

James E. VanZandt Medical Center
Altoona, PA
Replace Boilers

VA Project No.: 244-13-R-0160
M-R Project No.: 0499-0034
100% Bid Documents: 06/03/2014
Addendum #2: 02/08/2016

SECTION 33 51 00

NATURAL-GAS DISTRIBUTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies materials and procedures for the construction of outside underground gas distribution system for natural 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

1.3 DEFINITIONS

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

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.

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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

- 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

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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

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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

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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):

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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 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

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:

1. Butt weld fittings shall be wrought steel, per ASME B16.9.
2. Wrought-Steel Welding Fittings shall meet ASTM A234 for butt welding and socket welding.
3. Unions shall be ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings shall be 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 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.

5. Protective Coating for Underground Piping:

- 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.
- d. Steel flanges and tube with epoxy finish.
- e. Buna-nitrile seals.
- f. Steel bolts, washers, and nuts.
- g. Factory-installed anode for steel-body couplings installed underground.

2.2 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.

2.3 DIELECTRIC FITTINGS

- A. Dielectric Unions shall comply with ASSE 1079 and have a pressure rating of 150 psi (1035 kPa).
- B. Dielectric Flanges shall comply with ASSE 1079 and have a pressure rating of 150 psi (1035 kPa).
- C. Dielectric-Flange insulating kits shall have a pressure rating of 150 psi (1035 kPa).

2.4 LABELING AND IDENTIFYING

- 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.

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PART 3 - EXECUTION

3.1 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 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. The main shall be concrete encased or sleeved as to replicate the existing conditions.
- F. Connections between metallic and plastic piping shall be made only outside, underground, and with approved transition fittings.

3.3 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 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

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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 //.

3.4 OUTDOOR PIPING

INSTALLATION

- A. Comply with NFPA 54 and 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) 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.

3.5 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.

3.6 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.

3.7 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.

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3.8 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.

3.9 CATHODIC PROTECTION

- A. Where soil resistivity is less than 4000 ohm-cm or when required by gas utility, cathodic protection is required. Contractor to perform soil resistivity measurement and provide report to the A/E and VA COR.

3.10 TESTS

- A. Piping System: Inspection, testing and purging shall be in accordance with NFPA 54 and ASME B31.8.
- 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

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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.

3.11 OUTDOOR PIPING SCHEDULE

- A. Underground natural-gas piping shall be the following:
1. Steel pipe with wrought-steel fittings and welded joints, or mechanical couplings. Coat pipe and fittings with protective coating for steel piping.
- B. Containment conduit shall be steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

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