

**SECTION 02685  
GAS MAINS AND ACCESSORIES**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. This Section describes products to be incorporated into the gas mains and requirements for the installation and use of these items. Furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.
- B. This specification covers requirements for YELLOWSTRIPE 8300 polyethylene pipe and fittings for underground gas distribution systems. All work shall be performed in accordance with these specifications.

**1.02 QUALIFICATIONS**

If requested by the Owner, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years. Only persons qualified under 49 CFR 192.285 shall be allowed to join plastic pipe. If requested by the Owner or Engineer, documentation and/or qualifications must be provided by the Contractor prior to awarding of contract.

**1.03 SUBMITTALS**

Complete shop drawings, product data and engineering data for all products shall be submitted to the Owner. Shop drawings, catalog data, and manufacturer's technical data showing complete information on material composition, color, physical properties, and dimensions of new pipe and fittings. Include manufacturer's recommendation for handling, storage, and repair of pipe and fittings.

**1.04 TRANSPORTATION AND HANDLING**

- A. Unloading: Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification. Pipe handled on skids shall not be rolled or skidded against the pipe on the ground.
- B. Handling: Handle pipe, fittings, valves and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front end loader. Do not use material damaged in handling. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe. Caution shall be taken to prevent kinking and buckling. Any damage, including kinks and buckles that occur shall be removed by cutting out as a cylinder and replacing at no cost to the owner.

**1.05 STORAGE AND PROTECTION**

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- A. Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.
- B. Stored materials shall be kept safe from damage. The interior of all pipe, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves and fittings shall be drained and stored in a manner that will protect them from damage by freezing.
- C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails or concrete.

### **1.06 QUALITY ASSURANCE**

The manufacturer shall provide written certification to the City that all products furnished comply with all applicable requirements of these Specifications.

### **1.07 ENGINEERED AND APPROVED PLANS**

Underground gas distribution piping construction shall be performed in accordance with engineered construction plans for the work prepared under the direction of a Professional Engineer. Plans shall conform to the standards and regulations for gas distribution piping. Pipe, fittings, and the installation shall meet the applicable requirements of the U. S. Department of Transportation, Pipeline Safety Regulations, Title 49, Code of Federal Regulations, Part 192. Private systems shall meet relevant requirements of NFPA 54/ANSI Z223.1, or NFPA 58, or ASME B31.8.

### **1.08 REFERENCED STANDARDS**

Where all or part of a Federal, ASTM, ANSI, US DOT, NFPA, PPI, AGA, etc., standard specification is incorporated by reference in these Specifications, the reference standard shall be the latest edition and revision.

### **1.09 LICENSES AND PERMITS**

A licensed and bonded Contractor shall perform all underground gas distribution piping construction work. The Contractor shall secure all necessary permits before commencing construction.

### **1.10 INSPECTIONS**

All work shall be inspected by an Authorized Representative of the City who shall have the authority to halt construction if, in his opinion, these specifications or standard construction practices are not being followed. Whenever any portion of these specifications is violated, the Engineer or his Authorized Representative shall, by written notice, order further construction to cease until all deficiencies are corrected. A copy of the order shall be filed with the Contractor's license application for future review. If the deficiencies are not corrected, performance shall be required of the Contractor's surety.

**1.11 RELATED SECTIONS**

- A. Section 01415-Testing Requirements
- B. Section 02200-Basic Pipeline Construction
- C. Section 02225-Trench Excavation and Backfill

**PART 2 PRODUCTS**

**2.01 PIPING MATERIALS AND ACCESSORIES**

A. High-Density Polyethylene (HDPE) Pipe and Fittings

1. Polyethylene Pipe and Fittings:

a. **Qualification of Manufacturers:** The Manufacturer shall have manufacturing and quality control facilities that are capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The Manufacturer's production facilities shall be open for inspection by the Customer or his Authorized Representative. The pipe and fitting manufacturer shall be ISO Certified in accordance with the current edition of ISO 9001 and a documented quality management system that defines product specifications and manufacturing and quality assurance procedures that assure conformance with customer and applicable regulatory requirements. Upon request, the manufacturer shall provide a current Certificate of Compliance from an independent ISO 9000 Registrar.

b. **Approved Manufacturers:** Manufacturers that are qualified and approved by the Project Engineer are listed below. Products from unapproved manufacturers are prohibited.

Performance Pipe, a division of Chevron Phillips Chemical Company LP, JM Eagle Manufacturing out of Adel, Georgia or approved equal.

c. **Materials:** Materials used for the manufacture of polyethylene pipe and fittings shall be PE3408/PE4710-PE100 high-density polyethylene meeting cell classification 445576C per ASTM D3350; and shall be listed in PPI (Plastics Pipe Institute) TR-4 with standard grade HDB ratings of 1600 psi at 73°F and 1000 psi at 140°F. The material shall also be listed in the same PPI document as a PE100 with a MRS (Minimum Required Strength) of 10 Mpa (1450 psi) at 20°C (68°F).

*The new PE4710-PE100 materials are not yet recognized by 49 CFR Part 192. The pipe will be dual or triple marked (PE3408/PE4710-PE100) as long as required by 49 CFR Part 192. Yellowstripe meets new requirements for PE4710PE100 material.*

- d. Service Identification Stripes: Permanent identification of gas piping service shall be provided by co-extruding color stripes into the pipe outside surface. The striping material shall be the same material as the pipe material except for color. Stripes printed or hot-stamped on the pipe outside surface shall not be acceptable. Pipes shall have four equally spaced longitudinal color stripes. The stripe color shall be yellow.
- e. Interchangeability of Pipe and Fittings: The same Qualified and Approved Manufacturer shall produce polyethylene pipe and fittings. Products such as fittings or flange adapters made by sub-contractors or distributors are prohibited.
- f. Polyethylene Pipe: **Pipe shall be SDR-11 and black in color with minimum of 40 foot pipe lengths**, and shall be manufactured and tested in accordance with the latest published edition of ASTM D 2513.
- g. Polyethylene Fittings: Polyethylene molded heat fusion fittings shall be manufactured with PE3408/PE4710-PE100 material and in accordance with ASTM D 2513 and DOT requirements.
- h. Manufacturer's Quality Control: The pipe and fitting manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rate, and contamination. The supplier shall certify the cell classification properties of incoming material. Incoming materials shall be approved by Quality Control before processing into finished goods.
  - 1) Outgoing materials shall be checked for diameter, wall thickness, roundness, concentricity, toe-in, inside and outside surface finish, markings, and end cut. Quality control shall verify production checks, and test for density, melt flow rate, hoop tensile strength and ductility. X-ray inspection procedures shall be used to inspect molded fittings for voids, and knit line strength shall be tested. Representative tests to verify long-term performance shall include slow crack growth, pipe inside surface ductility, and ambient and elevated temperature sustained pressure testing.
  - 2) Compliance Tests: The Manufacturer shall certify the inspection and testing of the materials and products. In case of conflict with Manufacturer's certifications, the Contractor or Engineer may request retesting by the Manufacturer or have retests performed by an outside testing service. All retesting shall be at the requestor's expense, and shall be performed in accordance with the Specifications.

## **2.02**

### **VALVES**

All valves on the polyethylene pipe shall be a full port polyethylene ball valve compatible with the piping material, and be manufactured in the United States. The polyethylene

valve stub ends must be fabricated from material that is compatible with the pipe used and also meeting the requirements of ANSI B-16.40, including the Standard Dimension Ratios (SDR) and shall be manufactured by Fralen, Ballomax or approved equal.

**2.03 VALVE BOXES (VB) AND EXTENSION STEMS**

All valves shall be equipped with valve boxes. Valve boxes shall be heavy roadway type and the word "GAS" clearly visible. The valve boxes shall be cast iron two-piece slip or screw type with drop covers. The valve boxes shall be adjustable to 6 inches up or down from the nominal required cover over the pipe. Typical valve box details are shown on the plans.

**2.04 VALVE MARKERS**

The Contractor shall provide a precast concrete valve marker (28 day compressive strength of 3,000 psi) as detailed on the Drawings for each valve installed. Valve markers shall be stamped "GAS".

**2.05 TAPPING OF MAINS (a.k.a. Hot Tap)**

Taps into mains under pressure without the interruption of gas flow shall be made by the installation of a side tap through a full port valve. The Contractor shall have all materials on hand and shall conduct the work in a manner to insure the installation of the stopper fitting in a safe manner and in the minimum amount of time. The Contractor shall utilize only those persons who are qualified and knowledgeable in the tapping of mains under pressure. The Contractor shall furnish and install only those materials designed for making taps under pressure. The Contractor shall furnish the Owner all coupons cut out of the existing main during the tapping operation. The system operating pressure will not be lowered at any time during the construction to facilitate lower pressure tapping equipment. Valve shall meet the requirements of ANSI 150 at 285 psi and be manufactured by Ballomax or approved equal.

**2.06 DETECTION TAPE & WIRE**

Detection Tape shall be composed of a continuous color-code warning tape of at least six inches in width with the wording "Danger – Natural Gas Pipeline Buried Below" shall be placed in the trench directly above the pipe at a distance of no greater than 18" or two diameters, whichever is greater, above the pipe. The pipe shall be principally yellow and black in color and of a non-biodegradable nature. Prior to backfill of trench, the Contractor shall furnish and install a yellow coated, stranded, single conductor copper cable insulated with high molecular weight polyethylene (HMW/PE) and shall be solid, No.12 AWG, PRO-TRACE HD-CCS PE45 as manufactured by Pro-Line Safety Products or approved equal. The wire shall be installed along the pipe during the backfill operation. Wire shall be brought up at each valve. Wire shall be spliced together using DRYCONN waterproof connectors.

**PART 3 EXECUTION**

**3.01 LOCATION AND GRADE**

- A. The Drawings show the alignment of the gas main and the location of valves and other appurtenances. Gas mains shall be constructed at a depth as specified in Section 02225, Article 3.01, Paragraph D.
- B. After the Contractor locates and marks the gas main centerline or baseline, the Contractor shall perform clearing and grubbing.
- C. Construction shall begin at a connection location and proceed without interruption. Multiple construction sites shall not be permitted without written authorization from the Engineer for each site.

**3.02 LAYING AND JOINTING PIPE AND ACCESSORIES**

- A. Lay all pipe and fittings to accurately conform to the lines and grades established by the engineering plans.
- B. Pipe Installation
  - 1. General: Polyethylene gas distribution piping shall be installed in accordance with C.F.R. 49, Part 192, Subpart G (mains), Subpart H (service lines), applicable codes and regulations and ASTM D 2774.
    - a. When delivered, a receiving inspection shall be performed, and any shipping damage shall be noted on the Bill of Lading and reported to the Manufacturer within 7 days.
  - 2. Burial Depth: All polyethylene gas distribution piping shall be installed in accordance with applicable federal, state and local codes and shall have at three (3) feet of cover and a minimum of 18-inches of vertical separation shall be maintained between the pipeline and any existing structure.
  - 3. Excavation: Trench excavations shall conform to the plans and drawings, as otherwise authorized in writing by the Project Engineer or his Approved Representative, and in accordance with all applicable codes. The Contractor shall remove excess groundwater. Where necessary, trench walls shall be shored or reinforced, and all necessary precautions shall be taken to ensure a safe working environment.
  - 4. Foundation & Bedding: Pipe shall be laid on grade and on a stable foundation. Unstable trench bottom soils shall be removed, and a 6" foundation or bedding of compacted, clean granular material shall be installed to pipe bottom grade. A trench cut in rock or stony soil shall be excavated to 6" below pipe bottom grade, and brought back to grade with compacted, clean granular bedding. All ledge rock, boulders and large stones shall be removed.

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5. Pipe Handling: Pipe shall be handled in a safe manner that avoids damage to the product. When lifting with slings, only wide fabric choker slings capable of safely carrying the load, shall be used to lift, move, or lower pipe and fittings. Wire rope or chain shall not be used. Slings shall be of sufficient capacity for the load and shall be inspected before use. Worn or damaged equipment shall not be used.
  6. Backfilling: Embedment material soil type and particle size shall be in accordance with ASTM D 2774. Embedment shall be placed and compacted to at least 90% Standard Proctor Density in 6" lifts to at least 6" above the pipe crown. During embedment placement and compaction, care shall be taken to ensure that the haunch areas below the pipe springline are completely filled and free of voids.
  7. Protection against shear and bending loads: In accordance with ASTM D 2774, connections shall be protected where an underground polyethylene branch or service pipe is joined to a branch fitting such as a service saddle, branch saddle or tapping tee on a main pipe, and where pipes enter or exit casings or walls. The area surrounding the connection shall be embedded in properly placed, compacted backfill, preferably in combination with a protective sleeve or other mechanical structural support to protect the polyethylene pipe against shear and bending loads.
  8. Final Backfilling: Final backfill shall be placed and compacted to finished grade. Native soils may be used provided the soil is free of debris, stones, boulders, clumps, frozen clods or the like larger than 8" in their largest dimension.
- C. Alignment and Gradient
1. Lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. Do not deflect any joint more than the maximum deflection recommended by the manufacturer.
  2. Maintain a transit, level and accessories on the job to lay out angles and ensure that deflection allowances are not exceeded.
- D. Expediting of Work: Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug, either push-on, mechanical joint, restrained joint or as approved by the Engineer.
- E. Joining

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1. Heat Fusion Joining: Butt, socket, and saddle fusion joints in polyethylene gas piping shall be made using procedures that have been qualified and approved by the City in accordance with Title 49, CFR, Part 192.283.
    - a. In accordance with C.F.R. 49, part 192, Section 192.285, the City shall ensure that all persons making heat fusion joints have been qualified to make joints in accordance with the City's Approved Qualified Fusion Procedures. The City shall maintain records of qualified personnel, and shall certify that qualification training was received not more than 12 months before commencing construction. The Contractor shall ensure that all persons making heat fusion joints are qualified in accordance with this section.
    - b. The Manufacturer shall offer qualified fusion procedures and training materials for the use of the City.
    - c. Butt Fusion of Unlike Wall Thickness: Butt fusion shall be performed between pipe ends, or pipe ends and fitting outlets that have the same outside diameter and are not different in wall thickness by more than one Standard DR, for example, SDR 9 to SDR 11, or SDR 11 to SDR 13.5. Transitions between unlike wall thickness greater than one SDR shall be made with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means or electrofusion. Standard DR's for polyethylene pipe are 7.3, 9, 11, 13.5 and 17.
  2. Joining by Other Means: Polyethylene gas pipe and fittings may be joined together or to other materials by transition fittings, fully restrained mechanical couplings, or electrofusion. These devices shall be designed for joining polyethylene to another material and shall be approved by the City for use in the gas distribution system. When joining by other means, the installation instructions of the joining device manufacturer shall be observed.
    - a. When mechanical OD compression couplings are used, polyethylene gas pipe shall be reinforced with a stiffener in the pipe bore. Stiffeners shall be properly sized for the diameter and wall thickness of polyethylene pipe being joined. For service pipe connections, the stiffener length shall match the pipe end penetration depth into the coupling.
- F. Valve and Fitting Installation
1. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be corrected or held for inspection by the City. Valves shall be closed before being installed.



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2. Valves, fittings, plugs and caps shall be set and joined to the pipe in the manner specified in this Section for cleaning, laying and joining pipe, except that 12-inch and larger valves shall be provided with special support, such as treated timbers, crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. Valves shall be installed in the closed position.
3. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve-operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. Extension stems shall be installed where depth of bury places the operating nut in excess of 60-inches beneath finished grade so as to set the top of the operating nut 30-inches below finished grade. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the Engineer.
4. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.

### **3.04 DETECTION TAPE & WIRE**

Provide detection tape and wire for all gas mains.

### **3.05 INSPECTION & TESTING**

- A. Fusion Quality: The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site. Upon request by the City, the Contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D 2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The Contractor at his expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions.
- B. Leak Testing: Polyethylene gas distribution systems that are subject to D.O.T. Pipeline Safety Regulations shall be tested in accordance to C.F.R. 49, Part 192, Section 192.513 as applicable.
  1. The Contractor shall take all precautions to eliminate hazards to persons near lines being tested. Pipes being tested shall be supervised at all times.

### **3.06 PIGGING OF PIPE**

Before placing the facility into operation, the Contractor shall ensure that all pipe and tubing is free from welding icicles, rust, moisture, scale and foreign particles. The Contractor shall remove any such material by propelling a polyethylene foam type cleaning pig(s) with compressed air or inert gas through all steel and poly pipe installed as part of this project. This shall be repeated as many times as necessary to ensure removal of any such defects.

**3.07 PLACING FACILITY INTO OPERATION**

After all fabrication, backfilling and testing is completed and acceptable to the Owner, the Contractor shall purge the newly constructed facility. Purge tees shall be provided and installed by the Contractor at no expense to the Owner. Owner shall be given 72 hours notice before purging begins. A combustible gas indicator shall be used when purging mains and piping. When purging gas from abandoned lines, the air and the gas must be discharged away from power lines or structures. When purging air from new lines, installation of a 3/4-inch service saddle and non-corrodible riser is required four feet from each dead-end on all new installations of pipe in order to purge air from all deadens simultaneously. Release gas into new lines at a rate that will prevent formation of a hazardous mixture of gas and air or preceded natural gas with a slug of inert gas.

**3.08 PREVENTION OF ACCIDENTAL IGNITION**

The Contractor shall take the necessary precautions to prevent the accidental ignition of natural gas when cutting into and/or removing a section of pipe. These precautions shall include, but not be limited to, grounding and bonding. The cutting into of a section of pipe shall not commence until that section is isolated and the pressure in the section has been reduced to atmospheric. Only mechanical cutters will be allowed when cutting into a pipe section.

**END OF SECTION**