

University of Houston Master Specification

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SECTION 23 1123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Conditions of the Contract and applicable requirements of Division 1, "General Requirements," and Section 23 0100, "Mechanical Scope of Work," govern this Section.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. The current version of the *Uniform General Conditions for Construction Contracts*, State of Texas, available on the web site of the Texas Facilities Commission.
 - 2. The University of Houston's Supplemental General Conditions and Special Conditions for Construction.

1.2 APPLICABLE PUBLICATIONS

The International Fuel Gas Code.
NFPA 54.

Comply with all applicable locally enforced codes and standards.

Comply with local utility company and AGA regulations which require the products used for gas piping work to be selected from lists in certain published standards or coded as indicated.

1.3 DEFINITIONS

- A. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms. Securing and installing gas services for the building.
- C. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

1.4 DESCRIPTION OF WORK:

- A. Work Included: Provide complete operating natural gas piping systems including pipe, tube, fittings, piping specialties, piping and tubing joining materials, manual gas shutoff valves, motorized gas valves, seismic valves, seismic restraints, pressure regulators, service meter(s), dielectric fittings, and appurtenances as indicated and in compliance with these specifications. The work of this section shall include, but not be limited to:
 - 1. Securing and installing a complete natural gas distribution system.
 - 2. Gas services for the building.
 - 3. Testing of gas piping systems
 - 4. Miscellaneous gas equipment and specialties required for a complete plumbing system as specified.

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5. Gas piping run concealed in walls, chases, or above ceilings shall be installed in a Schedule 20 welded steel sleeve vented to the outside atmosphere. Suitable internal spacers shall be provided.
 6. Inaccessible piping shall be all-welded connections. Socket type weld fittings may be used for sleeved gas piping.
 7. Drip pipes shall be provided throughout the gas piping systems for the purpose of accumulating moisture and condensate. They shall be sized no smaller than the gas main which they drain in each instance.
- B. Gas Services: Secure gas services necessary for the project as required or shown on the Contract Drawings, including paying all required fees and charges. Work related to gas services maybe shown on Plumbing, Civil, Architectural or other drawings in the Contract Documents. Gas services include, but are not limited to:
1. Arranging with the gas company to have the necessary gas service and properly sized gas meter station located where shown on drawings.
 2. Installation of gas meter and meter box in accordance with authority having jurisdiction if required.
 3. Extending gas service or providing sleeves as required by gas company from gas main at property line or street to building meter and entry.
 4. Securing connection permit from the authority having jurisdiction if required.
 5. Boring and jacking existing streets, sidewalks, etc., in city right-of-ways as is necessary. (Where this stipulation cannot be met, it shall be the responsibility of the plumbing contractor to secure all necessary permits at his cost to do whatever is required to secure the service from the city or local authority, and make whatever repairs necessary after the service is secured.)
 6. Extending gas service from the gas meter station to the building entry.
- C. Coordination: The Division 23 Contractor shall be responsible for coordinating plumbing services and site utility work as shown on the Contract Drawings with the General Contractor to determine what work is included in the scope of the Division 23 Contractor.
- D. Basic Materials and Methods: Refer to Section 23 0300 "Basic Materials and Methods" for additional plumbing piping system requirements.
- E. Vibration Isolation: Refer to Division 23 "Vibration Isolation" for piping system isolation.
- F. Insulation: Refer to Section 23 0700, "System Insulation", for piping system insulation.
- 1.5 QUALITY ASSURANCE
- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

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- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 SUBMITTALS

- A. Shop drawing submittals shall include, but not be limited to, the following:
 1. Cut sheets marked to clearly indicate all plumbing piping system materials.
 2. Piping fabrication drawings for all main piping runs **[including connections to existing piping]**. Fabrication drawings shall include plan views and suitable elevations and shall include all accessories and equipment.
 3. Additional items as required in Section 23 0100 "Mechanical General Provisions".
 4. Grooved joint couplings and fittings shall be shown on drawings and product materials and be specifically identified with the applicable Victaulic style or series number.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Product Data: For each type of the following, as applicable.
 1. Piping specialties.
 2. Corrugated, stainless-steel tubing with associated components.
 3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
 4. Pressure regulators. Indicate pressure ratings and capacities.
 5. Service meters. Indicate **[pressure ratings and]** capacities. Include all accessories and supports.
 6. Dielectric fittings
- B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
 1. Shop Drawing Scale: **[1/4 inch per foot]** <Insert scale>
 2. Retain service meter assembly option in subparagraph below if Contractor installs service.
- C. Delegated-Design Submittal: For natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Detail fabrication and assembly of seismic restraints.
- E. Store components in a clean, dry space, and protect from weather.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

AE Project Number:

Facility Natural-Gas Piping

23 1123 – 3

AE Project #: <Insert Project Number>

UH Master: 03.2020

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A. Minimum Operating-Pressure Ratings:

Revise pressure ratings in three subparagraphs below to suit Project. Ratings must be at least one and one-half times the system's operating pressure. Verify requirements with authorities having jurisdiction. Line pressure is usually less than 65 psig (450 kPa).

1. Piping and Valves: **100 psig** minimum unless otherwise indicated.
2. Service Regulators: **100 psig** minimum unless otherwise indicated.

Pressure at meter, if downstream from regulator, should be 5 psig (34.5 kPa) or lower for most applications. Pressure for industrial applications may be 100 psig (690 kPa) or higher, but these industrial applications are not addressed in the scope of this Section. If service meters and regulators with more than one pressure rating are required, indicate location of each on Drawings along with their outlet pressure setting.

3. Minimum Operating Pressure of Service Meter: **5 psig** <Insert value>.

Retain one of first four paragraphs below. NFPA 54 limits the pressure for natural gas in buildings to maximum 5 psig (34.5 kPa) unless specific construction details are followed, such as all welded piping, and venting pipe chases to outside.

- B. Natural-Gas System Pressure within Buildings: [**More than 0.5 psig but not more than 5 psig**] <Insert pressure range>.
- C. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

2.2 PIPE/TUBE FITTINGS

A. Steel Pipe: ASTM A53/A53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A234/A234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - a. Material Group: 1.1.
 - b. End Connections: Threaded or butt welding to match pipe.
 - c. Lapped Face: Not permitted underground.
 - d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
 - e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

Retain first subparagraph below for underground steel piping. Cathodic protection may be required in addition to protective coating. Coordinate with requirements in Division 13 "Cathodic Protection."

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5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
6. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

Verify acceptability of couplings in subparagraph below with authorities having jurisdiction before retaining. These couplings are available in NPS 1 (DN 25) and larger.

Tubing in first paragraph below is limited in application to 0.5 psig (3.45 kPa) and less and NPS 1 (DN 25) and smaller. Verify acceptability with authorities having jurisdiction before retaining.

Verify acceptability of tubing in first paragraph below with authorities having jurisdiction before retaining.

Do not use copper tubes in first two paragraphs below if natural gas contains more than 0.3 grains of hydrogen sulfide/100 cu. ft. (0.7 mg/100 L) of gas.

CSA B149.1 allows the use of ASTM B837 copper tubing, which defines "Type G."

2.3 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

- A. Shutoff valves for natural-gas service must comply with one or more standards. Revise this article if compliance with specific standards apply. If locking devices are required, verify that they are available from listed manufacturers.
- A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.
- B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.
 1. CWP Rating: [125 psig] <Insert pressure>.
 2. Threaded Ends: Comply with ASME B1.20.1.
 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.

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6. Service Mark: Valves **1-1/4 inches** to **NPS 2** shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, **NPS 2-1/2** and Larger: Comply with ASME B16.38.

1. CWP Rating: [**125 psi**] <Insert pressure>.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

Caution: Two-piece ball valves with a full or regular port are recommended for most services. One-piece ball valves have a reduced port but one fewer leak paths.

D. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. Body: Bronze, complying with ASTM B584.
2. Ball: Chrome-plated brass.
3. Stem: Bronze; blowout proof.
4. Seats: Reinforced TFE; blowout proof.
5. Packing: Separate packnut with adjustable-stem packing threaded ends.
6. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. CWP Rating: **600 psig**.
8. Listing: Valves **NPS 1** and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

Where pressure drop is a concern, use full-port ball valves. For corrosive or high-temperature applications, use stainless-steel trim ball valves.

E. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Body: Bronze, complying with ASTM B584.
2. Ball: Chrome-plated bronze.
3. Stem: Bronze; blowout proof.
4. Seats: Reinforced TFE; blowout proof.
5. Packing: Threaded-body packnut design with adjustable-stem packing.
6. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. CWP Rating: **600 psig**.
8. Listing: Valves **NPS 1** and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Body: Bronze, complying with ASTM B584.
2. Ball: Chrome-plated bronze.

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3. Stem: Bronze; blowout proof.
4. Seats: Reinforced TFE.
5. Packing: Threaded-body packnut design with adjustable-stem packing.
6. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. CWP Rating: **600 psig**.
8. Listing: Valves **NPS 1** and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

G. Bronze Plug Valves: MSS SP-78.

1. Body: Bronze, complying with ASTM B584.
2. Plug: Bronze.
3. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Operator: Square head or lug type with tamperproof feature where indicated.
5. Pressure Class: **125 psig**.
6. Listing: Valves **NPS 1** and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
7. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

H. Cast-Iron, Non-lubricated Plug Valves: MSS SP-78.

1. Body: Cast iron, complying with ASTM A126, Class B.
2. Plug: Bronze or nickel-plated cast iron.
3. Seat: Coated with thermoplastic.
4. Stem Seal: Compatible with natural gas.
5. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
6. Operator: Square head or lug type with tamperproof feature where indicated.
7. Pressure Class: **125 psig**.
8. Listing: Valves **NPS 1** and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

I. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. Body: Cast iron, complying with ASTM A126, Class B.
2. Plug: Bronze or nickel-plated cast iron.
3. Seat: Coated with thermoplastic.
4. Stem Seal: Compatible with natural gas.
5. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
6. Operator: Square head or lug type with tamperproof feature where indicated.
7. Pressure Class: **125 psig**.

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8. Listing: Valves **NPS 1** and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

J. PE Ball Valves: Comply with ASME B16.40.

1. Body: PE.
2. Ball: PE.
3. Stem: Acetal.
4. Seats and Seals: Nitrile.
5. Ends: Plain or fusible to match piping.
6. CWP Rating: [**80 psig**] <Insert pressure>.
7. Operating Temperature: [**Minus 20 to plus 140 deg F**] <Insert temperature range>.
8. Operator: Nut or flat head for key operation.
9. Include plastic valve extension.
10. Include tamperproof locking feature for valves where indicated on Drawings.

K. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of **5 inches** in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.5 MOTORIZED GAS VALVES

A. Automatic Gas Valves: Comply with ANSI Z21.21.

1. Body: Brass or aluminum.
2. Seats and Disc: Nitrile rubber.
3. Springs and Valve Trim: Stainless steel.
4. Normally closed.
5. Visual position indicator.
6. [**Electrical**] [**Mechanical**] operator for actuation by appliance automatic shutoff device.

Valves in paragraph below are solenoid type and are used in natural-gas piping for automatic shutoff service when interlocked with a hazard-condition initiating device.

B. Electrically Operated Valves: Comply with UL 429.

1. Pilot operated.
2. Body: Brass or aluminum.
3. Seats and Disc: Nitrile rubber.
4. Springs and Valve Trim: Stainless steel.
5. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
6. NEMA ICS 6, Type 4, coil enclosure.

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7. Normally closed.
8. Visual position indicator.

2.6 EARTHQUAKE VALVES

- A. Earthquake Valves, Maximum Operating Pressure of **5 psig**: Comply with ASCE 25.
 1. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 2. Maximum Operating Pressure: **5 psig**.
 3. Cast-aluminum body with nickel-plated chrome steel internal parts.
 4. Nitrile-rubber valve washer.
 5. Sight windows for visual indication of valve position.
 6. Threaded end connections complying with ASME B1.20.1.
 7. Wall mounting bracket with bubble level indicator.
- B. Earthquake Valves, Maximum Operating Pressure of **60 psig**: Comply with ASCE 25.
 1. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 2. Maximum Operating Pressure: [**0.5 psig**] [**7 psig**] [**60 psig**].
 3. Cast-aluminum body with stainless-steel internal parts.
 4. Nitrile-rubber, reset-stem o-ring seal.
 5. Valve position, open or closed, indicator.
 6. Composition valve seat with clapper held by spring or magnet locking mechanism.
 7. Level indicator.
 8. End Connections: Threaded for valves **NPS 2** and smaller; flanged for valves **NPS 2-1/2** and larger.

2.7 PRESSURE REGULATORS

- A. General Requirements:
 1. Single stage and suitable for natural gas.
 2. Steel jacket and corrosion-resistant components.
 3. Elevation compensator.
 4. End Connections: Threaded for regulators **NPS 2** and smaller; flanged for regulators **NPS 2-1/2** and larger.

Service pressure regulators in first paragraph below are usually provided by natural-gas supplier. Retain paragraph to require Contactor to provide service regulators.

- B. Service Pressure Regulators: Comply with ANSI Z21.80.
 1. Body and Diaphragm Case: Cast iron or die-cast aluminum.
 2. Springs: Zinc-plated steel; interchangeable.
 3. Diaphragm Plate: Zinc-plated steel.
 4. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
 5. Orifice: Aluminum; interchangeable.
 6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.

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7. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
8. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.

Overpressure protection device is optional feature. See Evaluations.

9. Overpressure Protection Device: Factory mounted on pressure regulator.
10. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
11. Maximum Inlet Pressure: **[100 psig]** <Insert pressure>.

C. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Body and Diaphragm Case: Cast iron or die-cast aluminum.
2. Springs: Zinc-plated steel; interchangeable.
3. Diaphragm Plate: Zinc-plated steel.
4. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
5. Orifice: Aluminum; interchangeable.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
8. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.

Overpressure protection device is optional feature. See Evaluations.

9. Overpressure Protection Device: Factory mounted on pressure regulator.
10. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
11. Maximum Inlet Pressure: **[2 psig]** **[5 psig]** **[10 psig]** <Insert pressure>.

D. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Body and Diaphragm Case: Die-cast aluminum.
2. Springs: Zinc-plated steel; interchangeable.
3. Diaphragm Plate: Zinc-plated steel.
4. Seat Disc: Nitrile rubber.
5. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
6. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
7. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
8. Maximum Inlet Pressure: **[1 psig]** **[2 psig]** **[5 psig]** <Insert pressure>.

2.8 SERVICE METERS

In first paragraph below, retain first option for units having capacities of 500 cfh (3935 mL/s) and less and second for units having capacities more than 500 cfh (3935 mL/s).

- A. Diaphragm-Type Service Meters: Comply with **[ANSI B109.1]** **[ANSI B109.2]**.

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1. Case: Die-cast aluminum.
2. Connections: Steel threads.
3. Diaphragm: Synthetic fabric.
4. Diaphragm Support Bearings: Self-lubricating.

Pressure compensation is available, but is not usually required.

5. Compensation: Continuous temperature[**and pressure**].
6. Meter Index: [**Cubic feet**] [**Liters**] [**Cubic feet and liters**].
7. Meter Case and Index: Tamper resistant.
8. Remote meter reader compatible.
9. Maximum Inlet Pressure: [**100 psig**] <Insert pressure>.
10. Pressure Loss: Maximum [**0.5-inch wg**] [**2.0-inch wg**] <Insert pressure differential>.
11. Accuracy: Maximum plus or minus [**1.0**] <Insert number> percent.

B. Rotary-Type Service Meters: Comply with ANSI B109.3.

1. Case: Extruded aluminum.
2. Connection: Flange.
3. Impellers: Polished aluminum.
4. Rotor Bearings: Self-lubricating.

Pressure compensation is available, but is not usually required.

5. Compensation: Continuous temperature[**and pressure**].
6. Meter Index: [**Cubic feet**] [**Liters**] [**Cubic feet and liters**].
7. Tamper resistant.
8. Remote meter reader compatible.
9. Maximum Inlet Pressure: [**100 psig (690 kPa)**] <Insert pressure>.
10. Accuracy: Maximum plus or minus [**2.0**] <Insert number> percent.

C. Turbine Meters: Comply with ASME MFC-4M.

1. Housing: Cast iron or welded steel.
2. Connection Threads or Flanges: Steel.
3. Turbine: Aluminum or plastic.
4. Turbine Bearings: Self-lubricating.

Pressure compensation is available, but is not usually required.

5. Compensation: Continuous temperature[**and pressure**].
6. Meter Index: [**Cubic feet**] [**Liters**] [**Cubic feet and liters**].
7. Tamper resistant.
8. Remote meter reader compatible.
9. Maximum Inlet Pressure: [**100 psig**] <Insert pressure>.
10. Accuracy: Maximum plus or minus [**2.0**] <Insert number> percent.

Service-meter bars in first paragraph below are normally limited to NPS 1 (DN 25).

D. Service-Meter Bars:

1. Malleable- or cast-iron frame for supporting service meter.

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2. Include offset swivel pipes, meter nuts with o-ring seal, and factory- or field-installed dielectric unions.
3. Omit meter offset swivel pipes if service-meter bar dimensions match service-meter connections.

Retain paragraph below if permitted by utility and authorities having jurisdiction.

- E. Service-Meter Bypass Fittings:
 1. Ferrous, tee, pipe fitting with capped side inlet for temporary natural-gas supply.
 2. Integral ball-check bypass valve.

2.9 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

Unions in first paragraph below are available in at least NPS 1/2 to NPS 2 (DN 15 to DN 50).

- B. Dielectric Unions:
 1. Description:
 - a. Standard: ASSE 1079.

Revise pressure rating and temperature in first subparagraph below to suit Project, or insert other options for specific applications.

- b. Pressure Rating: [**125 psig minimum at 180 deg F**] [**150 psig**] [**250 psig**].
- c. End Connections: Solder-joint copper alloy and threaded ferrous.

Flanges in first paragraph below are available in at least NPS 1-1/2 to NPS 4 (DN 40 to DN 100).

- C. Dielectric Flanges:
 1. Description:
 - a. Standard: ASSE 1079.
 - b. Factory-fabricated, bolted, companion-flange assembly.

Revise pressure rating in first subparagraph below to suit Project, or insert other options for specific applications.

- c. Pressure Rating: [**125 psig minimum at 180 deg F**] [**150 psig**] [**175 psig**] [**300 psig**].
- d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

Flanges in paragraph below are available in at least NPS 1/2 to NPS 48 (DN 15 to DN 1200).

- D. Dielectric-Flange Insulating Kits:
 1. Description:

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- a. Non-conducting materials for field assembly of companion flanges.

Revise pressure rating in first subparagraph below to suit Project, or insert other options for specific applications.

- b. Pressure Rating: [150 psig] <Insert pressure>.
- c. Gasket: Neoprene or phenolic.
- d. Bolt Sleeves: Phenolic or polyethylene.
- e. Washers: Phenolic with steel backing washers.

2.10 LABELING AND IDENTIFYING

- A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

- B. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

Retain first paragraph below for renovations and additions.

- D. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- E. Inspect natural-gas piping according to [NFPA 54] [the International Fuel Gas Code] to determine that natural-gas utilization devices are turned off in piping section affected.
- F. Comply with [NFPA 54] [the International Fuel Gas Code] requirements for prevention of accidental ignition.

1.2 OUTDOOR PIPING INSTALLATION

- A. Comply with [NFPA 54] [the International Fuel Gas Code] for installation and purging of natural-gas piping.

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NFPA 54 requires a minimum of 18 inches (450 mm) of cover over buried natural-gas piping, or 12 inches (300 mm) with shielding. Pipe with less than 12 inches (300 mm) of cover must be installed in a containment conduit.

- B. Install underground, natural-gas piping buried at least [**36 inches**] <Insert value> below finished grade. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.
 - 1. If natural-gas piping is installed less than **36 inches** below finished grade, install it in containment conduit.
- C. Install underground, PE, natural-gas piping according to ASTM D2774.
- D. Steel Piping with Protective Coating:

Retain first two subparagraphs below for steel pipe protected from corrosion by PE coating.

- 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.

Retain one of two subparagraphs below. Verify acceptability of repaired coating systems with authorities having jurisdiction.

- 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
- 3. Replace pipe having damaged PE coating with new pipe.
- 4. Gas piping installed below grade shall be coated with Republic Steel Corporation (US) "X Tru Coat" high density polyethylene extruded coating, factory-applied with a fluid mastic to a minimum thickness of 0.040". Field welds, joints, and fittings shall be protected with mastic undercoat and by wrapping at least two layers of "X Tru Tape" installed as instructed by manufacturer.

CSA B149.1 requires protective coating for Type G and Type L (Type B) copper pipe and tube installed underground.

- E. Install fittings for changes in direction and branch connections.
- F. Install pressure gage [**downstream**] [**upstream and downstream**] from each service regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

1.3 INDOOR PIPING INSTALLATION

- A. Comply with [**NFPA 54**] [**the International Fuel Gas Code**] for installation and purging of natural-gas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss,

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expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. 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.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.

Retain first paragraph below for other than dry gas.

- H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Verify final equipment locations for roughing-in.
- L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
 - 1. Gas Distribution System Drip Pipes shall be provided throughout the gas piping systems for the purpose of accumulating moisture and condensate. They shall be sized no smaller than the gas main which they drain in each instance
 - 2. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

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- P. Concealed Location Installations When Allowed by Owner: Except as specified below, install concealed natural-gas piping under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

Five subparagraphs below are taken from NFPA 54. Conditions are subject to approval of authorities having jurisdiction.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.

Underground piping installed below a building must be installed in a containment conduit that is vented to outside.

2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of **1-1/2 inches** of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.

Coordinate first subparagraph below with Drawings.

3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

- a. Exception: Tubing passing through partitions or walls does not require striker barriers.

5. Prohibited Locations:

- a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
- b. Do not install natural-gas piping in solid walls or partitions.
- c. All prohibited locations as indicated in applicable codes

- Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

- R. Connect branch piping from top or side of horizontal piping.

- S. Install unions in pipes **NPS 2** and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

- T. Do not use natural-gas piping as grounding electrode.

- U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

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- V. Install pressure gage [**downstream**] [**upstream and downstream**] from each line regulator. Pressure gages are specified in Division 23 "Meters and Gages for HVAC Piping."
- W. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 "Sleeves and Sleeve Seals for HVAC Piping."

Retain first paragraph below for piping that penetrates an exterior concrete wall or concrete slab.

- X. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 "Sleeves and Sleeve Seals for HVAC Piping."
- Y. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 "Escutcheons for HVAC Piping."

1.4 SERVICE-METER ASSEMBLY INSTALLATION

Service meters are often installed by utility. Retain this article to require Contractor to install service meter. Install meter assemblies in heated spaces if natural gas contains moisture.

- A. Install service-meter assemblies above ground[, **on concrete bases**].
- B. Install metal shutoff valves upstream from service regulators. Shutoff valves are not required at second regulators if two regulators are installed in series.
- C. Install strainer on inlet of service-pressure regulator and meter set.
- D. Install service regulators mounted outside with vent outlet horizontal or facing down. Install screen in vent outlet if not integral with service regulator.
- E. Install metal shutoff valves upstream from service meters. Install dielectric fittings downstream from service meters.
- F. Install service meters downstream from pressure regulators.

Revise paragraph below to suit Project and show bollards on Drawings; delete if not required.

- G. Install metal bollards to protect meter assemblies. Comply with requirements in Section 05 5000 "Metal Fabrications" for pipe bollards.

1.5 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install underground valves with valve boxes.

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- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install earthquake valves aboveground outside buildings according to listing.
- E. Install anode for metallic valves in underground PE piping.

1.6 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
 - 4. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints:
 - 1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
 - 2. Bevel plain ends of steel pipe.
 - 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
- F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.
- G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.
- H. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.

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1.7 HANGER AND SUPPORT INSTALLATION

Retain first paragraph below for projects in areas that require seismic restraints.

- A. Comply with requirements for seismic-restraint devices specified in Division 23 "Vibration and Seismic Controls for HVAC."
- B. Comply with requirements for pipe hangers and supports specified in Division 23 "Hangers and Supports for HVAC Piping and Equipment."
- C. Install hangers for [**steel piping**] [**and**] [**copper tubing**], with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Install hangers for corrugated stainless-steel tubing, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Support horizontal piping within [**12 inches**] <Insert dimension> of each fitting.
- F. Support vertical runs of [**steel piping**] [**and**] [**copper tubing**] to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- G. Support vertical runs of corrugated stainless-steel tubing to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

1.8 CONNECTIONS

Coordinate piping installations and specialty arrangements with schematics on Drawings. If Drawings are explicit enough, these requirements may be reduced or omitted.

Delete first two paragraphs below if utility makes connection to its gas main, or retain one of two paragraphs and revise to suit Project.

- A. Connect to utility's natural gas main according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within **72 inches** of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

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- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

1.9 LABELING AND IDENTIFYING

Retain one of two paragraphs in this article.

- A. Comply with requirements in Division 23 "Identification for HVAC Piping and Equipment" for piping and valve identification.
- B. Install detectable warning tape directly above gas piping, **12 inches** below finished grade, except **6 inches** below subgrade under pavements and slabs.

1.10 PAINTING

Section 09 9113 "Exterior Painting" and Section 09 9123 "Interior Painting" specify paint products for various surfaces (e.g., ferrous and nonferrous metals). For HVAC items to be field painted, choose among various application methods and coating systems (number of prime and finish coatings and coating thicknesses). Coordinate these requirements with Architect to ensure that appropriate painting requirements are retained in Section 09 9113 "Exterior Painting" and Section 09 9123 "Interior Painting."

- A. Comply with requirements in Section 09 9113 "Exterior Painting" and Section 09 9123 "Interior Painting" for painting interior and exterior natural-gas piping.
- B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.
 - 1. Alkyd System: MPI EXT 5.1D.
 - a. Prime Coat: Alkyd anticorrosive metal primer.

For a Premium Grade system, "MPI Manual" requires intermediate coat; delete intermediate coat for a Custom Grade system.

- b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - c. Topcoat: Exterior alkyd enamel **[(flat)] [(semigloss)] [(gloss)]**.
 - d. Color: **[Gray]** <Insert color>.
 - C. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

Retain one of two subparagraphs below.

- 1. Latex Over Alkyd Primer System: MPI INT 5.1Q.

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- a. Prime Coat: **[Alkyd anticorrosive]** **[Quick-drying alkyd]** metal primer.

For a Premium Grade system, "MPI Manual" requires intermediate coat; delete intermediate coat for a Custom Grade system.

- b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex **[(flat)] [(low sheen)] [(eggshell)] [(satin)] [(semigloss)] [(gloss)]**.
 - d. Color: **[Gray]** <Insert color>.
2. Alkyd System: MPI INT 5.1E.

- a. Prime Coat: **[Alkyd anticorrosive]** **[Quick-drying alkyd]** metal primer.

For a Premium Grade system, "MPI Manual" requires intermediate coat; delete intermediate coat for a Custom Grade system.

- b. Intermediate Coat: Interior alkyd matching topcoat.
- c. Topcoat: Interior alkyd **[(flat)] [(eggshell)] [(semigloss)] [(gloss)]**.
- d. Color: **[Gray]** <Insert color>.

- D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

1.11 CONCRETE BASES

Coordinate concrete work in this article with Section 03 3000 "Cast-in-Place Concrete."

- A. Concrete Bases: Anchor equipment to concrete base **[according to seismic codes at Project]**.
 1. Construct concrete bases of dimensions indicated, but not less than **4 inches** in both directions than supported unit.
 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on **[18-inch]** <Insert dimension> centers around the full perimeter of the base.
 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 6. Use **[3000-psi]** <Insert value>, 28-day, compressive-strength concrete and reinforcement as specified in Section 03 3000 "Cast-in-Place Concrete."

1.12 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

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B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to [NFA 54] [the International Fuel Gas Code] and authorities having jurisdiction.

See Section 01 4000 "Quality Requirements" for retesting and reinspecting requirements and Section 01 7300 "Execution" for requirements for correcting the Work.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

1.13 DEMONSTRATION

Delete this article if no earthquake valves or if training is not required.

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain earthquake valves.

1.14 OUTDOOR PIPING SCHEDULE

Retain and revise applicable piping applications. Coordinate with materials specified in Part 2. Retain multiple materials for Contractor's option.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

- A. Underground natural-gas piping shall be[**one of**] the following:

PE pipe is available in NPS 1/2 to NPS 16 (DN 15 to DN 400), maximum NPS 2 (DN 50) in 1000-foot (305-m) rolls.

1. PE pipe and fittings joined by heat fusion, or mechanical couplings; service-line risers with tracer wire terminated in an accessible location.
2. Steel pipe with wrought-steel fittings and welded joints, or mechanical couplings. Coat pipe and fittings with protective coating for steel piping.

Practical size limit for copper is NPS 4 (DN 100) as joints are difficult to heat evenly for brazing.

3. [Annealed] [Drawn]-temper copper tube with wrought-copper fittings and brazed joints. Coat pipe and fittings with protective coating for copper tubing.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

- B. Aboveground natural-gas piping shall be[**one of**] the following:

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1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

Practical size limit for copper is NPS 4 (DN 100) because joints are difficult to heat evenly for brazing.

3. **[Annealed]** **[Drawn]**-temper copper tube with wrought-copper fittings and brazed joints.
- C. Branch Piping in Cast-in-Place Concrete to Single Appliance: Annealed-temper copper tube with wrought-copper fittings and **[brazed]** **[flared]** joints. Install piping embedded in concrete with no joints in concrete.

Indicate extent of containment conduit on Drawings. Containment conduit is required for piping with insufficient depth of bury.

- D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

1.15 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

Retain and revise applicable piping applications. Coordinate with materials specified in Part 2.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

- A. Aboveground, branch piping **[NPS 1]** <Insert pipe size> and smaller shall be **[one of]** the following:

Contact authorities having jurisdiction and verify approval before specifying corrugated stainless-steel tubing.

1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.

Tin-lined copper tube in first subparagraph below is available in 1/4- to 5/8-inch (6.3- to 15.8-mm) OD and is equivalent to NPS 1/8 to NPS 1/2 (DN 6 to DN 15).

2. Annealed-temper, tin-lined copper tube with flared joints and fittings.
3. Annealed-temper, copper tube with wrought-copper fittings and **[brazed]** **[flared]** joints.
4. Aluminum tube with flared fittings and joints.
5. Steel pipe with malleable-iron fittings and threaded joints.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

- B. Aboveground, distribution piping shall be **[one of]** the following:

Authorities having jurisdiction may require welded steel pipe at different sizes and pressures.

1. Steel pipe with malleable-iron fittings and threaded joints.

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- 2. Steel pipe with wrought-steel fittings and welded joints.

Practical size limit for copper is NPS 4 (DN 100) because joints are difficult to heat evenly for brazing.

- 3. Drawn-temper copper tube with wrought-copper fittings and brazed joints.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

- C. Underground, below building, piping shall be[**one of**] the following:

- 1. Steel pipe with malleable-iron fittings and threaded joints.
- 2. Steel pipe with wrought-steel fittings and welded joints.

Retain both paragraphs below for piping below building.

Indicate extent of containment conduit on Drawings. Containment conduit is required for piping under buildings.

- D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- E. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

1.16 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG AND LESS THAN 5 PSIG.

Retain and revise applicable piping applications. Coordinate with materials specified in Part 2.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

- A. Aboveground, branch piping [**NPS 1** <Insert pipe size> and smaller shall be[**one of**] the following:

Verify acceptability of corrugated stainless-steel tubing with authorities having jurisdiction before retaining first subparagraph below.

- 1. Steel pipe with malleable-iron fittings and threaded joints.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

- B. Aboveground, distribution piping shall be[**one of**] the following:

Authorities having jurisdiction may require welded steel pipe at different sizes and pressures. Verify size break and insert sizes to suit Project.

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1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with steel welding fittings and welded joints.

Practical size limit for copper is NPS 4 (DN 100) because joints are difficult to heat evenly for brazing. Type G copper tube is permitted in CSA B149.1.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

C. Underground, below building, piping shall be [**one of**] the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

Indicate extent of containment conduit on Drawings. Containment conduit is required for piping under buildings.

Retain both paragraphs below for piping below building.

D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat underground pipe and fittings with protective coating for steel piping.

E. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

1.17 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 5 PSIG

Retain and revise applicable piping applications. Coordinate with materials specified in Part 2.

- A. Aboveground Piping: Maximum operating pressure more than [**5 psig**] <Insert pressure>.
- B. Aboveground, Branch Piping: Steel pipe with steel welding fittings and welded joints.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

C. Aboveground, distribution piping shall be [**one of**] the following:

1. Steel pipe with steel welding fittings and welded joints.

Practical size limit for copper is NPS 4 (DN 100) because joints are difficult to heat evenly for brazing. Type G copper tube is permitted in CSA B149.1.

2. Drawn-temper copper tube with wrought-copper fittings and brazed joints.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

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D. Underground, below building, piping shall be **one of** the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

Indicate extent of containment conduit on Drawings. Containment conduit is required for piping under buildings.

Retain both paragraphs below for piping below building.

- E. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- F. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

1.18 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

Retain and revise applicable piping applications. Coordinate with materials specified in Part 2.

- A. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping utility's gas mains and listed by an NRTL.
- B. Underground:

Retain first subparagraph below for PE piping.

1. PE valves.

Retain both subparagraphs below for steel or PE piping.

2. **NPS 2** and Smaller: Bronze plug valves.
3. **NPS 2-1/2** and Larger: Cast-iron, plug valves.

1.19 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

Retain and revise applicable piping applications. Coordinate with materials specified in Part 2.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

- A. Valves for pipe sizes **NPS 2** and smaller at service meter shall be the following:
1. Bronze plug valve.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

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- B. Valves for pipe sizes **NPS 2-1/2** and larger at service meter shall be one of the following:
1. Bronze plug valve.
 2. Cast-iron, nonlubricated plug valve.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

- C. Distribution piping valves for pipe sizes **NPS 2** and smaller shall be the following:
1. Bronze plug valve.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

- D. Distribution piping valves for pipe sizes **NPS 2-1/2** and larger shall be one of the following:
1. Bronze plug valve.
 2. Cast-iron, plug valve.

Retain "one of" option in paragraph below to allow Contractor to select piping materials from those retained.

- E. Valves in branch piping for single appliance shall be the following:
1. Bronze plug valve.

1.20 IDENTIFICATION:

- A. Refer to Section 23 0300 "Basic Materials and Methods" for applicable painting, nameplates, and labeling requirements.

END OF SECTION 23 1123