

This Product MasterSpec Section is licensed by ARCOM to Viega LLC. ("Licensee").

This Product MasterSpec Section modifies the original MasterSpec text, and does not include the full content of the original MasterSpec Section.

Revisions made to the original MasterSpec text are made solely by the Licensee and are not endorsed by, or representative of the opinions of, ARCOM or The American Institute of Architects (AIA). Neither AIA nor ARCOM are liable in any way for such revisions or for the use of this Product MasterSpec Section by any end user. A qualified design professional should review and edit the document to suit project requirements.

For more information, contact Viega LLC., 100 N. Broadway, 6th Floor, Wichita, KS 67202; Phone: (800) 976-9819; Fax: (316) 425-1618; Website: www.viega.us; Email: insidesales@viega.us.

For information about MasterSpec contact ARCOM at (800) 424-5080 or visit www.MasterSpec.com.

SECTION 231123 - FACILITY NATURAL-GAS PIPING

TIPS:

To view non-printing **Editor's Notes** that provide guidance for editing, click on MasterWorks/Single-File Formatting/Toggle/Editor's Notes.

To read **detailed research, technical information about products and materials, and coordination checklists**, click on MasterWorks/Supporting Information.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipes, tubes, and fittings.
 - 2. Piping specialties.
 - 3. Piping and tubing joining materials.
 - 4. Valves.
 - 5. Pressure regulators.
 - 6. Service meters.
 - 7. Concrete bases.

1.3 DEFINITIONS

- A. 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.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
 - 1. Piping and Valves: [**100 psig (690 kPa)**] <Insert value> minimum unless otherwise indicated.
 - 2. Service Regulators: [**65 psig (450 kPa)**] [**100 psig (690 kPa)**] <Insert value> minimum unless otherwise indicated.
 - 3. Minimum Operating Pressure of Service Meter: [**5 psig (34.5 kPa)**] [**10 psig (69 kPa)**] [**20 psig (138 kPa)**] [**65 psig (450 kPa)**] <Insert value>.
- B. Natural-Gas System Pressure within Buildings: [**0.5 psig (3.45 kPa) or less**] [**More than 0.5 psig (3.45 kPa) but not more than 2 psig (13.8 kPa)**] [**More than 2 psig (13.8 kPa) but not more than 5 psig (34.5 kPa)**] <Insert pressure range>.
- C. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is more than **0.5 psig (3.45 kPa)** but not more than **2 psig (13.8 kPa)**, and is reduced to secondary pressure of **0.5 psig (3.45 kPa)** or less.
- D. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is more than **2 psig (13.8 kPa)** but not more than **5 psig (34.5 kPa)**, and is reduced to secondary pressure of more than **0.5 psig (3.45 kPa)** but not more than **2 psig (13.8 kPa)**.
- E. Natural-Gas System Pressures within Buildings: Three pressure ranges. Primary pressure is more than **2 psig (13.8 kPa)** but not more than **5 psig (34.5 kPa)**, and is reduced to secondary pressures of more than **0.5 psig (3.45 kPa)** but not more than **2 psig (13.8 kPa)**, and is reduced again to pressures of **0.5 psig (3.45 kPa)** or less.
- F. 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.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 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 [**bypass fittings**] [**bypass fittings and meter bars**] [**meter bars**] [**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 (1:50)**] <Insert scale>.
 2. Detail mounting, supports, and valve arrangements for [**service meter assembly and**] pressure regulator assembly.
- 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.
1. Detail fabrication and assembly of seismic restraints.
 2. Design Calculations: Calculate requirements for selecting seismic restraints.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans and details, drawn to scale, on which natural-gas piping is shown and coordinated with other installations, using input from installers of the items involved.
- B. Site Survey: Plans, drawn to scale, on which natural-gas piping is shown and coordinated with other services and utilities.
- C. Qualification Data: For qualified professional engineer.
- D. Welding certificates.
- E. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For [**motorized gas valves**] [**pressure regulators**] [**and**] [**service meters**] to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualification:
 1. Press-Connect Joining Procedure for Copper Tubing: Qualify operators according to training provided by Viega; Plumbing and Heating Systems.

2. Press-Connect Joining Procedure for Steel Piping. Qualify operators according to training provided by Viega; Plumbing and Heating Systems.
- B. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- D. 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.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.
- B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.
- D. Protect stored PE pipes and valves from direct sunlight.

1.10 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:
 1. Notify [**Architect**] [**Construction Manager**] [**Owner**] no fewer than [**two**] <Insert **number**> days in advance of proposed interruption of natural-gas service.
 2. Do not proceed with interruption of natural-gas service without [**Architect's**] [**Construction Manager's**] [**Owner's**] written permission.

1.11 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.
- B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Section 083113 "Access Doors and Frames."

1.12 WARRANTY

- A. Special Limited Warranty: Viega LLC warrants to wholesalers, and licensed plumbing and mechanical contractors in the United States and Canada, that its fittings, when properly installed in nonindustrial and non-marine applications and under normal conditions of use, will be free of failure from manufacturing defect for the following component warranty periods:
1. Warranty Period for ProPress Fittings: 50 years from date of Substantial Completion.
 2. Warranty Period for ProPress Valves: Two years from date of Substantial Completion.
 3. Warranty Period for MegaPress Fittings: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, 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 A 234/A 234M for butt welding and socket welding.
 3. Steel Press-Connect Fittings: CSA LC-4, 125-psig (860-kPa) pressure rating.
 - a. Press Ends: Unpressed fitting identification feature to the fitting wall.
 - b. Pipe Threads: ASME B1.20.1.
 - c. Sealing Elements: HNBR.
 - d. Tools: Manufacturer's recommended tools, jaws, rings, and actuators.
 4. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 5. 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.
 6. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
 7. Mechanical Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Dresser Piping Specialties.
 - 2) Smith-Blair, Inc.
 - 3) Victaulic Company.
 - 4) <Insert manufacturer's name>.
- b. [Stainless-steel] [Steel] flanges and tube with epoxy finish.
 - c. Buna-nitrile seals.
 - d. [Stainless-steel] [Steel] bolts, washers, and nuts.
 - e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
 - f. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.
- B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. FlashShield; a brand of Titeflex.
 - b. OmegaFlex, Inc.
 - c. Parker Hannifin Corporation.
 - d. Tru-Flex Metal Hose Corp.
 - e. <Insert manufacturer's name>.
 2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
 3. Coating: PE with flame retardant.
 - a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1) Flame-Spread Index: [25] <Insert value> or less.
 - 2) Smoke-Developed Index: [50] [450] <Insert value> or less.
 4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
 5. Striker Plates: Steel, designed to protect tubing from penetrations.
 6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
 7. Operating-Pressure Rating: 5 psig (34.5 kPa).
- C. Aluminum Tubing: Comply with ASTM B 210 and ASTM B 241/B 241M.
1. Aluminum Alloy: Alloy 5456 is prohibited.
 2. Protective Coating: Factory-applied coating capable of resisting corrosion on tubing in contact with masonry, plaster, insulation, water, detergents, and sewerage.
 3. Flare Fittings: Comply with ASME B16.26 and SAE J513.
 - a. Copper-alloy fittings.

- b. Metal-to-metal compression seal without gasket.
 - c. Dryseal threads shall comply with ASME B1.20.3.
- D. Drawn-Temper Copper Tube: Comply with [**ASTM B 88, Type K (ASTM B 88M, Type A)**] [**ASTM B 88, Type L (ASTM B 88M, Type B)**] [**ASTM B 837, Type G**].
1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
 2. Copper or Bronze Press-Connect Fittings: CSA LC-4, **125 psi (860 k-Pa)** pressure rating
 - a. Press Ends: Unpressed fitting identification feature to the fitting wall.
 - b. Sealing Element: HNBR.
 3. Bronze Flanges and Flanged Fittings: ASME B16.24, Class 150.
 - a. Gasket Material: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
 - b. Bolts and Nuts: ASME B18.2.1, carbon steel or stainless steel.
 4. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of **0.022 inch (0.56 mm)** thick.
- E. Annealed-Temper Copper Tube: Comply with [**ASTM B 88, Type K (ASTM B 88M, Type A)**] [**ASTM B 88, Type L (ASTM B 88M, Type B)**] [**ASTM B 837, Type G**].
1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
 2. Copper or Bronze Press-Connect Fittings: CSA LC-4, **125 psi (860 k-Pa)** pressure rating.
 - a. Press Ends: Unpressed fitting identification feature to the fitting wall.
 - b. Sealing Element: HNBR.
 3. Flare Fittings: Comply with ASME B16.26 and SAE J513.
 - a. Copper fittings with long nuts.
 - b. Metal-to-metal compression seal without gasket.
 - c. Dryseal threads complying with ASME B1.20.3.
 4. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of **0.022 inch (0.56 mm)** thick.
- F. Tin-Lined Copper Tube: ASTM B 280, seamless, annealed, with interior tin-plated lining.
1. Flare Fittings: Comply with ASME B16.26 and SAE J513.
 - a. Copper fittings with long nuts.
 - b. Metal-to-metal compression seal without gasket.
 - c. Dryseal threads complying with ASME B1.20.3.
- G. PE Pipe: ASTM D 2513, SDR 11.
1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.

2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
3. Anodeless Service-Line Risers: Factory fabricated and leak tested.
 - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
 - b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering. [**Vent casing aboveground.**]
 - c. Aboveground Portion: PE transition fitting.
 - d. Outlet shall be threaded or flanged or suitable for welded connection.
 - e. Tracer wire connection.
 - f. Ultraviolet shield.
 - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.
4. Transition Service-Line Risers: Factory fabricated and leak tested.
 - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
 - b. Outlet shall be threaded or flanged or suitable for welded connection.
 - c. Bridging sleeve over mechanical coupling.
 - d. Factory-connected anode.
 - e. Tracer wire connection.
 - f. Ultraviolet shield.
 - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.
5. Plastic Mechanical Couplings, **NPS 1-1/2 (DN 40)** and Smaller: Capable of joining PE pipe to PE pipe.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Lyall, R. W. & Company, Inc.
 - 2) Mueller Co.
 - 3) Perfection Corporation.
 - 4) **<Insert manufacturer's name>**.
 - b. PE body with molded-in, stainless-steel support ring.
 - c. Buna-nitrile seals.
 - d. Acetal collets.
 - e. Electro-zinc-plated steel stiffener.
6. Plastic Mechanical Couplings, **NPS 2 (DN 50)** and Larger: Capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Lyall, R. W. & Company, Inc.
 - 2) Mueller Co.

- 3) Perfection Corporation.
 - 4) <Insert manufacturer's name>.
- b. Fiber-reinforced plastic body.
 - c. PE body tube.
 - d. Buna-nitrile seals.
 - e. Acetal collets.
 - f. Stainless-steel bolts, nuts, and washers.
7. Steel Mechanical Couplings: Capable of joining plain-end PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Dresser Piping Specialties.
 - 2) Smith-Blair, Inc.
 - 3) <Insert manufacturer's name>.
 - b. [Stainless-steel] [Steel] flanges and tube with epoxy finish.
 - c. Buna-nitrile seals.
 - d. [Stainless-steel] [Steel] bolts, washers, and nuts.
 - e. Factory-installed anode for steel-body couplings installed underground.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig (3.45 kPa).
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches (1830 mm.)

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.

3. Strainer Screen: [40] [60]-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

D. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: [40] [60]-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

E. T-Pattern Strainers:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: [40] [60]-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig (5170 kPa).

- F. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

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 (540 deg C) 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. 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 (DN 50) and Smaller: Comply with ASME B16.33.
 1. CWP Rating: [125 psig (862 kPa)] <Insert pressure>.
 2. Threaded Ends: Comply with ASME B1.20.1.
 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.

4. Copper or Bronze Press-Connect Fittings: CSA LC-4, **125 psi (860 k-Pa)** pressure rating.
 - a. Press Ends: Unpressed fitting identification feature to the fitting wall.
 - b. Sealing Element: HNBR.
 5. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 6. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves **1 inch (25 mm)** and smaller.
 7. Service Mark: Valves **1-1/4 inches (32 mm)** to **NPS 2 (DN 50)** shall have initials "WOG" permanently marked on valve body.
- C. General Requirements for Metallic Valves, **NPS 2-1/2 (DN 65)** and Larger: Comply with ASME B16.38.
1. CWP Rating: [**125 psig (862 kPa)**] **<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.
- D. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. BrassCraft Manufacturing Co.; a Masco company.
 - c. Conbraco Industries, Inc.
 - d. Lyall, R. W. & Company, Inc.
 - e. Perfection Corporation.
 - f. **<Insert manufacturer's name>**.
 2. Body: Bronze, complying with ASTM B 584.
 3. Ball: Chrome-plated brass.
 4. Stem: Bronze; blowout proof.
 5. Seats: Reinforced TFE; blowout proof.
 6. Packing: Separate packnut with adjustable-stem packing threaded ends.
 7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 8. CWP Rating: **600 psig (4140 kPa)**.
 9. Listing: Valves **NPS 1 (DN 25)** and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- E. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. A.Y. McDonald Mfg. Co.
 - b. BrassCraft Manufacturing Co.; a Masco company.
 - c. Conbraco Industries, Inc.
 - d. Lyall, R. W. & Company, Inc.
 - e. Perfection Corporation.
 - f. <Insert manufacturer's name>.
2. Body: Bronze, complying with ASTM B 584.
 3. Ball: Chrome-plated bronze.
 4. Stem: Bronze; blowout proof.
 5. Seats: Reinforced TFE; blowout proof.
 6. Packing: Threaded-body packnut design with adjustable-stem packing.
 7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 8. CWP Rating: 600 psig (4140 kPa).
 9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 10. 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. BrassCraft Manufacturing Co.; a Masco company.
 - c. Conbraco Industries, Inc.
 - d. Lyall, R. W. & Company, Inc.
 - e. Perfection Corporation.
 - f. <Insert manufacturer's name>.
 2. Body: Bronze, complying with ASTM B 584.
 3. Ball: Chrome-plated bronze.
 4. Stem: Bronze; blowout proof.
 5. Seats: Reinforced TFE.
 6. Packing: Threaded-body packnut design with adjustable-stem packing.
 7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 8. CWP Rating: 600 psig (4140 kPa).
 9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- G. Bronze Plug Valves: MSS SP-78.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. Lee Brass Company.
 - c. <Insert manufacturer's name>.

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig (862 kPa).
7. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. Mueller Co.
 - c. Xomox Corporation.
 - d. <Insert manufacturer's name>.
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. Flowserve Corporation.
 - c. Homestead Valve.
 - d. Milliken Valve Company.
 - e. Mueller Co.
 - f. R & M Energy Systems; Robbins & Myers.
 - g. <Insert manufacturer's name>.
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.

7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Kerotest Manufacturing Corp.
 - b. Lyall, R. W. & Company, Inc.
 - c. Perfection Corporation.
 - d. <Insert manufacturer's name>.
2. Body: PE.
3. Ball: PE.
4. Stem: Acetal.
5. Seats and Seals: Nitrile.
6. Ends: Plain or fusible to match piping.
7. CWP Rating: [80 psig (552 kPa)] <Insert pressure>.
8. Operating Temperature: [Minus 20 to plus 140 deg F (Minus 29 to plus 60 deg C)] <Insert temperature range>.
9. Operator: Nut or flat head for key operation.
10. Include plastic valve extension.
11. 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 (125 mm) 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dungs, Karl, Inc.
 - b. Eaton.
 - c. Eclipse Innovative Thermal Technologies.
 - d. Honeywell Building Solutions; Honeywell International, Inc.
 - e. Johnson Controls.

- f. <Insert manufacturer's name>.
 2. Body: Brass or aluminum.
 3. Seats and Disc: Nitrile rubber.
 4. Springs and Valve Trim: Stainless steel.
 5. Normally closed.
 6. Visual position indicator.
 7. [Electrical] [Mechanical] operator for actuation by appliance automatic shutoff device.
- B. Electrically Operated Valves: Comply with UL 429.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dungs, Karl, Inc.
 - b. Eclipse Innovative Thermal Technologies.
 - c. Goyen Valve Corp.
 - d. Magnatrol Valve Corporation.
 - e. Parker Hannifin Corporation.
 - f. Watts; a Watts Water Technologies company.
 - g. <Insert manufacturer's name>.
 2. Pilot operated.
 3. Body: Brass or aluminum.
 4. Seats and Disc: Nitrile rubber.
 5. Springs and Valve Trim: Stainless steel.
 6. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
 7. NEMA ICS 6, Type 4, coil enclosure.
 8. Normally closed.
 9. Visual position indicator.

2.6 EARTHQUAKE VALVES

- A. Earthquake Valves: Comply with ASCE 25.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Vanguard Valves, Inc.
 - b. <Insert manufacturer's name>.
 2. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 3. Maximum Operating Pressure: 5 psig (34.5 kPa).
 4. Cast-aluminum body with nickel-plated chrome steel internal parts.
 5. Nitrile-rubber valve washer.
 6. Sight windows for visual indication of valve position.
 7. Threaded end connections complying with ASME B1.20.1.
 8. Wall mounting bracket with bubble level indicator.
- B. Earthquake Valves: Comply with ASCE 25.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Pacific Seismic Products, Inc.
 - b. <Insert manufacturer's name>.
2. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
3. Maximum Operating Pressure: [0.5 psig (3.45 kPa)] [7 psig (48 kPa)] [60 psig (414 kPa)].
4. Cast-aluminum body with stainless-steel internal parts.
5. Nitrile-rubber, reset-stem o-ring seal.
6. Valve position, open or closed, indicator.
7. Composition valve seat with clapper held by spring or magnet locking mechanism.
8. Level indicator.
9. End Connections: Threaded for valves NPS 2 (DN 50) and smaller; flanged for valves NPS 2-1/2 (DN 65) 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 (DN 50) and smaller; flanged for regulators NPS 2-1/2 (DN 65) and larger.

B. Service Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Actaris.
 - b. American Meter Company.
 - c. Fisher Control Valves & Instruments; a brand of Emerson Process Management.
 - d. Invensys.
 - e. Itron Gas.
 - f. Richards Industries.
 - g. <Insert manufacturer's name>.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.

9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: [**100 psig (690 kPa)**] <Insert pressure>.

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Actaris.
 - b. American Meter Company.
 - c. Eclipse Innovative Thermal Technologies.
 - d. Fisher Control Valves & Instruments; a brand of Emerson Process Management.
 - e. Invensys.
 - f. Itron Gas.
 - g. Maxitrol Company.
 - h. Richards Industries.
 - i. <Insert manufacturer's name>.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: [**2 psig (13.8 kPa)**] [**5 psig (34.5 kPa)**] [**10 psig (69 kPa)**] <Insert pressure>.

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Canadian Meter Company Inc.
 - b. Eaton.
 - c. Harper Wyman Co.
 - d. Maxitrol Company.
 - e. SCP, Inc.
 - f. <Insert manufacturer's name>.

2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: [**1 psig (6.9 kPa)**] [**2 psig (13.8 kPa)**] [**5 psig (34.5 kPa)**] **<Insert pressure>**.

2.8 SERVICE METERS

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Actaris.
 - b. American Meter Company.
 - c. Invensys.
 - d. Itron Gas.
 - e. **<Insert manufacturer's name>**.
2. Case: Die-cast aluminum.
3. Connections: Steel threads.
4. Diaphragm: Synthetic fabric.
5. Diaphragm Support Bearings: Self-lubricating.
6. Compensation: Continuous temperature[**and pressure**].
7. Meter Index: [**Cubic feet**] [**Liters**] [**Cubic feet and liters**].
8. Meter Case and Index: Tamper resistant.
9. Remote meter reader compatible.
10. Maximum Inlet Pressure: [**100 psig (690 kPa)**] **<Insert pressure>**.
11. Pressure Loss: Maximum [**0.5-inch wg (124 Pa)**] [**2.0-inch wg (498 Pa)**] **<Insert pressure differential>**.
12. Accuracy: Maximum plus or minus [**1.0**] **<Insert number>** percent.

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Meter Company.
 - b. Invensys.
 - c. **<Insert manufacturer's name>**.
2. Case: Extruded aluminum.
3. Connection: Flange.
4. Impellers: Polished aluminum.
5. Rotor Bearings: Self-lubricating.

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

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Meter Company.
 - b. Invensys.
 - c. <Insert manufacturer's name>.
2. Housing: Cast iron or welded steel.
3. Connection Threads or Flanges: Steel.
4. Turbine: Aluminum or plastic.
5. Turbine Bearings: Self-lubricating.
6. Compensation: Continuous temperature[**and pressure**].
7. Meter Index: [**Cubic feet**] [**Liters**] [**Cubic feet and liters**].
8. Tamper resistant.
9. Remote meter reader compatible.
10. Maximum Inlet Pressure: [**100 psig (690 kPa)**] <Insert pressure>.
11. Accuracy: Maximum plus or minus [**2.0**] <Insert number> percent.

D. Service-Meter Bars:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. Actaris.
 - c. American Meter Company.
 - d. Itron Gas.
 - e. Lyall, R. W. & Company, Inc.
 - f. Mueller Co.
 - g. Perfection Corporation.
 - h. <Insert manufacturer's name>.
2. Malleable- or cast-iron frame for supporting service meter.
3. Include offset swivel pipes, meter nuts with o-ring seal, and factory- or field-installed dielectric unions.
4. Omit meter offset swivel pipes if service-meter bar dimensions match service-meter connections.

E. Service-Meter Bypass Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Lyall, R. W. & Company, Inc.
 - b. Williamson, T. D., Inc.
 - c. <Insert manufacturer's name>.
2. Ferrous, tee, pipe fitting with capped side inlet for temporary natural-gas supply.
 3. 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.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. Capitol Manufacturing Company.
 - c. Central Plastics Company.
 - d. HART Industrial Unions, LLC.
 - e. Jomar Valve.
 - f. Matco-Norca.
 - g. Watts; a Watts Water Technologies company.
 - h. Wilkins.
 - i. Zurn Industries, LLC.
 - j. <Insert manufacturer's name>.
2. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: [**125 psig (860 kPa) minimum at 180 deg F (82 deg C)**] [**150 psig (1035 kPa)**] [**250 psig (1725 kPa)**].
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Matco-Norca.
 - d. Watts; a Watts Water Technologies company.
 - e. Wilkins.
 - f. <Insert manufacturer's name>.
2. Description:
 - a. Standard: ASSE 1079.

- b. Factory-fabricated, bolted, companion-flange assembly.
- c. Pressure Rating: [**125 psig (860 kPa) minimum at 180 deg F (82 deg C)**] [**150 psig (1035 kPa)**] [**175 psig (1200 kPa)**] [**300 psig (2070 kPa)**].
- d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
 - e. <Insert manufacturer's name>.
- 2. Description:
 - a. Nonconducting materials for field assembly of companion flanges.
 - b. Pressure Rating: [**150 psig (1035 kPa)**] <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 (150 mm)** wide and **4 mils (0.1 mm)** 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 (750 mm)** deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- B. 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.

- C. Comply with **[NFPA 54] [the International Fuel Gas Code]** requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

- A. Comply with **[NFPA 54] [the International Fuel Gas Code]** for installation and purging of natural-gas piping.
- B. Install underground, natural-gas piping buried at least **[36 inches (900 mm)]** <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 (900 mm)** below finished grade, install it in containment conduit.
- C. Install underground, PE, natural-gas piping according to ASTM D 2774.
- D. Steel Piping with Protective Coating:
 - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
 - 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.
- E. Copper Tubing with Protective Coating:
 - 1. Apply joint cover kits over tubing to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
- F. Install fittings for changes in direction and branch connections.
- G. Install pressure gage **[downstream] [upstream and downstream]** from each service regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

3.4 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, 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.
- 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. 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 (75 mm)** 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.
- P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed 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.
 - 1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
 - 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 (38 mm)** 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.
 - 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.
- 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 (DN 50)** 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.
- V. Install pressure gage [**downstream**] [**upstream and downstream**] from each line regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."
- W. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- X. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "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 Section 230518 "Escutcheons for HVAC Piping."
- 3.5 SERVICE-METER ASSEMBLY INSTALLATION
- A. Install service-meter assemblies aboveground[, **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.
- G. Install metal bollards to protect meter assemblies. Comply with requirements in Section 055000 "Metal Fabrications" for pipe bollards.

3.6 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.
- 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.

3.7 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 dryseal 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. Press Connect Joints: Construct joints according to fitting manufacturer's instructions using tools, jaws, rings, and actuators recommended by fittings manufacturer.

- G. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.
- H. 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.
- I. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.8 HANGER AND SUPPORT INSTALLATION

- A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- B. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1 (DN 25) and Smaller: Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch (10 mm).
 - 2. NPS 1-1/4 (DN 32): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
 - 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
 - 4. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Maximum span, 10 feet (3 m); minimum rod size, 1/2 inch (13 mm).
 - 5. NPS 4 (DN 100) and Larger: Maximum span, 10 feet (3 m); minimum rod size, 5/8 inch (15.8 mm).
- D. Install hangers for horizontal drawn-temper copper tubing with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/8 (DN 10): Maximum span, 48 inches (1220 mm); minimum rod size, 3/8 inch (10 mm).
 - 2. NPS 1/2 and NPS 5/8 (DN 15 and DN 18): Maximum span, 72 inches (1830 mm); minimum rod size, 3/8 inch (10 mm).
 - 3. NPS 3/4 and NPS 7/8 (DN 20 and DN 22): Maximum span, 84 inches (2134 mm); minimum rod size, 3/8 inch (10 mm).
 - 4. NPS 1 (DN 25): Maximum span, 96 inches (2440 mm); minimum rod size, 3/8 inch (10 mm).
- E. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8 (DN 10): Maximum span, 48 inches (1220 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1/2 (DN 15): Maximum span, 72 inches (1830 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 3/4 (DN 20) and Larger: Maximum span, 96 inches (2440 mm); minimum rod size, 3/8 inch (10 mm).

3.9 CONNECTIONS

- A. Connect to utility's 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 (1800 mm) of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.10 LABELING AND IDENTIFYING

- A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.
- B. Install detectable warning tape directly above gas piping, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.11 PAINTING

- A. Comply with requirements in Section 099113 "Exterior Painting" and Section 099123 "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.
 - 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.
1. Latex Over Alkyd Primer System: MPI INT 5.1Q.
 - a. Prime Coat: **[Alkyd anticorrosive]** **[Quick-drying alkyd]** metal primer.
 - 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.
 - 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.

3.12 CONCRETE BASES

- 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 (100 mm)** larger 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 (450-mm)] <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 (20.7-MPa)] <Insert value>**, 28-day, compressive-strength concrete and reinforcement as specified in **[Section 033000 "Cast-in-Place Concrete."]** **[Section 033053 "Miscellaneous Cast-in-Place Concrete."]**

3.13 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
1. Test, inspect, and purge natural gas according to **[NFPA 54]** **[the International Fuel Gas Code]** and authorities having jurisdiction.

- C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.14 DEMONSTRATION

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

3.15 OUTDOOR PIPING SCHEDULE

- A. Underground natural-gas piping shall be[**one of**] the following:
 - 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, mechanical couplings or press-connect fittings. Coat pipe and fittings with protective coating for steel piping.
 - 3. [Annealed] [Drawn]-temper copper tube with wrought-copper fittings and brazed joints. Coat pipe and fittings with protective coating for copper tubing.
 - 4. [Annealed] [Drawn]-temper copper tube with copper alloy press-connect fittings and press-connect joints. Coat pipe and fittings with protective coating for copper tubing.
- B. Aboveground natural-gas 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.
 - 3. Steel pipe with press-connect fittings and press-connect joints.
 - 4. [Annealed] [Drawn]-temper copper tube with wrought-copper fittings and brazed joints.
 - 5. [Annealed] [Drawn]-temper copper tube with press-connect fittings and press-connect 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.
- D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.16 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG (3.45 kPa)

- A. Aboveground, branch piping [NPS 1 (DN 25)] <Insert pipe size> and smaller shall be[**one of**] the following:
 - 1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
 - 2. Annealed-temper, tin-lined copper tube with flared joints and fittings.
 - 3. [Annealed] [Drawn]-temper, copper tube with wrought-copper fittings and [brazed] [flared] joints.

4. [Annealed] [Drawn]-temper, copper tube with bronze or copper alloy press-connect fittings and press-connect joints.
 5. Aluminum tube with flared fittings and joints.
 6. Steel pipe with malleable-iron fittings and threaded joints.
 7. Steel pipe with press-connect fittings and press-connect joints.
- B. Aboveground, distribution 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.
 3. Steel pipe with press-connect fittings and press-connect joints.
 4. Drawn-temper copper tube with wrought-copper fittings and brazed joints.
 5. [Annealed] [Drawn]-temper, copper tube with copper alloy press-connect fittings and press-connect joints.
- 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.
- 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.
- 3.17 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN **0.5 PSIG (3.45 kPa)** AND LESS THAN **5 PSIG (34.5 kPa)**
- A. Aboveground, branch piping [**NPS 1 (DN 25)**] <Insert pipe size> and smaller shall be[**one of**] the following:
1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
 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. [Annealed] [Drawn]-temper, copper tube with copper alloy press-connect fittings and press-connect joints.
 5. Aluminum tube with flared fittings and joints.
 6. Steel pipe with malleable-iron fittings and threaded joints.
 7. Steel pipe with press-connect fittings and press-connect joints.
- B. Aboveground, distribution piping shall be[**one of**] the following:
1. Steel pipe with malleable-iron fittings and threaded joints.
 2. Steel pipe with steel welding fittings and welded joints.
 3. Steel pipe with press-connect fittings and press-connect joints.
 4. Drawn-temper copper tube with wrought-copper fittings and brazed joints.

5. **[Annealed] [Drawn]**-temper, copper tube with copper alloy press-connect fittings and press-connect joints.
- 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.
 - 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.
- 3.18 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN **5 PSIG (34.5 kPa)**
- A. Aboveground Piping: Maximum operating pressure more than **[5 psig (34.5 kPa)]** **<Insert pressure>**.
 - B. Aboveground, Branch Piping shall be **[one of]** the following:
 1. Steel pipe with steel welding fittings and welded joints.
 2. Steel pipe with press-connect fittings and press-connect joints.
 - C. Aboveground, distribution piping shall be **[one of]** the following:
 1. Steel pipe with steel welding fittings and welded joints.
 2. Steel pipe with press-connect fittings and press-connect joints.
 3. Drawn-temper copper tube with wrought-copper fittings and brazed joints.
 4. **[Annealed] [Drawn]**-temper, copper tube with copper alloy press-connect fittings and press-connect joints.
 - 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.
 - 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.
- 3.19 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE
- 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:
1. PE valves.
 2. NPS 2 (DN 50) and Smaller: Bronze plug valves.
 3. NPS 2-1/2 (DN 65) and Larger: Cast-iron, [lubricated] [nonlubricated] plug valves.

3.20 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for pipe sizes NPS 2 (DN 50) and smaller at service meter shall be[**one of**] the following:
1. One-piece, bronze ball valve with bronze trim.
 2. Two-piece, [full] [regular]-port, bronze ball valves with bronze trim.
 3. Bronze plug valve.
- B. Valves for pipe sizes NPS 2-1/2 (DN 65) and larger at service meter shall be[**one of**] the following:
1. Two-piece, [full] [regular]-port, bronze ball valves with bronze trim.
 2. Bronze plug valve.
 3. Cast-iron, nonlubricated plug valve.
- C. Distribution piping valves for pipe sizes NPS 2 (DN 50) and smaller shall be[**one of**] the following:
1. One-piece, bronze ball valve with bronze trim.
 2. Two-piece, [full] [regular]-port, bronze ball valves with bronze trim.
 3. Bronze plug valve.
- D. Distribution piping valves for pipe sizes NPS 2-1/2 (DN 65) and larger shall be[**one of**] the following:
1. Two-piece, [full] [regular]-port, bronze ball valves with bronze trim.
 2. Bronze plug valve.
 3. Cast-iron, [nonlubricated] [lubricated] plug valve.
- E. Valves in branch piping for single appliance shall be[**one of**] the following:
1. One-piece, bronze ball valve with bronze trim.
 2. Two-piece, [full] [regular]-port, bronze ball valves with bronze trim.
 3. Bronze plug valve.

END OF SECTION 231123