

# **Lenoir City Utilities Board**

## **Natural Gas Department**

### *Standards and Specifications*

## SECTION 1

### GENERAL INFORMATION

#### PART 1 - GENERAL

##### 1.01 Requirements Included

1. Basic natural gas requirements specifically applicable.
2. General and procedural requirements for work specified shall be as required herein.

##### 1.02 Definitions

1. **OWNER** – The OWNER is the Lenoir City Utilities Board.
2. **CONTRACTOR** – The CONTRACTOR is the person, firm or corporation with whom owner has entered into the agreement.
3. **AUTHORIZED PROJECT REPRESENTATIVE (APR)** – The AUTHORIZED PROJECT REPRESENTATIVE is the representative of the Lenoir City Utilities Board who is assigned to the site or any part thereof.

##### 1.03 Contractor's Responsibility

CONTRACTOR agrees to assume responsibility for liability, workmanship, and quality concerning work subcontracted to others. Before any portion of the work is sublet, submit in writing the name of proposed subcontractor to OWNER for consideration and approval thereof.

##### 1.04 Codes and Fees

1. All work shall be installed in accordance with the applicable provisions in 49 CFR Part 192 Minimum Federal Safety Standards and related Lenoir City Utilities Board codes.
2. CONTRACTOR shall be responsible for obtaining any local permits required for the performance of work.

## **1.05 Quality Control**

Qualifications: Where qualifications are specified in an individual specification section provide required data for CONTRACTOR and all subcontractors as required by the OWNER.

## **1.06 Guarantee**

1. CONTRACTOR warrants and guarantees to OWNER that all work will be in accordance with the Contract Documents and will not be defective. Notice of all defects shall be given to CONTRACTOR promptly upon discovery thereof. All defective work, whether in place or not, may be rejected, corrected, or accepted as provided in this Article and the Contract Documents.
2. Access to Work – OWNER and his Authorized Project Representative (APR), other representatives of the OWNER, testing agencies and governmental agencies with jurisdictional interests will have access to the work at reasonable times for their observation, inspection, and testing. CONTRACTOR shall provide proper and safe conditions for such access.
3. Test and Inspections:
  - a. CONTRACTOR shall give OWNER a minimum of 48 hours notice of the readiness of the work for all required inspections, tests, or approvals.
  - b. If any applicable law or regulation requires any portion of CONTRACTOR's work to be specifically inspected, tested, or approved, CONTRACTOR shall assume full responsibility therefore, pay all costs in connection therewith, and furnish OWNER the appropriate certificates of inspection, testing, or approval.
  - c. All inspections, tests, or approvals shall be performed by an organization acceptable to OWNER.
  - d. If any work is covered that requires inspection, testing, or approval, it must, if requested by OWNER, be uncovered for such inspection and testing. Such uncovering shall be at CONTRACTOR's expense unless CONTRACTOR has given timely written notice of his intention to cover the work and OWNER has not

acted with reasonable promptness (within 48 hours) in response to such notice.

- e. Neither inspections nor observations by OWNER or his Authorized Project Representative shall relieve CONTRACTOR from his obligation to perform the work in accordance to Contract Documents.
4. OWNER may stop work. If the work is defective or CONTRACTOR fails to supply sufficiently skilled workers, or fails to perform the work in such a way that the completed work will conform to the Contract Documents, then OWNER may order CONTRACTOR to stop the work, or any portion thereof, until the cause for such order has been eliminated. The right of OWNER to stop the work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR or any other party. Neither the existence of this right nor the exercise or the failure of exercise of this right to stop the work shall preclude the exercise of any other rights or remedies of OWNER or constitute a waiver of any rights or remedies of OWNER.
5. Correction or Removal of Defective Work – If required by OWNER or his Authorized Project Representative, CONTRACTOR shall promptly, as directed, either correct all defective work or if the work has been rejected by OWNER or his Authorized Project Representative remove it and replace it with non-defective work. CONTRACTOR shall bear all direct, indirect, and consequential costs of such removal and/or correction.
6. One Year Correction Period – If within the one year warranty period beginning at the date of substantial completion any work is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with the OWNER's instructions correct such defective work. If CONTRACTOR does not promptly comply with the terms of such instructions, or if in an emergency where delay would cause serious risk of loss or damage, OWNER may have such defective work repaired and/or replaced; then all direct, indirect, and consequential costs will be paid by CONTRACTOR.

## **PART 2 - EXECUTION**

### **2.01 Materials/Equipment Installation**

1. All materials used in the installation of the natural gas system shall be pre-approved by the OWNER prior to installation. The OWNER has pre-approved materials suppliers that currently furnish materials based on approved status. The description and approved manufacturer of all current items is also available. Approval of new items for installation in the natural gas distribution system normally takes a minimum of 60 days for approval.
2. Install all material and equipment in accordance with applicable manufacturer's drawings and recommendations, OWNER's installation details and drawings, and industry codes, standards, etc.

### **2.02 Alterations and Additions to Facilities**

Make alterations and additions to existing facilities work as indicated and as required to accommodate new construction and to clear all interference therewith. This includes disconnecting, removing, relocating, rerouting, extending, reworking, reconnecting, or otherwise altering existing natural gas facilities as required, whether indicated on the drawings or not.

### **2.03 Continuity of Existing Natural Gas Service, and Salvaged Existing Materials**

1. Arrange all work to interfere as little as possible with OWNER's normal operations. Do not interrupt existing natural gas service at any time without OWNER's prior approval. During a scheduled service interruption, complete all necessary work to restore natural gas service as soon as possible. CONTRACTOR shall obtain approval of the OWNER prior to any work on existing facilities. CONTRACTOR shall not "open" or "close" any valve except upon the order of OWNER or his Authorized Project Representative.
2. Promptly haul away from OWNER's premises, right-of-way, property, etc., all demolished materials, equipment, and excavation spoils neither indicated nor required to be reused in the completed project. OWNER may at its sole discretion select certain removed materials retained for future use. Before

removing any materials and equipment, determine from OWNER and/or his APR which of these materials and equipment (if any) OWNER desires to retain.

**2.04 Protection and Maintenance**

Work as installed shall be protected at all times. Pipe openings shall be closed with water tight caps or plugs until permanent connections are made. All new facilities shall be maintained in good working condition for the duration of the project. CONTRACTOR shall be responsible for maintenance until all the work is accepted by OWNER.

## **SECTION 2**

### **STORAGE, HANDLING and TRANSPORTATION OF POLYETHYLENE GAS PIPE**

#### **PART 1 - GENERAL**

##### **1.01 Requirements Included**

It is most important that polyethylene gas pipe be stored and handled in such a way as to avoid damage.

#### **PART 2 - EXECUTION**

##### **2.01 Minimizing Damage to Polyethylene Pipe**

1. When loading and unloading pipe, use canvas or nylon slings. If a forklift is to come into direct contact with the pipe rather than a wood pallet, the forklift should be padded.
2. Make sure that the storage area or truck bed is clear of debris, etc. that could damage the pipe.
3. Store pipe in a manner which will minimize crushing or bending. Pipe should lay flat and be stacked no higher than 84-inches or it can be forced out of round. Do not stand pipe coils in a vertical position.
4. During stringing operations, avoid dragging pipe over rocks, asphalt, concrete, or other abrasive material. Precautions should be taken with straight lengths to ensure pipe is not put in an excessive strain.
5. Pipe must be carefully inspected for cuts, gouges, deep scratches and other defects before use. The segment of pipe containing defects shall be cut out. The only exception is pipe with scratches and gouges less than 10% of the wall thickness can be used. Pipe may also be repaired with patching saddles or other repair fittings.

A 10% reduction for LCUB's standard polyethylene pipes are as follows:

<b>Size</b>	<b>SDR</b>	<b>Wall Thickness</b>	<b>10% Reduction</b>	<b>Fraction Eqv.</b>
6-inch	11.5	0.5761-inch	0.05761-inch	1/16-inch
4-inch	11.5	0.3913-inch	0.03913-inch	1/32-inch
2-inch	11	0.2159-inch	0.02159-inch	1/64-inch
3/4-inch	11	0.1010-inch	0.01010-inch	1/64-inch

6. Medium density polyethylene natural gas pipe shall be installed within 2 years of the manufacturer date shown on the pipe.
7. Shipping Instructions:
  - a. Pipe shall be completely covered during shipment if transported more than 50 miles.
  - b. Nesting of coiled pipe is not allowed.



## SECTION 3

### TRACER WIRE INSTALLATION FOR POLYETHYLENE PIPE

#### PART 1 - GENERAL

A coated copper clad steel tracer wire of #12 gauge (or larger) shall be installed with all buried polyethylene mains and services. The tracer wire shall be laid within 6 inches of the polyethylene pipe where practical and directly above if possible. Tracer wire should not be wrapped around pipe or connectors except at the riser. **Never** wrap tracer wire around polyethylene pipe or fittings.

#### PART 2 - EXECUTION

The contractor shall install a #12 (or larger) insulated tracer wire 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 piping 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 a mechanical connector. To complete the connection, wrap all exposed wire thoroughly with electrical tape. **Twisting of copper wire is not allowed.**

## **SECTION 4**

### **STATIC ELECTRICITY DISCHARGE PROCEDURE FOR POLYETHYLENE PIPE**

#### **PART 1 - GENERAL**

##### **1.01 Description**

This procedure describes the precautions to be taken to reduce the potential for static electricity discharge from polyethylene pipe where a hazardous atmosphere could exist. An approved method will be used to reduce static electricity.

#### **PART 2 - EXECUTION**

##### **2.01 Reduction of Static Discharge for Polyethylene Pipe**

1. Anti-static solution should be applied to all exposed polyethylene pipe where a hazardous atmosphere could exist.
2. A grounded wet tape conductor can be placed in direct contact with the entire section of exposed piping, except the area necessary working on the pipe, to maintain the anti-static solutions contact with the polyethylene pipe. The wet tape conductor shall be burlap, cotton cloth or other approved anti-static wrap thoroughly wet with the approved anti-static solution.
3. Currently, anti-static solutions are available from Lyle and Normac. In addition, a dilute solution of water and a dishwasher type detergent is an acceptable substitute.
4. Efforts should be made to keep the tape wet during repairs.
5. Do not vent gas using an ungrounded gas pipe.

## SECTION 5

### POLYETHYLENE GAS TEE AND VALVE INSTALLATION

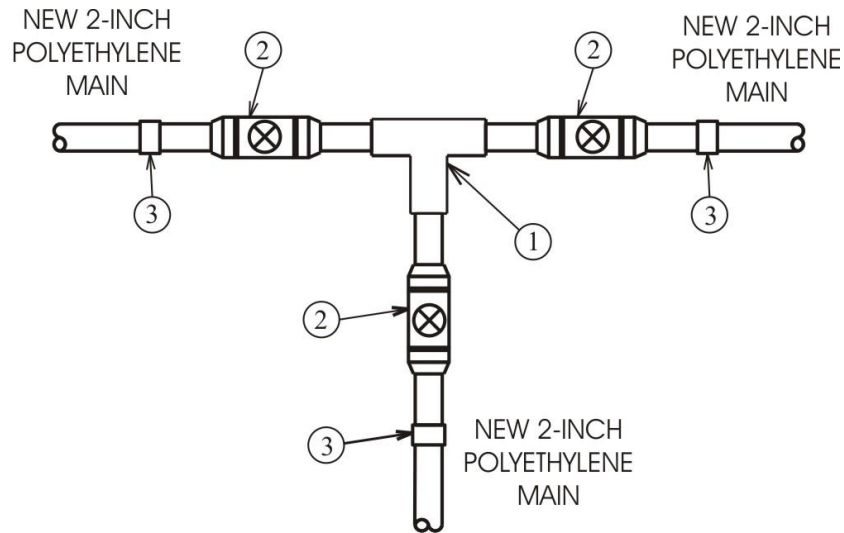
#### PART 1 - GENERAL

1. The work to be performed herein shall consist of the installation of new or replacement polyethylene or steel natural gas tapping hardware and polyethylene valves in new and existing mains. All work shall be performed in accordance with this section and all additional OWNER standards and specifications that may or may not be referred to in this section.
2. LCUB Standards and Specifications for Polyethylene Gas Tee and Valve Installation are intended to meet or exceed the Code of Federal Regulations part 192 – Transportation of Natural and Other Gases by Pipeline: minimum Federal Safety Standards (MFSS).
3. Definitions:
  - a. **IPS** – means iron pipe size (for polyethylene pipe nominal inside diameters).
  - b. **CTS** – means copper tubing size (for polyethylene pipe nominal inside diameters).
  - c. **SDR** – means standard dimension ratio ( for polyethylene pipe outside diameter divided by the minimum pipe wall thickness).
  - d. **Socket Fusion** – the method of joining polyethylene pipe using a coupling with an inside diameter sized to the outside diameter of the pipe. A short length of outside surface of the pipe and inside surface of the coupling are heated to a molten state. The pipe is then pressed into the opening of the coupling.
  - e. **Butt Fusion** – the method of joining polyethylene pipe where two pipe ends are heated to a molten state and rapidly brought together under pressure to form a bond.

**PART 2 - EXECUTION**

**2.1 See the following drawings, notes, and material lists for polyethylene gas tee and valve installations for new mains:**

**3-Valve Installation on New 2-inch Polyethylene Main**



**Figure 1-400**

**3-valve installation on new 2-inch polyethylene main**

Notes:

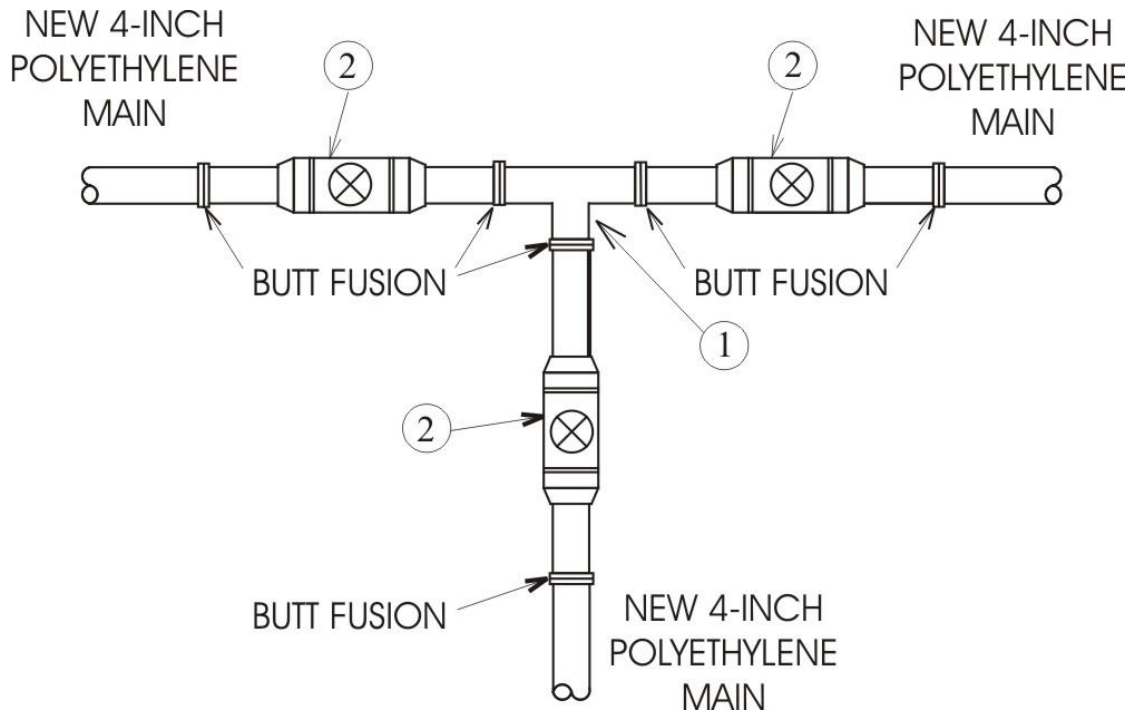
1. Compact all sidefill around polyethylene components prior to backfilling.
2. Cluster valves as near to tee as feasible, unless otherwise approved by OWNER's Engineering.
3. Tracer wire and connections not shown on above drawing.
4. 2-inch Lyco Tee (LCUB Item #1280) may be substituted for Item 1.
5. 2-inch Lyco Sleeve (LCUB Item #1575) may be substituted for Item 3.

**Materials List for Figure 1-400**

**Gas Valves and Tee Installation on New 2-inch Polyethylene Main**

<u>Item</u>	<u>Quantity</u>	<u>LCUB Item #</u>	<u>Description</u>
1	1	1210	2-inch Polyethylene Tee
2	3	0400	2-inch Polyethylene Valve
3	3	No #	2-inch Polyethylene Socket Fusion Coupling

**3-Valve Installation on New 4-inch Polyethylene Main**



**Figure 2-405**

3-valve installation on new 4-inch polyethylene main

Notes:

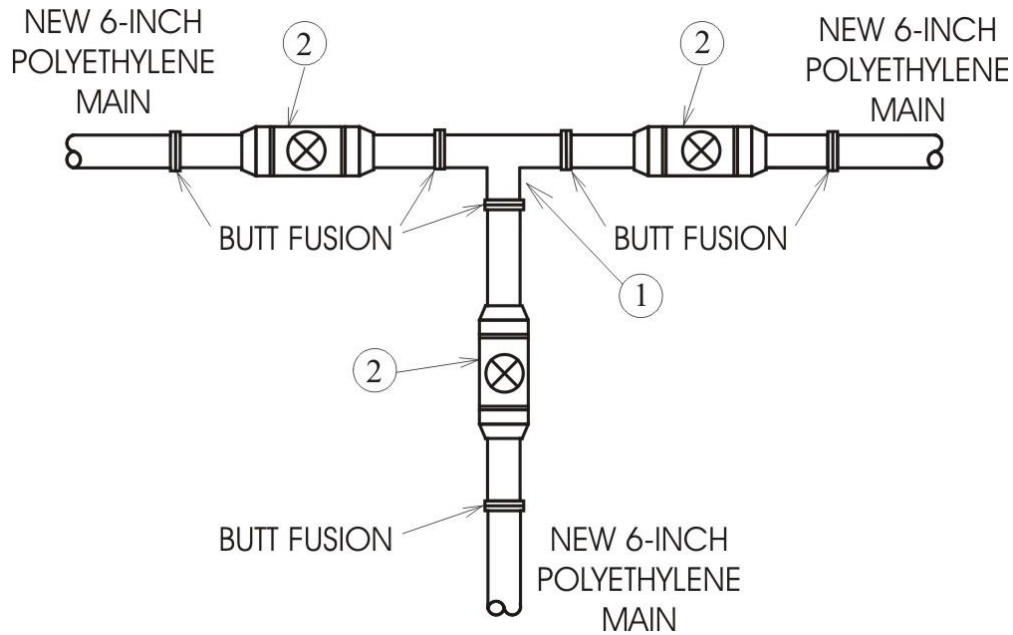
1. Compact all sidefill around polyethylene components prior to backfilling.
2. Cluster valves as near to tee as feasible, unless otherwise approved by OWNER's Engineering.
3. Tracer wire and connections not shown on above drawing.

**Materials List for Figure 2-405**

**Gas Valves and Tee Installation on New 4-inch Polyethylene Main**

<u>Item</u>	<u>Quantity</u>	<u>LCUB Item #</u>	<u>Description</u>
1	1	1215	4-inch Polyethylene Tee
2	3	0405	4-inch Polyethylene Valve

### 3-Valve Installation on New 6-inch Polyethylene Main



**Figure 3-410**

#### 3-valve installation on new 6-inch polyethylene main

Notes:

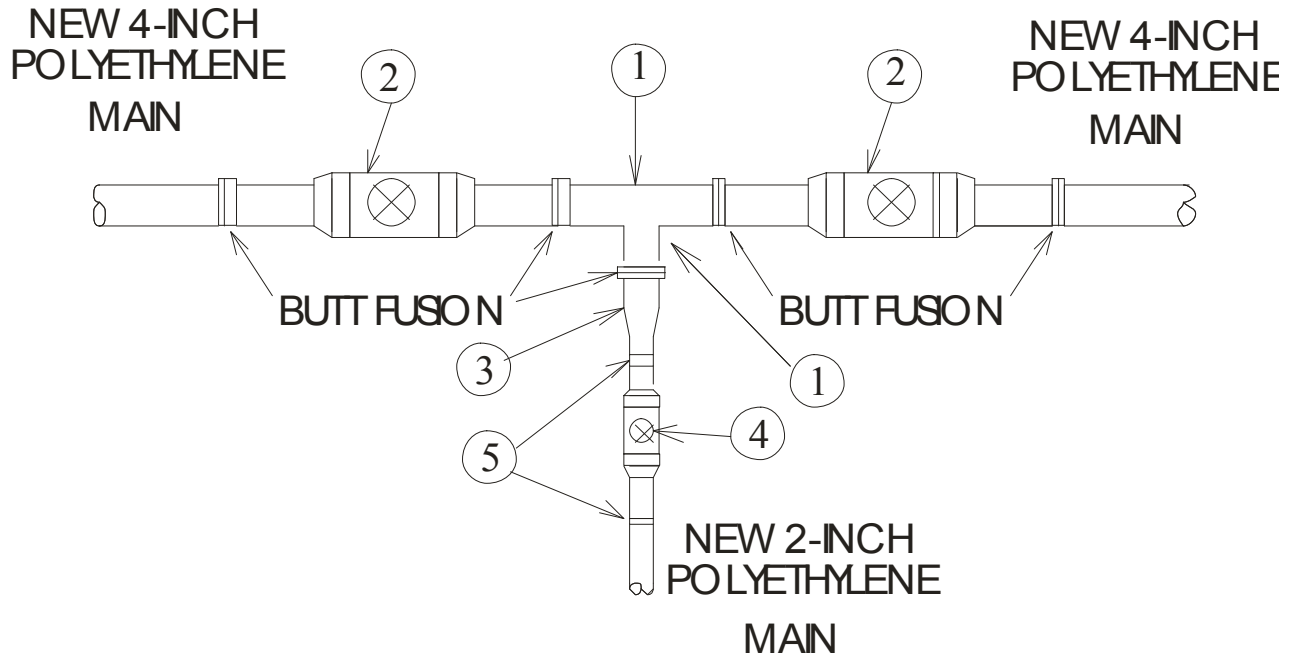
1. Compact all sidefill around polyethylene components prior to backfilling.
2. Cluster valves as near to tee as feasible, unless otherwise approved by OWNER's Engineering.
3. Tracer wire and connections not shown on above drawing.

#### **Materials List for Figure 3-410**

##### **Gas Valves and Tee Installation on New 6-inch Polyethylene Main**

<u>Item</u>	<u>Quantity</u>	<u>LCUB Item #</u>	<u>Description</u>
1	1	1220	6-inch Polyethylene Tee
2	3	0410	6-inch Polyethylene Valve

**3-Valve Installation on New 4-inch to 2-inch Polyethylene Main**



**Figure 4-405400**

3-valve installation on new 4-inch/2-inch polyethylene main

Notes:

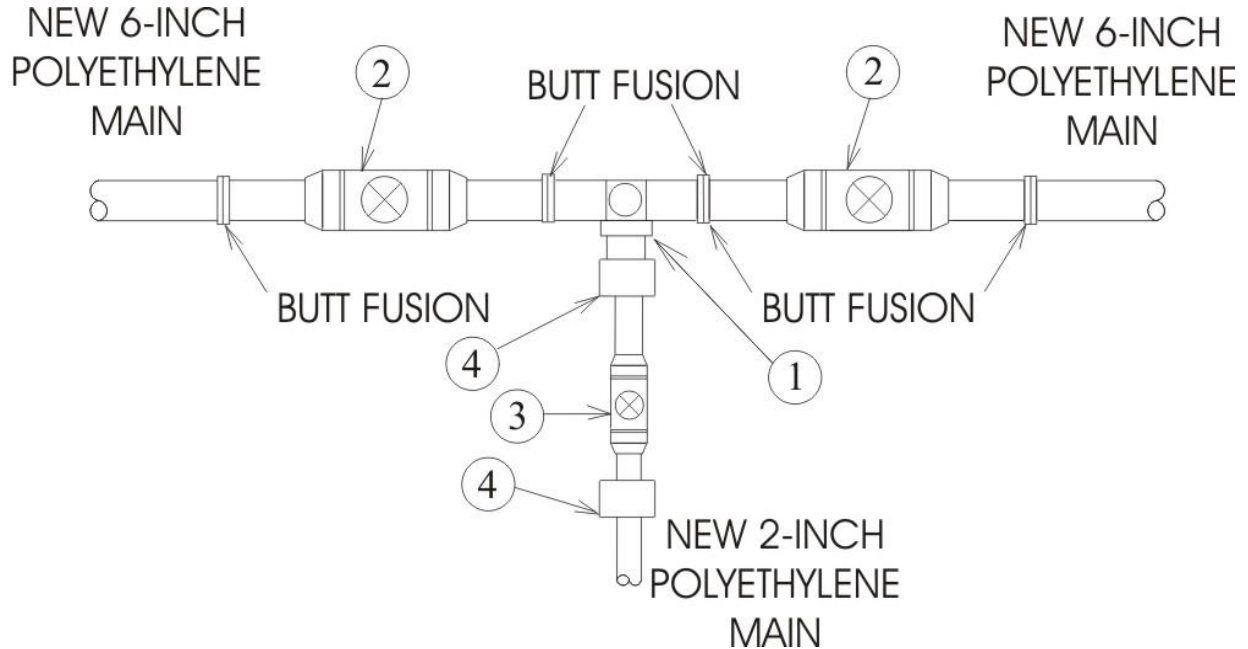
1. Compact all sidefill around polyethylene components prior to backfilling.
2. Cluster valves as near to tee as feasible, unless otherwise approved by OWNER's Engineering.
3. Tracer wire and connections not shown on above drawing.
4. 2-inch Lyco Sleeve (LCUB Item #1575) may be substituted for Item 5.

**Materials List for Figure 4-405400**

**Gas Valves and Tee Installation on New 4-inch to 2-inch Polyethylene Main**

<b><u>Item</u></b>	<b><u>Quantity</u></b>	<b><u>LCUB Item #</u></b>	<b><u>Description</u></b>
1	1	1215	4-inch Polyethylene Butt Fusion Tee
2	2	0405	4-inch Polyethylene Valve
3	1	0910	4 x 2 Polyethylene Reducer
4	1	0400	2-inch Polyethylene Valve
5	2	No #	2-inch Polyethylene Socket Fusion Coupling

**3-Valve Installation on New 6-inch to 2-inch Polyethylene Main**



**Figure 5-410400**

3-valve installation on new 6-inch to 2-inch polyethylene main

Notes:

1. Compact all sidefill around polyethylene components prior to backfilling.
2. Cluster valves as near to tee as feasible, unless otherwise approved by OWNER's Engineering.
3. Tracer wire and connections not shown on above drawing.
4. 2-inch Lyco Sleeve (LCUB Item #1575) may be substituted for Item 4.

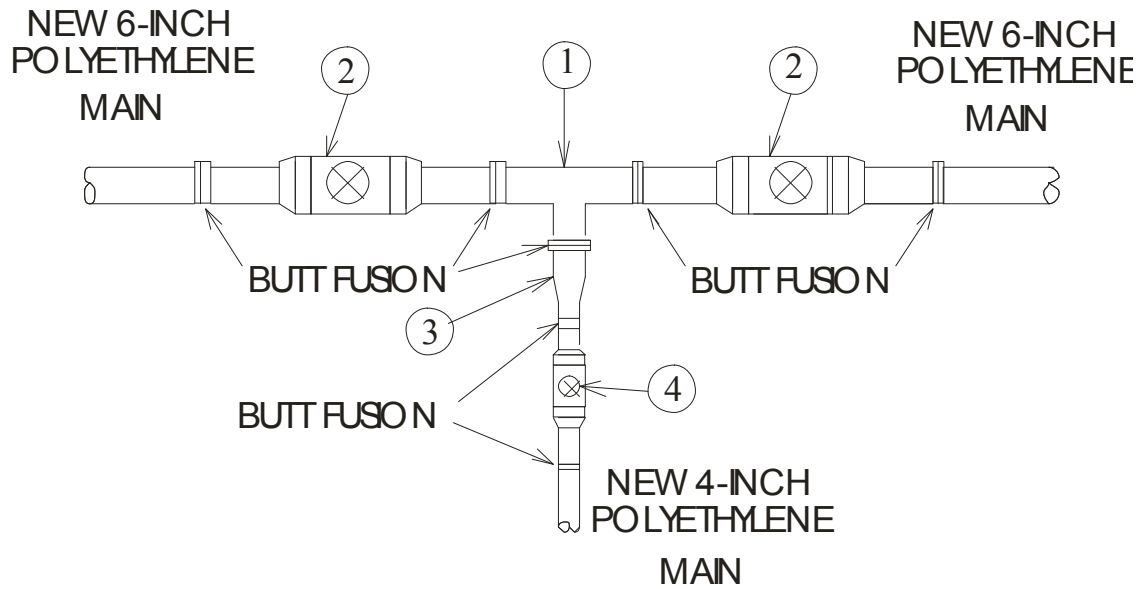
**Materials List for Figure 5-410400**

**Gas Valves and Tee Installation on New 6-inch to 2-inch Polyethylene Main**

<b><u>Item</u></b>	<b><u>Quantity</u></b>	<b><u>LCUB Item #</u></b>	<b><u>Description</u></b>
1	1	0640	6 x 2 Polyethylene Tapping Tee
2	2	0410	6-inch Polyethylene Valve
3	1	0400	2-inch Polyethylene Valve
4	2	No #	2-inch Polyethylene Socket Fusion Coupling



**3-Valve Installation on New 6-inch to 4-inch Polyethylene Main**



**Figure 6-410405**

**3-valve installation on new 6-inch to 4-inch polyethylene main**

Notes:

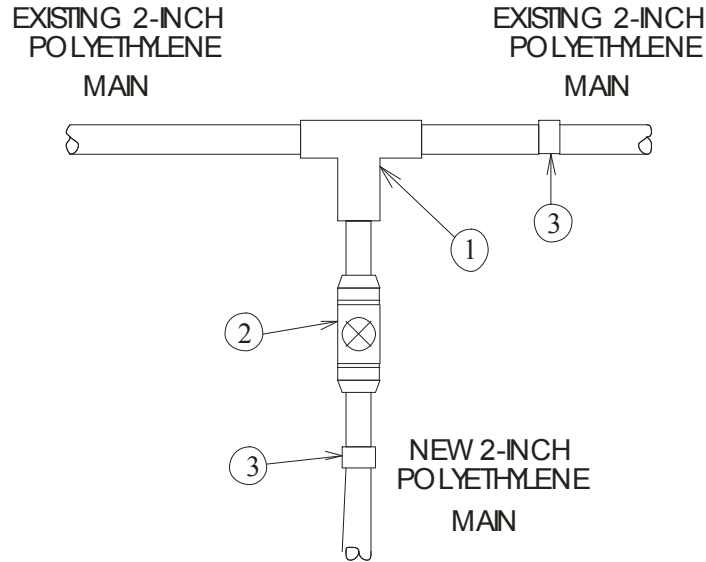
1. Compact all sidefill around polyethylene components prior to backfilling.
2. Cluster valves as near to tee as feasible, unless otherwise approved by OWNER's Engineering.
3. Tracer wire and connections not shown on above drawing.

**Materials List for Figure 6-410405**

**Gas Valves and Tee Installation on New 6-inch to 4-inch Polyethylene Main**

<b><u>Item</u></b>	<b><u>Quantity</u></b>	<b><u>LCUB Item #</u></b>	<b><u>Description</u></b>
1	1	1220	6-inch Polyethylene Butt Fusion Tee
2	2	0410	6-inch Polyethylene Valve
3	1	0915	6 x 4 Polyethylene Reducer
4	1	0405	4-inch Polyethylene Valve

**New 2-inch Polyethylene Main and Valve on Existing 2-inch Polyethylene Main**



**Figure 7-400-a**

**Single-valve installation for new 2-inch polyethylene main on existing 2-inch polyethylene main**

Notes:

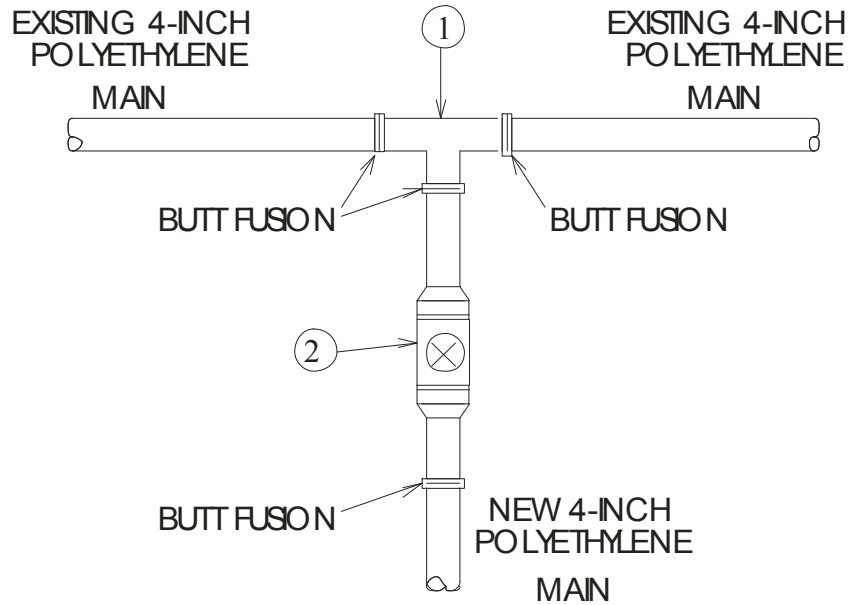
1. Compact all sidefill around polyethylene components prior to backfilling.
2. Cluster valves as near to tee as feasible, unless otherwise approved by OWNER's Engineering.
3. Tracer wire and connections not shown on above drawing.
4. 2-inch Lyco Tee (LCUB Item #1280) may be substituted for Item 1.
5. 2-inch Lyco Sleeve (LCUB Item #1575) may be substituted for Item 3.
6. 2-inch Electro Fusion sleeve (LCUB Item #1580) may be substituted for socket fusion couplings on existing main.

**Materials List for Figure 7-400-a**

**Gas Valve and Tee Installation on Existing 2-inch Polyethylene Main**

<b><u>Item</u></b>	<b><u>Quantity</u></b>	<b><u>LCUB Item #</u></b>	<b><u>Description</u></b>
1	1	1210	2-inch Polyethylene Tee
2	1	0400	2-inch Polyethylene Valve
3	2	No #	2-inch Polyethylene Socket Fusion Coupling

**New 4-inch Polyethylene Main and Valve on Existing 4-inch Polyethylene Main**



**Figure 8-405-a**

Single-valve installation for new 4-inch polyethylene main on existing 4-inch polyethylene main

Notes:

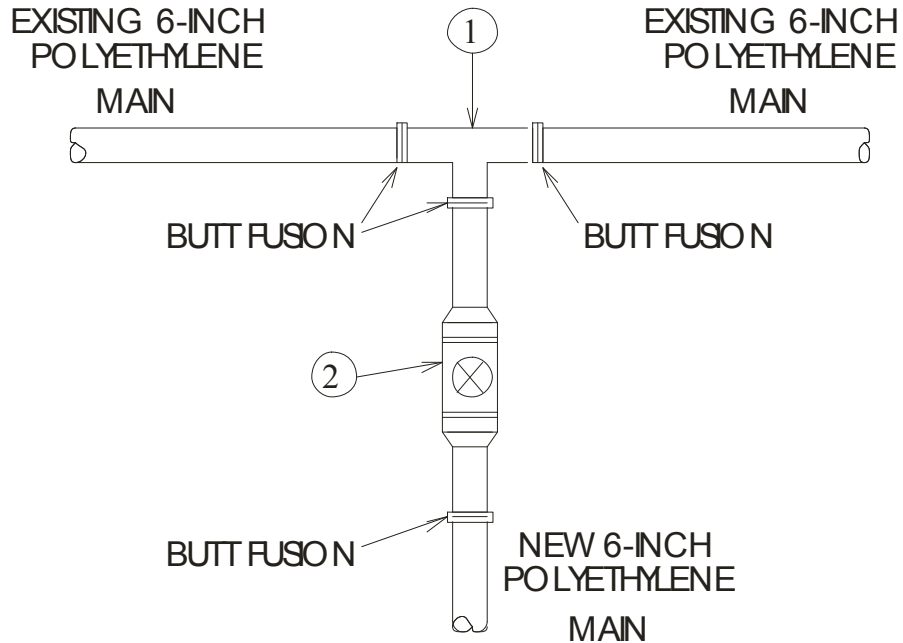
1. Compact all sidefill around polyethylene components prior to backfilling.
2. Cluster valves as near to tee as feasible, unless otherwise approved by OWNER's Engineering.
3. Tracer wire and connections not shown on above drawing.
4. 4-inch Electro Fusion sleeves (LCUB Item #1590) may be used on each side of the 4-inch tee to be installed on the existing main.

**Materials List for Figure 8-405-a**

**Gas Valve and Tee Installation on Existing 4-inch Polyethylene Main**

<u>Item</u>	<u>Quantity</u>	<u>LCUB Item #</u>	<u>Description</u>
1	1	1215	4-inch Polyethylene Tee
2	1	0405	4-inch Polyethylene Valve

**New 6-inch Polyethylene Main and Valve on Existing 6-inch Polyethylene Main**



**Figure 9-410-a**

Single-valve installation for new 6-inch polyethylene main on existing 6-inch polyethylene main

Notes:

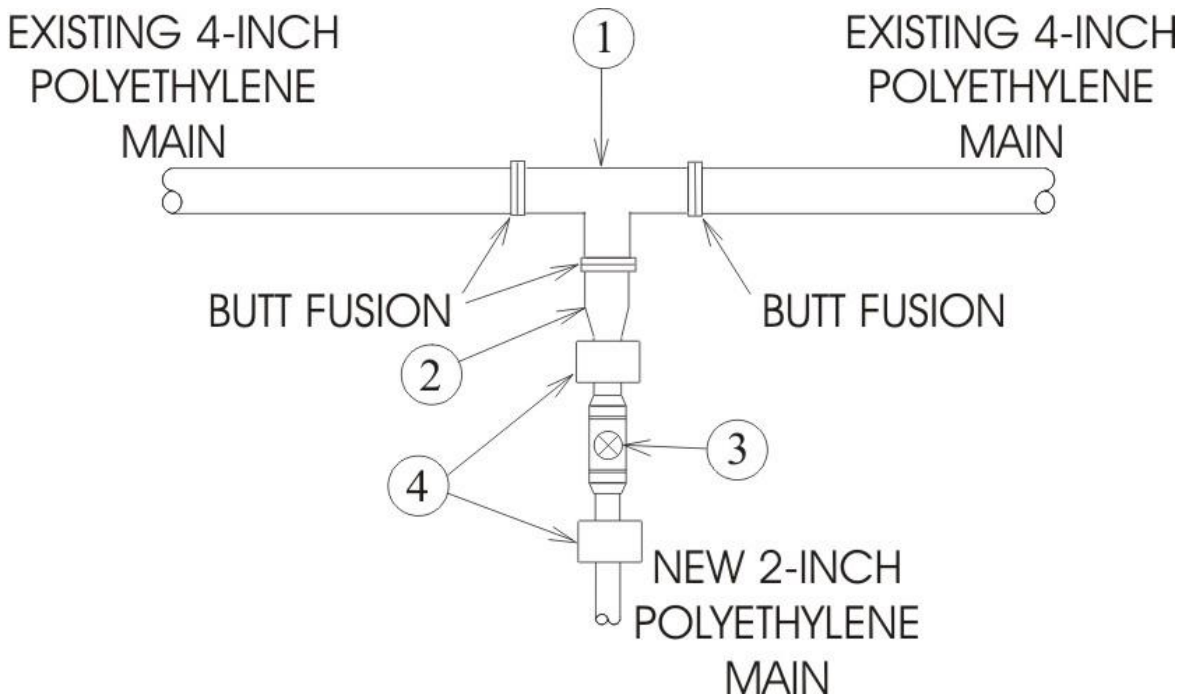
1. Compact all sidefill around polyethylene components prior to backfilling.
2. Cluster valves as near to tee as feasible, unless otherwise approved by OWNER's Engineering.
3. Tracer wire and connections not shown on above drawing.
4. 6-inch Electro Fusion sleeves (LCUB Item #1595) may be used on each side of the 6-inch tee to be installed on the existing main.

**Materials List for Figure 9-410-a**

**Gas Valve and Tee Installation on Existing 6-inch Polyethylene Main**

<b><u>Item</u></b>	<b><u>Quantity</u></b>	<b><u>LCUB Item #</u></b>	<b><u>Description</u></b>
1	1	1220	6-inch Polyethylene Tee
2	3	0410	6-inch Polyethylene Valve

**New 2-inch Polyethylene Main and Valve on Existing 4-inch Polyethylene Main**



**Figure 10-405400-a**

Single-valve installation for new 2-inch polyethylene main on existing 4-inch polyethylene main

Notes:

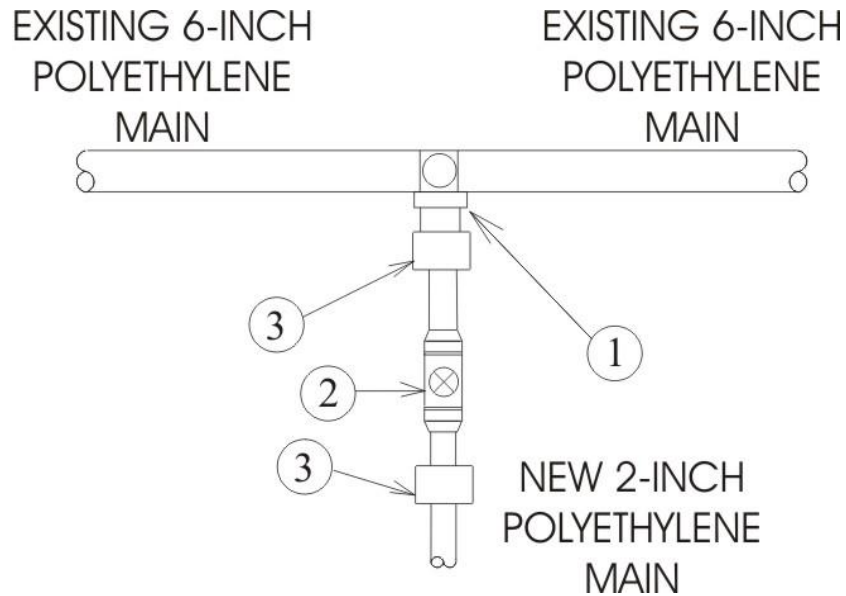
1. Compact all sidefill around polyethylene components prior to backfilling.
2. Cluster valves as near to tee as feasible, unless otherwise approved by OWNER's Engineering.
3. Tracer wire and connections not shown on above drawing.
4. 2-inch Lyco Sleeve (LCUB Item #1575) may be substituted for Item 4.
5. 4-inch Electro fusion sleeves (LCUB Item # 1590) may be used on each side of the 4-inch tee to be installed on the existing main.

**Materials List for Figure 10-405400-a**

**Gas Valve and Tee Installation for New 2-inch Polyethylene Main on Existing 4-inch Polyethylene Main**

<b><u>Item</u></b>	<b><u>Quantity</u></b>	<b><u>LCUB Item #</u></b>	<b><u>Description</u></b>
1	1	1215	4-inch Polyethylene Butt Fusion Tee
2	1	0910	4 x 2 Polyethylene Reducer
3	1	0400	2-inch Polyethylene Valve
4	2	No #	2-inch Polyethylene Socket Fusion Coupling

**New 2-inch Polyethylene Main and Valve on Existing 6-inch Polyethylene Main**



**Figure 11-410400-a**

Single-valve installation for new 2-inch polyethylene main on existing 6-inch polyethylene main

Notes:

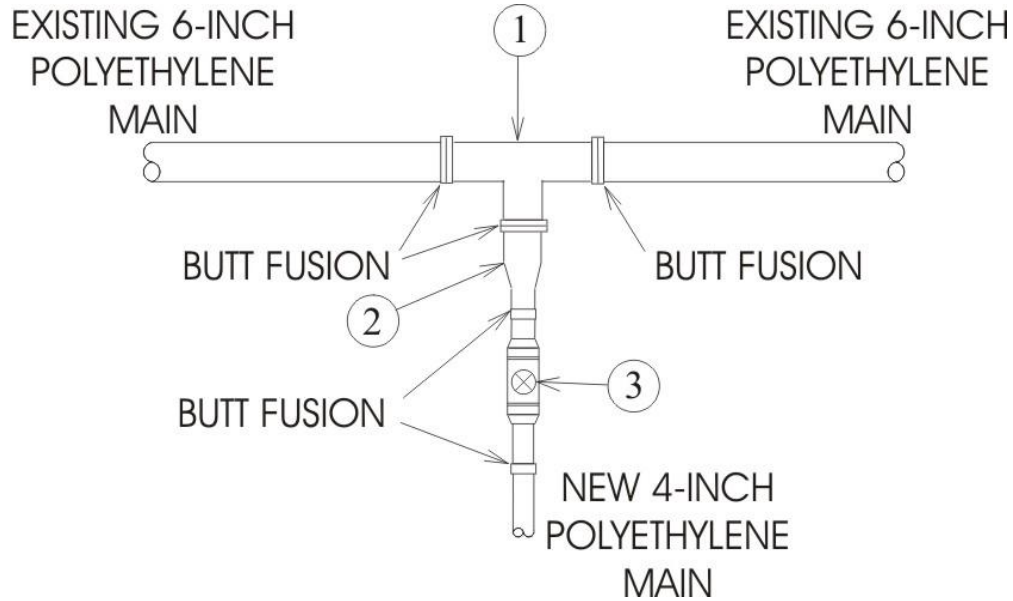
1. Compact all sidefill around polyethylene components prior to backfilling.
2. Cluster valves as near to tee as feasible, unless otherwise approved by OWNER's Engineering.
3. Tracer wire and connections not shown on above drawing.
4. 2-inch Lyco Sleeve (LCUB Item #1575) may be substituted for Item 4.

**Materials List for Figure 11-410400-a**

**Gas Valve and Tee Installation for New 2-inch Polyethylene Main on Existing 6-inch Polyethylene Main**

<b><u>Item</u></b>	<b><u>Quantity</u></b>	<b><u>LCUB Item #</u></b>	<b><u>Description</u></b>
1	1	0640	6 x 2 Polyethylene Tapping Tee
2	1	0400	2-inch Polyethylene Valve
3	2	No #	2-inch Polyethylene Socket Fusion Coupling

**New 4-inch Polyethylene Main and Valve on Existing 6-inch Polyethylene Main**



**Figure 12-410405-a**

Single-valve installation for new 4-inch polyethylene main on existing 6-inch polyethylene main

Notes:

1. Compact all sidefill around polyethylene components prior to backfilling.
2. Cluster valves as near to tee as feasible, unless otherwise approved by OWNER's Engineering.
3. Tracer wire and connections not shown on above drawing.
4. 6-inch Electro fusion sleeves (LCUB Item # 1595) may be used on each side of the 6-inch tee to be installed on the existing main.

**Materials List for Figure 12-410405-a**

**Gas Valve and Tee Installation for New 4-inch Polyethylene Main on Existing 6-inch Polyethylene Main**

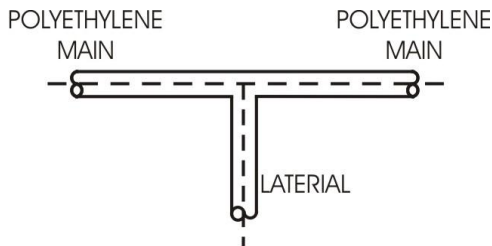
<u>Item</u>	<u>Quantity</u>	<u>LCUB Item #</u>	<u>Description</u>
1	1	1220	6-inch Polyethylene Butt Fusion Tee
2	1	0915	6 x 4 Polyethylene Reducer
3	1	0405	4-inch Polyethylene Valve

# TRACER WIRE INSTALLATION

## Installation of Tracer Wire

### At Lateral (Top View)

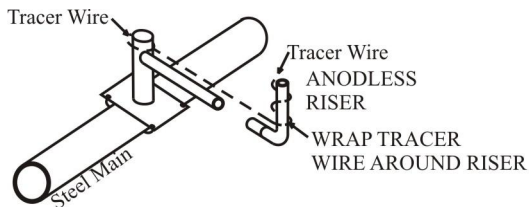
Strip one inch of insulation from main wire and from end of lateral wire to install LCUB-approved connector. Thoroughly wrap connector and bare wire with electrical tape.



**Figure 13-0070-a** (Tracer wire installation at laterals)

### Polyethylene Service off Steel Main

Loop end of wire around tee and secure with electrical tape. Do not cadweld to steel main.

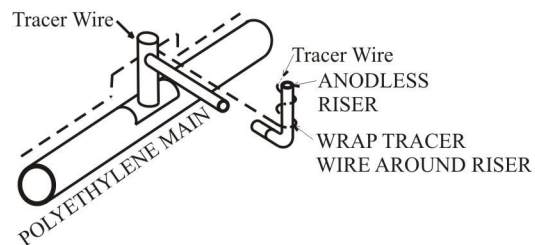


**Figure 14-0070-b**

### Polyethylene Service off Polyethylene Main

### Polyethylene Main

Strip one inch of insulation from main wire and from end of lateral wire to install LCUB-approved connector. Thoroughly wrap connector and bare wire with electrical tape.



**Figure 15-0070-c**

Notes:

1. All tracer wire to be brought above ground and wrapped around anodeless riser.
2. Tracer wire to be laid 6 inches directly above pipe.



## SECTION 6

### POLYETHYLENE GAS MAIN INSTALLATION

#### **PART 1 - GENERAL**

1. LCUB Standards and Specifications for Polyethylene Gas Main Installations are intended to meet or exceed the Code of Federal Regulations title 49 part 192 – Transportation of Natural and Other Gases by Pipeline: Minimum Federal Safety Standards (MFSS).
2. LCUB standard requirements shall provide the minimum requirements for main tie-ins, unless they do not meet MFSS requirements. Main tie-ins installed at less than MFSS minimum depth due to underground structures shall be approved by the OWNER’s Engineering based on a design to provide the pipe with adequate additional protection to withstand anticipated external loads. All tie-ins not installed at minimum depth or at more than maximum depth shall be noted on the completed as-built drawings.
3. Electro fusion couplings may be used for the final tie-in or in other difficult locations with approval of the OWNER’s Engineering.
4. LCUB standards require that natural gas mains be installed in accordance with all CFR 49 part 192 requirements and to the following depths below the roadbed (if on city, county or state right-of-way), and on private property according to size:

<b><u>Size</u></b>	<b><u>Type</u></b>	<b><u>Minimum Pipe Coverage</u></b>
2-inch	Polyethylene	24 inches
2-inch	Steel	24 inches
4-inch	Polyethylene	36 inches
4-inch	Steel	36 inches
6-inch	Polyethylene	36 inches
6-inch	Steel	36 inches

5. OWNER’s Engineering may adjust required depths due to potential future land grading, unusual circumstances, underground structures or other obstructions.
  - a. Contractors performing work on LCUB’s natural gas system shall have a drug testing program in place in accordance with the Pipeline Safety Regulations, Part 199 – Drug Testing Pipeline Safety and Part 40 – Procedures for Transporting Workplace Drug Testing Programs and provide current Drug Testing Plan and test results prior to beginning work.

- b. Contractors making any heat fusions on newly installed polyethylene mains on LCUB's natural gas distribution system shall be certified in plastic pipe fusion and shall provide current documentation records.
- c. Contractors performing work on existing mains on LCUB's natural gas distribution system shall provide current Operator Qualification Plan and testing records for covered tasks and must be qualified under LCUB's Operator Qualification Plan prior to beginning work.
- d. Contractors performing work on LCUB's natural gas system shall provide all equipment necessary to complete the assigned task including but not limited to: generator, backhoe, trencher, fusion equipment, LYCO machine, tapping machine and electro fusion machine.
- e. Contractor performing work on LCUB's natural gas system is responsible for all Tennessee One-Call locate requests and coordination with other utilities.
- f. Contractor performing work on LCUB's natural gas system is responsible for restoring customer property, state and county right-of-way and easements to preconstruction condition.

## **PART 2 - MATERIALS**

### **2.01 Polyethylene Pipe**

1. All polyethylene pipe shall be yellow PE 2406.
2. All polyethylene pipe shall be of virgin quality material.
3. Polyethylene pipe shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, blisters, dents and other defects. The pipe shall be as uniform as practical in color, opacity, density and other physical properties.
4. 2-inch IPS polyethylene pipe shall be supplied in coils of 500 foot lengths. The coil shall consist of a single length of pipe. 4-inch IPS and 6-inch IPS polyethylene pipe shall be supplied in 40 foot lengths.

### **2.02 Polyethylene Fittings**

1. All polyethylene fittings shall be yellow PE 2406.
2. All polyethylene fittings shall be made of virgin quality material.

3. Polyethylene fittings shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, blisters, dents and other defects. The pipe shall be as uniform as practical in color, opacity, density and other physical properties.
4. All polyethylene fittings 2-inch – 6-inch shall be butt fusion type.

### **2.03 Electro Fusion Couplings**

All electro fusion couplings shall be compatible with the Innogaz Electro Fusion System and shall have socket outlets. All electro fusion couplings will be 4-inch and 6-inch.

### **2.04 Mechanical Tapping Tees and Couplings**

All mechanical tapping tees and couplings shall be LYCO brand. All mechanical tapping tees will be 2 x  $\frac{3}{4}$ , 4 x  $\frac{3}{4}$  and 6 x  $\frac{3}{4}$ . All mechanical couplings will be  $\frac{3}{4}$ -inch and 2-inch.

### **2.05 Polyethylene Gas Valves**

1. Polyethylene gas valves shall be manufactured by either Nordstrom or Lyall Polytec.
2. The valves shall be assembled so to operate smoothly and provide a gas tight seal.
3. All polyethylene gas valves shall be supplied with butt outlets.
4. All polyethylene gas valves shall be full port.

### **2.06 Valve Boxes**

All valve boxes and lids for 2-inch, 4-inch and 6-inch valves shall be metal and manufactured by Sigma or equivalent. The valve box shall consist of a standard base, middle section and telescoping top section. The lid shall be 5  $\frac{1}{4}$  inches and marked GAS.

### **2.07 Tracer Wire**

All tracer wire shall be #12 AWG solid copper coated wire. #10 AWG solid copper coated wire may be used when plowing 2-inch pipe and below.

## **2.08 Steel Pipe and Fittings**

1. Steel Pipe shall be schedule 40 grade B A53 seamless with a 30 mil extruded polyethylene coating.
2. All welded fittings shall be schedule 40.
3. All steel pipe used for casings shall be schedule 40 grade A106.
4. Commercial available casing insulators with a minimum of 4 plastic runners shall be installed at 5 feet maximum intervals on the steel gas main prior to insertion in a casing. Insulators shall be sized to center the gas main in the casing.
5. End seals capable of forming a watertight seal shall be used at the ends of the casing.

## **PART 3 – EXECUTION**

### **3.01 General**

1. Gas mains shall be installed with a minimum cover of 36 inches for 4-inch and 6-inch pipe and 24 inches for 2-inch pipe.
2. Unless otherwise approved by OWNER's Engineering, a minimum 12 inches of clearance vertically and 24 inches horizontally shall be maintained between the pipe surface and other utility lines or adjacent structures.
3. Trench shall be free of debris, sharp rocks, etc. before placing pipe in the trench.
4. Extreme care must be exercised when moving polyethylene pipe. Polyethylene pipe shall not be dragged on the ground or on paved surfaces.
5. Pipe that has scratches, notches, cuts or any other abrasions that exceed 10% of the wall thickness shall not be used. OWNER's Engineering must be notified of all defects and repairs.
6. The minimum bend radius for polyethylene pipe is 25 times the outside diameter of the pipe. If a fusion joint is in the bend radius, the minimum bend radius is 50 times the outside diameter of the pipe. Fittings are not permitted in pipe bends.

7. Polyethylene pipe shall be installed in the trench by the “snaking” method and additional pipe length shall be allowed for thermal contraction of the pipe.
8. All tracer wire connections shall be made with an approved method of connection. Wire twisting and taping the ends is not allowed. Tracer wire shall be brought to the top of valve boxes, where applicable.
9. Valves shall be installed at the marked locations. Valves shall be installed with the operating nut on top, facing vertically up. LCUB will not accept valves that are cocked or oriented in any direction except up.
10. Telescoping, metal valve boxes shall be installed for all valves. The boxes shall be well supported and vertical. LCUB will not accept any valve boxes that are in any position other than vertical.
11. The contractor shall conduct main line pressure tests at a pressure of 1.5 times the maximum allowable operating pressure (MAOP) of the natural gas system. OWNER’s Engineering will inform the contractor of LCUB’s MAOP. The test shall be charted and remain on for 24 hours. The test pressure shall not decrease during the test period.

### **3.02 Inspections**

1. LCUB will have a polyethylene qualified inspector that may come to the job site at any time. The inspector has the right to reject any fusions not meeting LCUB requirements. The contractor shall replace all fusions not meeting LCUB requirements at its own expense.
2. The contractor shall also designate a qualified supervisor who will be present on site at all times to observe fuser(s).

### **3.03 Boring**

1. All underground utilities shall be potholed and located prior to the start of boring.
2. All pipe ends shall be sealed with a butt fusion end cap or similar fitting prior to pulling the pipe into a borehole.

### **3.04 Sealing Installed Piping**

1. Contractor shall seal open piping with butt fusion end caps or similar fitting at the end of each workday. No open pipe ends will be allowed at the end of the day.

## SECTION 7

### POLYETHYLENE GAS SERVICE LINE INSTALLATION

#### PART 1 - GENERAL

1. The work to be performed herein shall consist of the installation of new or replacement polyethylene natural gas service lines operating at or below 60 psig, which includes but is not limited to the anodeless riser, meter valve, service piping, tracer wire, excess flow valve, and tapping saddle (or mechanical saddle) connection to existing facilities. All work shall be performed in accordance with this section and all additional OWNER standards and specifications that may or may not be referred to in this section.
2. LCUB Standards and Specifications for Polyethylene Gas Service Line Installation are intended to meet or exceed the Code of Federal Regulations title 49 part 192 – Transportation of Natural and Other Gases by Pipeline: Minimum Safety Standards (hereafter referred to as “MFSS”).
3. MFSS part numbers may be included in these standards as a reference for review purposes. LCUB standard requirements shall provide the minimum requirements for service line installation, unless they do not meet MFSS requirements.
4. “Service Line” as defined by MFSS (192.3) means a distribution line that transports gas from a common source of supply to an individual customer, to two adjacent or adjoining residential or small commercial customers, or to multiple residential or small commercial customers served through a meter header or manifold. A service line ends at the outlet of the customer meter or at the connection to a customer’s piping, whichever is further downstream.
5. Contractor is responsible for all Tennessee One-Call locate requests and coordination with other utilities.

The aforementioned sections shall also govern and are incorporated into this section by reference. In the event of a conflict between the referenced sections, the one requiring the highest quality of work shall control.

#### PART 2 – EXECUTION

##### **2.01 General**

1. Prior to making service line connections to an existing main, the depth of the main shall be confirmed to meet the MFSS minimum depth. If the existing main does not meet the depth requirements, OWNER’s Engineering shall be contacted prior to making the service connection.

2. New residential and small commercial services shall be a  $\frac{3}{4}$  inch minimum with a service shut-off valve of the appropriate size.
  - a. New service lines larger than  $\frac{3}{4}$ -inch shall be installed by specification requirements for mains.
  - b. See tracer wire installation requirements for polyethylene pipe in Section 5.

## 2.02 Installation Depths

1. Service lines shall be installed to the standard depth as listed in the following table with the depth being measured from ground level to the top of the service line:

	State Right-of-Way	Lenoir City/Loudon Co. Right-of-Way	Cust. Property/ LCUB Easement
Standard Depth	24-inch	24-inch	18-inch
MFSS minimum Depth	18-inch	18-inch	12-inch
Maximum Depth	60-inch	60-inch	60-inch

- a. Service lines installed at less than the standard depth or more than the maximum depth shall be approved by OWNER's Authorized Project Representative based on the individual site conditions.
- b. Service lines installed at less than the MFSS minimum depth due to underground structures, shall be approved by OWNER's Engineering based on a design to provide the service pipe with adequate additional protection to withstand anticipated external loads.
- c. All installations of service lines at less than the standard depth or more than the maximum depth shall be noted on the service line installation form and/or as-built drawings.



### **2.03 Installation Restrictions**

1. Service lines shall not be installed under buildings, permanent structures or future proposed structures.
2. Polyethylene pipe shall be installed below ground.
3. Anodeless risers are marked with the correct burial depth, denoted as "GROUND LEVEL HERE". MFSS require finished grade to be at this level so that all polyethylene pipe is below ground and all steel piping without cathodic protection is above ground. Risers shall be vertically plumb.
4. Service lines should run in the most direct (shortest) path feasible between the gas main and the meter location. Where possible, service lines should be as close as practical to perpendicular with the gas main.

### **2.04 Excess Flow Valves**

1. An excess Flow Valve (EFV) shall be installed on all new single-residential natural gas service lines and on all replacement single-residential natural gas service lines.
2. The EFV size shall be determined by OWNER based on the customer's gas demand and the service line length.
3. An EFV shall not be installed in areas determined by the OWNER to experience contaminants in the gas that could interfere with the proper operation of the EFV.
4. The EFV shall be installed inline with and at the same depth as the service piping and at no less than 12 inches and no more than 24 inches from the connection of the service line to the gas main.
5. If space does not permit the EFV installation as described above, then the EFV shall be located as near as practical to the supply main, but **NOT** under paving or a road bed unless it is impractical or otherwise approved by OWNER's Engineering.
6. New service lines shall not be connected to an existing service line that contains an EFV unless the connection can be made between the existing gas main and EFV and is approved by OWNER's Engineering prior to installation.

7. All new and existing service lines that have been modified or reconnected shall have individual EFV's.
8. All residential service lines containing an EFV shall have a tag or other OWNER-approved EFV label attached to the meter set-up in plain site for the ease of field verification that the service line is equipped with an EFV.
9. Gas service line installation forms and/or as-built drawings shall indicate the existence of installed EFV's.

## **2.05 Standard Service Details**

1. Polyethylene Service Connected to Polyethylene Main:
  - a. Service line connection on polyethylene main shall be made by use of a polyethylene fusion service saddle or by a mechanical Lyco tapping saddle.
  - b. All joints on service lines connected to polyethylene mains shall be made by socket, saddle or butt fusion. The use of Lyco mechanical fittings is also acceptable.
  - c. Backfill shall be well compacted around the service tee and special care taken not to damage the piping during compaction.
2. Polyethylene Service connected to Steel Main:
  - a. Polyethylene services connected to steel gas mains may be connected using OWNER-approved weld x fusion fittings or mechanical x stab fittings.
  - b. For service lines larger than 2-inch, special design will be prepared by OWNER's Engineering.

## **2.06 Riser Location/Installation**

1. When installing the service line riser, make sure that the weight of the meter is supported by the riser and fuel line piping, not the polyethylene service line.

2. Pre-bent anodeless riser shall be used for all service line applications unless otherwise approved by OWNER. When other than anodeless risers are used, OWNER-approved corrosion control practices shall be observed.
3. Risers shall not be installed under windows or stairways.
4. Risers shall be a minimum 36 inches from air intake vents and 15 feet from fire hose connections unless otherwise approved by OWNER's Engineering.
5. Risers shall be vertically plumb.
6. Meter valve shall be on the left side of the riser with the locking mechanism facing away from the building for all residential and small commercial applications.

#### **2.07 Standard Location of 3/4-inch Riser**

The standard location of a  $\frac{3}{4}$ -inch riser for residential/small commercial shall be as follows (unless change otherwise approved by OWNER's Engineering):

1. Shall be located 12 inches to left of customer's fuel line.
2. Shall be located 12 inches from building.
3. Riser and meter valve shall extend 12 inches above finished grade.

#### **2.08 Standard Location of 1 1/2-inch riser**

The standard location of a 1  $\frac{1}{2}$ -inch riser for commercial shall be as follows (unless change otherwise approved by OWNER's Engineering):

1. Shall be located 24 inches to left of customer's fuel line.
2. Shall be located 18 inches from building.
3. Riser and meter valve shall extend 12 inches above finished grade.

## **2.09 Standard Location of 2-inch Riser**

The standard location of a 1 ½-inch riser for commercial shall be as follows (unless change otherwise approved by OWNER's Engineering):

1. May be located 36 inches to the right/left of customer's fuel line.
2. Shall be located 18 inches from building.
3. Riser and flange shall extend 12 inches above finished grade.
4. Top of flange shall be level.
5. Riser shall have tapered angle-iron attached for stabilization.

## **2.10 Testing**

1. The complete service line including the service connection to the main shall be tested at a minimum of 1.5 times the maximum allowable operating pressure (MAOP) at a test duration of 10 minutes for ¾-inch and of 2 hours for 2-inch.
2. The test procedure shall insure discovery of all leaks in the segment being tested.
3. A pressure recording chart may be required by OWNER's Authorized Project Representative. In general, most ¾-inch service lines do not require a pressure recording chart. Most 2-inch service lines should be tested using a pressure recording chart.
4. If OWNER's Engineering determines that testing the entire service line is not feasible, the service line connection to the main may be given a leakage test at the operating pressure when placed into service.
5. Any threaded connections shall be soap tested for leaks during the pressure test.

## **2.11 Tapping – Service Connected to Polyethylene Main**

1. Service connections to polyethylene mains must be allowed to completely cool before tapping the main.
2. Service connections to polyethylene mains using mechanical tapping tees (Lyco) must be installed in accordance with the manufacturer's specifications.

3. Service saddle caps should be hand tightened according to manufacturer's recommendation.

#### **2.12 Tapping – Service Connected to Steel Main**

1. Use self-tapping outlet (valve tee) on steel mains only.

#### **2.13 Reconnection of Existing Polyethylene Services to New Mains**

1. Existing polyethylene services shall be reconnected by socket fusion or by using Lyco fusion sleeves.
2. Services shall be tested in accordance with Section 3.7 from the point of disconnection to the meter prior to reconnection.

#### **2.14 Purging**

1. All purging shall be conducted in accordance with AGA's "Purging Principles and Practices".
2. Gas shall be vented in a manner that will prevent gas from entering a structure.
3. Pipe shall be away from sources of ignition and grounded to reduce static discharge.

#### **2.15 Cathodic Protection**

1. Saddles on steel mains shall have all exposed metal surfaces cleaned, primed and coated to prevent contact between metal surfaces and surrounding backfill.

#### **2.16 As-built Records – Service Installation Forms**

1. Records shall be maintained on all new piping system installation and repairs and/or changes to existing piping systems in sufficient detail to provide historical information, physical locating, fittings used (including excess flow valves), and other data necessary for the continuous operation and maintenance of the natural gas system. Cathodic protection and test data reports shall be neat, legible, and accurate. Properly completed service installation forms shall be provided for all natural gas service lines installed and connected to a main by OWNER and OWNER-approved contractor for all projects. Service installation forms shall be completed by Contractor's installer on the job site and returned to OWNER within 5 working days.

## **2.17 Tapping/Purging Safety**

1. A manned fire extinguisher shall be positioned, if possible, upwind from purging point at all times during purging.
2. Protective clothing should be worn by personnel on site – long sleeve 100% cotton shirts or “supervisor’s coveralls”, cotton or leather gloves, hard hats and safety glasses are recommended at a minimum.

## SECTION 8

### NATURAL GAS POLYETHYLENE PIPE JOINING PROCEDURES

#### **PART 1 - GENERAL**

The work in this section shall consist of joining polyethylene pipe as well as testing pipe afterwards. Also included is the cleaning of pipe as well as the site after work is completed.

#### **PART 2 - EXECUTION**

##### **2.1 Polyethylene Pipe Joining**

1. Polyethylene pipe must be joined using a qualified procedure and by persons qualified on that procedure.
2. **Procedure Qualification** – Title 49 CFR, Part 192.283(a) requires that all joining methods for polyethylene pipe be qualified. The polyethylene pipe manufacturers have developed qualified procedures for heat fusion of PE 2406 pipe. LCUB currently uses Poly Pipe and has adopted the qualifying procedure for this pipe, attached as Appendix A. LCUB uses LYCO mechanical fittings and uses manufacturer's recommended procedures, attached as Appendix B. LCUB also uses innogaz electro fusion procedures and the recommended manufacturer's specifications, attached as Appendix C.
3. Mechanical couplings designed for use in polyethylene natural gas piping have qualified installation procedures developed by the manufacturer. These procedures will be followed for installation. All mechanical couplings used in polyethylene piping systems shall be designed with a pullout resistance greater than or equal to that required by Title 49 CFR, Part 192.283(b).
4. **Joiner Qualification** – Title 49 CFR, Part 192.285 requires persons making either heat fusion or mechanical joints be qualified using applicable joining procedures mentioned above. Each person shall be required to qualify for each of the joints they are expected to make. The qualifying procedure for polyethylene pipe joiners will consist of the following:
  - a. Training and experience with the qualified procedure.
  - b. Making a specimen joint according to the qualified procedure.

## **2.2 Qualification of Persons**

1. Qualification of persons making joints will remain qualified unless the qualified joiner did not make a joint under the applicable procedure during any 12 month period or has had 3 joints or 3% of the joints found unacceptable.



## SECTION 9

### NATURAL GAS POLYETHYLENE PIPE INSTALLATION

#### PART 1 - GENERAL

Polyethylene pipe installation must be installed properly to ensure a trouble-free service life. Since polyethylene pipe has less strength than steel, special care must be taken to minimize external stresses in polyethylene pipelines. It is especially important for construction personnel to carefully examine the installation and be able to recognize and correct potential stress points. Since polyethylene pipe will contract about 1 inch per 10 degree F temperature change per 100 feet of unrestrained pipe. This is especially critical when using mechanical couplings. In warm weather, polyethylene should be allowed to cool to ground temperature before making final tie-ins. Whenever possible, keep pipe in compressive mode. **Polyethylene pipe shall not be installed above ground whether exposed or inserted in an above ground casing.**

#### PART 2 - EXECUTION

##### 2.1 Trenching, Laying, Backfilling, Direct Burial

1. When trenching, a trench width appropriate for examination of sidewalls and contour of trench lines shall be provided.
2. Polyethylene pipe shall be laid and continuously supported on undisturbed or well-compacted soil. Do not use blocks or allow pipe to rest on rocks or large clods of dirt because this will set up shearing stresses in pipe during backfilling.
3. In rock excavation, pad the trench line with at least 4 inches of clean fill material.
4. Normal cover for polyethylene mains shall be listed in Section 6, Part 1, 4. Normal cover for service lines shall be as required in Section 7, Part 2.02. Any installation of less than the normal cover or more than the maximum cover shall be approved by the OWNER.
5. When fusing coil ends, join the coils so that the curvature of one coil is directly opposite the curvature of the other coil. This will minimize bending stresses at that joint.

6. Allow fusion joints to cool as required in the pipe manufacturer's joining procedures before stressing pipe either by lowering into trench or by pressure testing.
7. When lowering pipe into trench, pipe shall not be subjected to excessive twisting and bending stresses. At low temperatures, pipe flexibility is greatly reduced and could be damaged by excessive force.
8. Allow for contraction by "snaking" pipe from one side of the trench to the other.
9. Prior to backfilling, the entire trench shall be examined to ensure that the pipe is continuously supported at all points on undisturbed or well-compacted soil.
10. Initial backfill material should be placed and compacted in layers. Backfill material within 6 inches of the pipe shall be free from refuse, large rocks, sharp rocks, large dirt clods, construction debris, stumps, trash, or any other material that could cause damage to the pipe.
11. Backfill material within 6 inches of the pipe should be placed and spread uniformly in a manner as to fill the trench completely. When compacting backfill, special care shall be taken to prevent damage to the pipe. When heavy equipment is used to compact backfill, provide a cushion of at least 12 inches of backfill. Pressurizing the pipe prior to backfilling will also help prevent crushing the pipe.
12. A tracer wire of #12 coated copper clad steel (or larger) shall be installed with all polyethylene mains and services. The tracer wire shall be laid within 6 inches of the pipe where practical and directly above if possible.
13. When transporting welded pipe segments to open trench, special care should be taken not to drag pipe over rough ground or roadway that can damage pipe.
14. Special care should be given during construction to keep debris out of pipeline. Sealing the ends of the pipeline or fusing caps on the ends of the pipeline during construction should be done, at a minimum.

## **2.02 Main Lines**

Refer to Section 6

### **2.03 Service Lines**

Refer to Section 7

### **2.04 Cathodic Protection of Metallic Components in Polyethylene Systems**

1. All metallic valves, couplings, and other metallic fittings used in polyethylene systems shall be factory or field coated and cathodically protected using anodes.

### **2.05 Tie-ins**

12. When tying in to an existing polyethylene system, the preferable method shall be by heat fusion. All tie-ins using mechanical fittings shall be approved by the OWNER.
13. Normally, when tying into existing steel systems, the preferable tie-in method shall be to use a transition fitting that is welded to the steel pipe and heat or mechanical fused to the polyethylene. The transition between the steel and polyethylene shall rest on undisturbed or well-compacted soil. Precautions must be taken to prevent excessive heat build-up on transition fitting during welding to protect polyethylene portion.
14. All squeeze-offs of polyethylene pipe shall be in accordance with acceptable industry standards and manufacturer recommendations as approved by the OWNER.

### **2.06 Testing**

1. All mains shall be tested at a minimum of 1.5 times the maximum allowable operating pressure (MAOP) for a duration of 24 hours and shall be recorded by a pressure chart. OWNER's Engineering shall provide MAOP information.
2. The final tie-in shall be soap tested at the system operating pressure.

### **2.07 Installation Depths**

1. Mains shall be installed to the standard depth as listed in the following table. Depth shall be measured from ground level to the top of the pipe. Table A is for 4-inch and 6-inch polyethylene, Table B is for 2-inch polyethylene and Table C is for ¾-inch polyethylene:

Table A

	State Right-of-Way	Lenoir City Loudon County Right-of-Way	Cust. Property/ LCUB Easement
Standard Depth	36 inches	36 inches	36 inches
MFSS Minimum Depth	24 inches	24 inches	24 inches
Maximum Depth	60 inches	60 inches	60 inches

Table B

	State Right-of-Way	Lenoir City Loudon County Right-of-Way	Cust. Property/ LCUB Easement
Standard Depth	24 inches	24 inches	24 inches
MFSS Minimum Depth	24 inches	24 inches	24 inches
Maximum Depth	60 inches	60 inches	60 inches

Table C

	State Right-of-Way	Lenoir City Loudon County Right-of-Way	Cust. Property/ LCUB Easement
Standard Depth	24 inches	24 inches	18 inches
MFSS Minimum Depth	18 inches	18 inches	12 inches
Maximum Depth	60 inches	60 inches	60 inches

## **Appendix A**

### **Butt Fusion Process**

Butt fusions may be made with a specially designed machine that secures and aligns the pipe ends for the process. The general steps of the butt fusion process are as follows:

1. Securely fasten the components to be joined
2. Face and clean the pipe ends (remember to turn off power facers before removing).
3. Align the pipe profile.
4. Melt the pipe interfaces.
5. Join the two profiles together.
6. Hold under pressure and allow cooling.
7. Remove from fusion equipment.

### **Sidewall Fusion Process**

The general steps for the sidewall fusion process are as follows:

1. Clean the pipe.
2. Install the sidewall (saddle fusion) machine on the pipe.
3. Install heater saddle adaptors.
4. Prepare the surfaces of the pipe and fitting.
5. Align the parts.
6. Heat both the pipe and saddle fitting.
7. Press and hold the parts together.
8. Cool the joint and remove the fusion machine.

Remember when heating the pipe to follow manufacturer's heating time and melt bead size guidelines. The heated surface should be 100% melted with no cold spots.

LCUB uses the manufacturer's specifications for Poly Pipe.

## Appendix B

### Mechanical Process

LCUB currently uses LYCO mechanical sleeves, tees, ells, end caps and tapping saddles.

#### Tapping Saddles

When installing a LYCO tapping saddle, the following general guidelines shall apply:

1. Prepare the polyethylene pipe by cleaning the surface.
2. Mount tee on main and tighten bolts.
3. Connect outlet using procedure for sleeves.
4. Leak test.
5. Tap the main by removing the cap and inserting a 3/8" hex drive into the cutter. Advance the cutter until contact has been made with the stop. Unscrew the cutter until it is approximately 1/4" below the rim of the tapping tee.
6. Install cap.
7. Pressurize and soap test the mechanical fitting for leaks.

#### Sleeves

When installing a LYCO sleeve, the following general guidelines shall apply:

1. With the pipe reasonably clean, slide the sleeve onto the polyethylene pipe exposing approximately 4 inches of the pipe.
2. Slide the LycoRing onto the pipe with the small end going first.
3. Push spigot end of the coupling into end of pipe and position for machine.
4. Slide the sleeve over the LycoRing so the ring starts to grip.
5. Position the polyethylene pipe and completion sleeve into the LAP tool and use pump to bring the tool's moving jaw into place.
6. Operate hydraulic pump to advance pipe over spigot until pipe covers the last barb on spigot.
7. Release hydraulic pressure and let the tool jaw open enough to pull sleeve back to expose the LycoRing.
8. Remove the LycoRing.
9. Operate the pump to advance the sleeve over the polyethylene pipe and spigot. Stop sleeve advancement when the sleeve is fully inserted over the spigot.
10. Repeat steps 1 – 9 for the opposite side of the sleeve.
11. Leak test.

Tees, ells and end caps follow the same general procedure as sleeves.

## Appendix C

### Electro Fusion Process

Electro fusing is done where an electrical resistance element is incorporated into the socket of the fitting which, when connected to an appropriate power supply, melts and fuses the materials of the pipe and fitting together. The following is a general procedure for electro fusion:

1. Ensure there is sufficient space to permit access to the jointing area.
2. Check that the pipe ends to be jointed are cut square to the axis and any burrs removed.
3. Wipe pipe ends clean with a lint free cloth to remove any debris. Pipe ends may be washed, but must be dry at the time fusion begins.
4. Measure the depth of penetration of the fitting and put a mark on the pipe at the fitting depth and the half-way point for scraping.
5. Check that the pipe clamps are appropriately sized.
6. Using an appropriate scraper, remove the entire surface of the pipe to the half-way mark.
7. Wipe the scraped surface with an appropriate cleaner to remove any dust residue. Let pipe dry before proceeding.
8. Remove the fitting from its bag and clean the inside with a cleaner. Let dry before proceeding.
9. Insert fitting onto pipe end until they are at the measured mark or stop point.
10. Secure the pipe with pipe clamps so that it may not move during fusion.
11. Check to make sure of alignment.
12. Follow the instructional menu on the electro fusion machine.

