

**SECTION 33 51 00****NATURAL-GAS DISTRIBUTION**

SPEC WRITER NOTE: Delete // \_\_\_\_\_ // if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraphs.

**PART 1 - GENERAL****1.1 DESCRIPTION**

A. This section specifies materials and procedures for the construction of outside underground gas distribution system for // natural // manufactured // mixture of natural and manufactured // gas, complete, ready for operation, including cathodic protection if required, all appurtenant structures, and connections to new building structures and to existing gas supply. This specification does not apply to LPG distribution systems.

**1.2 RELATED WORK**

- A. Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing: Section 31 20 00, EARTH MOVING.
- B. Submittals: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- C. General plumbing, protection of Materials and Equipment, and quality assurance: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING
- D. Where soil resistivity is less than 4000 ohm-cm or when required by gas utility, Section 26 42 00, CATHODIC PROTECTION.
- E. Metering: SECTION 25 10 10, ADVANCED UTILITY METERING SYSTEM.

**1.3 DEFINITIONS**

SPEC WRITER NOTE: Add definitions as necessary for project clarity.

- A. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

**1.4 ABBREVIATIONS**

- A. HDPE: High-density polyethylene plastic
- B. PE: Polyethylene plastic
- C. WOG: Water, oil and gas
- D. NRTL: National recognized testing laboratory

**1.5 DELIVERY, STORAGE, AND HANDLING**

SPEC WRITER NOTE: Retain first paragraph below for projects involving existing systems.

- A. 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.

**1.6 COORDINATION**

- A. Coordinate connection to natural-gas main with Utility Company.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided.
- C. Coordinate exterior utility lines and connections to building services up to the actual extent of building wall.

**1.7 QUALITY ASSURANCE:**

- A. Products Criteria:
  - 1. When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.
  - 2. A nameplate bearing manufacturer's name or trademark, including model number, shall be securely affixed in a conspicuous place on equipment. In addition, the model number shall be either cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.
- B. Comply with the rules and regulations of the Utility Company having jurisdiction over the connection to public natural-gas lines and the extension, and/or modifications to public utility systems.

**1.8 APPLICABLE PUBLICATIONS**

SPEC WRITER NOTE: Based on project design for local conditions, delete references not applicable for project.

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred in the text by basic designation only.
- B. American National Standards Institute (ANSI):

- B31.8-2010 ..... Gas Transmission and Distribution Piping Systems
- B109.1-92 ..... Diaphragm-Type Gas Displacement Meters (Under 500-Cubic-Feet-per-hour Capacity)
- B109.2-2000 ..... Diaphragm-Type Gas Displacement Meters (500-Cubic-Feet-per-hour Capacity and over)
- B109.3-92 ..... Rotary-Type Gas Displacement Meters
- IAS LC 1-2005 ..... Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST)
- Z21.18-07/CSA 6.3-07 ... Gas Appliance Pressure Regulators
- Z21.21-2005/CSA 6.5 .... Automatic Valves for Gas Appliances
- Z21.41-2003/CSA 6.9 .... Quick Disconnect Devices for Use with Gas Fuel Appliances
- Z21.75-2007/CSA 6.27 ... Connectors for Outdoor Gas Applications and Manufactured Homes
- Z21.80a-2005/CSA 6.22a . Line Pressure Regulators, Addenda 1 to Z21.80-2003/CSA 6.22
- C. American Petroleum Institute (API):
- Spec 6D-2010 ..... Pipeline Valves
- D. American Society of Civil Engineers (ASCE):
- 25-06 ..... Earthquake Actuated Automatic Gas Shutoff Devices
- E. American Society of Mechanical Engineers (ASME):
- B1.20.1-1983 ..... Pipe Threads, General Purpose, Inch
- B1.20.3-2008 ..... Dryseal Pipe Threads (Inch)
- B16.3-2006 ..... Malleable Iron Threaded Fittings: Classes 150 and 300
- B16.5-2009 ..... Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard
- B16.9-2007 ..... Factory-Made Wrought Buttwelding Fittings
- B16.11-2009 ..... Forged Fittings, Socket-Welding and Threaded

- B16.20-2007 ..... Metallic Gaskets for Pipe Flanges: Ring-Joint, Spiral-Wound, and Jacketed
- B16.26-2006 ..... Cast Copper Alloy Fittings for Flared Copper Tubes
- B16.33-2002 ..... Manually Operated Metallic Gas Valves for use in Gas Piping Systems up to 125 psi (Sizes NPS 1/2 through NPS 2)
- B16.34-2009 ..... Valves - Flanged, Threaded and Welded End
- B16.38-2007 ..... Large Metallic Valves for Gas Distribution Manually Operated, NPS 2-1/2 (DN 65) to NPS 12 (DN 300), 125 psig (8.6 bar) Maximum
- B16.39-2009 ..... Malleable Iron Threaded Pipe Unions: Classes 150, 250, and 300
- B16.40-2008 ..... Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems
- B18.2.1-2010 ..... Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)
- B31.8-2010 ..... Gas Transmission and Distribution Piping Systems
- MFC-4M-1986 ..... Measurement of Gas Flow by Turbine Meters
- F. American Society of Safety Engineers (ASSE):
- 1079-2005 ..... Dielectric Pipe Unions
- G. American Society for Testing and Materials (ASTM):
- A53/A53M-10 ..... Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- A126-042009) ..... Gray Iron Castings for Valves, Flanges, and Pipe Fittings
- A234/A234M-11 ..... Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service

- A312/A312M-11 ..... Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
- B210-04 ..... Aluminum and Aluminum-Alloy Drawn Seamless Tubes
- B241/B241M-10 ..... Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
- B584-11 ..... Copper Alloy Sand Castings for General Applications
- D2513-11e1 ..... Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings
- D2517-06 ..... Reinforced Epoxy Resin Gas Pressure Pipe and Fittings
- D2683-10 ..... Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
- D2774-08 ..... Underground Installation of Thermoplastic Pressure Piping
- D3261-10a ..... Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
- E84-11 ..... Standard Test Method for Surface Burning Characteristics of Building Materials
- H. American Water Works Association (AWWA):
- C203-08 ..... Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied
- I. American Welding Society (AWS):
- A5.8/A5.8M:2004 ..... Filler Metals for Brazing and Braze Welding
- D10.12/D10.12M:2000 .... Guide for Welding Mild Steel Pipe
- J. Manufacturers Standardization Society (MSS):
- SP-78-2005 ..... Gray Iron Plug Valves Flanged and Threaded Ends

SP-110-2010 ..... Ball Valves Threaded, Socket-Welding, Solder  
Joint, Grooved and Flared Ends

K. National Fire Protection Agency (NFPA):

54-2009 ..... National Fuel Gas Code

70-2011 ..... National Electric Code

L. Society of Automotive Engineers (SAE):

J513-199901 ..... Refrigeration Tube Fittings - General  
Specifications \*HS-150/2000\*

M. Underwriters Laboratories (UL):

UL 429-2010 ..... Electrically Operated Valves

**1.9 WARRANTY**

A. The Contractor shall remedy any defect due to faulty material or workmanship and pay for any damage to other work resulting therefrom within a period of // one year // two years // from final acceptance. Further, the Contractor will furnish all manufacturer's and supplier's written guarantees and warranties covering materials and equipment furnished under this Contract.

**PART 2 - PRODUCTS**

SPEC WRITER NOTE: Delete sections not applicable to project.

**2.1 PIPES, TUBES, AND FITTINGS**

A. Steel Pipe: Steel pipe shall be as per ASTM A53, black steel, Schedule 40, // Type E // or // Type S //, Grade B. Copper tubes are not allowed by code for natural gas distribution in the United States.

B. Fittings:

SPEC WRITER NOTE: Select type of fitting for project. Remove rest of section.

- 1. Malleable-Iron Threaded Fittings shall meet ASME B16.3, // Class 150 // or // Class 300 //, standard pattern. Threaded joints are not permitted except at valve connections.
- 2. Butt weld fittings shall be wrought steel, per ASME B16.9.
- 3. Wrought-Steel Welding Fittings shall meet ASTM A234 for butt welding and socket welding.

4. Unions shall be ASME B16.39, // Class 150 // Class 250 // or // Class 300 //, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
5. Forged-Steel Flanges and Flanged Fittings shall be // ASME B16.5 // or // ASME B16.11 //, 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 shall be threaded or butt welded to match pipe.
  - c. Lapped Face is not permitted underground.
  - d. Gasket Materials shall be ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
  - e. Bolts and Nuts shall be ASME B18.2.1, carbon steel aboveground and stainless steel underground.

SPEC WRITER NOTE: Retain first subparagraph below for underground steel piping. Cathodic protection may be required in addition to protective coating. ASME B31.8.

6. Protective Coating for Underground Piping:

SPEC WRITER NOTE: Select from the following:

- a. Factory-applied, three-layer coating of epoxy, adhesive, and polyethylene PE).
- b. Coal Tar Enamel Coating on exterior of pipe and fittings shall be cleaned, primed with Type B primer and coated with hot-applied coal-tar enamel with bonded layer of felt wrap in accordance with AWWA C203. Asbestos felt shall not be used; felt material shall be fibrous-glass mat as specified in Appendix Sec. A2.1 of AWWA C203.
- c. Joint cover kits shall include epoxy paint, adhesive, and heat-shrink PE sleeves.

SPEC WRITER NOTE: Verify acceptability of couplings in subparagraph below with authorities having jurisdiction before retaining.

7. Mechanical Couplings shall include:

- a. // Stainless-steel // Steel // flanges and tube with epoxy finish.
- b. Buna-nitrile seals.
- c. // Stainless-steel // Steel // bolts, washers, and nuts.

- d. Couplings shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
  - e. Steel body couplings installed underground on plastic pipe shall be factory equipped with anodes.
- C. Corrugated, Stainless-Steel Tubing shall comply with ANSI/IAS LC 1 and ASTM A312, corrugated, Series 300 stainless steel.
- 1. Coating shall be PE with flame retardant with surface-burning characteristics determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Flame-Spread Index: // 25 // Insert value // or less.
    - b. Smoke-Developed Index: // 50 // 450 // Insert value // or less.
  - 2. Fittings shall be 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.
  - 3. Striker Plates shall be steel, designed to protect tubing from penetrations.
  - 4. Manifolds shall be 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.
  - 5. Operating-Pressure Rating shall be 5 psi (34.5 kPa).
 

SPEC WRITER NOTE: Verify acceptability of tubing in first paragraph below with authorities having jurisdiction before retaining.
- D. Aluminum Tubing shall comply with ASTM B210 and ASTM B241/B241M.
- 1. Aluminum Alloy 5456 is prohibited.
  - 2. Protective coating shall be factory-applied and capable of resisting corrosion on tubing in contact with masonry, plaster, insulation, water, detergents, and sewerage.
  - 3. Flare fittings shall comply with ASME B16.26 and SAE J513-199901 and the following:
    - a. Copper-alloy fittings shall include metal-to-metal compression seal without gasket.
    - b. Dryseal threads shall comply with ASME B1.20.3.
- E. PE Pipe: Pipe shall conform to // ANSI B31.8 // or // ASTM D2513 //.
- 1. Minimum wall thickness shall conform to ASME B31.8. PE pipe is for underground use only. Polyethylene pipe shall be marked "GAS" and it

is not be used where gas pressures are above 100 psi (690 kPa) or with operating temperatures below 20 deg F (7 deg C) or above 140 deg F (60 deg C).

2. PE Fittings shall be as per // ASTM D2513 // ASTM D2683, socket-fusion type // or // ASTM D3261, butt-fusion type //.
3. PE Transition Fittings shall be factory-fabricated fittings with PE pipe complying with ASTM D2513, SDR 11; and steel pipe complying with ASTM A53, black steel, Schedule 40, Type E or S, Grade B.

SPEC WRITER NOTE: Retain one of first two subparagraphs below for anode-less or transition service-line risers for PE pipe.

4. Polyethylene pipe joints shall be heat fused, either butt fusion or socket fusion.
5. Anode-less Service-Line Risers shall be factory fabricated and leak tested.
  - a. Underground portion shall be PE pipe complying with ASTM D2513.
  - b. Casing shall be steel pipe complying with ASTM A53, Schedule 40, black steel, // Type E // or // Type S //, Grade B, with corrosion-protective coating covering. // Vent casing aboveground. //.
  - c. Aboveground portion shall have PE transition fittings. Outlet shall be // threaded // flanged // or // suitable for welded connection //. Include tracer wire connection and ultraviolet shield.
  - d. Stake supports with factory finish to match steel pipe casing or carrier pipe.
6. Transition Service-Line Risers shall be factory fabricated and leak tested.
  - a. Underground Portion shall be PE pipe complying with ASTM D2513, connected to steel pipe complying with ASTM A53, Schedule 40, // Type E // or // Type S //, Grade B, with corrosion-protective coating for aboveground outlet.
  - b. Outlet shall be threaded or flanged or suitable for welded connection. Include factory-connected anode, tracer wire connection and ultraviolet shield.
  - c. Stake supports with factory finish to match steel pipe casing or carrier pipe. Bridging sleeve over mechanical coupling.

SPEC WRITER NOTE: Verify acceptability of couplings in first subparagraph below with authorities having jurisdiction before retaining.

7. Plastic Mechanical Couplings, NPS 1-1/2 (DN 40) and Smaller: Capable of joining PE pipe to PE pipe.
- a. PE body with molded-in, stainless steel support ring.
  - b. Buna-nitrile seals.
  - c. Acetal collets.
  - d. Electro-zinc-plated steel stiffener.

SPEC WRITER NOTE: Verify acceptability of couplings in first subparagraph below with authorities having jurisdiction before retaining.

8. Plastic Mechanical Couplings, NPS 2 (DN 50) and Larger shall be Capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
- a. Fiber-reinforced plastic body.
  - b. PE body tube.
  - c. Buna-nitrile seals.
  - d. Acetal collets.
  - e. Stainless-steel bolts, nuts, and washers.

SPEC WRITER NOTE: Couplings in first subparagraph below are available in NPS 9 (DN 25) and larger. Verify acceptability of couplings below with authorities having jurisdiction before retaining.

9. Steel Mechanical Couplings shall be capable of joining plain-end PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe. Include:
- a. // Stainless-steel // Steel // flanges and tube with epoxy finish.
  - b. Buna-nitrile seals.
  - c. // Stainless-steel // Steel // bolts, washers, and nuts.
  - d. Factory-installed anode for steel-body couplings installed underground.
- F. Fiberglass pipe shall conform to ASTM D2517. Pipe sections shall be marked "GAS" and as required by ASTM D2517. Minimum wall thickness shall be based on ASME B31.8.

1. Fiberglass pipe shall not be used where gas pressures are above 100 psi (690 kPa) or with operating temperatures below -20 deg F (-29 deg C) or above 150 deg F (66 deg C).
2. Fiberglass fittings, joints and adhesive shall conform to ASTM D2517.

SPEC WRITER NOTE: Select specialty piping items for the project. Delete other unrelated paragraphs.

## 2.2 PIPING SPECIALTIES

A. Outdoor, Appliance Flexible Connectors shall comply with ANSI Z21.75/CSA 6.27, made of corrugated stainless steel tubing with polymer coating.

1. Operating-Pressure Rating shall be 0.5 psi (3.45 kPa) with zinc-coated steel end fittings. Threaded ends shall comply with ASME B1.20.1. Maximum Length shall be 72 inches (1830 mm).

SPEC WRITER NOTE: Detail quick-disconnect devices on Drawings for specific gas appliances.

B. Quick-Disconnect devices shall comply with ANSI Z21.41/CSA 6.9, having copper-alloy convenience outlet and matching plug connector, nitrile seals. Disconnect should be hand operated with automatic shutoff, rated for indoor or outdoor applications and have an adjustable, retractable restraining cable.

SPEC WRITER NOTE: Retain one or more of first three paragraphs below. If retaining more than one type, indicate location of each type on Drawings.

C. Y-Pattern Strainers:

1. Body: ASTM A126, 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 psi (862 kPa).

D. Basket Strainers:

1. Body: ASTM A126, 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 psi (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 psi (5170 kPa).

F. Weatherproof Vent Cap shall be cast or malleable-iron increaser fitting with corrosion-resistant wire screen, and 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 shall be suitable for natural-gas.
- B. Welding filler metals shall comply with AWS D10.12 for appropriate wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing filler metals shall be alloy with a melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

SPEC WRITER NOTES:

1. Select valves to be used for project. Delete paragraphs not used. Verify that cathodic protection is not required for metallic valves placed underground.
2. Sections 2.4, 2.5 and 2.6 may be used individually, or in combination for project. Delete sections not relative to project.

### 2.4 MANUAL GAS SHUTOFF VALVES

- A. All types of valves shall be accessible, labeled and specified for use for controlling multiple systems.
- B. Metallic Valves, NPS 2 (DN 50) and smaller shall comply with ASME B16.33, and have the following characteristics:
  1. CWP Rating of // 125 psi (862 kPa) // Insert pressure //.
  2. Threaded ends complying with ASME B1.20.1.
  3. Dryseal threads on flare ends that comply with ASME B1.20.3.
  4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
  5. Valves 1-1/4 inches (32 mm) to NPS 2 (DN 50) shall have initials "WOG" permanently marked on valve body.

C. Metallic Valves, NPS 2-1/2 (DN 65) and larger shall comply with ASME B16.38.

1. CWP Rating of // 125 psi (862 kPa) // Insert pressure //.
2. Flanged Ends shall comply with ASME B16.5 for steel flanges.
3. The initials "WOG" shall be permanently marked on valve body.

D. // One-Piece, Bronze Ball Valve with Bronze Trim // Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim // Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim // shall comply with MSS SP-110, and have the following characteristics:

1. Bronze body complying with ASTM B584.
2. Chrome-plated brass ball and bronze, blowout proof stem.
3. Seats shall be reinforced TFE and blowout proof.
4. Include separate packnut with adjustable-stem packing threaded ends.
5. Ends shall be threaded, flared, or socket and valve shall have a CWP rating of 600 psi (4140 kPa).
6. Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction, suitable for natural-gas service with "WOG" indicated on valve body.

E. // Bronze Plug Valves // Cast-Iron, Nonlubricated Plug Valves // Cast-Iron, Lubricated Plug Valves // shall comply with MSS SP-78, and have the following characteristics:

1. // Bronze body complying with ASTM B584 // Cast iron complying with ASTM A126, Class B // and a // bronze plug // nickel-plated cast iron //.
2. Ends shall be threaded, socket, or flanged and the operator shall be square head or lug type with tamperproof feature where indicated. Pressure class shall be 125 psi (862 kPa).
3. Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction suitable for natural-gas service with "WOG" indicated on valve body.

F. Steel valves shall have capacity to operate in lines with 100 psi (690 kPa) working pressure.

1. Valves 1-1/2 inches (40 mm) and smaller installed underground shall conform to ASME B16.34, carbon steel, socket weld ends.
2. Valves 1-1/2 inches (40 mm) and smaller, installed aboveground, shall conform to ASME B16.34, carbon steel, socket weld or threaded ends.
3. Valves 2 inches (50 mm) and larger shall conform to API spec 6D, carbon steel, buttweld ends.

4. Aboveground valves 2 inches or larger (50 mm) shall conform to API Spec 6D, carbon steel, butt-welded or flanged ends.
  5. Cast iron valves shall conform to ASTM A126, Class B, Type 301 or 302.
- G. PE Ball Valves shall comply with ASME B16.40. Valves in sizes 1/2 inch to 6 inches (15 mm to 150 mm) may be used with polyethylene distribution and service lines, in lieu of steel valves, for underground installation only.
1. CWP Rating: // 80 psi (552 kPa) // Insert pressure // with an operating temperature of // Minus 20 to plus 140 deg F (Minus 29 to plus 60 deg C) // Insert temperature range //.
- H. Valve Boxes shall be cast iron, two-section box.
1. Top section shall include a cover with "GAS" lettering.
  2. Bottom section shall have a base to fit over valve and barrel a minimum of 5 inches (125 mm) in diameter.
  3. 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 shall comply with ANSI Z21.21/CSA 6.5.
- B. Electrically operated valves shall comply with UL 429. Include 120-V ac, 60 Hz, Class B, continuous-duty molded replaceable coil with visual position indicator.

## **2.6 EARTHQUAKE VALVES**

- A. Valves shall automatically stop gas flow when actuated by earth tremor and shall be single seated with manual reset. Do not provide manual shut-off attachments.
  1. Valve shall comply with ASCE 25 and automatically shut bubble tight within five seconds when subjected to a horizontal sinusoidal oscillation having a peak acceleration of 0.3 gravity with a period of 0.4 seconds. The valve shall not shut-off when subjected for five seconds to horizontal, sinusoidal oscillations having a peak acceleration of 0.4 gravity with a period of 0.1 second; a peak acceleration of 0.08 gravity with a period of 0.4 second or 1.0 second.
  2. Valve should be rated for 125 psi (850 kPa) with flanged ends for pipe sizes above 2 inches (50 mm). Valves should have threaded ends for pipe sizes 2 inches (50 mm) and under.

3. Approvals: UL listed, State of California Standards for Earthquake Actuated Automatic Gas Shut-Off Systems.

#### **2.7 VALVE BOXES**

- A. Provide cast iron extension box with screw or slide type adjustment and flared base. Minimum thickness of metal, 3/16 inch (5 mm). Box shall be of such length as can be adapted, without full extension, to depth of cover required over pipe at valve location with the word "GAS" in cover.
- B. Provide // Insert number // "T" handle socket wrenches of 5/8 inch (16 mm) round stock long enough to extend 2 feet (600 mm) above top of deepest valve box.

#### **2.8 PRESSURE REGULATORS**

- A. Pressure regulators for individual service lines shall be capable of reducing distribution line pressure to pressures required for users. Ferrous bodies. Regulators should be:
  - 1. Single stage and suitable for natural-gas, having a steel jacket and corrosion-resistant components and elevation compensator. End Connections should be threaded for regulators NPS 2 (DN 50) and smaller; flanged for regulators NPS 2-1/2 (DN 65) and larger.
- B. Service Pressure Regulators shall comply with ANSI Z21.80a/CSA 6.22a, with a maximum inlet pressure of // 100 psi (690 kPa) // Insert pressure //.
- C. Line Pressure Regulators shall comply with ANSI Z21.80a/CSA 6.22a with a maximum inlet pressure of // 2 psi (13.8 kPa) // 5 psi (34.5 kPa) // 10 psi (69 kPa) // Insert pressure //.
- D. Appliance Pressure Regulators shall comply with ANSI Z21.18/CSA 6.3 and have a maximum inlet pressure of // 1 psi (6.9 kPa) // 2 psi (13.8 kPa) // 5 psi (34.5 kPa) // Insert pressure //.

#### **2.9 SERVICE METERS**

- A. Meters shall comply with Section 25 10 10, ADVANCED UTILITY METERING SYSTEM and ANSI B109.2.
- B. Gas meters shall be // furnished and installed by local gas Utility // of type approved by local gas Utility // as specified herein.
- C. Meters shall be // pipe // pedestal // mounted. Meters shall be provided with // over-pressure protection as specified in ASME B31.8 // tamper-proof protection // frost protection // fungus-proof protection //.
- D. Diaphragm-Type service meters shall comply with // ANSI B109.1 // ANSI B109.2 // with a maximum inlet pressure of // 690 kPa (100 psi) // Insert pressure //.

- E. Rotary-Type service meters shall comply with ANSI B109.3 with a maximum inlet pressure of // 100 psi (690 kPa) // Insert pressure //.
- F. Turbine meters shall comply with ASME MFC-4M with a maximum inlet pressure of // 100 psi (690 kPa) // Insert pressure //.
- G. Service-Meter Bars shall be malleable- or cast iron frame for supporting service meter and include offset swivel pipes, meter nuts with o-ring seal, and factory- or field-installed dielectric unions.
  - 1. Omit meter offset swivel pipes if service-meter bar dimensions match service-meter connections.

SPEC WRITER NOTE: Retain paragraph below if permitted by utility and authorities having jurisdiction.

- H. Service-Meter bypass fittings shall be ferrous, tee, pipe fitting with capped side inlet for temporary natural-gas supply, having an integral ball-check bypass valve.

## **2.10 DIELECTRIC FITTINGS**

- A. Dielectric Unions shall comply with ASSE 1079 and have a pressure rating of // 125 psi (860 kPa) minimum at 180 deg F (82 deg C) // 150 psi (1035 kPa) // 250 psi (1725 kPa) //.
- B. Dielectric Flanges shall comply with ASSE 1079 and have a pressure rating of // 125 psi (860 kPa) minimum at 180 deg F (82 deg C) // 150 psi (1035 kPa) // 175 psi (1200 kPa) // 300 psi (2070 kPa) //.
- C. Dielectric-Flange insulating kits shall have a pressure rating of // 150 psi (1035 kPa) // Insert pressure //.

## **2.11 LABELING AND IDENTIFYING**

SPEC WRITER NOTE: Use non-detectable type for cemeteries only.

- A. Detectable warning tape shall be 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 PREPARATION**

SPEC WRITER NOTE: Retain first paragraph below for renovations and additions.

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

### **3.2 METALLIC PIPING INSTALLATION**

- A. Heating trenches, storm and sanitary sewer lines, and water mains shall have right of way.
- B. Warning tape shall be continuously placed 12 inches (300 mm) above buried gas lines.
- C. Main services and main service shut off valves shall have a 24 inch (600 mm) minimum cover or as recommended by local utility.
- D. Service lines shall have an 18 inch (450 mm) minimum cover or as recommended by local utility.
- E. Where indicated, the main shall be // concrete-encased // sleeved //.
- F. Connections between metallic and plastic piping shall be made only outside, underground, and with approved transition fittings.

### **3.3 NON-METALLIC PIPE INSTALLATION**

- A. Install pipe in trench in accordance with recommendations of the pipe manufacturer. Provide sufficient slack to allow for expansion and contraction.
- B. Joints shall be fusion welds made in accordance with the recommendations of the polyethylene pipe manufacturer. Adhesive joints for fiberglass plastic pipe shall be made in accordance with manufacturer's recommendations.
- C. All offsets in piping shall be made with manufactured fittings. Bending of piping to form offsets shall not be permitted.
- D. Connections between plastic pipe and metal pipe shall be made in accordance with recommendations of the pipe manufacturer.
- E. Copper Tracer Wire consisting of No. 14 AWG solid, single conductor, insulated copper wire shall be installed in the trench with all piping to permit location of the pipe with electronic detectors. The wire shall not be spiraled around the pipe nor taped to the pipe. Wire connections are to be made by stripping the insulation from the wire and soldering with rosin core solder. Solder joints shall be wrapped with rubber tape and electrical tape. At least every 1000 feet (300 m), provide a 5 pound

(2.3 kg) magnesium anode attached to the main tracer wire by solder joint shall be wrapped with rubber tape and with electrical tape. An anode shall be attached at the end of each line.

### 3.4 BUILDING SERVICE LINES

- A. Before entering building, underground service line shall rise above grade close to building to permit possible gas leaks to vent themselves.
- B. Install gas service lines to point of connection within approximately 5 feet (1500 mm) outside of buildings to which such service is to be connected and make connections thereto. The point of delivery is the // meter set assembly // service regulator // shutoff valve //.
- C. Connect service lines to top of mains by two-strap service clamp or coupling socket) welded to main and into which is screwed a street tee and street elbow swing, joint assembly.
- D. The service lines shall be as short and as straight as practicable between the point of delivery and the gas main and shall not be bent or curved laterally unless necessary to avoid obstructions or otherwise permitted. Service lines shall be laid with as few as joints as practicable using standard lengths of pipe. Polyethylene or fiberglass service lines shall not be installed aboveground except as permitted in ANSI B31.8.
- E. Install gas service lines to point of connection within approximately 5 feet (1500 mm) outside of buildings to which such service is to be connected and make connections thereto. The point of delivery is the // meter set assembly // service regulator // shutoff valve //.

### 3.5 OUTDOOR PIPING INSTALLATION

- A. Comply with // ASTM D2774 // NFPA 54 // the International Fuel Gas Code // for installation and purging of natural-gas piping.

SPEC WRITER NOTE: NFPA 54 requires a minimum of 18 inches (450 mm) of cover over buried natural-gas piping. If rock is encountered and 18 inches is not allowed, install the line in vented concrete encasement or vented sleeved conduit.

- B. Install underground, natural-gas piping buried at least // 36 inches (900 mm) // 24 inches (600 mm) // Insert value // below finished grade. Minimum cover depth is 18 inches (450 mm). Natural-gas piping installed less than 18 inches (450 mm) below finished grade shall be installed in vented containment conduit.
- C. Install fittings for changes in direction and branch connections.

- D. Install pressure gauge // downstream // upstream and downstream // from each service regulator.

### 3.6 PIPE SLEEVES

- A. Pipe shall be continuous through sleeves. Set sleeves in place before concrete is poured. Seal between sleeve/core opening and the pipe with modular mechanical type link seal. All sleeves shall be vented.
- B. Provide sleeves where gas lines pass through retaining walls, foundation walls or floors. Split sleeves may be installed where existing lines pass thru new construction.

### 3.7 SERVICE-METER ASSEMBLY INSTALLATION

SPEC WRITER NOTE: 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 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.

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

- G. Install metal bollards to protect meter assemblies.

### 3.8 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.

- F. Do not install valves under pavement unless shown on drawings.
- G. Clean valve interior before installation.

### 3.9 VALVE BOXES

- A. Set cover flush with finished grade.
- B. Protect boxes located in roadway against movement by a concrete slab at least 3 feet (900 mm) square by 6 inches (150 mm) deep.
- C. Set other valve boxes with a concrete slab 18 inches (450 mm) by 18 inches (450 mm) by 6 inches (150 mm) deep and set flush with grade.
- D. All exposed portions of valve boxes shall be painted bright yellow.

### 3.10 CONNECTIONS

SPEC WRITER NOTE: 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 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. Install tee fitting with capped nipple in bottom to form drip sediment traps. Install as close as practical to inlet of each appliance.

### 3.11 LABELING AND IDENTIFYING

- A. 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.

### 3.12 CONCRETE BASES

- A. 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 // 4000 psi (27.5 MPa) // Insert value //, 28-day, compressive-strength concrete and reinforcement.

### 3.13 PIPE CLEANING

- A. All pipe sections shall be blown down with 100 psi (690 kPa) air to remove all sand, soil and debris.
- B. Blow down procedure shall be done after system is complete, but before valves are installed.

SPEC WRITER NOTE: Use following only if Public Gas Company or geotechnical report recommends cathodic protection.

### 3.14 CATHODIC PROTECTION

- A. Where soil resistivity is less than 4000 ohm-cm or when required by gas utility, Section 26 42 00, CATHODIC PROTECTION is required.

### 3.15 DEMONSTRATION

SPEC WRITER NOTE: 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.

### 3.16 TESTS

- A. Piping System: Inspection, testing and purging shall be in accordance with NFPA 54 and ASME B31.8. Maximum working pressure will be // Insert psi (Insert kPa) //.

SPEC WRITER NOTE: Use paragraph B only if cathodic protection is provided.

- B. Cathodic Protection System:

1. Testing of Anodes: Prior to connecting anode lead wire to the piping, insert a millimeter in the circuit and measure and record current output of each anode. When maximum current outputs, as set below, for the different sizes of anodes are exceeded, insert nickel chromium resistance wire in the circuit to reduce current output to maximum allowable for a given size anode. Resistance wire connections to

anode lead wires shall be accomplished with silver solder and soldered joints wrapped with a minimum of three layers of high dielectric strength electrical tape. Cover with rubber all nickel chromium resistance wire. Maximum allowable current outputs for the different size anodes to allow for design life are as follows:

Weight Bare Anodes	Allowable Current Output
5 lb (2.3 kg) Anode	10 Milliamperes
9 lb (4 kg) Anode	20 Milliamperes
17 lb (7.7 kg) Anode	40 Milliamperes
32 lb (14.5 kg) Anode	75 Milliamperes

2. Final Test: Final test of the cathodic protection system shall include measuring pipe-to-soil potentials over the entire system. Make potential measurements with potentiometer voltmeter (minimum internal resistance of 50,000 ohms per volt) and a copper/copper sulfate reference electrode placed at the finished grade level and directly over the pipe. Adequate number of measurements shall be taken over the extent of piping to insure that a minimum potential value of -0.85 volts exists over all new gas piping. Upon completion of testing, a report setting forth potential values acquired by location shall be submitted to the Government.

### 3.17 OUTDOOR PIPING SCHEDULE

SPEC WRITER NOTE: 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:
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.

SPEC WRITER NOTE: 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:

1. Steel pipe with malleable-iron fittings and threaded joints.
  2. Steel pipe with wrought-steel fittings and welded joints.
  3. // Annealed // Drawn // -temper copper tube with wrought-copper fittings and brazed joints.
- C. Containment conduit shall be steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

### 3.18 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 use bronze plug valves.
  3. NPS 2-1/2 (DN 65) and larger use Cast-iron, // lubricated // nonlubricated // plug valves.

### 3.19 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

SPEC WRITER NOTE: 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 (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.

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

- 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.

SPEC WRITER NOTE: 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 (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.

SPEC WRITER NOTE: 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 (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.

SPEC WRITER NOTE: 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 // 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.

--- E N D ---