Preparing Activity: AFCEC

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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SECTION 33 51 13.00 30

NATURAL-GAS METERING
05/10

NOTE: This specification covers the requirements for gas meters, regulators, piping to accommodate new meters, and provisions for automated meter reading.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

PART 1 GENERAL

NOTE: This guide specification is intended for use when specifying steel piping in nominal pipe size at pressures and other conditions governed by ASME B31.8, "Gas Transmission and Distribution Piping Systems," and aboveground steel piping both outside (up to 1.50 meters 5 feet beyond exterior walls) and within buildings in compliance with NFPA 54, "National Fuel Gas Code."

Show the following information on the project drawings:

1. Layout and location of piping.

2. Location of appurtenances, valves, etc.

3. Details of method of mounting piping.

4. Capacity of pressure regulators.

****

1.1 RELATED REQUIREMENTS

Section 23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS applies to this section, with additions and modifications specified herein.

1.2 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN GAS ASSOCIATION (AGA)

AGA ANSI B109.1	(2000) Diaphragm Type Gas Displacement Meters (Under 500 cubic ft./hour Capacity)
AGA ANSI B109.2	(2000) Diaphragm Type Gas Displacement Meters (500 cubic ft./hour Capacity and Over)
AGA ANSI B109.3	(2019) Rotary-Type Gas Displacement Meters

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 25-16	(2016) Earthquake-Activated Automatic Gas Shutoff Devices

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.1	(2003; R 2018) Unified Inch Screw Threads

	(UN and UNR Thread Form)
ASME B1.20.1	(2013; R 2018) Pipe Threads, General Purpose (Inch)
ASME B16.3	(2021) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.5	(2020) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.9	(2018) Factory-Made Wrought Buttwelding Fittings
ASME B16.11	(2022) Forged Fittings, Socket-Welding and Threaded
ASME B16.33	(2012; R 2017) Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 125 psi, (Sizes NPS 1/2 - NPS 2)
ASME B16.38	(2012; R 2017) 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
ASME B16.39	(2020) Standard for Malleable Iron Threaded Pipe Unions; Classes 150, 250, and 300
ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2022) Nuts for General Applications: Machine Screw Nuts, and Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B31.8	(2022; Supplement 2022) Gas Transmission and Distribution Piping Systems
ASME BPVC SEC VIII D1	(2019) BPVC Section VIII-Rules for Construction of Pressure Vessels Division 1

ASTM INTERNATIONAL (ASTM)

ASTM A53/A53M	(2022) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A193/A193M	(2023) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A194/A194M	(2023) Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(2018) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation
MSS SP-69	(2003; Notice 2012) Pipe Hangers and Supports - Selection and Application (ANSI Approved American National Standard)

MASTER PAINTERS INSTITUTE (MPI)

MPI 9	(2016) Alkyd, Exterior Gloss (MPI Gloss Level 6)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 54	(2021) National Fuel Gas Code

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1981	(2008) Seismic Restraint Manual Guidelines for Mechanical Systems, 3rd Edition

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC 7/NACE No.4	(2007) Brush-Off Blast Cleaning
SSPC Paint 25	(1997; E 2004) Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 3	(2018) Power Tool Cleaning

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-101	(2014; Rev C) Color Code for Pipelines and for Compressed Gas Cylinders

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

49 CFR 192	Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards
49 CFR 195	Transportation of Hazardous Liquids by Pipeline

1.3 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification

technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Pressure Regulator; G[, [_____]]

Valves

Risers

Transition Fittings

Gas Meter; G[, [_____]]

SD-07 Certificates

Welder's Qualifications

Welder's Identification Symbols

1.4 QUALITY ASSURANCE

1.4.1 Welder's Qualifications

Comply with ASME B31.8. The steel welder will provide a copy of a certified ASME B31.8 qualification test report. Submit each welder's identification symbols, assigned number, or letter, used to identify work of the welder. Affix symbols immediately upon completion of welds. Welders making defective welds after passing a qualification test will be given a requalification test and, upon failing to pass this test, will not be permitted to work this contract.

1.4.2 Safety Standards

Conform to 49 CFR 192 [and 49 CFR 195].

1.5 DELIVERY, STORAGE, AND HANDLING

Handle, transport, and store pipe and fittings carefully. Plug or cap pipe ends during transportation or storage to minimize dirt and moisture entry. Do not subject to abrasion or concentrated external loads.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Conform to NFPA 54 and with requirements specified herein.

2.2 PIPE AND FITTINGS

2.2.1 Aboveground and Within Buildings and Vaults

****

NOTE: For steam electric generation stations, industrial and institutional plants, and central heating plants, use Schedule 80 black steel piping in accordance with ANSI B31.1 for threaded joints.

****

2.2.1.1 Pipe

Black steel in accordance with ASTM A53/A53M, Schedule [40] [80], threaded ends for sizes 50 mm 2 inches and smaller; otherwise, plain end beveled for butt welding.

2.2.1.2 Threaded Fittings

ASME B16.3, black malleable iron

2.2.1.3 Socket-Welding Fittings

ASME B16.11, forged steel

2.2.1.4 Butt-Welding Fittings

ASME B16.9, with backing rings of compatible material

2.2.1.5 Unions

ASME B16.39, black malleable iron. Provide dielectric unions where cathodic protection is provided on steel gas mains and/or service lines.

2.2.1.6 Flanges and Flanged Fittings

ASME B16.5 steel flanges or convoluted steel flanges conforming to ASME BPVC SEC VIII D1. Flange faces will have integral grooves of rectangular cross-sections which afford containment for self-energizing gasket material.

2.2.2 Risers

Manufacturer's standard riser, transition from plastic to steel pipe with 0.18 to 0.30 mm 7 to 12 mil thick epoxy coating. Use swaged gas-tight construction with O-ring seals, metal insert, and protective sleeve. Provide [remote bolt-on or bracket] [or] [wall-mounted] riser supports [as indicated].

2.2.3 Transition Fittings

****
NOTE: Choose the applicable options from the following.
****

[2.2.3.1 Steel to Plastic (PE)

As specified for "riser" except designed for steel-to-plastic with tapping tee or sleeve. Coat or wrap exposed steel pipe with heavy plastic coating.

][2.2.3.2 Plastic to Plastic

[Manufacturer's standard bolt-on (PVC to PE) plastic tapping saddle tee, UL listed for gas service, rated for 690 kPa (gage) 100 psig, and O-ring seals.] [Manufacturer's standard slip-on PE mechanical coupling, molded, with stainless-steel ring support, O-ring seals, and rated for 1035 kPa (gage) 150 psig gas service.] [Manufacturer's standard fused tapping (PE-to-PE) tee assembly with shut-off feature.]

]2.3 VALVES, ABOVEGROUND

[Provide lockable valves where indicated.]

2.3.1 Shutoff Valves, Sizes Larger Than 50 mm 2 Inches

****
NOTE: Choose one of the options below.

Do not use cast-iron material for valve body or gas-meter body in seismic zones 3 and 4.
****

[[Cast-iron] [or] [steel] body ball valve with flanged ends in accordance with ASME B16.38. Provide PTFE seats.] [Cast-iron body plug valve in accordance with ASME B16.38, nonlubricated, wedge-mechanism or tapered lift plug, and flanged ends.]

2.3.2 Shutoff Valves, Sizes50 mm 2 Inches and Smaller

****
NOTE: Choose one of the options below.
****

[[Bronze] [Steel] body ball valve in accordance with ASME B16.33, full port pattern, reinforced PTFE seals, threaded ends, and PTFE seat.] [[Bronze] [Steel] body plug valve in accordance with ASME B16.33, straightway, taper plug, regular pattern with a port opening at least equal to the internal pipe area or round port full bore pattern, non-lubricated, PTFE packing, flat or square head stem with lever operator, 860 kPa (gage) 125 psig rating, threaded ends.]

2.3.3 Pressure Regulator

Self-contained with spring-loaded diaphragm pressure regulator, kPa to mm psig to inches water reduction, pressure operating range as required for the pressure reduction indicated, volume capacity not less than indicated, and threaded ends for sizes 50 mm 2 inches and smaller, otherwise flanged.

2.3.4 Earthquake Automatic Gas Shutoff Valves

****
NOTE: Provide this earthquake protective feature primarily for seismic zones 3 and 4.
****

ASCE 25-16 and UL listed or AGA listed or International Association of Plumbing and Mechanical Officials (IAPMO) listed. The valve may be either pendulum or ball construction with [remote [, pneumatic] [electronic] [or] [electric]] actuator.

2.4 GAS METER

****
NOTE: Do not use cast-iron material for valve body or gas-meter body in seismic zones 3 and 4.
****

[AGA ANSI B109.1] [AGA ANSI B109.2] [AGA ANSI B109.3] [pipe] [pedestal] mounted, [diaphragm] or [bellow] [style], [cast-iron] [enamel-coated steel] [aluminum] case. Provide combined [odometer-type] register totalizer index, UV-resistant index cover, water escape hole in housing, and means for sealing against tampering. Meter will be temperature-compensated type and sized for the required CFM [BTU/HR] flow rate. Provide meters with a pulse switch initiator capable of operating up to speeds of 500 maximum pulses per minute with no false pulses and requiring no field adjustments. Provide not less than one pulse per 2.83 cubic meters 100 cubic feet) of gas. Minimum service life will be 30,000,000 cycles.

2.4.1 Energy Monitoring and Control (EMCS) or Automatic Meter Reading Interfaces

****
NOTE: Where an Installation-wide Energy Monitoring and Control System exists, provide EMCS manufacturer compatible remote monitoring, meter reading and data

collection. Designer should verify EMCS compatibility with specific gas meter manufacturer to ensure accurate transmission of data as generated. Of particular note is if there are "pre-divide" parameters associated with the meter that reflects the actual volume measurement and the meter cam settings.

Designer will have to edit this paragraph to include specific requirements for the EMCS or for an automated meter reading system. Since there are several protocols and proprietary systems, meter data capture and transmission are unique to each project and Installation. Typically there are data loggers and remote reporting units that may use communication protocols and transmission such as a local LAN, hardwire, or radio frequencies. Specifications for the communication protocol should be listed here or included in a separate specification.

****

Gas meters must be capable of interfacing (output signal equivalent to flow rate) with the existing Energy Management Control System (EMCS) for data gathering in units of CFM. Meters are to to function and deliver data without requiring power. Provide output signal that is either a voltage or amperage signal with can be converted to a flow rate specification.

2.5 HANGERS AND SUPPORTS

MSS SP-58, as required by MSS SP-69.

2.6 WELDING FILLER METAL

ASME B31.8.

2.7 PIPE-THREAD TAPE

Antiseize and sealant tape of polytetrafluoroethylene (PTFE).

2.8 BOLTING (BOLTS AND NUTS)

Stainless steel bolting; ASTM A193/A193M, Grade B8M or B8MA, Type 316, for bolts; and ASTM A194/A194M, Grade 8M, Type 316, for nuts. Dimensions of bolts, studs, and nuts are to conform with ASME B18.2.1 and ASME B18.2.2 with coarse threads conforming to ASME B1.1, with Class 2A fit for bolts and studs and Class 2B fit for nuts. Extend bolts or bolt-studs through the nuts, and may have reduced shanks of a diameter not less than the diameter at root of threads. Bolts are to have American Standard regular square or heavy hexagon heads, and nuts will be American Standard heavy semifinished hexagonal.

2.9 GASKETS

Fluorinated elastomer, compatible with flange faces.

2.10 IDENTIFICATION FOR ABOVEGROUND PIPING (INTERIOR)

MIL-STD-101 for legends and type and size of characters. For pipes 19 mm 3/4 inch OD and larger, provide printed legends to identify contents of pipes and arrows to show direction of flow. Color code label backgrounds to signify levels of hazard. Make labels of plastic sheet with pressure-sensitive adhesive suitable for the intended application. For pipes smaller than 19 mm 3/4 inch OD, provide brass identification tags 40 mm 1-1/2 inches in diameter with legends in depressed black-filled characters.

PART 3 EXECUTION

3.1 INSTALLATION

****

NOTE: To assist the designer in selecting the proper documents for a specific project, the following scope in accordance with documents is provided:

1. NFPA 54 Scope: "1.1.1 Applicability: Coverage of piping systems extends from the point of delivery to the connections with each gas utilization device. For other than indicated liquefied petroleum gas systems, the point of delivery is the outlet of the service meter assembly, or the outlet of the service regulator."

2. ASME B31.8 Scope: "802.11. This code covers the design, fabrication, installation, inspection, testing and safety aspects of operation and maintenance of gas transmission and distribution systems, including gas pipelines, gas compressor stations, gas metering and regulation stations, gas mains, and service lines up to the outlet of the customer's meter set assembly 802.14. This code does not apply to (c) piping beyond the outlet of the customers meter set assembly."

****

Install gas piping, appliances, and equipment in accordance with NFPA 54. [Install distribution piping in accordance with ASME B31.8.]

3.1.1 Meters

Install meters in accordance with [AGA ANSI B109.1] [AGA ANSI B109.2] [AGA ANSI B109.3]

3.1.2 Piping

Cut pipe to actual dimensions and assemble to prevent residual stress. [Provide supply connections entering the buildings as indicated.] Within buildings, run piping parallel to structure lines and conceal in finished spaces. Terminate each vertical supply pipe to burner or appliance with tee, nipple and cap to form a sediment trap. To supply multiple items of gas-burning equipment, provide manifold with inlet connections at both ends.

3.1.2.1 Cleanliness

Clean inside of pipe and fittings before installation. Blow lines clear using 550 to 690 kPa (gage) 80 to 100 psig clean, dry compressed air. Rap steel lines sharply along entire pipe length before blowing clear. Cap or plug pipe ends to maintain cleanliness throughout installation.

3.1.2.2 Aboveground Steel Piping

Determine and establish measurements for piping at the job site and accurately cut pipe lengths accordingly. For 50 mm 2 inch diameter and smaller, use threaded or socket-welded joints. For 65 mm 2-1/2 inch diameter and larger, use flanged or butt-welded joints.

a. Threaded Joints: Where possible, use pipe with factory-cut threads; otherwise cut pipe ends square, remove fins and burrs, and cut taper pipe threads in accordance with ASME B1.20.1. Provide threads smooth, clean, and full-cut. Apply anti-seize paste or tape to male threads portion. Work piping into place without springing or forcing. Backing off to permit alignment of threaded joints will not be permitted. Engage threads so that not more than three threads remain exposed. Use unions for connections to [valves] [meters] for which a means of disconnection is not otherwise provided.

b. Welded Joints: Weld by the shielded metal-arc process, using covered electrodes and in accordance with procedures established and qualified in accordance with ASME B31.8.

c. Flanged Joints: Use flanged joints for connecting welded joint pipe and fittings to valves to provide for disconnection. Install joints so that flange faces bear uniformly on gaskets. Engage bolts so that there is complete threading through the nuts and tighten so that bolts are uniformly stressed and equally torqued.

d. Pipe Size Changes: Use reducing fittings for changes in pipe size. Size changes made with bushings will not be accepted.

e. Painting: Paint new ferrous metal piping, including supports, in accordance with Section 09 90 00 PAINTS AND COATINGS. Do not apply paint until piping tests have been completed.

f. Identification of Interior Piping: Identify interior piping aboveground in accordance with MIL-STD-101, using adhesive-backed or snap-on plastic labels and arrows. In lieu of labels, identification tags may be used. Apply labels or tags to finished paint at intervals of not more than 15 meters 50 feet). Provide two copies of the piping identification code framed under glass and install where directed.

3.1.2.3 Wrapping

Where connection to existing steel line is made underground, tape wrap new steel transition fittings and exposed existing pipe having damaged coating. Clean pipe to bare metal. Initially stretch first layer of tape to conform to the surface while spirally half-lapping. Apply a second layer, half-lapped and spiraled as the first layer, but with spirals perpendicular to first wrapping. Use0.025 mm 10 mil minimum thick polyethylene tape. In lieu of tape wrap, heat shrinkable 0.025 mm 10 mil) minimum thick polyethylene sleeve may be used.

3.1.3 Regulators and Valves

3.1.3.1 Pressure Regulator

Provide [plug cock] [or] [ball valve] ahead of regulator. [Install regulator outside of building and 450 mm 18 inches aboveground on riser.] [Install regulator inside building and extend a full-size vent line from relief outlet on regulator to a point outside of building.] [Install gas meter in conjunction with pressure regulator]. On outlet side of [regulator] [meter], provide a union and a 10 mm 3/8 inch gage tap with plug.

3.1.3.2 Stop Valve and Shutoff Valve

Provide stop valve on service branch at connection to main and shut-off valve on riser outside of building.

3.1.4 Pipe Sleeves

[Comply with Section 07 84 00 FIRESTOPPING.] Where piping penetrates concrete or masonry wall, floor, or firewall, provide pipe sleeve poured or grouted in place. Make sleeve of steel or cast-iron pipe of such size to provide6 mm 1/4 inch) or more annular clearance around pipe. Extend sleeve through wall or slab and terminate flush with both surfaces. Pack annular space with oakum, and caulk at ends with silicone construction sealant.

3.1.5 Piping Hangers and Supports

****

NOTE: In seismic zone 3 or 4, provide seismic restraints in accordance with SMACNA Seismic Restraint Mnl.

****

Ensure selection, fabrication, and installation of piping hangers and supports conform with MSS SP-69 and MSS SP-58, unless otherwise indicated. [Provide seismic restraints in accordance with SMACNA 1981.]

3.2 FIELD QUALITY CONTROL

3.2.1 Metal Welding Inspection

****

NOTE: To assist the designer in selecting the proper documents for a specific project, the following scope in accordance with documents is provided:

1. NFPA 54 Scope: "1.1.1 Applicability: Coverage of piping systems extends from the point of delivery to the connections with each gas utilization device. For other than indicated liquefied petroleum gas systems, the point of delivery is the outlet of the service meter assembly, or the outlet of the service regulator or service shutoff valve when no gas meter is provided.

2. ASME B31.8 Scope: "802.11. This code covers

the design, fabrication, installation, inspection, testing and safety aspects of operation and maintenance of gas transmission and distribution systems, including gas pipelines, gas compressor stations, gas metering and regulation stations, gas mains, and service lines up to the outlet of the customer's meter set assembly 802.14. This code does not apply to (c) piping beyond the outlet of the customers meter set assembly."

****

Inspect for compliance with [NFPA 54] [and] [ASME B31.8]. Replace, repair, and then re-inspect defective welds.

3.3 PROTECTIVE COVERING FOR ABOVEGROUND PIPING SYSTEMS

Apply finish painting conforming to the applicable paragraphs of Section 09 90 00 PAINTS AND COATINGS and as follows: for Ferrous Surfaces, touch up shop-primed surfaces with ferrous metal primer of the same type paint as the shop primer. Solvent-clean surfaces that have not been shop primed in accordance with SSPC SP 1. Mechanically clean surfaces that contain loose rust, loose mill scale, and other foreign substances by power wire brushing in accordance with SSPC SP 3 or brush-off blast clean in accordance with SSPC 7/NACE No.4 and primed with ferrous metal primer in accordance with SSPC Paint 25. Finish primed surfaces with two coats of exterior alkyd paint conforming to MPI 9.

-- End of Section --