

SECTION 33 51 15

NATURAL-GAS / LIQUID PETROLEUM GAS DISTRIBUTION

PART 1 GENERAL

1.1 SYSTEM DESCRIPTION

The gas distribution system includes natural gas piping and appurtenances from point of connection with existing system to final termination point, as indicated on drawings.

1.2 QUALITY ASSURANCE

1.2.1 Jointing of Polyethylene Piping

a. Join piping by performance qualified PE joiners, qualified by a person who has been trained and certified by the manufacturer of the pipe, using manufacturer's pre-qualified joining procedures in accordance with AGA XR0603. Inspect joints by an inspector qualified in the joining procedures being used and in accordance with AGA XR0603. Welders training, qualifications and procedures, (metal and PE) includes use of equipment, explanation of the procedure, and successfully making joints which pass tests specified in AGA XR0603.

b. Submit a certificate of qualified jointing procedures, training procedures, qualifications of trainer, and training test results for joiners and inspectors. Notify the Contracting Officer at least 24 hours in advance of the date to qualify joiners and inspectors.

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery and Storage

Inspect materials delivered to the site for damage, and store with a minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

1.3.2 Handling

Handle pipe and components carefully to ensure a sound, undamaged condition. Take particular care not to damage pipe coating. Repair damaged coatings to original finish. Do not place pipe or material of any kind inside another pipe or fitting after the coating has been applied, except as specified in paragraph INSTALLATION. Handle steel piping with coal-tar enamel coating in accordance with AWWA C203, and fusion-bonded epoxy coatings per AWWA C213. Handle plastic pipe in conformance with AGA XR0603.

PART 2 PRODUCTS

2.1 PIPE, FITTINGS, AND ASSOCIATED MATERIALS

Provide materials and equipment which are the standard products of a manufacturer regularly engaged in the manufacture of the products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Asbestos or products containing asbestos are not allowed. Provide written verification and point of contact for a supporting service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site. Mark all valves, flanges, and fittings in accordance with MSS SP-25. Submit a complete list of materials and equipment, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions, including, but not limited to the following:

- a. Dielectric Waterways and Flange Kits.
- b. Fittings
- c. Piping
- d. Pipe and Accessory coatings
- e. Pressure Reducing Valves.
- f. Meters
- g. Regulators.
- h. Shut-off Valves

2.1.1 Polyethylene Pipe, Tubing, Fittings and Joints

Provide polyethylene pipe, tubing, fittings and joints conforming to ASTM D3350 and ASTM D2513, pipe designations PE 2406 and PE 3408, rated SDR 11 or less, as specified in ASME B31.8. Mark pipe sections as required by ASTM D2513. Provide butt fittings conforming to ASTM D3261 and socket fittings conforming to ASTM D2683. Match fittings to the service rating of the pipe, ASTM D2774.

2.1.2 Sealants for Steel Pipe Threaded Joints

2.1.3 Sealing Compound

Provide joint sealing compound as listed in UL Gas&Oil Dir, Class 20 or less.

2.1.4 Tape

Provide polytetrafluoroethylene tape conforming to ASTM D3308.

2.1.5 Identification

Provide pipe flow markings and metal tags for each valve, meter, and regulator as required by local codes.

2.1.6 Insulating Joint Materials

Provide insulating joint materials between flanged or threaded metallic pipe systems where shown to isolate galvanic or electrolytic action.

2.1.7 Gas Transition Fittings

Provide manufactured steel gas transition fittings approved for jointing steel and polyethylene or fiberglass pipe, conforming to AGA XR0603 requirements for transition fittings.

2.2 PRESSURE REGULATORS

Provide ferrous bodied regulators with backflow protection, designed to meet the pressure, load and other service conditions.

2.2.1 Service Line Regulators

a. Provide ferrous bodied pressure regulators for individual service lines, capable of reducing distribution line pressure to pressures required for users. Provide regulators where gas will be distributed at pressures in excess of 10 inches of water column, with pressure relief set at a lower pressure than would cause unsafe operation of any connected user.

b. Provide regulator(s) having a single port with orifice diameter no greater than that recommended by the manufacturer for the maximum gas pressure at the regulator inlet. Provide regulator valve vent of resilient materials designed to withstand flow conditions when pressed against the valve port, capable of regulating downstream pressure within limits of accuracy and limiting the buildup of pressure under no-flow conditions to 50 percent or less of the discharge pressure maintained under flow conditions. Provide a self contained service regulator, and pipe not exceeding exceed 2 inch size.

2.4 METERS

Provide meters conforming to AGA ANSI B109.2, pipe mounted. Provide meters with over-pressure protection as specified in ASME B31.8, tamper-proof protection, frost protection suitable for accurately measuring and handling gas at pressures, temperatures, and flow rates indicated in drawing.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 SERVICE LINES

3.2.1 General

Construct service lines of materials specified for gas mains and extend from a gas main to and including the point of delivery as shown on drawings. Where indicated, provide service line with an isolation valve of the same size as the service line. Make the service lines as short and as straight as practicable between the point of delivery and the gas main, without bends or lateral curves unless necessary to avoid obstructions or otherwise permitted. Lay service lines with as few joints as practicable using standard lengths of pipe, use shorter lengths only for closures. Do not install polyethylene or fiberglass service lines aboveground.

3.5 WORKMANSHIP AND DEFECTS

Make pipe, tubing, and fittings clear and free of cutting burrs and defects in structure or threading, and thoroughly brushed and blown free of chips and scale. Do not repair, but replace defective pipe, tubing, or fittings.

3.6 PROTECTIVE COVERING

3.6.1 Protective Covering for Underground Steel Pipe

Except as otherwise specified, apply protective coverings mechanically in a factory or field plant especially equipped for the purpose. Hand apply protective covering to valves and fittings that cannot be coated and wrapped mechanically, preferably at the plant that applies the covering to the pipe. Coat and wrap joints by hand, in a manner and with materials that will produce a covering equal in thickness to that of the covering applied mechanically.

3.6.1.1 Thermoplastic Resin Coating System

Provide a thermoplastic coating system conforming to NACE SP0185, Type A. Clean the exterior of the pipe to a commercial grade blast cleaning finish in accordance with SSPC SP 6/NACE No.3, and apply adhesive compound to the pipe. Immediately after the adhesive is applied, extrude a seamless tube of polyethylene over the adhesive to produce a bonded seamless coating, with a nominal thickness of 10 mils (plus or minus 10 percent) of adhesive and 40 mils (plus or minus 10 percent) of polyethylene for pipes up to 16 inches in diameter. Apply joint coating and field repair material as recommended by the coating manufacturer, consisting of one the following:

- a. Heat shrinkable polyethylene sleeves.

- b. Polyvinyl chloride pressure-sensitive adhesive tape.
- c. High density polyethylene/bituminous rubber compound tape.

Inspect the coating system for holes, voids, cracks, and other damage during installation.

3.6.1.2 Inspection of Pipe Coatings

Repair any damage to the protective covering during transit and handling before installation. After field coating and wrapping has been applied, inspect the entire pipe using an electric holiday detector with impressed current set at a value in accordance with NACE RP0274 using a full-ring, spring-type coil electrode. Equip the holiday detector with a bell, buzzer, or other type of audible signal which sounds when a holiday is detected. Immediately repair all holidays in the protective covering upon detection. The Contracting Officer reserves the right to inspect and determine the suitability of the detector. Furnish labor, materials, and equipment necessary for conducting the inspection.

3.6.2 Protective Covering for Aboveground Piping Systems

Apply finish painting conforming to normal pipe coating practices, subject to approval by Shaw.

3.7 INSTALLATION

Install gas distribution system and equipment in conformance with the manufacturer's recommendations and applicable sections of ASME B31.8, AGA XR0603 and 49 CFR 192. Perform abandonment of existing gas piping in accordance with ASME B31.8. Cut the pipe without damaging the pipe; unless otherwise authorized, use an approved type of mechanical cutter. Use wheel cutters where practicable. On steel pipe 6 inches and larger, an approved gas-cutting-and-beveling machine may be used. Cut plastic pipe in accordance with AGA XR0603. Design valve installation in plastic pipe to protect the plastic pipe against excessive torsional or shearing loads when the valve is operated and from other stresses which may be exerted through the valve or valve box.

3.7.1 Installing Pipe Underground

Grade gas mains and service lines as indicated. Weld joints in steel pipe except as otherwise permitted for installation of valves. Provide service lines with 36 inch minimum cover; and place both mains and service lines on firmly compacted select material for the full length. Where indicated, encase, bridge, or design the main to withstand any anticipated external loads as specified in ASME B31.8. Provide standard weight black steel pipe encasement material with a protective coating as specified. Separate the pipe from the casing by insulating spacers and seal the ends with casing bushings. Excavate the trench below pipe grade, bed with bank sand, and compact to provide full-length bearing. Laying pipe on blocks to produce uniform grade is not permitted. Ensure that the pipe is clean inside before it is lowered into the trench and keep free of water, soil, and all other foreign matter that might damage or obstruct the operation of the valves, regulators, meters, or other equipment. When work is not in progress, securely close open ends of pipe or fittings with expandable plugs or other suitable means. Minor changes in line or gradient of pipe that can be accomplished through the natural flexibility of the pipe material without producing permanent deformation and without overstressing joints may be made when approved. Make changes in line or gradient that exceed the limitations specified with fittings. When cathodic protection is furnished,

provide electrically insulated joints or flanges. When polyethylene or fiberglass piping is installed underground, place foil backed magnetic tape above the pipe to permit locating with a magnetic detector. After laying of pipe and testing, backfill the trench in accordance with drawings.

3.7.2 Installing Pipe Aboveground

Protect aboveground piping against dirt and other foreign matter, as specified for underground piping.

3.8 PIPE JOINTS

Design and install pipe joints to effectively sustain the longitudinal pullout forces caused by the contraction of piping or superimposed loads.

3.8.1 Threaded Steel Joints

Provide threaded joints in steel pipe with tapered threads evenly cut, made with UL approved graphite joint sealing compound for gas service or polytetrafluoroethylene tape applied to the male threads only. Caulking of threaded joints to stop or prevent leaks is not permitted.

3.8.2 Polyethylene Pipe Jointing Procedures

Use jointing procedures conforming to AGA XR0603. Avoid making indiscriminate heat fusion joining of plastic pipe or fittings made from different polyethylene resins by classification or by manufacturer if other alternative joining procedures are available. If heat fusion joining of dissimilar polyethylene is required, special procedures are required. Test the method of heat fusion joining dissimilar polyethylene resins in accordance with paragraph TESTS.

3.8.3 Connections Between Metallic and Plastic Piping

Only make metallic to plastic connections outside, underground, and with approved transition fittings.

3.9 DRIPS

Install drips at locations where indicated, conforming to the details shown, or provide commercial units of approved type and capacity. Connect a blow off pipe 1-1/4 inches or larger to each drip at its lowest point and extend to or near the ground surface at a convenient location away from traffic. Provide a reducing fitting for each discharge at each drip terminal (outlet), a plug valve, and a 1/2 inch nipple turned down. Locate the discharge terminal (outlet) inside a length of 12 inches or larger vitrified clay pipe, concrete sewer pipe or concrete terminal box set vertically on a bed of coarse gravel 1 foot thick and 3 feet square, and closed at the ground surface with a suitable replacement cover.

3.11 PRESSURE REGULATOR INSTALLATION

3.11.1 Service Line Regulators

Install a shutoff valve and service regulator on the service line, 18 inches above the ground on the riser. Install an insulating joint on the inlet side of the service regulator and construct to

prevent flow of electrical current. Provide a 3/8 inch tapped fitting equipped with a plug on both sides of the service regulator for installation of pressure gauges for adjusting the regulator. Terminate all service regulator vents and relief vents in the outside air in rain and insect resistant fittings. Locate the open end of the vent where gas can escape freely into the atmosphere, away from any openings into the building and above areas subject to flooding.

3.12 METER INSTALLATION

Install meters in accordance with ASME B31.8. Install permanent gas meters with provisions for isolation and removal for calibration and maintenance, and suitable for operation in conjunction with an energy monitoring and control system.

3.13 CONNECTIONS TO EXISTING LINES

Make connections between new work and existing gas lines, where required, in accordance with ASME B31.8, using proper fittings to suit the actual conditions. When connections are made by tapping into a gas main, provide the same size connecting fittings as the pipe being connected.

3.13.1 Connection to Government Owned/Operated Gas Lines

Provide connections to the existing gas lines in accordance with approved procedures. Only perform deactivation of any portion of the existing system at the valve location shown on the drawings. Reactivation of any existing gas lines will only be done by the Operating Agency. Notify the Contracting Officer, in writing, 10 days before connections to existing lines are to be made.

3.14 CATHODIC PROTECTION

Provide cathodic protection for all metallic gas piping installed underground and install as specified in the drawings.

3.15 TESTS

3.15.1 Pressure and Leak Tests

Test the system of gas mains and service lines after construction and before being placed in service, using air as the test medium. Submit data in booklet form from all pressure tests of the distribution system. Conform testing to ASTM D1598 and ASTM D1599 for plastic piping. The normal operating pressure for the system is 25. The test pressure shall be in accordance with the operating agency.

a. Prior to testing the system, blow-out, clean, and clear the interior of all foreign materials. Remove all meters, regulators, and controls before blowing out and cleaning, and reinstall after clearing of all foreign materials.

b. Perform testing of service lines with due regard for the safety of employees and the public during the test. Keep persons not working on the test operations out of the testing area while testing is proceeding. Perform the test on the system as a whole or on sections that can

be isolated.

c. Test joints in sections prior to backfilling when trenches will be backfilled before the completion of other pipeline sections. Continue the test for at least 24 hours from the time of the initial readings to the final readings of pressure and temperature. Do not take the initial test readings of the instrument for at least 1 hour after the pipe has been subjected to the full test pressure. Do not take initial or final readings at times of rapid changes in atmospheric conditions, and temperatures are representative of the actual trench conditions. No indication of reduction of pressure is allowed during the test after corrections have been made for changes in atmospheric conditions in conformity with the relationship $T(1)P(2)=T(2)P(1)$, in which T and P denote absolute temperature and pressure, respectively, and the numbers denote initial and final readings.

d. During the test, completely isolate the entire system from all compressors and other sources of air pressure. Test each joint by means of soap and water or an equivalent nonflammable solution prior to backfilling or concealing any work. Secure approval of testing instruments from Shaw. Furnish all labor, materials and equipment for conducting the tests subject to inspection at all times during the tests. Maintain safety precautions for air pressure testing at all times during the tests.

3.16 UNDERGROUND WARNING TAPE

A minimum of 3-inch wide polyethylene detectable type marking tape shall be installed above piping. The tape shall be resistant to alkalis, acids and other destructive agents found in soil and impregnated with metal so that it can be readily recognized after burial by standard locating equipment.

- A. Lamination bond of one (1) layer of Minimum 0.35 mils thick aluminum foil between two (2) layers of minimum 4.3 mils thick inert plastic film.
- B. Minimum tensile strength: 63 LBS per 3 IN width.
- C. Minimum elongation: 500 percent.
- D. Provide continuous yellow with black letter printed message repeated every 16 to 36 inches warning of pipe buried below (e.g.: "CAUTION GAS LINE BURIED BELOW").

3.17 TRACER WIRE

A minimum of 12 (AWG) (or larger) insulated tracer wire shall be installed in the trench above the polyethylene pipe. The tracer wire shall be approximately 6 inches above the pipe where practical. The tracer wire shall be installed so that electrical continuity is maintained throughout the pipe system. As few connections as possible shall be made in the tracer wire. Connections will be made by stripping the insulation back one inch and joining the two ends using an approved mechanical connector and a split bolt connector. (Twisting of copper wire will not be acceptable.) To complete this connection, wrap all exposed wire thoroughly with electrical tape. A minimum 5 foot of additional tracer wire will be coiled, buried and terminate at the ends of the gas pipeline. Of the 5 foot tracer wire section at the ends of the pipeline, one foot of insulation will be stripped back, prior to burial.

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