

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Compressed-air piping and specialties for nonmedical laboratory facilities, designated "laboratory air," operating at 65 psi.

B. Related Sections include the following:

1. Division 11 - Laboratory Fume Hoods for compressed-air outlets in laboratory fume hoods.
2. Division 12 - Laboratory Casework for compressed-air outlets in casework.
3. Section 22 05 03 - Pipes and Tubes for Plumbing Piping and Equipment: Product and installation requirements for piping materials applying to various system types.
4. Section 22 61 19 - Compressed-Air Equipment for Laboratory Facilities for laboratory air compressors.

1.02 DEFINITIONS

- A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.03 QUALITY ASSURANCE

- A. Brazing: Qualify processes and operators 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."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. ASME Compliance:
 1. Comply with ASME B31.9, "Building Services Piping," for laboratory compressed-air piping operating at 150 psig or less.

1.04 PROJECT CONDITIONS

- A. Interruption of Existing Laboratory Compressed-Air Service(s): Do not interrupt laboratory compressed-air service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager and Owner no less than one week in advance of proposed interruption of laboratory compressed-air service(s).
2. Do not proceed with interruption of laboratory compressed-air service(s) without Construction Manager's and Owner's written permission.

PART 2 - PRODUCTS

2.01 JOINING MATERIALS

- A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- B. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- C. Threaded-Joint Tape: PTFE.

2.02 VALVES

- A. Ball Valves: MSS SP-110, 3-piece body, brass or bronze.
 1. Manufacturers: Subject to requirements of the specification, provide the following manufacturer's products by one of the following or approved equal:
 - a. Conbraco Industries, Inc.
 - b. NIBCO INC.
 - c. Squire-Cogswell/Aeros Instruments, Inc.
 - d. Tri-Tech Medical.
 2. Pressure Rating: 150 psig minimum.
 3. Ball: Full-port, chrome-plated brass.
 4. Seats: PTFE or TFE.
 5. Handle: Lever.
 6. Stem: Blowout proof with PTFE or TFE seal.
 7. Ends: Manufacturer-installed ASTM B 819, copper-tube extensions.
- B. Check Valves: In-line pattern, bronze.
 1. Manufacturers: Subject to requirements of the specification, provide the following manufacturer's products by one of the following or approved equal:

- a. Allied Healthcare Products, Inc.; Chemetron Div.
 - b. Conbraco Industries, Inc.
 - c. Squire-Cogswell/Aeros Instruments, Inc.
 - d. Tri-Tech Medical.
- 2. Pressure Rating: 150 psig minimum.
- 3. Operation: Spring loaded.
- 4. Ends: Manufacturer-installed ASTM B 819, copper-tube extensions.
- C. Safety Valves: Bronze-body, ASME-construction, poppet, pressure-relief type with settings to match system requirements.
- D. Pressure Regulators: Bronze body and trim; spring-loaded, diaphragm-operated relieving type; manual pressure-setting adjustment; rated for 250-psig minimum inlet pressure; and capable of controlling delivered air pressure within 0.5 psig for each 10-psig inlet pressure.
- E. Automatic Drain Valves: Stainless-steel body and internal parts, rated for 200-psig minimum working pressure, capable of automatic discharge of collected condensate. Include mounting bracket where wall mounting is indicated.

2.03 FLEXIBLE PIPE CONNECTORS

- A. Manufacturers: Subject to requirements of the specification, provide the following manufacturer's products by one of the following or approved equal:
 - 1. Flex-Hose Co., Inc.
 - 2. Flexicraft Industries.
 - 3. Hyspan Precision Products, Inc.
 - 4. Metraflex, Inc.
 - 5. Unaflex.
 - 6. Universal Metal Hose; a Hyspan Co.
- B. Description: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
 - 1. Working-Pressure Rating: 150 psig minimum.
 - 2. End Connections: Threaded copper pipe or plain-end copper tube.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

- A. Connect new tubing to existing tubing with memory-metal couplings.

- B. Laboratory Air Piping: Use one of the following piping materials for each size range:
 - 1. NPS 4 and Smaller: Type L, copper; wrought-copper fittings; and brazed joints.
- C. Instrument Air Piping:
 - 1. NPS 3 and Smaller: Use Type L, copper; wrought-copper fittings; and brazed joints.
 - 2. NPS 3-1/2 and Larger: Use Type L, copper; wrought-copper fittings; and brazed joints.
- D. Drain Piping: Use the following piping materials:
 - 1. Copper water tube, cast- or wrought-copper fittings, and soldered.

3.02 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Comply with ASSE Standard #6010 for installation of compressed-air piping.
- C. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and coordinate with other services occupying that space.
- F. Install piping adjacent to equipment and specialties to allow service and maintenance.
- G. Install air and drain piping with 1 percent slope downward in direction of flow.
- H. Install nipples, unions, special fittings, and valves with pressure ratings same as or higher than system pressure rating used in applications below unless otherwise indicated.
- I. Install eccentric reducers, if available, where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.

- J. Install branch connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.
- K. Install thermometer and pressure gage on discharge piping from each air compressor and on each receiver.
- L. Install piping to permit valve servicing.
- M. Install piping free of sags and bends.
- N. Install fittings for changes in direction and branch connections.
- O. Connect compressed-air piping to air compressors and to compressed-air outlets and equipment requiring compressed-air service.
- P. Install unions in copper compressed-air tubing adjacent to each valve and at final connection to each piece of equipment, machine, and specialty.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors.
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.03 VALVE INSTALLATION

- A. Install shutoff valve at each connection to and from compressed-air equipment and specialties.
- B. Install check valves to maintain correct direction of compressed-air flow from compressed-air equipment.
- C. Install safety valves on compressed-air receivers where required by NFPA 99 and where recommended by specialty manufacturers.
- D. Install pressure regulators on compressed-air piping where reduced pressure is required.
- E. Install automatic drain valves on equipment, specialties, and piping with drain connection. Run drain piping to floor drain so contents spill over or into it.
- F. Install flexible pipe connectors in discharge piping of each air compressor.

3.04 JOINT CONSTRUCTION

- A. Remove scale, slag, dirt, and debris from outside of cleaned tubing and fittings before assembly.
- B. Threaded Joints: Apply appropriate tape to external pipe threads.

- C. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter. Continuously purge joint with oil-free dry nitrogen during brazing.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux to tube end. Join copper tube and fittings according to ASTM B 828.

3.05 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices.
- B. Vertical Piping: MSS Type 8 or 42, clamps.
- C. Individual, Straight, Horizontal Piping Runs:
 - 1. 100 Feet and Less: MSS Type 1, adjustable, steel, clevis hangers.
 - 2. Longer Than 100 Feet: MSS Type 43, adjustable, roller hangers.
- D. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for trapeze hangers.
- E. Base of Vertical Piping: MSS Type 52, spring hangers.
- F. Support horizontal piping within 12 inches of each fitting and coupling.
- G. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1/4: 60 inches with 3/8-inch rod.
 - 2. NPS 3/8 and NPS 1/2: 72 inches with 3/8-inch rod.
 - 3. NPS 3/4: 84 inches with 3/8-inch rod.
 - 4. NPS 1: 96 inches with 3/8-inch rod.
 - 5. NPS 1-1/4: 108 inches with 3/8-inch rod.
 - 6. NPS 1-1/2: 10 feet with 3/8-inch rod.
 - 7. NPS 2: 11 feet with 3/8-inch rod.
 - 8. NPS 2-1/2: 13 feet with 1/2-inch rod.
 - 9. NPS 3: 14 feet with 1/2-inch rod.

10. NPS 3-1/2: 15 feet with 1/2-inch rod.

11. NPS 4: 16 feet with 1/2-inch rod.

I. Install supports for vertical copper tubing every 10 feet.

3.06 LABELING AND IDENTIFICATION

A. Install identifying labels and devices for nonmedical laboratory compressed-air piping, valves, and specialties. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.07 FIELD QUALITY CONTROL FOR COMPRESSED-AIR PIPING IN NON-MEDICAL LABORATORY FACILITIES

A. Testing Agency: Engage qualified testing agency to perform field tests and inspections of compressed-air piping in nonmedical laboratory facilities and prepare test reports.

B. Perform tests and inspections of compressed-air piping in nonmedical laboratory facilities and prepare test reports.

C. Tests and Inspections:

1. Piping Leak Tests for Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry nitrogen to pressure of 50 psig above system operating pressure, but not less than 150 psig. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.

2. Repair leaks and retest until no leaks exist.

3. Inspect filters and pressure regulators for proper operation.

END OF SECTION