

**CONSTRUCTION STANDARD SPECIFICATION**

**SECTION 02553**

**EXTERIOR GAS PIPING SYSTEMS**

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**SECTION 02553**

**EXTERIOR GAS PIPING SYSTEMS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This section shall apply to the materials and operations required for the installation of underground exterior gas distribution systems, including all piping, fittings, installation, joints, location devices, service risers, and tests.
- B. Related Sections: Refer to Section 02200, "Earthwork" for related work.

**1.02 SUBMITTALS**

- A. General: Submit the following items in accordance with the Conditions of Contract and Section 01330, "Submittal Procedures."
  - B. Product Data: Submit product data for the following materials and items
    - 1. Pipe
    - 2. Fittings
    - 3. Valves
    - 4. Valve boxes
    - 5. Test Boxes and markers
    - 6. Risers
    - 7. Transition fittings.
  - C. Installation Instructions: Submit installation instructions for the following materials and items
    - 1. Pipe
    - 2. Risers
- D. All welding certifications shall be submitted to the Sandia Construction Observer (SCO) for verification of quality assurance at least two weeks prior to starting any work. The procedures and certifications will be reviewed by Sandia's designated certified welding inspector.

### 1.03 QUALITY ASSURANCE

The materials and practices comprising the work shall conform to this and other referenced standard specifications. Where this specification conflicts with the requirements of another referenced specification or manufacturer's recommendation, the more stringent shall prevail.

## PART 2 - PRODUCTS

### 2.01 PIPE

The underground gas distribution system shall be all polyethylene plastic pipe PE 3406, or PE 3408, SDR 11 IPS, (Performance Pipe CPCC8100 or approved equal) unless otherwise specified on the contract drawings. The polyethylene plastic pipe used shall conform with the latest American Society of Testing Materials (ASTM) D2513, publication of specifications for thermoplastic gas pressure pipe, tubing, fittings and the following ASTM minimum test requirements (D 1505, D 1238, D 1693, D 638, D 256, D 1525, D 746, D 3350, D 638, D 2240, D 696, D 2837).

### 2.02 PIPE FITTINGS

- A. Heat fusion fittings shall conform to ASTM D2513 and be installed in accordance with manufacturer's recommendations. Heat fusion joints shall be allowed only when joining new sections of pipe together that are of the same type (ASTM D2513 PE3408) and size unless approved by the Sandia gas system engineer. All other connections shall be electrofusion couplings. Electrofusion fittings shall be Kerotest, Central or approved equal.
- B. Mechanical joint fittings shall conform to ASTM D2513 and be installed as per manufacturer's recommendations.
- C. Valves shall be full-port polyethylene ball valve SDR 11, high density PE3408 body, with 2-inch operating square. Valves shall meet the requirements of American National Standards Institute (ANSI) B16.40, U.S. Department of Transportation (DOT) Title 49 Code of Federal Regulations (CFR) Part 192, and ASTM D2513. Valves shall be Nordstrom "Poly-Gas" valve, Kerotest, or approved equal. Where full-port valves are not available from the manufacturer, the next larger size valve shall be provided. Provide valves with manufacturer's extended stem or fabricate valve extension per Sandia National Laboratories (SNL) standard detail where valve wrench longer than 18-inches would otherwise be required to operate valve. Valves with exposed metal parts requiring cathodic protection or which require any maintenance or lubrication will not be allowed.
- D. Valve Boxes: Valve boxes shall be Tyler model 6860, cast iron shaft screw type, with lid marked "GAS", length to suit burial depth. Install per SNL standard detail.

- E. Test Boxes:
  - 1. Flush mount test boxes shall be Handley model T4H5C, 4" diameter, 18-inch long flared plastic body, cast iron lid with "TEST" cast in cover, heavy duty cast iron flange suitable for direct installation in asphalt, 5 terminals, vent hole in lid.
  - 2. Raised type shall be Cott Manufacturing "Big Fink", number of terminal leads to suit, yellow polyethylene 3" diameter 5-foot long mounting conduit with "GAS" written on post.
- F. Risers shall be R.W. Lyall "Lyco" 90 degree Bend Rigid **Anodeless** risers or equal.
- G. Transition Fittings shall be R.W. Lyall "Lyco" with PE 3408 and ASTM A53 end connections, size and thickness to match connecting pipe sizes.

### PART 3 - EXECUTION

#### 3.01 PIPE

- A. General Installation
  - 1. Do not install gas lines under buildings, structures, or in crawl spaces.
  - 2. Install a schedule 40 steel sleeve on all risers passing through asphalt or concrete slabs. Allow at least 1" of radial clearance between sleeve and riser. Fill void with pea gravel.
  - 3. Burial Depth: Buried plastic piping shall be buried a minimum depth of 24 inches unless noted otherwise.
- B. Trenching
  - 1. Trench width: Width shall be wide enough to provide at least 6 inches clearance on both sides of the pipe. Trench width shall not exceed outside diameter of pipe plus 24 inches to an elevation 12 inches above the top of pipe.
  - 2. Trench bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along the trench sub grade.
- C. Plastic pipe shall not be subjected to unnecessary strains such as bending or twisting at any time and shall be handled with care as it is lowered into the ditch. The pipe shall be laid on the ditch bottom in such a manner as to snake the pipe from one side of the ditch to the other with one cycle approximately every 40 feet. The pipe shall be laid and continuously supported on undisturbed or well-compacted soil.

1. **Underground Clearance:** Each distribution line shall be installed with at least 12" of radial clearance from any other underground structure not associated with the distribution line. SDR approval is necessary should this dimension requirement not be attainable. In addition, all plastic pipe and plastic service lines shall be installed with sufficient clearance, or shall be insulated, from any source of heat so as to prevent the heat from impairing the serviceability of the pipe.
  2. **Bends:** The pipe may be bent or deflected no more than to the minimum radius recommended by the manufacturer. Bends shall be free of buckles, cracks, or other evidence of damage. Changes in direction, which cannot be made by bends, shall be made with elbow or tee fittings. Elbow or tee fittings shall not be trimmed to fit. Miter joints are not permitted.
  3. **Obstructions in the Pipe:** The open ends of the pipeline shall be closed at all times, and shall not be reopened until such time as the next joint of pipe is to be connected. This closure shall be capable of preventing the entrance of small animals or the introduction of foreign material (water included) of any nature into the line.
    - a. After the pipe has been strung along the right-of-way, each length shall be swabbed prior to welding it into the pipeline. The swab shall be a soft cloth. Each length shall be visually inspected internally prior to use.
    - b. Care shall be exercised when joining the sections of pipe to minimize the possibilities of any foreign material being in the line after its completion. The Contractor shall remove any obstructions in the pipeline caused by foreign material.
    - c. After the pipeline or measured portions is complete, the Contractor shall run a polyurethane pipeline pig through the line (2X) to displace any foreign material introduced during construction. Prior to the pigging operations, a "pig catcher" shall be installed to the end of the pipeline to prevent an uncontrolled release during pressurization. The pig shall be moved by air pressure only. The use of gas pressure in the pigging operation is prohibited.
- D. **Backfill:** In warm weather, backfilling shall be performed during the coolest part of the day whenever possible. Backfill material shall be soft dirt or sand free of stones or debris that may cut or otherwise damage the pipe. Clean backfill material shall surround the pipe for at least 4" or one pipe diameter (whichever is greater) in all directions. Backfill shall be placed level from one wall of the ditch to the other and shall not be mounded over the pipe.
1. Place backfill with a maximum of 8" lifts and perform tamping with the proper equipment. The pipe shall not be damaged during compaction. When flooding of the ditch is used to consolidate backfill, the pipe shall not be allowed to float

from its bearing on the ditch bottom. Compaction with heavy equipment is not permitted unless the pipe has 24" of cover and the pipe internal pressure exceeds 15 psig.

- E. Location Device: Install an electrically conductive 12 gauge copper wire with yellow insulation. The tracer wire shall be installed at a distance of four to six inches adjacent to the pipe. The wire and all of its connections shall be insulated to prevent corrosion. The wire and locating tape shall be installed as shown on the "Warning Tape and Tracer Wire Detail" drawing detail. The detectable warning tape shall have a foil core and shall be reinforced consisting of 5 mil total thickness.
- F. Tie-in to Other Lines: After lowering the pipe into the ditch and prior to joining installed sections or making tie-ins to other lines, sufficient time shall be allowed for contraction as the pipe assumes ground temperature. Tie-ins to existing lines shall be performed in an atmosphere absent of gas. Tie-ins or connections to all existing lines shall be made using the appropriate electrofusion couplings. Hot tie-ins shall be permitted only when using electrofusion-tapping tee after providing documentation of procedures to be used and obtaining written authorization from Sandia Construction Observer (SCO). Procedure shall be performed in the presence of SNL Utilities Maintenance personnel.
- G. Pipe Squeeze-Off: Shall be permitted only using squeeze tool meeting ASTM F1563 and following procedures meeting ASTM F1041. Contractor shall be allowed only to perform squeeze-off operation after providing documentation of procedures to be used and obtaining written authorization from SCO. This action may not be performed more than once at the same point on the pipe. Procedure shall be performed in the presence of SNL Utilities Maintenance personnel.
- H. Static Discharge Protection: Whenever performing work on or near gas lines that could potentially contain combustible gas contractor shall evaluate potential for static discharge. Work shall be permitted only after providing documentation of procedures to be used and obtaining written authorization from SCO. Procedure shall be performed in the presence of SNL Utilities Maintenance personnel.

### 3.02 JOINING OF POLYETHYLENE PLASTIC PIPE

- A. General: The Contractor's personnel who perform heat-fusion joining on distribution facilities shall be qualified by the pipe manufacturer's qualifying representative prior to starting any work. The Contractor may, at his option, submit a list of previously qualified candidates to the Sandia Construction Observer (SCO) in lieu of retesting. The list shall include the date of qualification, and the name of the qualifying representative that was present for the test.
- B. No heat-fusion joining shall be performed when the quality of the joining may be adversely affected by weather conditions. Rain, blowing sand, windstorms, and other inclement weather shall be cause for the SCO to cease welding operations. Windshields may be used during windy weather if approved by the SCO.

- C. Heat-Fusion Joints: Heat the mating surfaces to their fusion temperature, compress the mating surfaces together, and hold the mating surfaces together until the joint cools naturally. Direct application of heat using a torch or other open flame is prohibited.
- D. Equipment and tools, which are manufactured specifically for the fusion process, shall be used. The equipment shall be designed to hold the heating element firmly against and parallel to the mating surfaces, compress the heated surfaces together and hold the surfaces firmly together in alignment until the joint cools naturally. The heating elements shall be electric type, which are thermostatically controlled. The heating tools shall be capable of maintaining uniform surface temperature within the melt-temperature range specified by the material manufacturer. A crayon temperature indicator shall be used by the Contractor to verify that the heating element temperature is correct prior to making each joint. The temperature crayon mark shall not be applied to the part of the heater face that comes in direct contact with the pipe.
- E. Marking of Joints: Each person performing heat-fusion joining on a pipeline shall have a distinctive mark which shall be placed on the pipe with a felt-tip pen near each heat-fusion joint completed. The mark shall be that appearing on the welder's certification card. The color of the pen shall be such that the mark is distinguishable from the color of the pipe.
- F. At any time during the assembly process, the SCO may request that a joint be tested by non-destructive or destructive methods.

### 3.03 MATERIAL HANDLING AND DEFECTS

- A. When loading or unloading plastic pipe, the pipe shall be placed into the desired position without damage. The pipe shall not be allowed to drop freely from the truck bed to the ground. The pipe shall be strung onto terrain free from rocks or other projections, which might cause damage to the pipe. The pipe shall not be dragged over rocks or other abrasive material.
- B. Plastic pipe shall be protected from fire, excessive heat, or harmful chemicals. Cleaning solutions, detergents, solvents, alcohols, etc., shall not be allowed to contact the pipe.
- C. Inspection of Materials: The Contractor shall visually inspect each length of pipe and all components, both inside and out, at the site of installation to insure that it has not sustained damage that could impair its serviceability. A second surface inspection shall be made immediately prior to lowering the pipe into the ditch.
- D. Damage, Defects, and Repairs: Any pipe which has cuts gouges, scratches, or punctures greater than 10 percent of the pipe wall thickness, or other damage or defects that would impair the serviceability of the pipe, shall be repaired by removal of the defective section and replacement by a new section of pipe.

3.04 TEST REQUIREMENTS

- A. The Contractor, in accordance with the following procedure, shall test all new segments of line. The SCO shall be notified prior to the start of each test.
- B. Test Procedure:
  - a. Dry air shall be the test media. The air used in testing shall be free of contaminants.
  - b. The temperature of the plastic material shall not exceed 100 deg F due to the temperature of the compressed air or any other source.
  - c. The minimum test pressure shall be 1.5 times the maximum operating pressure or 60 psig whichever is greater. (Typical distribution pressure at SNL NM is 20 psig, so required test pressure for distribution system is typically 60 psig.)
  - d. Tie-in joints, which are not included in the test, shall be soap-tested at the operating pressure. After the soap test, all of the soap shall be removed from the pipe by a thorough washing with water.
  - e. Due to the possibility of static electric discharge, polyethylene pipe or other plastic tubing shall not be used as vent lines in testing or purging operations.
- C. Test Duration: The pressure shall be maintained at or above the minimum test pressure for the periods shown in the following tables. Time shall begin when the pressure in the system has stabilized. Any leakage in the line shall be cause for failure of the test. If the test is failed, the Contractor shall repair the defective line and retest at no additional cost to Sandia National Laboratories (SNL).

3" Pipe or Less

<u>Length</u>	<u>Time in Hours</u>
100 feet or less	1
101 feet to 500 feet	2
501 feet to 2,000 feet	3
2,001 feet to 10,000 feet	4
Over 10,000 feet	12

4" Pipe or Greater

<u>Length</u>	<u>Time in Hours</u>
100 feet or less	1

101 feet to 500 feet	2
501 feet to 2,000 feet	3
2,001 feet to 10,000 feet	12
Over 10,000 feet	16

- D. Compensation for change in temperature: The temperature shall be monitored throughout the test duration. Losses due to change in temperature shall be calculated with the following equation:

$$\text{Corrected Ending Pressure (psia)} = \text{Measured Ending Pressure (psia)} \times \frac{\text{Starting Temperature (F)} + 460}{\text{Ending Temperature (F)} + 460}$$

$$\text{Absolute pressure (psia)} = \text{Gauge Pressure (psig)} + 12.2$$

- E. Pressure Gauges: For test pressures of 10 psig or less, gauge shall have increments of 1/10<sup>th</sup> psi or less, for pressures greater than 10 psig gauges shall have increments of one psi or less. The maximum scale on the gauge shall be no more than twice the test pressure applied.
- F. Safety During Test: Every reasonable precaution shall be taken to protect workers and the general public during testing. No direct connections will be permitted from the new line to any existing gas lines unless they are physically separated. Suitable steps shall be taken to keep persons not involved in the test procedure out of the testing area during the test.
- G. Test Records: The attached “Exterior Gas Piping System Test Record” shall be prepared as part of the test procedure. The completed form shall be submitted to the SCO for final approval.

- END OF SECTION -

ATTACHMENT 1 - Exterior Gas Piping System Test Record



Check off boxes as you complete each line.



Project No.: \_\_\_\_\_ Project Title: \_\_\_\_\_



Test conducted by: Name: \_\_\_\_\_

Company: \_\_\_\_\_



SNL Mechanical Inspector: \_\_\_\_\_



Attached qualifications of individual conducting test.



Pipe size:  3" pipe or less  4" pipe or greater



Total length of pipe: \_\_\_\_\_ feet



Test duration required: \_\_\_\_\_



Test duration used:



Maximum operating pressure: \_\_\_\_\_ psig



1.5 times maximum operating pressure = \_\_\_\_\_ psig



Required test pressure = greater of 60 psig or 1.5 x MOP = \_\_\_\_\_ psig



Temperature at start of test: \_\_\_\_\_ (°F)



Test pressure at start of test: \_\_\_\_\_ psig



Temperature at end of test: \_\_\_\_\_ (°F)



Test pressure at end of test: \_\_\_\_\_ psig



+12.2 = \_\_\_\_\_ psia



Temperature correction factor =  $\frac{\text{starting temperature (F)} + 460}{\text{ending temperature (F)} + 460}$  = \_\_\_\_\_



Corrected pressure at end of test = \_\_\_\_\_



pressure at end of test (psia) x temperature correction factor = \_\_\_\_\_ psia



-12.2 = \_\_\_\_\_ psig



Any leaks / failures noted and disposition if any: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



\_\_\_\_\_

SCO Signature

Date