
B16.22-01 (R 2005).....Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
B40.1-06.....Pressure Gauges and Gauge Attachment

D. American Society for Testing and Materials (ASTM):

A47-99 (R 2004).....Standard Specification for Steel Sheet, Aluminum Coated, by the Hot Dip Process
A53-07.....Standard Specification for Pipe, Steel, Black, and Hot Dipped Zinc Coated, Welded and Seamless
A536-84(R2004).....Standard Specification for Ductile Iron Castings

B819-00 (R 2006).....Standard Specification for Seamless Copper Tube for Medical Gas Systems

E. American Society of Mechanical Engineers (ASME):

Section IX-07.....Welding and Brazing Qualifications

F. American Welding Society (AWS):

AWS A5.8-04 (R 2004)....Specification for Filler Metals for Brazing and Braze Welding

AWS B2.2-91.....Standard for Brazing Procedure and Performance Qualification (Modified per NFPA 99)

G. Compressed Gas Association (CGA):

G-4.1-04.....Cleaning Equipment for Oxygen Service

G-10.1-04.....Nitrogen, Commodity

P-9-01.....Inert Gases Argon, Nitrogen and Helium

V-1-03.....Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connection

V-5-05 .....Diameter Index Safety System (Non Interchangeable Low Pressure Connections for Medical Gas Applications)

H. National Fire Protection Association (NFPA):

99-05.....Health Care Facilities

I. United States Pharmacopoeia XXI/National Formulary XVI (USP/NF).

J. National Association of Architectural Metal Manufacturers (NAAMM):

Metal Finishes Manual, Dated January 1988.

K. Manufacturing Standardization Society: (MSS)

MSS-SP-72-99.....Standard for Ball Valves with Flanged or Butt-Welding Ends for General Service

MSS-SP-73-03.....Brazing Joints for Copper and Copper Alloy Pressure Fittings

MSS-SP-110-96.....Ball Valves Threaded, Socket Welding, Solder Joint, Grooved and Flared Ends

L. American Society of Sanitary Engineering (ASSE):

6010.....Professional Standard for Medical Gas Systems Professional: Medical Gas Systems Installers

6020.....Professional Standard for Medical Gas Systems Professional: Medical Gas Systems Inspectors

6030.....Professional Standard for Medical Gas Systems Professional: Medical Gas Systems Verifiers

1.6 PROJECT CONDITIONS

A. Interruption of existing medical air systems shall not be made without the coordination of the Medical Center. The medical center shall be notified 14 days in advance of proposed interruption. The interruption shall not be made without the written permission from the Medical Center.

PART 2 - PRODUCTS

2.1 PIPING

A. Copper medical gas tube shall be type K or L, seamless, drawn temper meeting ASTM B819 that has been cleaned, purged, and sealed for medical gas service by the pipe manufacturer. Standard color markings “ACR/MED” shall be in green for Type K and in blue for type L tubing.

B. Wrought copper fittings shall be solder joint, dimensions for brazed joints complying with ASME B16.22.

C. Brazing filler Metals shall be BCuP series, copper-phosphorus allows for general duty brazing conforming to AWS A5.8. C. Screw Joints shall be made with Degreased polytetrafluoroethylene (teflon) tape.

D. Piping identification labels shall be applied in accordance with NFPA 99. Supplementary color identification shall be in accordance with CGA pamphlet C-9.

E. Temperature and pressure ratings of Memory metal couplings shall be not less than that of a brazed joint shall be permitted. The memory metal couplings shall be made of ASTM F 2063, nickel titanium, shape memory alloy, cleaned, purged, and sealed for medical gas service.

2.2 VALVES

A Valves shall be cleaned purged, and bagged according to CGA G-4.1 for oxygen service.

B. Ball:

1. Ball valves 100 millimeters or DN100 (4 inches) and smaller shall be full port, chrome plated brass with PTFE or TGFE seats, lever type handle with locking device, blowout proof stem with PTFE or TFE seal and ends manufactured according to ASTM B 819 with copper tube extensions. The ball valve shall have a pressure rating of 2070 kPa (300 psig).

C. Check:

1. Check valves 80 millimeters or DN80 (3 inches) and smaller shall be spring loaded with ends manufactured according to ASTM B819 with

copper tube extensions. The check valve shall have a pressure rating of 2070 kPa (300 psig).

D. Zone Valves:

1. Zone valves shall be three-piece body, brass or bronze full port, chrome plated brass ball valve with gage with PTFE or TGFE seats, lever type handle with locking device, blowout proof stem with PTFE or TFE seal and ends manufactured according to ASTM B 819 with copper tube extensions. The ball valve shall have a pressure rating of 2070 kPa (300 psig).

2.3 ZONE VALVE BOXES

A. Zone Valve boxes shall be formed steel with anchors for recessed mounted and includes holes with grommets in the box sides for tubing extension protection. The zone valve box shall be of the size for single or multiple valves as indicated with pressure gages and space for manual operation of valves.

B. The interior finish shall be factory applied white enamel.

C. The cover plate shall be stainless steel with NAAMM AMP 503, No. 4 finish and frangible or removable windows. The valve box windows shall be clear or tinted transparent plastic with labeling that includes rooms served according to NFPA 99.

2.4 OUTLETS

A. The outlet shall be for specific medical/dental compressed air pressure and service listed. Rough-in assemblies shall be included. Recessed units shall be provided unless indicated.

B. Finish assembly shall include primary check valve, double seals to prevent air leakage and cover plate with service label.

C. Quick coupler service connections shall include a pressure outlet with non-interchangeable keyed indexing and constructed to permit one-handed connection and removal of equipment using a positive locking ring that retains the equipment stem in valve during use.

D. DISS service connection outlets shall comply with CGA V-5 with threaded indexing constructed to permit one handed connection and removal of equipment.

2.5 GAGES, PRESSURE

A. Pressure gages used for testing purposes shall be listed for dental compressed air.

B. Pressure gages for line pressure use adjacent to source equipment shall be 115 millimeter (4-1/2 inch) diameter, accuracy to within 2%. The pressure range shall be twice the operating pressure. Dial graduations and figures shall be black on white background. Gage shall be cleaned and listed for oxygen use and marked “USE NO OIL”. The pressure gage shall comply with ANSI B40.1 and have a gage cock. , and marked "USE NO OIL". Install with gage cock.

C. For all services downstream of main shutoff valve, the pressure gages shall be manufactured expressly for oxygen use but labeled for dental air service and marked "USE NO OIL", 40 mm (1-1/2 inch) diameter gage with dial range 1-2050 kPa (1-300 psi).

PART 3 EXECUTION

3.1 PREPERATION

A. All dental air tube and fittings, valves, gages, and other components shall be of oil, grease, and other readily oxidizable materials as required according to CGA G-4.1, “Cleaning Equipment for Oxygen Service.

B. All dental air tube and components shall be washed in hot, alkaline cleaner water solution of sodium carbonate or tri-sodium phosphate in proportion of .453 kg (one pound) of chemical to 11.3 liters (three gallons) of water. All components shall be scrubbed and rinsed using new cleaning pads.

3.2 INSTALLATION

A. Pipe, fitting, and component installation shall conform to NFPA 99.

B. New pipe to existing pipe connections shall be connected with memory metal couplings.

C. Dental air piping shall use either type L or K, copper medical gas tube, wrought copper fittings, and brazed joints.

D. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, shall be used for pipe penetrations and sleeves.

E. Pipe installation shall comply with ASSE standard #6010.

F. Pipes indicated to be exposed and piping in Mechanical rooms and utility areas shall be installed parallel or at right angles to building walls.

G. Piping above ceilings shall be installed to allow for the removal of ceiling tiles.

H. Air and drain piping shall be installed at a one percent slope.

I. Nipples, unions, special fittings shall be installed with pressure ratings same as or higher than system pressure rating.

J. Eccentric reduces shall be used when dental air piping is reduced in the direction of flow with bottoms of both pipes and reduced fitting flush with bottom of pipe.

K. Branch connections shall be installed from the top of the main.

L. Pressure gages shall be installed on discharge piping from each compressor and on each receiver.

M. Seismic restrains shall be installed as required by the location and section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.

N. Open ends of tube shall be capped or plugged at all times or otherwise sealed until final assembly.

O. Piping shall be cut square and accurately with a tube cutter (sawing not permitted) to measurements determined at place of installation. Pipe shall be reamed to remove burrs, being careful not to expand tube, and so no chips of copper remain in the tube. Piping shall be worked into place without springing or forcing. Tube shall be bottomed in socket so there are no gaps between tube and fitting. Care shall be exercised 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 shall be no longer suitable for dental air service.

P. Spacing of Hangers shall comply with NFPA 99.

Q. Valves and other equipment shall be rigidly supported to prevent strain on tube or joints.

R. While being brazed, joints shall be continuously purged with oil-free dry nitrogen. The flow of purge gas shall be maintained until joint is cool to the touch.

S. Pipe fittings shall be used for all changes in direction. Tube shall not be bent or forced into place.

T. Support ceiling column assembly from heavy sub-mounting castings furnished with the unit as part of roughing-in. The ceiling column assembly shall be anchored with 15 mm (1/2 inch) diameter bolts attached to angle iron frame supported from structural ceiling, unless otherwise indicated.

U. Pressures and vacuum switches, transmitters, and gauges shall be installed to be easily accessed, and provide access panel where installed above plaster ceiling. Pressure switches and sensors shall be installed for gas specific demand check valves.

V. Pipe labeling shall be applied during installation process and not after installation is completed. The size of legend letters shall be in accordance with ANSI A13.1.

W. Compressor intake shall be piped to a source of clean ambient air as indicated in NFPA 99.

X. After initial leakage testing is completed, allow piping to remain pressurized with testing gas until testing agency performs final tests.

Y. Penetrations:

1. Where pipes pass through fire partitions, fire walls, smoke 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. Completely fill and seal clearances between raceways and openings with the fire stopping material.
2. At floor penetrations, completely seal clearances around the pipe and make watertight with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.3 TESTS

A. Blow down, piping purge, and high and low pressure leakage tests shall be conducted as required by NFPA 99 for a level 3 compressed air system with documentation.

B. Static pressure test, pressure relief test, cross connection test, alarm tests and test of secondary equipment shall be conducted for a level 3 compressed air system as required by current NFPA.

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