SECTION 221513

COMPRESSED-AIR PIPING

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**NOTE TO SPECIFIER**

*Use this Specification Section for Mail Processing Facilities.*

***This is a Type 2 Specification with primarily editable text; therefore, most of the text can be edited, but there is some required text which is noted within the Section with a “Note to Specifier.” Do not revise these paragraphs without an approved Deviation from USPS Headquarters, Facilities Program Management, through the USPS Project Manager.***

*For Design/Build projects, do not delete the Notes to Specifier in this Section so that they may be available to Design/Build entity when preparing the Construction Documents.*

*For the Design/Build entity, this specification is intended as a guide for the Architect/Engineer preparing the Construction Documents.*

*The MPF specifications may also be used for Design/Bid/Build projects. In either case, it is the responsibility of the design professional to edit the Specifications Sections as appropriate for the project.*

*Text shown in brackets must be modified as needed for project specific requirements.* *See the “Using the USPS Guide Specifications” document in Folder C for more information.*

*The last date that USPS revised this standard specification section occurs in two places, at the end of this section and in the Table of Contents. If the date in this section matches the date in the Table of Contents, then you are using the latest version. Do not delete or revise the “last revised” date at the end of the section during the development of the Project Manual.*

*The footer in this section should be edited to replace the text, “USPS MPF SPECIFICATION” with the project name, and the blank date in the center should be replaced with the submission date, for interim design reviews, or the issue date of the completed Project Manual.*

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1. GENERAL
   1. SUMMARY
      1. This Section includes piping and related specialties for general-service compressed-air systems operating at 200 psig or less.
      2. See Division 22 Section 221519 - General-Service Packaged Air Compressors and Receivers for general-service air compressors and accessories.
   2. PERFORMANCE REQUIREMENTS
      1. Seismic Performance: Compressed-air piping and support and installation shall withstand effects of seismic events determined according to SEI/ASCE 7, "Minimum Design Loads for Buildings and Other Structures.", where applicable.
   3. SUBMITTALS
      1. Product Data: For the following:
         1. Pressure regulators. Include rated capacities and operating characteristics.
         2. Automatic drain valves.
         3. Filters. Include rated capacities and operating characteristics.
         4. Lubricators. Include rated capacities and operating characteristics.
      2. Field quality-control test reports.
      3. Operation and maintenance data.
   4. QUALITY ASSURANCE
      1. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for low-pressure compressed-air piping.
2. PRODUCTS

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**NOTE TO SPECIFIER**

\*\*Required: Piping and fittings materials must comply with the chart in Section 220000 - Plumbing

Do not revise the materials below without an approved deviation; however, items may be removed to comply with local code requirements or for building requirements for MPF Repair & Alteration or Expansion projects; verify with the facility.

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* 1. PIPES, TUBES, AND FITTINGS
     1. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B, black or hot-dip zinc coated with ends threaded according to ASME B1.20.1.
        1. Steel Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized seamless steel pipe. Include ends matching joining method.
        2. Malleable-Iron Fittings: ASME B16.3, Class 150 or 300, threaded.
        3. Malleable-Iron Unions: ASME B16.39, Class 150 or 300, threaded.
        4. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel, threaded.
        5. Wrought-Steel Butt-Welding Fittings: ASME B16.9, Schedule 40.
        6. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel.
     2. Copper Tube: ASTM B 88, Type L seamless, drawn-temper, water tube.
        1. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type or MSS SP-73, wrought copper with dimensions for brazed joints.
        2. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300.
        3. Copper Unions: ASME B16.22 or MSS SP-123.
     3. Transition Couplings for Metal Piping: Metal coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
  2. JOINING MATERIALS
     1. Pipe-Flange Gasket Materials: Suitable for compressed-air piping system contents.
        1. ASME B16.21, nonmetallic, flat, full-face, asbestos free, 1/8-inch maximum thickness.
     2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
     3. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
     4. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.
     5. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer complying with ASTM F 656.
  3. VALVES
     1. Metal Ball, Butterfly, Check, Gate, and Globe Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping."
  4. DIELECTRIC FITTINGS
     1. General Requirements for Dielectric Fittings: Combination fitting of copper alloy and ferrous materials with insulating material; suitable for system fluid, pressure, and temperature. Include threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
     2. Dielectric Unions: Factory-fabricated union assembly, for 250-psig minimum working pressure at 200 deg F.
  5. FLEXIBLE PIPE CONNECTORS
     1. Bronze-Hose Flexible Pipe Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
        1. Working-Pressure Rating: 200 psig minimum.
        2. End Connections, NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
        3. End Connections, NPS 2-1/2 and Larger: Flanged copper alloy.
     2. Stainless-Steel-Hose Flexible Pipe Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
        1. Working-Pressure Rating: 200 psig minimum.
        2. End Connections, NPS 2 and Smaller: Threaded steel pipe nipple.
        3. End Connections, NPS 2-1/2 and Larger: Flanged steel nipple.
  6. SLEEVES
     1. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
  7. ESCUTCHEONS
     1. General Requirements: Manufactured wall and ceiling escutcheons and floor plates, with ID to closely fit around pipe and tube and OD that completely covers opening.
     2. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with polished chrome-plated finish.
     3. One-Piece, Cast-Brass Escutcheons: With set screw.
        1. Finish: [Polished chrome-plated] [Rough brass] [Polished chrome-plated and rough brass].
     4. One-Piece, Stamped-Steel Escutcheons: With set screw or spring clips and chrome-plated finish.
     5. One-Piece, Floor-Plate Escutcheons: Cast iron.
  8. SPECIALTIES
     1. Safety Valves: ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," construction; National Board certified, labeled, and factory sealed; constructed of bronze body with poppet-type safety valve for compressed-air service.
        1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.
     2. Air-Main Pressure Regulators: Bronze body, pilot-operated direct acting, spring-loaded manual pressure-setting adjustment, and rated for 250-psig inlet pressure, unless otherwise indicated.
     3. Air-Line Pressure Regulators: Diaphragm or pilot operated, bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 200-psig minimum inlet pressure, unless otherwise indicated.
     4. 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 if wall mounting is indicated.
     5. Coalescing Filters: Coalescing type with activated carbon capable of removing water and oil aerosols; with color-change dye to indicate when carbon is saturated and warning light to indicate when selected maximum pressure drop has been exceeded. Include mounting bracket if wall mounting is indicated.
     6. Mechanical Filters: Two-stage, mechanical-separation-type, air-line filters. Equip with deflector plates, resin-impregnated-ribbon-type filters with edge filtration, and drain cock. Include mounting bracket if wall mounting is indicated.
  9. QUICK COUPLINGS
     1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
        1. Aeroquip Corporation; Eaton Corp.
        2. Bowes Manufacturing Inc.
        3. Foster Manufacturing, Inc.
        4. Milton Industries, Inc.
        5. Parker Hannifin Corp.; Fluid Connectors Group; Quick Coupling Div.
        6. Schrader-Bridgeport; Amflo Div.
        7. Schrader-Bridgeport/Standard Thomson.
        8. Snap-Tite, Inc.; Quick Disconnect & Valve Division.
        9. TOMCO Products Inc.
     2. General Requirements for Quick Couplings: Assembly with locking-mechanism feature for quick connection and disconnection of compressed-air hose.
     3. Automatic-Shutoff Quick Couplings: Straight-through brass body with O-ring or gasket seal and stainless-steel or nickel-plated-steel operating parts.
        1. Socket End: With one-way valve and threaded inlet for connection to piping or threaded hose fitting.
        2. Plug End: [Flow-sensor-bleeder, check-valve] [Straight-through] type with barbed outlet for attaching hose.
     4. Valveless Quick Couplings: Straight-through brass body with stainless-steel or nickel-plated-steel operating parts.
        1. Socket End: With O-ring or gasket seal, without valve, and with barbed inlet for attaching hose.
        2. Plug End: With barbed outlet for attaching hose.
  10. HOSE ASSEMBLIES
      1. Description: Compatible hose, clamps, couplings, and splicers suitable for compressed-air service, of nominal diameter indicated, and rated for 300-psig minimum working pressure, unless otherwise indicated.
         1. Hose: Reinforced double-wire-braid, CR-covered hose for compressed-air service.
         2. Hose Clamps: Stainless-steel clamps or bands.
         3. Hose Couplings: Two-piece, straight-through, threaded brass or stainless-steel O-ring or gasket-seal swivel coupling with barbed ends for connecting two sections of hose.
         4. Hose Splicers: One-piece, straight-through brass or stainless-steel fitting with barbed ends for connecting two sections of hose.

1. EXECUTION
   1. PIPING APPLICATIONS
      1. Compressed-Air Piping between Air Compressors and Receivers: Use[ one of] the following piping materials for each size range:
         1. NPS 2 and Smaller: Steel pipe; threaded, malleable-iron fittings; and threaded joints.
         2. NPS 2 and Smaller: Type L, copper tube; wrought-copper fittings; and brazed joints.
         3. NPS 2-1/2 and Larger: Steel pipe; welded, welded steel fittings.
      2. Low-Pressure Compressed-Air Distribution Piping: Use[ one of] the following piping materials for each size range:
         1. NPS 2 and Smaller: Steel pipe; threaded, malleable-iron fittings; and threaded joints.
         2. NPS 2 and Smaller: Type L, copper tube; wrought-copper fittings; and brazed joints.
         3. NPS 2-1/2 and Larger: Steel pipe; welded, welded steel fittings.
      3. Drain Piping: Use[ one of] the following piping materials:
         1. NPS 2 and Smaller: Steel pipe; threaded, malleable-iron fittings; and threaded joints.
         2. NPS 2 and Smaller: Type L, copper tube; wrought-copper fittings; and brazed joints.
   2. VALVE APPLICATIONS
      1. Comply with requirements in "Valve Applications" Article in Division 22 Section "General-Duty Valves for Plumbing Piping."
      2. Equipment Isolation Valves: Safety-exhaust, copper-alloy ball valve with exhaust vent and pressure rating at least as great as piping system operating pressure.
   3. PIPING INSTALLATION
      1. 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.
      2. Install piping concealed from view and protected from physical contact by building occupants, unless otherwise indicated and except in equipment rooms and service areas.
      3. 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 otherwise indicated.
      4. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and to coordinate with other services occupying that space.
      5. Install piping adjacent to equipment and machines to allow service and maintenance.
      6. Install air and drain piping with 1 percent slope downward in direction of flow.
      7. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.
      8. Equipment and Specialty Flanged Connections:
         1. Use steel companion flange with gasket for connection to steel pipe.
         2. Use cast-copper-alloy companion flange with gasket and brazed[ or soldered] joint for connection to copper tube. Do not use soldered joints for connection to air compressors or to equipment or machines producing shock or vibration.
      9. 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.
      10. Install thermometer and pressure gage on discharge piping from each air compressor and on each receiver. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping."
      11. Install piping to permit valve servicing.
      12. Install piping free of sags and bends.
      13. Install fittings for changes in direction and branch connections.
      14. Install seismic restraints on piping. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."
      15. Install unions, adjacent to each valve and at final connection to each piece of equipment and machine.
   4. JOINT CONSTRUCTION
      1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
      2. Remove scale, slag, dirt, and debris from pipe and fittings before assembly.
      3. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Apply appropriate tape or thread compound to external pipe threads.
      4. Brazed Joints for Copper Tubing: Join according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
      5. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Join according to ASTM B 828 or CDA's "Copper Tube Handbook."
      6. Flanged Joints: Use asbestos-free, nonmetallic gasket suitable for compressed air. Join flanges with gasket and bolts according to ASME B31.9 for bolting procedure.
      7. Solvent-Cemented Joints for PVC Piping: Clean and dry joining surfaces. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer and join according to ASME B31.9 for solvent-cemented joints and to ASTM D 2672.
      8. Dissimilar Metal Piping Material Joints: Use dielectric fittings.
   5. VALVE INSTALLATION
      1. General-Duty Valves: Comply with requirements in Division 22 Section 221119- Domestic Water Piping Specialties for general duty valves for plumbing piping.
      2. Install shutoff valves and unions or flanged joints at compressed-air piping to air compressors.
      3. Install shutoff valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.
      4. Install check valves to maintain correct direction of compressed-air flow to and from compressed-air piping specialties and equipment.
   6. DIELECTRIC FITTING INSTALLATION
      1. Install dielectric unions in piping at connections of dissimilar metal piping and tubing.
   7. FLEXIBLE PIPE CONNECTOR INSTALLATION
      1. Install flexible pipe connectors in discharge piping[ and in inlet air piping from remote air-inlet filter] of each air compressor.
      2. Install bronze-hose flexible pipe connectors in copper compressed-air tubing.
      3. Install stainless-steel-hose flexible pipe connectors in steel compressed-air piping.
   8. SPECIALTY INSTALLATION
      1. Install safety valves on receivers in quantity and size to relieve at least the capacity of connected air compressors.
      2. Install air-main pressure regulators in compressed-air piping at or near air compressors.
      3. Install air-line pressure regulators in branch piping to equipment.
      4. Install automatic drain valves on aftercoolers, receivers, and dryers. Discharge condensate onto nearest floor drain.
      5. Install coalescing filters in compressed-air piping at or near air compressors and upstream from mechanical filters. Mount on wall at locations indicated.
      6. Install mechanical filters in compressed-air piping at or near air compressors and downstream from coalescing filters. Mount on wall at locations indicated.
      7. Install quick couplings at piping terminals for hose connections.
      8. Install hose assemblies at hose connections.
   9. SLEEVE INSTALLATION
      1. Install sleeves for pipes passing through concrete and masonry walls, gypsum board partitions, and concrete floor and roof slabs using galvanized-steel pipe.
      2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
      3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use Steel Pipe Sleeves.
      4. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
   10. ESCUTCHEON INSTALLATION
       1. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
          1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
          2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, [cast brass with polished chrome-plated finish] [stamped steel with set screw] [stamped steel with set screw or spring clips] [stamped steel with spring clips].
          3. Bare Piping at Ceiling Penetrations in Finished Spaces: [One piece, cast brass with polished chrome-plated finish] [One piece, stamped steel with set screw].
          4. Bare Piping in Unfinished Service Spaces: One piece, [cast brass with polished chrome-plated finish] [cast brass with rough-brass finish] [stamped steel with set screw] [stamped steel with spring clips] [stamped steel with set screw or spring clips].
          5. Bare Piping in Equipment Rooms: One piece, [cast brass] [stamped steel with set screw] [stamped steel with spring clips] [stamped steel with set screw or spring clips].
          6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.
   11. HANGER AND SUPPORT INSTALLATION
       1. Comply with requirements in Division 22 Section 220500 – Common Work Results for Plumbing for pipe hanger and support devices.
       2. Vertical Piping: MSS Type 8 or 42, clamps.
       3. Individual, Straight, Horizontal Piping Runs:
          1. 100 Feet or Less: MSS Type 1, adjustable, steel clevis hangers.
          2. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
       4. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
       5. Base of Vertical Piping: MSS Type 52, spring hangers.
       6. Support horizontal piping within 12 inches of each fitting and coupling.
       7. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
       8. Install hangers for Schedule 40, steel piping with the following maximum horizontal spacing and minimum rod diameters:
          1. NPS 1/4 to NPS 1/2: 96 inches with 3/8-inch rod.
          2. NPS 3/4 to NPS 1-1/4: 84 inches with 3/8-inch rod.
          3. NPS 1-1/2: 12 feet with 3/8-inch rod.
          4. NPS 2: 13 feet with 3/8-inch rod.
       9. Install supports for vertical, Schedule 40, steel piping every 15 feet.
       10. 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.
       11. Install supports for vertical copper tubing every 10 feet.
   12. LABELING AND IDENTIFICATION
       1. Install identifying labels and devices for general-service compressed-air piping, valves, and specialties. Comply with requirements in Division 22 Section 220500 - Common Work Results For Plumbing.
   13. FIELD QUALITY CONTROL
       1. Perform field tests and inspections.
       2. Tests and Inspections:
          1. Piping Leak Tests: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous 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 all accessories for proper operation.

END OF SECTION

USPS MPF Specification Last Revised: 10/1/2022