KNOXVILLE UTILITIES BOARD

Addendum No. 2

Project: **Gas & Water Service / Main Line Replacements & Installations**

Control No: **1363**

Issued: **To all listed Plan holders**

Date: **August 7, 2018**

This addendum forms a part of the Contract described above. The original Contract Documents and any prior addenda remain in full force and effect except as modified by the following which shall take precedence over any contrary provisions in prior documents.

See attached sheet for specifics of this addendum.

Each Bidder shall acknowledge receipt of this addendum by affixing his signature below, by noting this addendum on his Bid Form, and by attaching this addendum to his Bid. **Failure to acknowledge this addendum could be cause for bid rejection.**

ACKNOWLEDGMENT

The undersigned acknowledges receipt of this addendum and the Bid submitted is in accordance with information, instructions and stipulations set forth here in.

BIDDER _____

AUTHORIZED SIGNATURE_____

DATE _____

ADDENDUM 2 – Gas & Water Service / Main Line Replacements & Installations

Control No: 1363

Clarifications to Specifications

1. The bid opening date of August 7, 2018 as shown on pages 1 and 3 of Section 00030, Advertisement for Bids and page 1 and 2 of Section 00140, Information for Bidders has been changed to August 10, 2018. Please use the attached pages when submitting the bid.

2. KUB's proposed schedule as found in Item 5 on page 2 of Section 00140, Information for Bidders shall now read as:

   KUB's <u>proposed</u> schedule for this Project is as follows:
   a. Bid documents available on July 20, 2018.
   b. Mandatory pre-bid meeting on **July 27, 2018**, at **10:00AM**, EST, in the Procurement Conference Room at the KUB Hoskins Operations Center, 4505 Middlebrook Pike.
   c. Cut off for questions at 5:00PM, July 31, 2018.
   d. Issue addendum if required by August 2, 2018.
   e. Bid opening on **August 10, 2018**, at **2:00PM**, EST, in the Procurement Conference Room at the KUB Hoskins Operations Center, 4505 Middlebrook Pike.
   f. Award project on or before August 16, 2018.
   g. Notice to Proceed on or before September 1, 2018.

3. The language "*valve, valve box*" has been deleted from the description in line items G1, G2, G3, G7, G8 & G9 in spec section 00330sup Unit Price Schedule. Please replace section 00330sup Unit Price Schedule in its entirety with the attached 00330sup Unit Price Schedule.

4. Replace Spec Section 15345 Natural Gas Polyethylene Service Line Installation in its entirety with the attached spec.

5. Replace Spec Section 15720 Natural Gas Polyethylene Main Installation in its entirety with the attached spec.

END OF ADDENDUM 08/18

SECTION 00030
ADVERTISEMENT FOR BIDS

PROJECT:

KNOXVILLE UTILITIES BOARD
GAS & WATER SERVICE / MAIN LINE REPLACEMENTS & INSTALLATIONS
KNOXVILLE, TENNESSEE

Control Number 1276

Separate sealed bids for the **Gas & Water Service / Main Line Replacements & Installations**, will be received by the Knoxville Utilities Board, an agency of the City of Knoxville, (the "OWNER") 4505 Middlebrook Pike, Knoxville, Tennessee 37921, until **2:00 P.M., local time on August 10, 2018**, and then at said time publicly opened and read aloud.

The Instructions to Bidders, Form of Agreement, Specifications, Forms of Bid Bond and of Performance and Payment Bonds, and other Bidding Documents may be examined at:

Knoxville Utilities Board

Procurement Department

4505 Middlebrook Pike

Knoxville, TN 37921

One full copy of the Bidding Documents may be obtained at Knoxville Utilities Board Procurement Department, 4505 Middlebrook Pike, Knoxville, TN 37921 at no cost to the bidder. Complete sets of Bidding Documents must be used in preparing Bids; the OWNER does not assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

The OWNER, in making copies of the bidding documents available on the above terms, does so only for the purpose of obtaining bids for the work and does not confer a license or grant for any other use.

The OWNER reserves the right to reject any or all Bids and to waive any informalities or minor defects therein. All bidders must agree that such rejection shall be without liability on the part of the OWNER for any damage or claim, including but not limited to loss of profits, savings or

BID CONTRACTOR COVER SHEET

Knoxville Utilities Board requires that this form shall be firmly attached to the outside of the envelope containing the Bid.

Knoxville Utilities Board, Knoxville, Tennessee

PROJECT: GAS & WATER SERVICE / MAIN LINE REPLACEMENTS & INSTALLATIONS

CONTROL NUMBER: 1363

OPENS: 2:00 PM (local time) on August 10, 2018

PART 1 - BIDDER AS PRIME CONTRACTOR: Bidder shall complete this part in accordance with the State of Tennessee T.C.A. Title 62, Chapter 6. (Include **all classifications and sub-classifications** for Bidder's License Number listed)

BIDDER: _____

LICENSE NO: _____

CLASSIFICATION(S): _____

LICENSE EXPIRATION DATE: _____

PART 2 – BIDDER'S ELECTRICAL, PLUMBING, HVAC, or MASONRY SUBCONTRACTORS. Bidder shall complete this part in accordance with the State of Tennessee TCA Title 62, Chapter 6 requirement for listing Electrical, Plumbing, HVAC or Masonry Subcontractors on Bid Cover Sheets.

ELECTRICAL SUBCONTRACTOR:

NAME: _____
LICENSE NO: _____ EXPIRATION DATE: _____
CLASSIFICATION(S): _____

PLUMBING SUBCONTRACTOR:

NAME: _____
LICENSE NO: _____ EXPIRATION DATE: _____
CLASSIFICATION(S): _____

HVAC OR GEOTHERMAL HEATING AND COOLING SUBCONTRACTOR:

NAME: _____
LICENSE NO: _____ EXPIRATION DATE: _____
CLASSIFICATION(S): _____

MASONRY SUBCONTRACTOR:

NAME: _____
LICENSE NO: _____ EXPIRATION DATE: _____
CLASSIFICATION(S): _____

SECTION 00140
INFORMATION FOR BIDDERS

1. Separate sealed bids for the **Gas & Water Service / Main Line Replacements & Installations**, **Control No. 1363**, will be received by the Knoxville Utilities Board, an agency of the City of Knoxville, (the "OWNER") 4505 Middlebrook Pike, Knoxville, Tennessee 37921, until **2:00 p.m. local time, on August 10, 2018**, and then at said time publicly opened and read aloud.

2. **Description of work:**

   The intent of this contract is to provide the installation of gas and water services, on a unit basis, on KUB's natural gas and water systems. From time to time, OWNER may require installation of additional facilities and request additional unit pricing and hourly pricing to accommodate these requests. For any Work greater than $10,000, KUB Personnel reserves the right to coordinate with KUB Procurement and allow the work to be bid within this Agreement, within another existing Agreement, or completed through another publicly advertised project.

   OWNER intends to evaluate all bids and reserves the sole right to enter into agreements with one or more CONTRACTORS based on the results of its evaluations. As OWNER may enter into agreements with multiple contractors, and as OWNER employs its own workforce in the same capacity, OWNER reserves the sole right to assign work according to its best interests. CONTRACTOR acknowledges that entering into an agreement with OWNER to provide Gas & Water Service / Main Line Replacements & Installations, or other associated work, does not obligate OWNER to assign or guarantee any work to CONTRACTOR. Please see scope of work for additional details.

   Crews will be required to work on KUB's gas and water systems. The contractor should be able to tap existing DI, CI, AC, PVC, HDPE, and plastic gas, water, copper water pipe, and plastic gas pipe less than or equal to 8 inches. Examples of work these crews could be assigned includes, but is not limited to,
   - Installing Services / Mains
   - Relocating Services / Mains
   - Upgrading, Relocating or replacing gas risers (all sizes)
   - Relaying or repairing water services
   - Relocating or replacing gas services
   - Replacing a water well and horn
   - Installing anodes on gas services
   - Installing test station and anodes on gas mains
   - Splitting of mains
   - Repairing water service leaks

- Condemning water and gas services
- Pot-holing
- Installation of gas pipeline markers
- Gas and water valve replacements
- Installation of fire lines
- Install fire hydrants
- Install blow offs

CONTRACTOR will provide all labor, materials, equipment, and incidentals as required to perform the Work and to restore the Site to a condition equal to or better than the Site condition, which existed prior to the initiation of the Work activities. Contractor shall provide Traffic Control devices as may be required. The CONTRACTOR shall supply all other incidental items necessary to complete the Work. This shall include all cost required to complete the work including but not limited to supervision, supplies, labor, hand digging, transportation, and equipment.

3. **A mandatory pre-bid meeting will be held on July 27, 2018, at 10:00AM, EST, in the Procurement Conference Room at the KUB Hoskins Operations Center, 4505 Middlebrook Pike. You must attend this meeting to be eligible to bid.** In addition, the meeting will begin promptly at **10:00AM**, and once the meeting commences, no bids will be accepted by KUB from bidders arriving late to the meeting.

4. **This work is to be bid only by KUB pre-qualified contractors in the following areas: 3.2 Water Utility Construction, Unlimited -or- 3.3 Water Utility Construction, $225,000.00 Bid Limit and Nominal 8 inch and under pipe size -and- 4.2 Gas Utility Construction, Unlimited -or- 4.3 Gas Utility Construction, No Bid Limit and Nominal 4 inch and under pipe sizes in HDPE material.** Bids will not be accepted from contractors who are not pre-qualified in at least one of the referenced Water and Gas categories above prior to the bid opening.

5. **KUB's <u>proposed</u> schedule is as follows:**
   A. Bid documents available on July 20, 2018.
   B. Mandatory pre-bid meeting on **July 27, 2018**, at **10:00AM**, EST, in the Procurement Conference Room at the KUB Hoskins Operations Center, 4505 Middlebrook Pike.
   C. Cut off for questions at 5:00PM, July 31, 2018.
   D. Issue addendum if required by August 2, 2018.
   E. Bid opening on **August 10, 2018**, at **2:00PM**, EST, in the Procurement Conference Room at the KUB Hoskins Operations Center, 4505 Middlebrook Pike.
   F. Award project on or before August 16, 2018.
   G. Notice to Proceed on or before September 1, 2018.

PAYMENT SCHEDULE - GAS			
Services (Gas) Polyethylene. This unit includes, but not limited to, all work necessary to install, test and make serviceable, a natural gas service.			
	Description	**Unit**	**Bid Unit Price**
G1	**(1") Short Side Service Installation With (3/4") Riser (100ft or less)** The following unit prices will be utilized for the installation/full replacement of new or existing services for properties on the same side of the road as the gas main including up to 100' of pipe from the main to the meter location, tapping tee, EFV, riser, couplings, tracer wire, tracer wire clip, riser protective sleeve, backfill, cleanup/restoration, pressure test and NGUS as required by Section 15345.	EA	
G2	**(1") Short Side Service Installation With (1 1/4") Riser (100ft or less)** The following unit prices will be utilized for the installation/full replacement of new or existing services for properties on the same side of the road as the gas main including up to 100' of pipe from the main to the meter location, tapping tee, EFV, riser, couplings, tracer wire, tracer wire clip, riser protective sleeve, backfill, cleanup/restoration, pressure test and NGUS as required by Section 15345.	EA	
G3	**(1") Short Side Service Installation With (2") Riser (100ft or less)** The following unit prices will be utilized for the installation/full replacement of new or existing services for properties on the same side of the road as the gas main including up to 100' of pipe from the main to the meter location, tapping tee, EFV, riser, couplings, tracer wire, tracer wire clip, riser protective sleeve, backfill, cleanup/restoration, pressure test and NGUS as required by Section 15345.	EA	
G4	**(1 1/4") Short Side Service Installation With (1 1/4") Riser (100ft or less)** The following unit prices will be utilized for the installation/full replacement of new or existing services for properties on the same side of the road as the gas main including up to 100' of pipe from the main to the meter location, tapping tee, valve, valve box, EFV, riser, couplings, tracer wire, tracer wire clip, riser protective sleeve, backfill, cleanup/restoration, pressure test and NGUS as required by Section 15345.	EA	
G5	**(1 1/4") Short Side Service Installation With (2") Riser (100ft or less)** The following unit prices will be utilized for the installation/full replacement of new or existing services for properties on the same side of the road as the gas main including up to 100' of pipe from the main to the meter location, tapping tee, valve, valve box, EFV, riser, couplings, tracer wire, tracer wire clip, riser protective sleeve, backfill, cleanup/restoration, pressure test and NGUS as required by Section 15345.	EA	
G6	**(2") Short Side Service Installation With (2") Riser (100ft or less)** The following unit prices will be utilized for the installation/full replacement of new or existing services for properties on the same side of the road as the gas main including up to 100' of pipe from the main to the meter location, tapping tee, valve, valve box, EFV, riser, couplings, tracer wire, tracer wire clip, riser protective sleeve, backfill, cleanup/restoration, pressure test and NGUS as required by Section 15345.	EA	
G7	**(1") Long Side Service Installation With (3/4") Riser (150ft or less)** The following unit prices will be utilized for the installation/full replacement of new or existing gas services for properties on the opposite side of the road as the gas main including the road bore, bore pipe, up to 150' of pipe from the longside property line to the meter location, tapping tee, EFV, riser, tracer wire, tracer wire clip, riser protective sleeve, backfill cleanup/restoration, pressure test and NGUS as required by Section 15345.	EA	
G8	**(1") Long Side Service Installation With (1 1/4") Riser (150ft or less)** The following unit prices will be utilized for the installation/full replacement of new or existing gas services for properties on the opposite side of the road as the gas main including the road bore, bore pipe, up to 150' of pipe from the longside property line to the meter location, tapping tee, EFV, riser, tracer wire, tracer wire clip, riser protective sleeve, backfill cleanup/restoration, pressure test and NGUS as required by Section 15345.	EA	
G9	**(1") Long Side Service Installation With (2") Riser (150ft or less)** The following unit prices will be utilized for the installation/full replacement of new or existing gas services for properties on the opposite side of the road as the gas main including the road bore, bore pipe, up to 150' of pipe from the longside property line to the meter location, tapping tee, EFV, riser, tracer wire, tracer wire clip, riser protective sleeve, backfill cleanup/restoration, pressure test and NGUS as required by Section 15345.	EA	
G10	**(1 1/4") Long Side Service Installation With (1 1/4") Riser (150ft or less)** The following unit prices will be utilized for the installation/full replacement of new or existing gas services for properties on the opposite side of the road as the gas main including the road bore, bore pipe, up to 150' of pipe from the longside property line to the meter location, tapping tee, valve, valve box, EFV, riser, tracer wire, tracer wire clip, riser protective sleeve, backfill cleanup/restoration, pressure test and NGUS as required by Section 15345.	EA	
G11	**(1 1/4") Long Side Service Installation With (2") Riser (150ft or less)** The following unit prices will be utilized for the installation/full replacement of new or existing gas services for properties on the opposite side of the road as the gas main including the road bore, bore pipe, up to 150' of pipe from the longside property line to the meter location, tapping tee, valve, valve box, EFV, riser, tracer wire, tracer wire clip, riser protective sleeve, backfill cleanup/restoration, pressure test and NGUS as required by Section 15345.	EA	
G12	**(2") Long Side Service Installation With (2") Riser (150ft or less)** The following unit prices will be utilized for the installation/full replacement of new or existing gas services for properties on the opposite side of the road as the gas main including the road bore, bore pipe, up to 150' of pipe from the longside property line to the meter location, tapping tee, valve, valve box, EFV, riser, tracer wire, tracer wire clip, riser protective sleeve, backfill cleanup/restoration, pressure test and NGUS as required by Section 15345.	EA	

G13	**Service Install 1" PL in (Open Ditch)** (This unit includes but not limited to Contractor providing all materials and installing, stringing, fusing, air testing the pipe, installing tracer wire, warning tape, yellow locator flags, riser installation, and backfill, all per KUB Specifications)	EA	
G14	**Service Tie-In's 1" PL (Linked to new Open Ditch pay item)** (This unit includes but not limited to Contractor providing all materials and all procedures necessary to attach plastic saddle to main with up to 15 feet of service line, excess flow valve and terminated or tie to service line, all per KUB Specifications)	EA	
G15	**Service Install 1 1/4" PL (Open Ditch)** (This unit includes but not limited to Contractor providing all materials and installing, stringing, fusing, air testing the pipe, installing tracer wire, warning tape, yellow locator flags, riser installation, and backfill, all per KUB Specifications)	EA	
G16	**Service Tie-In's 1 1/4" PL (Linked to new Open Ditch pay item)** (This unit includes but not limited to Contractor providing all materials and all procedures necessary to attach plastic saddle to main with up to 15 feet of service line, excess flow valve and terminated or tie to service line, all per KUB Specifications)	EA	
G17	**Adder For 1" Gas Services Over 100/150 Feet Installed With Payment Codes G1-G3 or Payment Codes G7-G9** (This unit will be paid for any (1") service line that exceeds a length of 100 ft. for a short side installation or 150 ft for a long side installation.)	LF	
G18	**Adder For 1 1/4" Gas Services Over 100/150 Feet Installed With Payment Codes G4-G5 or Payment Codes G10-G11** (This unit will be paid for any (1 1/4") service line that exceeds a length of 100 ft. for a short side installation or 150 ft for a long side installation.)	LF	
G19	**Adder For 2" Gas Services Over 100/150 Feet Installed With Payment Code G6 or Payment Code G12** (This unit will be paid for any (2") service line that exceeds a length of 100 ft. for a short side installation or 150 ft for a long side installation.)	LF	
G20	**Excess Flow Valve (400 & 800) Installation** (This unit includes but not limited to payment for Contractor providing all materials and installing the excess flow valve, all per KUB Specifications)	EA	
G21	**Adder For (1800) PE excess flow valve**	EA	
G22	**Adder For (2600) PE excess flow valve**	EA	
G23	**(3/4") Riser Installation (Replacement)** (This unit includes but not limited to payment for Contractor providing all materials and installing the prefabricated riser, 90, meter cock and by-pass valve, all per KUB Specifications)	EA	
G24	**(1 1/4") Riser Installation (Replacement/upgrade)** (This unit includes but not limited to payment for Contractor providing all materials and installing the prefabricated riser, 90, meter cock and by-pass valve, all per KUB Specifications)	EA	
G25	**(2") Riser Installation (Replacement/upgrade)** (This unit includes but not limited to payment for Contractor providing all materials and installing the prefabricated riser, 90, flange, bolts, by-pass valve, blind flange and riser valve, all per KUB Specifications)	EA	
G26	**(3/4") Riser Relocation** (This unit includes but not limited to payment for Contractor providing all materials and installing the prefabricated riser, 90, meter cock, by-pass valve, flange, bolts, blind flange and/or riser valve, all per KUB Specifications)	HR	
G27	**(1 1/4") Riser Relocation** (This unit includes but not limited to payment for Contractor providing all materials and installing the prefabricated riser, 90, meter cock, by-pass valve, flange, bolts, blind flange and/or riser valve, all per KUB Specifications)	HR	
G28	**(2") Riser Relocation** (This unit includes but not limited to payment for Contractor providing all materials and installing the prefabricated riser, 90, meter cock, by-pass valve, flange, bolts, blind flange and/or riser valve, all per KUB Specifications)	HR	
G29	**Condemn Gas Service (2" or less outside pavement)** Condemn gas facilities, to include but not be limited to, the disconnecting, purging and sealing of existing facilities as indicated on the drawings, removal of valve boxes no longer in service and any above ground appurtenances, backfill, & cleanup/restoration.	EA	
G30	**Condemn Gas Service (2" or less in pavement)** Condemn gas facilities, to include but not be limited to, the disconnecting, purging and sealing of existing facilities as indicated on the drawings, removal of valve boxes no longer in service and any above ground appurtenances, backfill, asphalt/concrete restoration, & cleanup/restoration.	EA	
G31	**Pipeline Marker Installation (standard)** (This unit includes but not limited to payment for Contractor for installation of KUB provided standard pipeline marker, all per KUB Specifications)	HR	
G32	**Pipeline Marker Installation (with tracer wire)** (This unit includes but not limited to payment for Contractor for installation of KUB provided pipeline marker with tracer wire connections, all per KUB Specifications)	HR	
G33	**Service Crew** (This unit shall imply a crew of a minimum 2 persons and shall include but not limited to all adequate and appropriate working equipment and labor suitable to perform all aspects of the assigned job. This rate shall include but not be limited to locating, condemning existing facilities, relocating services, replacing gas risers, installing line markers, etc. This will be assigned and used by approval from a KUB Representative only. KUB will not pay for crew hour work unless approval for such work has been given and documented by a KUB Representative. Any materials used toward additional service crew work will be paid based on the prices listed.)	HR	

Mains (Gas) Polyethylene. This unit includes, but not limited to, all work necessary to install, test and make serviceable, a natural gas main.			
G34	**(2") Plastic Main Crew** (This unit shall imply a crew of a minimum 3 persons and shall include but not be limited to all adequate and appropriate working equipment and labor suitable to perform all aspects of the assigned job. This rate shall include but not be limited to locating, condemning, relocating existing facilities, etc. This will be assigned work and used by approval from a KUB Representative only. KUB will not pay for crew hours unless approval for such work has been given and documented by a KUB Representative. Any materials used toward additional service crew work will be paid based on the prices listed.)	HR	
G35	**(4") Plastic Main Crew** (This unit shall imply a crew of a minimum 3 persons and shall include but not be limited to all adequate and appropriate working equipment and labor suitable to perform all aspects of the assigned job. This rate shall include but not be limited to locating, condemning, relocating existing facilities, etc. This will be assigned work and used by approval from a KUB Representative only. KUB will not pay for crew hours unless approval for such work has been given and documented by a KUB Representative. Any materials used toward additional service crew work will be paid based on the prices listed.)	HR	
G36	**(8") Plastic Main Crew** (This unit shall imply a crew of a minimum 3 persons and shall include but not be limited to all adequate and appropriate working equipment and labor suitable to perform all aspects of the assigned job. This rate shall include but not be limited to locating, condemning, relocating existing facilities, etc. This will be assigned work and used by approval from a KUB Representative only. KUB will not pay for crew hours unless approval for such work has been given and documented by a KUB Representative. Any materials used toward additional service crew work will be paid based on the prices listed.)	HR	
Boring - All boring must be approved by KUB before payment for boring will be allowed. This unit includes, but not limited to, Contractor providing all materials, tools, equipment and permits necessary to perform the job. Contractor shall be paid a minimum of fifty (50) linear foot.			
G37	**1" Bore Price Dirt**	LF	
G38	**1.25" Bore Price Dirt**	LF	
G39	**2" Bore Price Dirt**	LF	
G40	**4" Bore Price Dirt**	LF	
G41	**8" Bore Price Dirt**	LF	
G42	**12" Bore Price Dirt**	LF	
Additional Unit Prices			
G43	**Trip Charge** (This unit includes no work performed by Contractor's crew. KUB reserves the right to dispute this pay item and KUB's decision shall be final.)	EA	
G44	**Traffic Control**	HR	
G45	**Asphalt Restoration**	SF	
G46	**Concrete Restoration**	SF	
G47	**Seed & Straw**	SF	
G48	**Erosion Matting**	SF	
G49	**Stone Backfill**	TON	
G50	**Dump Truck**	HR	
G51	**Hoe ram**	DAY	
G52	**Rock Saw**	LF	

Payment Schedule – Water

Services Water; Polyethylene, copper. This unit includes, but not limited to, all work necessary to install, test and make serviceable, a water service.			
Payment	**Description**	**Unit**	
W1	**(3/4") Short Side Service Installation on existing lateral** (This unit includes but not limited to Contractor providing all material, except water meter, and installing, testing chlorine residual, all per KUB Specifications)	EA	
W2	**(3/4") Short Side Service Installation - 30' or less with (¾") meter assembly** (This unit includes but not limited to Contractor providing all material, except water meter, and installing, testing chlorine residual, tracer wire, all per KUB Specifications) Service taps on existing main type (HDPE, DI, CI, AC, PVC)	EA	
W3	**(1") Short Side Service Installation - 30' or less with (¾") meter assembly** (This unit includes but not limited to Contractor providing all material, except water meter, and installing, testing chlorine residual, tracer wire, all per KUB Specifications) Service taps on existing main type (HDPE, DI, CI, AC, PVC)	EA	
W4	**(1") Short Side Service Installation - 30' or less with (1") meter assembly** (This unit includes but not limited to Contractor providing all material, except water meter, and installing, testing chlorine residual, tracer wire, all per KUB Specifications) Service taps on existing main type (HDPE, DI, CI, AC, PVC)	EA	
W5	**(2") Short Side Service Installation - 30' or less with (1 ½") meter assembly** (This unit includes but not limited to Contractor providing all material, except water meter, and installing, testing chlorine residual, tracer wire, all per KUB Specifications) Service taps on existing main type (HDPE, DI, CI, AC, PVC)	EA	

W6	**(2") Short Side Service Installation - 30' or less with (2") meter assembly** (This unit includes but not limited to Contractor providing all material, except water meter, and installing, testing chlorine residual, tracer wire, all per KUB Specifications) Service taps on existing main type (HDPE, DI, CI, AC, PVC)	EA	
W7	**(3/4") Long Side Service Installation - 60' or less with (¾") meter assembly** (This unit includes but not limited to Contractor providing all material, except water meter, and installing, boring, testing chlorine residual, tracer wire, all per KUB Specifications) Service taps on existing main type (HDPE, DI, CI, AC, PVC)	EA	
W8	**(1") Long Side Service Installation - 60' or less with (¾") meter assembly** (This unit includes but not limited to Contractor providing all material, except water meter, and installing, boring, testing chlorine residual, tracer wire, all per KUB Specifications) Service taps on existing main type (HDPE, DI, CI, AC, PVC)	EA	
W9	**(1") Long Side Service Installation - 60' or less with (1") meter assembly** (This unit includes but not limited to Contractor providing all material, except water meter, and installing, boring, testing chlorine residual, tracer wire, all per KUB Specifications) Service taps on existing main type (HDPE, DI, CI, AC, PVC)	EA	
W10	**(2") Long Side Service Installation - 60' or less with (1 ½") meter assembly** (This unit includes but not limited to Contractor providing all material, except water meter, and installing, boring, testing chlorine residual, tracer wire, all per KUB Specifications) Service taps on existing main type (HDPE, DI, CI, AC, PVC)	EA	
W11	**(2") Long Side Service Installation - 60' or less with (2") meter assembly** (This unit includes but not limited to Contractor providing all material, except water meter, and installing, boring, testing chlorine residual, tracer wire, all per KUB Specifications) Service taps on existing main type (HDPE, DI, CI, AC, PVC)	EA	
W12	**Service Crew** (This unit shall imply a crew of a minimum 2 persons and shall include but not limited to all adequate and appropriate working equipment and labor suitable to perform all aspects of the assigned job. This rate shall include but not be limited to locating, condemning existing facilities, relocating services, etc. This will be assigned and used by approval from a KUB Representative only. KUB will not pay for crew hour work unless approval for such work has been given and documented by a KUB Representative. Any materials used toward additional service crew work will be paid based on the prices listed.)	HR	
Mains and Large Services; Water: Polyethylene, Copper, Ductile Iron. This unit includes, but not limited to, all work necessary to install, test and make serviceable, a water main.			
W13	**(2") Main Crew** (This unit shall imply a crew of a minimum 3 persons and shall include but not be limited to all adequate and appropriate working equipment and labor suitable to perform all aspects of the assigned job. This rate shall include but not be limited to locating, condemning, relocating existing facilities, etc. This will be assigned work and used by approval from a KUB Representative Only. KUB will not pay for crew hours unless approval for such work has been given and documented by a KUB Representative. Any materials used toward additional service crew work will be paid based on the prices listed.)	HR	
W14	**(8") Main Crew** (This unit shall imply a crew of a minimum 3 persons and shall include but not be limited to all adequate and appropriate working equipment and labor suitable to perform all aspects of the assigned job. This rate shall include but not be limited to locating, condemning, relocating existing facilities, etc. This will be assigned work and used by approval from a KUB Representative Only. KUB will not pay for crew hours unless approval for such work has been given and documented by a KUB Representative. Any materials used toward additional service crew work will be paid based on the prices listed.)	HR	
Boring - All boring must be approved by KUB before payment for boring will be allowed. This unit includes, but not limited to, Contractor providing all materials, tools, equipment and permits necessary to perform the job. Contractor shall be paid a minimum of fifty (50) linear foot.			
W15	**3/4" & 1" Bore Price Dirt**	LF	
W16	**2" Bore Price Dirt**	LF	
W17	**6" & 8" Bore Price Dirt**	LF	
W18	**12" Bore Price Dirt**	LF	
Additional Unit Prices			
W19	**Adder For Trip Charge** (This unit includes no work performed by Contractor's crew. KUB reserves the right to dispute this pay item and KUB' S decision shall be final.)	EA	
W20	**Traffic Control**	HR	
W21	**Asphalt Restoration**	SF	
W22	**Concrete Restoration**	SF	
W23	**Seed & Straw**	SF	
W24	**Erosion Matting**	SF	
W25	**Stone Backfill**	TON	
W26	**Dump Truck**	HR	
W27	**Hoe ram**	DAY	
W28	**Rock Saw**	LF	

SECTION 15345

NATURAL GAS POLYETHYLENE SERVICE LINE INSTALLATION

TABLE OF CONTENTS

PART 1 GENERAL

1.1 The work to be performed herein shall consist of the installation of new, reconnected, or replacement medium density polyethylene (MDPE or PE) iron pipe size (IPS) service lines operating at or below a maximum allowable operating pressure (MAOP) of 60 pounds per square inch gauge (psig), which includes, but not limited to PE pipe and all appurtenances related to the construction of the service. All work shall be performed in accordance with this Section in conjunction with all additional project drawings and standards and specifications that may or may not be referred to in this Section.

1.2 KUB Standards and Specifications for Natural Gas Polyethylene 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 Federal Safety Standards (hereafter referred to as "MFSS").

1.3 DEFINITIONS:

1.3.1 **Branched Service** means a service line that has been tapped, teed, or split to feed two separate customers.

1.3.2 **Butt Fusion** means 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 homogeneous bond.

1.3.3 **Depth** means the distance from the top of the distribution line to finished grade.

1.3.4 **Distribution Line** is a pipeline other than a gathering or transmission line.

1.3.5 **IPS** means Iron Pipe Size (for PE pipe nominal inside diameters).

1.3.6 **Main** means a distribution line that serves as a common source of supply for more than one service line.

1.3.7 **New Service** means a service line to a customer that is newly installed.

1.3.8 **NGUS** means Natural Gas Utility Sheet: A document to be filled out by the installer of a natural gas service line. A NGUS is required for any work performed on a service line.

1.3.9 **Pipeline** means all parts of those physical facilities through which natural gas moves in transportation, including pipe, valves, and other appurtenances attached to pipe, compressor units, metering stations, regulator stations, delivery stations, holders, and fabricated assemblies.

1.3.10 **Reconnected Service Line** means an existing service line that has been disconnected from a main and reconnected to the same or different gas main for purposes of pressure testing.

1.3.11 **RPR** means the Gas Systems Engineering Representative(s) assigned to the site.

1.3.12 **SDR** means Standard Dimension Ratio (for PE pipe outside diameter divided by the minimum pipe wall thickness).

1.3.13 **Service Line** means a distribution line that transports gas from a common source of supply to a customer. A service line starts at the point of connection to the main and ends at the outlet of the customer meter or at the connection to a customer's piping, whichever is further downstream.

1.3.14 **Socket Fusion** means the method of joining PE 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 the inside surface of the coupling are heated to a molten state. The pipe is then pressed into the opening of the coupling.

PART 2 SAFETY

2.1 Refer to General Conditions 00700, 6.13. In addition to conditions noted in Section 00700, FR PPE is required during purging activities. All ignition sources shall be removed from the area during purging activities.

PART 3 EXECUTION

3.1 GENERAL SERVICE LINE INSTALLATION

3.1.1 Service lines shall not be installed under buildings, permanent structures, or future/proposed structures.

3.1.2 Service lines shall be installed below ground.

3.1.3 Service lines shall be installed in the most direct or shortest path feasible between the gas main and the meter location and in accordance with the project drawings. Where possible, the service line should be installed perpendicular to the main.

3.1.4 Materials not supplied through KUB Storerooms shall be submitted for approval for use to KUB Gas Systems Engineering prior to construction of the pipeline.

3.1.5 All pipe fusion connections shall be allowed to cool as required by the qualified joining procedures for socket or saddle fusion prior to lowering the pipe into the trench and/or excavation to eliminate stress on the fused connections.

3.1.6 Installation methods placing a tensile load on the PE pipe shall be done in accordance with ASTM F1804, Standard Practice for Determining Allowable Tensile Load for Polyethylene (PE) Gas Pipe During Pull-in Installation.

3.1.7 Each service line should be installed with at least 12 inches of clearance from any other utility or existing or proposed above ground structure including but not limited to buildings, retaining walls, and any below grade footing and/or foundation(s). If 12 inches of clearance cannot be obtained, protection from potential damage is required and shall be approved by the RPR, and additional protection shall be documented on the NGUS.

3.1.8 When crossing a heat source, including but not limited to a steam line, installation of PE pipe shall follow the utility crossing detail, **Detail 1: Crossing a Heat Source** in **Section 15720.**

3.1.9 All PE to PE pipe connections shall be made by socket fusion or saddle fusion. Butt fusion shall be acceptable only for pipe larger than 2 inch nominal diameter and shall be installed per **Section 15720**. All electrofusion fittings not specified in the project drawings shall be approved for use, by the RPR, prior to installation.

3.1.10 Only IPS PE pipe shall be installed for natural gas service lines, unless approved by RPR.

3.1.11 New service lines shall not be connected to any existing service lines. If a branched service line is discovered, it shall be split into two separate service lines, unless both service lines are on one property with one owner.

3.1.12 Prior to connecting a service line to a main, the depth of the main shall be confirmed to meet the MFSS minimum depth of 24 inches. If the natural gas main does not meet the MFSS minimum depth requirements, RPR shall be contacted prior to connecting the service line to the main as additional measures may be required to protect the connection.

3.1.13 All service lines with a nominal diameter of 2 inches and 50 feet in length or longer shall be pigged prior to pressure testing and introducing natural gas to the service line.

3.1.14 Service lines larger than 2 inch nominal diameter shall be installed to Section 15720 standards and specifications, with exception to pressure testing times and project drawings for that service line.

3.1.15 All service lines shall be locatable by tracer wire. Only services lines that are locatable by the installed tracer wire will be accepted.

3.1.16 All equipment shall be properly calibrated per the manufacturer's guidelines.

3.1.17 Service lines that do not have meters installed upon completion of installation shall have a lock (KUB Item #585971) installed on the meter valve.

3.2 HANDLING OF MATERIALS

3.2.1 PE pipe and components must be stored to prevent damage from ultraviolet (UV) rays. PE pipe and components with a print line dating back further than 729 calendar days shall not be installed.

3.2.2 For multiyear projects, CONTRACTOR shall submit, for approval, a pipe storage and protection plan to the OWNER. The pipe storage and protection plan shall address long term storage (greater that 729 calendar days) including how to protect pipe from UV degradation.

3.2.3 PE pipe may be stored by stacking, but only permitted if stacked pipe is lying flat.

3.2.4 When PE pipe is transported, it must be loaded, transported, and unloaded in a manner to prevent damage.

3.2.5 PE pipe shall be stored with manufacturer end caps in place.

3.2.6 When transporting pipe segments, pipe shall not be dragged across any type of hard surface such as pavement or rocks without protection from damage. RPR reserves the right to reject any pipe dragged across any type of pavement, rocks, or other hard surfaces.

3.2.7 A self-performed thorough inspection of the pipe and components shall be conducted to guarantee quality assurance prior to installation and backfilling. Any damages to the pipe shall be communicated to the RPR for review prior to installation. If found after installation, damages shall be reported immediately to the RPR. Natural gas shall not be introduced into the pipe without the RPR's approval after review of the damages. In the event damage (e.g., scratches, gouges, and deformation from stressing the pipe) is present and the pipe wall thickness is compromised greater than 10%, the damaged section shall be cut out and not used. RPR reserves the right to fail segments or sections of damaged pipe or components. These damaged sections shall be replaced with no additional cost to the OWNER.

3.2.8 CONTRACTOR shall not perform any repairs to existing pipe or new pipe that has been placed into service.

3.3 INSTALLATION METHODS

3.3.1 Open Trench

3.3.1.1 Service lines shall be laid and continuously supported on undisturbed or well-compacted soil. At a minimum, well compacted soil is defined as machine tamped. PE piping shall not be laid on blocks, rocks, or large dirt clods. Refer to **3.12 BACKFILL** for defined backfill requirements.

3.3.1.2 Service lines shall be installed along the bottom of the trench to accommodate for expansion and contraction. (PE pipe will contract 1 inch per 10 degrees F temperature drop for every 100 feet of unrestrained PE pipe.)

3.3.1.3 When fusing coil pipe to coil pipe, join the coils so the curvature of one coils is directly opposite to the curvature of the other coil to minimize bending stresses at the joint.

3.3.1.4 Prior to backfilling, the trench shall be examined to ensure the service line is continuously supported at all points. #12 gauge solid copper tracer wire (KUB Item #383448) shall be installed directly above and within 6 inches of the service line. Refer to Section 15105 for tracer wire requirements.

3.3.1.5 Warning tape (KUB Item #371534) shall be installed 6 to 12 inches below existing or proposed final grade directly above the PE service line.

3.3.1.6 The trench width shall be wide enough to allow for inspection once pipe is lowered into the trench as well as for compaction around the pipe to prevent trench settlement. The minimum requirements for trench width are in **TABLE 1: Minimum Trench Width**.

TABLE 1: Minimum Trench Width

	Trench Width (inches)	
Pipe Size (inches)	Soil (minimum)	Rock (minimum)
½	4	6
1	4	6
2	6	12

3.3.1.7 When lowering pipe and/or components into the trench and/or excavations, the pipe shall not be subjected to excessive twisting and/or bending stresses. At lower temperatures, flexibility of the pipe is greatly reduced and could potentially be damaged by excessive force. RPR reserves the right to reject any and all pipe and/or components that may have been compromised due to excessive stresses.

3.3.2 Horizontal Directional Drilling (Boring)

3.3.2.1 PE pipe installed by horizontal directional drilling shall have #12 gauge copper-clad steel tracer wire (KUB #363069) pulled back with the pipe. Multiple tracer wires (no less than 2) can be pulled together in the event a tracer wire breaks during installation ensuring the natural gas service line is locatable after installation. Refer to Section 15105 for tracer wire requirements.

3.3.2.2 A frac-out plan shall be provided to RPR for review prior to boring. All materials and equipment to mitigate a frac-out, as stated in the frac-out plan, shall be readily available on site prior to beginning the bore. If a frac-out occurs, the frac-out plan shall be immediately implemented, followed by immediate notification to the RPR.

3.3.2.3 When pulling the pipeline back through reamed borehole, the tensile loads in **TABLE 2: Maximum Allowable Tensile Loads** below shall not be exceeded. RPR shall be notified one full business day prior to pull back operations and may require on-site presence during pull back operations. An appropriately sized Condux International, Inc break away swivel weak link shall be used during pull back activities. Break away weak link devices other than Condux International products shall be submitted for approval to OWNER prior to use.

TABLE 2: Maximum Allowable Tensile Loads

Nominal Pipe Size (inches)	Allowable Tensile Load (pounds)	Swivel Size (millimeters)	Pin Rating (pounds)	Pin Color
½	181	22	150	Slate/Violet
1	444	22	400	Blue/Black
1 ¼	770	22	750	Orange/Violet
2	1441	22	1400	Green/Red

3.3.3 Plowing

3.3.3.1 PE pipe installed by plowing shall not be larger than 1 inch in nominal diameter and shall have #12 gauge copper-clad steel tracer wire (KUB Item #363069) installed with the pipe. Refer to Section 15105 for tracer wire requirements.

3.3.3.2 When plowing in the service line, the tensile loads in **TABLE 2: Maximum Allowable Tensile Loads** shall not be exceeded. To prevent exceeding the maximum allowable tensile loads, an appropriately sized Condux International, Inc break away swivel weak link shall be used.

3.3.4 Insertion (Sleeving)

3.3.4.1 Installing PE pipe by insertion will only be permitted if the casing pipe has a minimum of 1 inch nominal diameter and is no shallower than 12 inches deep at any location.

3.3.4.2 IPS pipe shall be used on all new service lines installed by insertion.

3.3.4.3 Prior to inserting the new PE pipe into the existing pipe, all sharp edges of the casing pipe shall be dulled.

3.3.4.4 After fully inserting the PE pipe into the casing pipe, 50 Grit Emery Cloth (KUB Item #370023) shall be installed between the carrier pipe ends and the casing pipe with the smooth side facing the carrier pipe and the rough side facing the casing pipe and taped in place with Tapecoat H50 Gray Tape (KUB Item #360671 or #360682) to prevent damage during expansion and contraction of the PE service line.

3.3.4.5 All inserted service lines shall be made locatable by cad welding tracer wire to the metallic casing pipe.

3.3.4.6 Unlocatable inserted service lines will not be accepted by OWNER.

3.4 DEPTH

3.4.1 Service lines shall be installed within the depths illustrated in **TABLE 3: Service Line Installation Depths** below.

TABLE 3: Service Line Installation Depths

Nominal Pipe Size (inches)	City/County/State Right-of-Way		Customer Property/KUB Easement	
	Minimum	Maximum	Minimum	Maximum
½-1	36 inches	60 inches	18 inches	60 inches
1-¼ - 2	36 inches	60 inches	24 inches	60 inches

3.4.2 If depth requirements cannot be met, approval shall be obtained from RPR on an individual service line basis, prior to installation. Service lines installed shallower than the depth specified may be required to have additional protective measures.

3.4.3 Service lines installed shallower than the minimum or deeper than the maximum depth shall be noted on the Natural Gas Utility Sheet.

3.5 SERVICE LINE TAP

3.5.1 The critical stress area for PE service lines is at the tapping tee. This section of pipe shall be protected using the support sleeve included with the tapping tee for PE mains, even if the service line is looped. The support sleeve shall be installed on all service lines without a shut off valve.

3.5.2 If the tapping tee assembly does not have a support sleeve with it, a 2 inch diameter, 12 to 18 inches long PE pipe shall be used as a support sleeve for ½ inch and 1 inch service lines.

3.5.3 Backfill shall be well compacted around the tapping tee to provide sufficient support and special care taken not to damage the tapping tee and pipe during compaction.

3.5.4 If the new PE service line is to be installed by a CONTRACTOR and connected to steel main, KUB's Underground Construction shall install the tapping tee and perform the main tap.

3.5.5 Service line connections to PE main, by use of tapping tees, shall be located on top of the main.

3.5.6 Service line connections to PE mains must be allowed to completely cool before pressure testing the service line in accordance with manufacturer's standards and specifications or tapping the main if the service line and main are pressure tested together.

3.5.7 Tapping tee caps shall be tightened according to the manufacturer's specifications.

3.6 SERVICE LINE SHUT OFF VALVE

3.6.1 Service line shut off valves shall be installed on all residential services larger than 1 inch nominal diameter, for all service lines with a 10 psig MAOP, and all commercial services.

3.6.2 The service line shut off valve shall be installed at the tapping tee, unless approved by RPR.

3.6.3 Service line shut off valves shall not be installed in existing or proposed pavement, unless stated in project drawings or approved by RPR.

3.6.4 When installing a service line shut off valve, the valve box shall be installed per **3.18 VALVE BOXES**.

3.6.5 **TABLE 4: Shut Off Valve and Excess Flow Valve Requirements by Service Type** in the next section illustrates valve requirements for each natural gas service type.

3.7 EXCESS FLOW VALVE

3.7.1 Excess flow valves (EFV) shall be installed with 26 inches of pipe from the outlet of the tapping tee to the fused on EFV connection. **TABLE 4: Shut Off Valve and Excess Flow Valve Requirements by Service Type** illustrates valve requirements for each natural gas service type.

TABLE 4: Shut Off Valve and Excess Flow Valve Requirements by Service Type

Service Type	Shut Off Valve	Excess Flow Valve
A single service line to a Single Family Residence with a diameter of 1 inch or smaller (See **TABLE 5**)	No	Yes
A single service line to a Single Family Residence with a diameter greater than 1 inch (See **TABLE 5**)	Yes	Yes
A single service line to a Multi-Family Residence with known customer loads less than or equal to 1,000 SCFH (See **TABLE 6**)	Yes	Yes
A single service line to a Multi-Family Residence with known customer loads greater than 1,000 SCFH	Yes	No
A single, commercial customer served by a single service line with a known customer load less than or equal to 1,000 SCFH (See **TABLE 6**)	Yes	Yes
A single, commercial customer served by a single service line with a known customer load greater than 1,000 SCFH	Yes	No
A service line to multiple commercial customers served by a single service line	Yes	No
A service line operating with a 10 psig MAOP serving any customer(s).	Yes	No

3.7.2 EFV size shall be determined by Gas Systems Engineering and is defined in the project drawings. If the existing site conditions have changed between the time the project drawings were developed and the work is to be performed, the installer shall cease work and notify the RPR for clarification prior to continuing work.

3.7.3 If the project drawings do not reflect EFV size, installer shall use **TABLE 4: Shut Off Valve and Excess Flow Valve Requirements by Service Type** to determine if an EFV is required, and if an EFV is required, use the appropriate tables below when installing an EFV for residential (**TABLE 5**) or commercial (**TABLE 6**) service lines. If the parameters for the service requiring the EFV are not covered in **TABLE 5** or **TABLE 6**, contact the RPR for clarification prior to continuing work.

TABLE 5: EFV's For Residential Service Lines (60 PSIG MAOP)

Service Line Length (feet)	Total Connected Load (Standard Cubic Feet Per Hour)			
	0-350	351-600	601-1600	1601-2300
0-325	½ inch – 400	½ inch – 800	1 inch – 1800	1-1/4 inch – 2600
326-630	½ inch – 400	1 inch – 800	1 inch – 1800	1-1/4 inch – 2600
631-1000	½ inch – 400	1 inch – 800	1-1/4 inch – 1800	2 inch – 2600

TABLE 6: EFV's For Multi-Family Residential or Commercial Service Lines (60 PSIG MAOP)

Service Line Length (feet)	Total Connected Load (Standard Cubic Feet Per Hour)	
	0-600	601-1000
0-500	1 inch – 800	1 inch – 1800

3.7.4 The EFV nominal diameter shall match the nominal diameter for the entire service line. Mismatching nominal diameters between the EFV and service line shall not be permitted unless instructed to do so by Gas Systems Engineering on a case by case basis.
3.7.5 EFV's shall not be installed on services operating at or below 10 psig.
3.7.6 Only heat fused EFVs shall be installed.
3.7.7 All service lines with an EFV installed shall have a tag or other OWNER approved EFV label attached to the riser. The tag or label shall be visible in plain sight for field verification of the EFVs presence.
3.7.8 The diameter and flow rating of the EFV installed shall be recorded on the NGUS.
3.7.9 Service lines taken out of service (disconnected from the gas main) and reconnected to a gas main shall have a new EFV installed or documented verification of existing EFV, even if the service line is not replaced.

3.8 ANODELESS RISER

3.8.1 Only anodeless risers shall be installed on PE service lines.
3.8.2 Anodeless risers shall not be installed on any metallic service lines.
3.8.3 Reconnected PE service lines shall not be placed back into service with a steel riser.
3.8.4 Risers shall be installed according to the project drawings, job package, or job site markings. Conditions may change on site in between project planning and construction. Risers shall not be installed in proposed locations not in compliance with this Section. If site conditions have changed, RPR shall be notified and will provide installer with instructions on how to proceed.
3.8.5 Risers shall be installed in a readily accessible, outdoor, ventilated, and aboveground location to ensure proper venting of the relief assembly. The location should be free of trees, shrubs, and any other items that will prevent accessibility for maintenance activities.
3.8.6 Risers shall be installed to allow gas to readily ventilate. Locations to avoid installation include, but are not limited to, areas directly below roof valleys, roof downspouts, decks, or building overhangs.
3.8.7 Risers shall not be installed such that the relief assembly will be located within 3 feet from any opening that could allow escaping natural gas to enter a structure without RPR approval. Openings include, but are not limited to, dryer, furnace, or foundation vents and fresh air intakes.
3.8.8 Risers shall not be installed under or immediately in front of operable windows.
3.8.9 Risers shall not be installed such that the relief assembly will be located within 3 feet of any ignition sources including, but not limited to, air conditioners, furnaces, and electrical circuits, breaker boxes, meters, and receptacles.
3.8.10 Risers shall not be installed within 10 feet of fire department connection (FDC), under stairways or other structure openings that may be utilized as emergency exits.
3.8.11 Risers should not be installed near any type of driveway or location where it is likely to be struck by a motor vehicle. If a riser is installed near a driveway or such location, protective bollards shall be installed. See **3.19 BOLLARDS** for bollard installation.
3.8.12 Manufacturer bent anodeless risers shall be installed for riser sizes less than 2 inch nominal diameter for connection with PE service lines.
3.8.13 When installing the riser, do so in a manner where the riser and fuel line piping (not the PE service line) supports the weight of the meter.

3.8.14 Risers requiring cathodic protection shall not be installed unless instructed to do so by Gas Systems Engineering.

3.8.15 Risers shall be installed in relation to the fuel line and building according to **TABLE 7** below.

TABLE 7: Location For Riser Installation

Riser Size	Distance To Building Wall	Distance To Fuel Line
¾ inch	12-18 inches	18 inches
1 ¼ inch	18-24 inches	36 inches
2 inch	30 inches	36 inches

3.8.16 Risers shall be installed through a PVC, MDPE or HDPE pipe as a protective sleeve that is a minimum of 4 inches long installed 2 inches below the transition on the riser. See the **TABLE 8** below for appropriately sized protective sleeves.

TABLE 8: Protective Sleeve Sizes for Risers

Riser Size	Protective Sleeve Size
¾ inch	2 inch Diameter
1 ¼ inch	3 inch Diameter
2 inch	3 inch Diameter

3.8.17 Anodeless risers are marked with the correct burial depth, noted as "GROUND LEVEL HERE." Anodeless risers installed at a depth where the marking is not visible shall be raised for OWNER acceptance.

3.8.18 The riser shall be installed to be vertically plumb.

3.9 METER VALVE

3.9.1 The meter valve (meter cock) shall be installed in the field. Meter valves installed on the riser by the manufacturer are not permitted.

3.9.2 The operating nut for the meter valve shall be on the outside of the proposed meter set with the locking mechanism facing away from the building.

3.9.3 Threaded connections shall be tightened according to manufacturer's installation procedures with a sealing compound containing Teflon (KUB Item #360800). For consistent sealing, threads must be sealed with solid, liquid, paste, or tape sealants. Threaded connections shall be soap-tested for leaks during the pressure test.

3.10 BACKFILL

3.10.1 Backfill shall be free from any material that could cause damage to the pipe including, but not limited to: refuse, large rocks, sharp rocks, large dirt clods, and/or any construction debris or trash.

3.10.2 In rocky excavation zones, a minimum of 6 inches of clean and well-compacted fill material shall be installed prior to the pipe being lowered into the trench. The pipe is then installed and side filled to the required trench width with clean and compacted fill material. Pipe shall be covered with a minimum of 6 inches of clean and well-compacted fill material prior to final backfill.

3.10.3 Clean backfill is defined as native materials, manufactured fill and/or delivered soil containing a maximum particle size of ½ inch diameter.

3.10.4 Backfill shall be free from contaminants. If native material has smell, sheen, discoloration, debris or any uncommon substances, work shall stop immediately and RPR notified. All native materials shall be held on site in a manner to limit cross contamination.

3.10.5 Backfill and side fill shall be well compacted around all PE pipe and components with special care taken not to damage the service line during compaction. At a minimum, well compacted soil is defined as machine tamped.

3.10.6 Backfill shall be installed in manner that protects the pipe service line from damages including but not limited to bends, crushing, gouges, and punctures.

3.10.7 Large rock is defined as having a diameter greater than 2 inch. If large rock is discovered during the excavation process, installer shall use clean backfill as defined in 3.10.3.

3.10.8 Backfilling a trench/excavation in a non-paved area shall be well compacted in a manner to prevent future below grade settling. At a minimum, well compacted soil is defined as machine tamped in 12 inch lifts.

3.10.9 Backfilling in a paved area shall be in compliance with TDOT, City of Knoxville, and Knox County requirements as noted in the project drawings.

3.10.10 Warning tape should be installed as stated in 3.3.1.5 in all open trench/excavation areas 6-12 inches below existing or proposed final grade directly above the PE service line.

3.11 PIGGING

3.11.1 Service lines with a nominal diameter of 2 inch or larger and longer than 50 feet shall be pigged until proven to be clean and dry. Based on the last pig run, there shall be no loose debris and no free liquids. RPR reserves the right to require additional pigging. RPR may require additional pigs to be new and unused.

3.11.2 RPR shall be notified, at a minimum, one full business day prior to pigging a service line.

3.11.3 Pig shall be caught as it exits pipe in a manner that ensures prevention of property damage, injury to employees, and injury to the public.

3.11.4 The inside of the service line shall remain clean and dry after pigging is complete.

3.11.5 If a service line is not connected to the main immediately, a fused on end cap shall be installed to assure the service line stays clean of debris and liquids.

3.12 PRESSURE TESTING

3.12.1 Pressure testing shall be performed for every service line and its components installed, including the service line connection to the main, whether the service line is newly installed or being tied over to a newly installed natural gas main.

3.12.2 If a service line is disconnected from the main, it shall pass a pressure test before having natural gas reintroduced.

3.12.3 Pipe and its components being pressure tested shall be restrained against possible movement. Backfill can be an appropriate restraint.

3.12.4 Every service line shall be pressure tested with inert gas or air free of contaminants to a minimum of 92 psig and a maximum of 96 psig. The pressure test shall establish an MAOP of 60 psig and detect any potentially hazardous leaks.

3.12.5 Pressure testing shall be performed with a Kuhlman Unit or RPR approved device.

3.12.6 Kuhlman unit or equivalent shall be labeled with last calibration date in a readily visible area. Units shall be calibrated within 365 calendar days from last calibration date unless required earlier by the manufacturer. Calibration verification shall be maintained for a minimum of 1 year.

3.12.7 Pressure testing durations vary depending upon nominal pipe size and length. For pressure testing time requirements, follow **TABLE 9: Pressure Testing Times for Service Lines**.

TABLE 9: Pressure Testing Times for Service Lines

	Nominal Pipe Size (inch)		
Service Line Length (feet)	**½**	**1**	**2**
0-50	15 minutes	15 minutes	15 minutes
51-250	15 minutes	15 minutes	15 minutes
251-500	15 minutes	15 minutes	30 minutes
501-1000	15 minutes	15 minutes	1 hour

1. If the pipe size being tested is not included in this table, but in between ½ inch and 2 inch pipe, use the test times for the next largest size pipe.
2. If the pipe length being tested is not included in this table, the pressure test time must be approved by Gas Systems Engineering.
3. Pressure testing times for service lines differ from pressure testing times for mains due to closer proximity to structures.

3.12.8 Pressure tests shall not be conducted against active valves or squeeze-off tools.

3.12.9 The pressure test shall be performed on the same day the service line is put into service or a fused cap must be installed to seal the pipe, and air or inert gas at 60 psig shall remain within service line prior to introducing natural gas to the pipe.

3.12.10 Service lines may be pressure tested with the main only in situations where the service line being pressure tested is fully installed. Service lines may not be installed and pressure tested in a manner to where the service line has multiple pressure test records (i.e. tap with active service stub and service line with riser). The pressure test for the service line shall cover the service line from tap to riser unless approved by RPR.

3.12.11 During the pressure test, the meter valve shall also be soap tested to confirm there are no leaks.

3.12.12 If connecting to an existing piping, final connection point shall be soap tested at service line's operating pressure.

3.12.13 A signed print out documenting a successful pressure test shall be attached to the NGUS for the service line. The service line shall not be placed into service without signed documentation of a successful pressure test. OWNER will not accept service line without signed documentation of a successful pressure test.

3.13 PURGING NATURAL GAS INTO A SERVICE LINE

3.13.1 A fire extinguisher shall be manned and positioned, upwind, from the purge point at all times during purging.

3.13.2 Natural gas shall be vented in a manner that is directed away from all ignition sources and done so to prevent natural gas from entering a structure

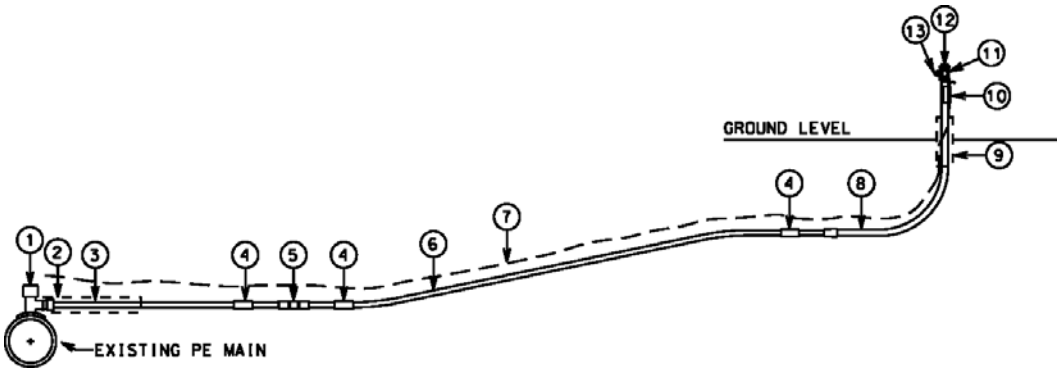
3.13.3 During purging, the riser shall be grounded to the soil with a minimum of #14 gauge solid or stranded wire with alligator clips/clamps, along with a grounding rod. Attach ground wire to meter valve or purge stack to ensure proper grounding.

3.13.4 If the service line has an EFV, confirm the EFV is operating properly during the purge.

3.14 RESIDENTIAL SERVICES (60 PSIG MAOP)

3.14.1 PE Residential Service Lines (60 PSIG MAOP)

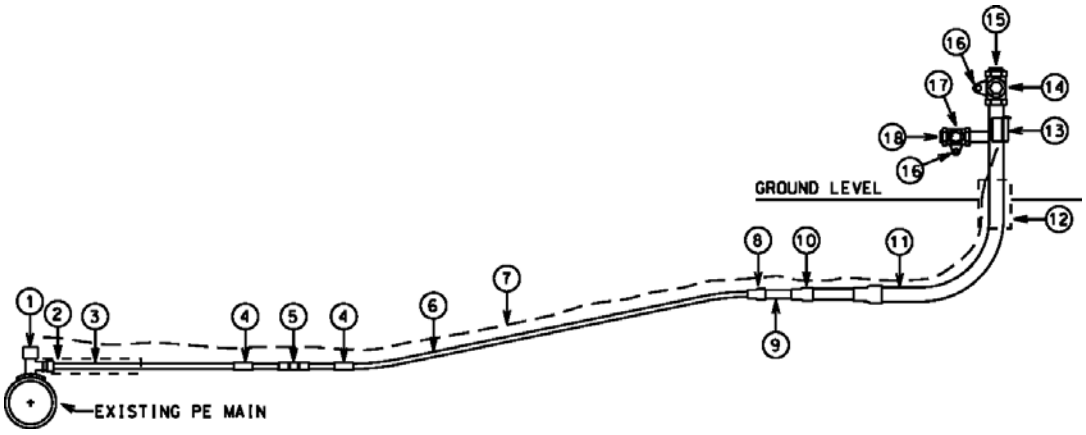
a. ½ inch PE Residential Service Line with a ¾ inch Riser – Figure 15345-A



Material List for Figure 15345-A

Item	Quantity	KUB Item #	Description
1	1	386029	1-¼ inch x ½ inch PE Tapping Tee
		384115	2 inch x ½ inch PE Tapping Tee
		380972	4 inch x ½ inch PE Tapping Tee
		386771	6 inch x ½ inch PE Tapping Tee
		374850	8 inch x ½ inch PE Tapping Tee
		360924	12 inch x ½ inch PE Tapping Tee
2	1	-	Protective Sleeve
3	26 inches	381558	½ inch PE Pipe
4	3	383828	½ inch PE Socket Fusion Coupling
5	1	361386	½ inch 400 PE Excess Flow Valve
		361400	½ inch 800 PE Excess Flow Valve
6	1-Lot	381558	½ inch PE Pipe
7	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
8	1	384057	¾ inch x ½ inch PE Anodeless Riser
9	1	-	Protective Sleeve
10	1	361980	¾ inch Tracer Wire Clip
11	1	362167	¾ inch Meter Valve
12	1	360354	¾ inch Plug
13	1	585971	Meter Valve Lock

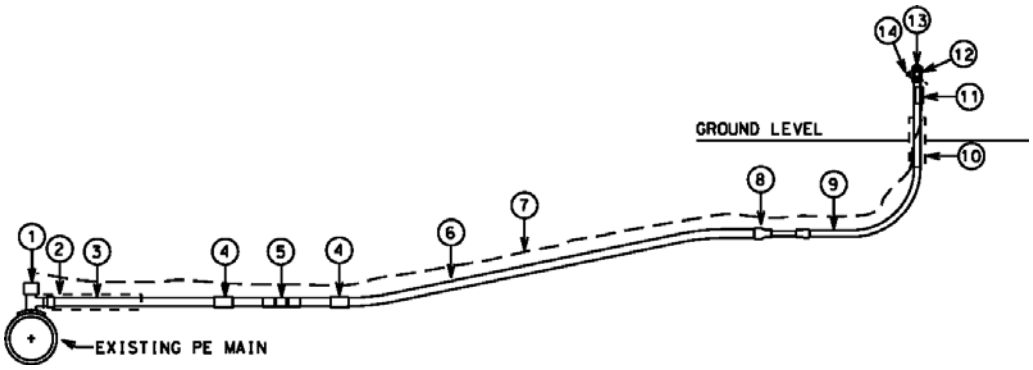
b. ½ inch PE Residential Service Line with a 1 ¼ inch Riser – Figure 15345-B



Material List for Figure 15345-B

Item	Quantity	KUB Item #	Description
1	1	386029	1-¼ inch x ½ inch PE Tapping Tee
		384115	2 inch x ½ inch PE Tapping Tee
		380972	4 inch x ½ inch PE Tapping Tee
		386771	6 inch x ½ inch PE Tapping Tee
		374850	8 inch x ½ inch PE Tapping Tee
		360924	12 inch x ½ inch PE Tapping Tee
2	1	-	Protective Sleeve
3	26 inches	381558	½ inch PE Pipe
4	2	383828	½ inch PE Socket Fusion Coupling
5	1	361400	½ inch 800 PE Excess Flow Valve
6	1-Lot	381558	½ inch PE Pipe
7	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
8	1	380931	1 inch x ½ inch PE Reducer
9	12 inches	386060	1 inch PE Pipe
10	1	382598	1-¼ inch x 1 inch PE Reducer
11	1	360627	1-¼ inch PE Anodeless Riser with Bypass
12	1	-	Protective Sleeve
13	1	362112	1-¼ inch Tracer Wire Clip
14	1	362189	1-¼ inch Meter Valve
15	1	363846	1-¼ inch Plug
16	2	585971	Meter Valve Lock
17	1	362178	1 inch Bypass Meter Valve
18	1	362814	1 inch Plug

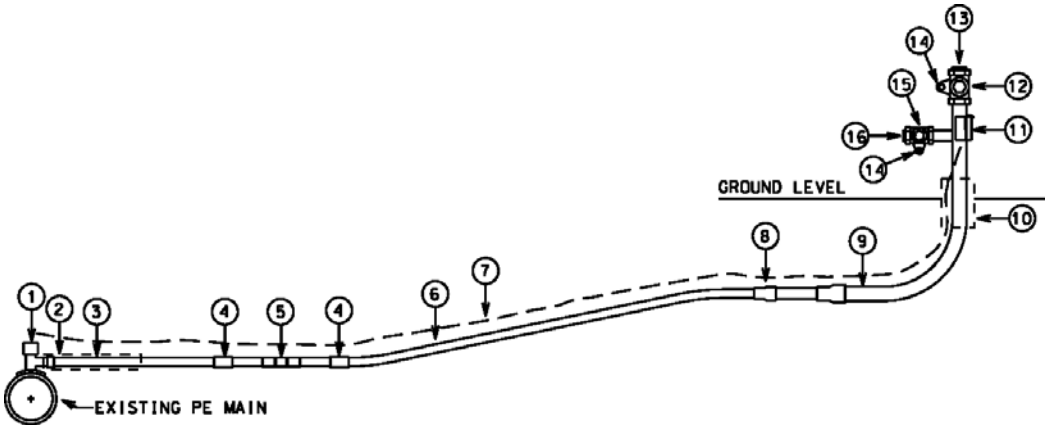
c. 1 inch PE Residential Service Line with a ¾ inch Riser – Figure 15345-C



Material List for Figure 15345-C

Item	Quantity	KUB Item #	Description
1	1	386052	1-¼ inch x 1 inch PE Tapping Tee
		380949	2 inch x 1 inch PE Tapping Tee
		380964	4 inch x 1 inch PE Tapping Tee
		386789	6 inch x 1 inch PE Tapping Tee
		374876	8 inch x 1 inch PE Tapping Tee
		360902	12 inch x 1 inch PE Tapping Tee
2	1	-	Protective Sleeve
3	26 inches	386060	1 inch PE Pipe
4	2	385013	1 inch PE Socket Fusion Coupling
5	1	362057	1 inch 800 PE Excess Flow Valve
6	1-Lot	386060	1 inch PE Pipe
7	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
8	1	380931	1 inch x ½ inch PE Reducer
9	1	384057	¾ inch x ½ inch PE Anodeless Riser
10	1	-	Protective Sleeve
11	1	361980	¾ inch Tracer Wire Clip
12	1	362167	¾ inch Meter Valve
13	1	360354	¾ inch Plug
14	1	585971	Meter Valve Lock

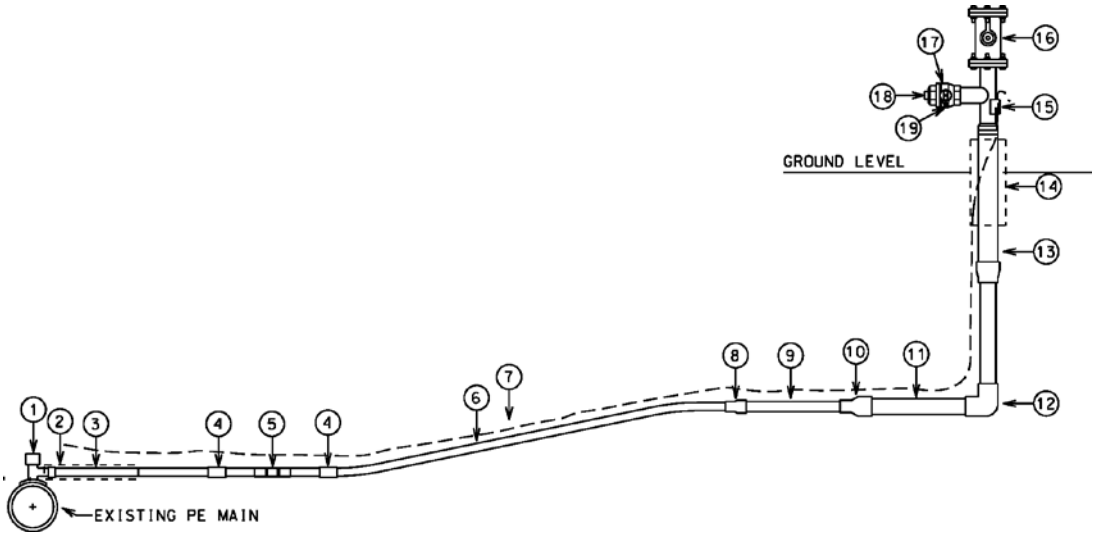
d. 1 inch PE Residential Service Line with a 1 ¼ inch Riser – Figures 15345-D



Material List for Figure 15345-D

Item	Quantity	KUB Item #	Description
1	1	386052	1-¼ inch x 1 inch PE Tapping Tee
		380949	2 inch x 1 inch PE Tapping Tee
		380964	4 inch x 1 inch PE Tapping Tee
		386789	6 inch x 1 inch PE Tapping Tee
		374876	8 inch x 1 inch PE Tapping Tee
		360902	12 inch x 1 inch PE Tapping Tee
2	1	-	Protective Sleeve
3	26 inches	386060	1 inch PE Pipe
4	2	385013	1 inch PE Socket Fusion Coupling
5	1	362057	1 inch 800 PE Excess Flow Valve
	1	362068	1 inch 1800 PE Excess Flow Valve
6	1-Lot	386060	1 inch PE Pipe
7	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
8	1	382598	1-¼ inch x 1 inch PE Reducer
9	1	360627	1-¼ inch PE Anodeless Riser with Bypass
10	1	-	Protective Sleeve
11	1	362112	1-¼ inch Tracer Wire Clip
12	1	362189	1-¼ inch Meter Valve
13	1	363846	1-¼ inch Plug
14	2	585971	Meter Valve Lock
15	1	362178	1 inch Bypass Meter Valve
16	1	362814	1 inch Plug

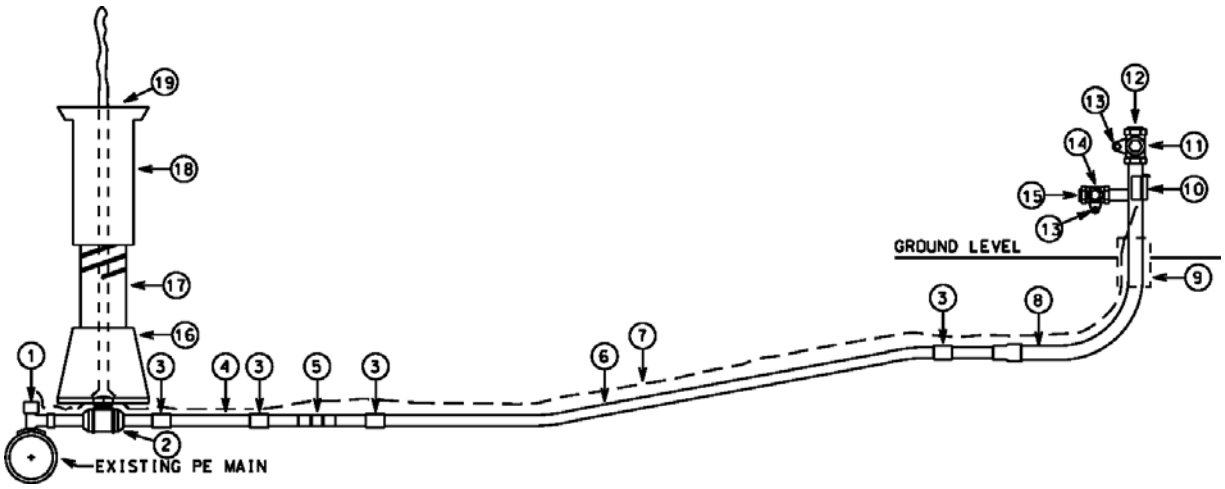
e. 1 inch PE Residential Service Line with a 2 inch Riser – Figure 15345-E



Material List for Figure 15345-E

Item	Quantity	KUB Item #	Description
1	1	386052	1-¼ inch x 1 inch PE Tapping Tee
		380949	2 inch x 1 inch PE Tapping Tee
		380964	4 inch x 1 inch PE Tapping Tee
		386789	6 inch x 1 inch PE Tapping Tee
		374876	8 inch x 1 inch PE Tapping Tee
		360902	12 inch x 1 inch PE Tapping Tee
2	1	-	Protective Sleeve
3	26 inches	386060	1 inch PE Pipe
4	2	385013	1 inch PE Socket Fusion Coupling
5	1	362068	1 inch 1800 PE Excess Flow Valve
6	1-Lot	386060	1 inch PE Pipe
7	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
8	1	382598	1-¼ inch x 1 inch PE Reducer
9	12 inches	386003	1-¼ inch PE Pipe
10	1	382689	2 inch x 1-¼ inch PE Reducer
11	12 inches	381160	2 inch PE Pipe
12	1	382952	2 inch PE 90 Degree Bend
13	1	360616	2 inch PE Anodeless Riser with Bypass
14	1	-	Protective Sleeve
15	1	362123	2 inch Tracer Wire Clip
16	1	360872	2 inch Flange Valve
17	1	362200	2 inch Meter Valve
18	1	364174	2 inch Plug
19	1	585971	Meter Valve Lock

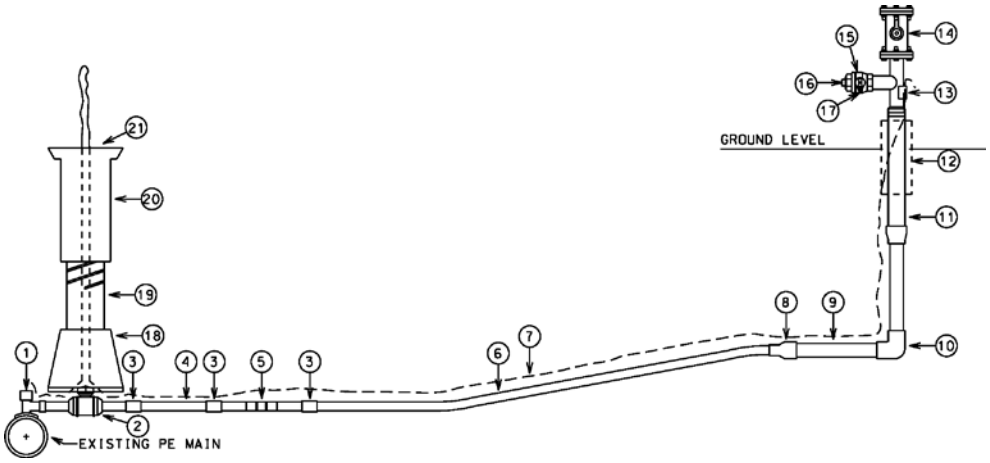
f. 1 ¼ inch PE Residential Service Line with a 1 ¼ inch Riser – Figure 15345-F



Material List for Figure 15345-F

Item	Quantity	KUB Item #	Description
1	1	373878	1-¼ inch x 1-¼ inch PE Tapping Tee
		380980	2 inch x 1-¼ inch PE Tapping Tee
		380956	4 inch x 1-¼ inch PE Tapping Tee
		386797	6 inch x 1-¼ inch PE Tapping Tee
		374892	8 inch x 1-¼ inch PE Tapping Tee
		360913	12 inch x 1-¼ inch PE Tapping Tee
2	1	371724	1-¼ inch PE Valve
3	3	384032	1-¼ inch PE Socket Fusion Coupling
4	12 inches	386003	1-¼ inch PE Pipe
5	1	362070	1-¼ inch 1800 PE Excess Flow Valve
6	1-Lot	386003	1-¼ inch PE Pipe
7	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
8	1	360627	1-¼ inch PE Anodeless Riser with Bypass
9	1	-	Protective Sleeve
10	1	362112	1-¼ inch Tracer Wire Clip
11	1	362189	1-¼ inch Meter Valve
12	1	363846	1-¼ inch Plug
13	2	585971	Meter Valve Lock
14	1	362178	1 inch Bypass Meter Valve
15	1	362814	1 inch Plug
16	1	294074	Valve Box Base Section
17	1	360440	Valve Box Middle Section
18	1	360451	Valve Box Top Section
19	1	383398	Valve Box Lid

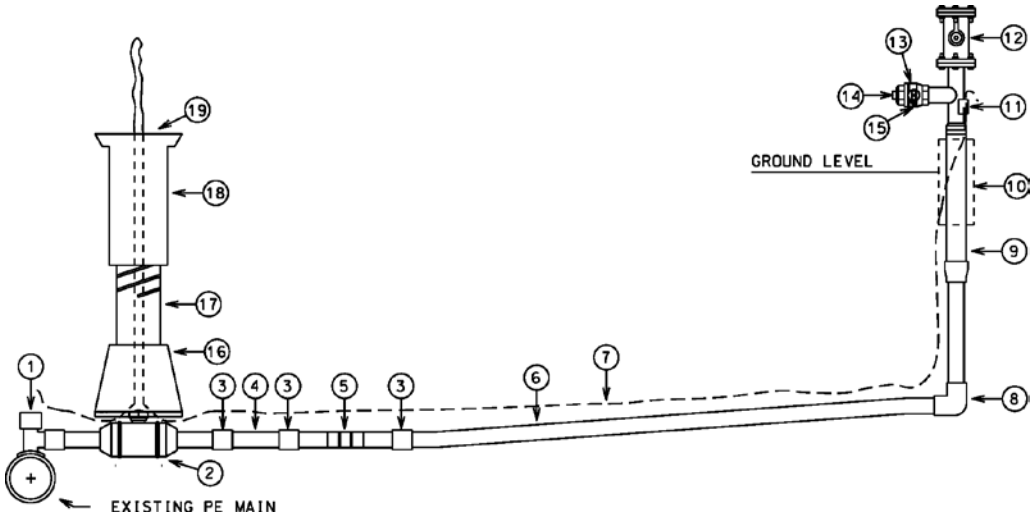
g. 1 ¼ inch PE Residential Service Line with a 2 inch Riser – Figure 15345-G



Material List for Figure 15345-G

Item	Quantity	KUB Item #	Description
1	1	373878	1-¼ inch x 1-¼ inch PE Tapping Tee
		380980	2 inch x 1-¼ inch PE Tapping Tee
		380956	4 inch x 1-¼ inch PE Tapping Tee
		386797	6 inch x 1-¼ inch PE Tapping Tee
		374892	8 inch x 1-¼ inch PE Tapping Tee
		360913	12 inch x 1-¼ inch PE Tapping Tee
2	1	371724	1-¼ inch PE Valve
3	3	384032	1-¼ inch PE Socket Fusion Coupling
4	12 inches	386003	1-¼ inch PE Pipe
5	1	362070	1-¼ inch 1800 PE Excess Flow Valve
		362076	1-¼ inch 2600 PE Excess Flow Valve
6	1-Lot	386003	1-¼ inch PE Pipe
7	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
8	1	382689	2 inch x 1-¼ inch PE Reducer
9	12 inches	381160	2 inch PE Pipe
10	1	382952	2 inch PE 90 Degree Bend
11	1	360616	2 inch PE Anodeless Riser with Bypass
12	1	-	Protective Sleeve
13	1	362123	2 inch Tracer Wire Clip
14	1	360872	2 inch Flange Valve
15	1	362200	2 inch Meter Valve
16	1	364174	2 inch Plug
17	1	585971	Meter Valve Lock
18	1	294074	Valve Box Base Section
19	1	360440	Valve Box Middle Section
20	1	360451	Valve Box Top Section
21	1	383398	Valve Box Lid

h. 2 inch PE Residential Service Line with a 2 inch Riser – Figure 15345-H



Material List for Figure 15345-H

Item	Quantity	KUB Item #	Description
1	1	300031	2 inch x 2 inch PE Tapping Tee
		380311	4 inch x 2 inch PE Tapping Tee
		380840	6 inch x 2 inch PE Tapping Tee
		374835	8 inch x 2 inch PE Tapping Tee
		360891	12 inch x 2 inch PE Tapping Tee
2	1	371740	2 inch PE Valve
3	3	383810	2 inch PE Socket Fusion Coupling
4	12 inches	381160	2 inch PE Pipe
5	1	362080	2 inch 2600 PE Excess Flow Valve
6	1-Lot	381160	2 inch PE Pipe
7	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
8	1	382952	2 inch PE 90 Degree Bend
9	1	360616	2 inch PE Anodeless Riser with Bypass
10	1	-	Protective Sleeve
11	1	362123	2 inch Tracer Wire Clip
12	1	360872	2 inch Flange Valve
13	1	362200	2 inch Meter Valve
14	1	364174	2 inch Plug
15	1	585971	Meter Valve Lock
16	1	294074	Valve Box Base Section
17	1	360440	Valve Box Middle Section
18	1	360451	Valve Box Top Section
19	1	383398	Valve Box Lid

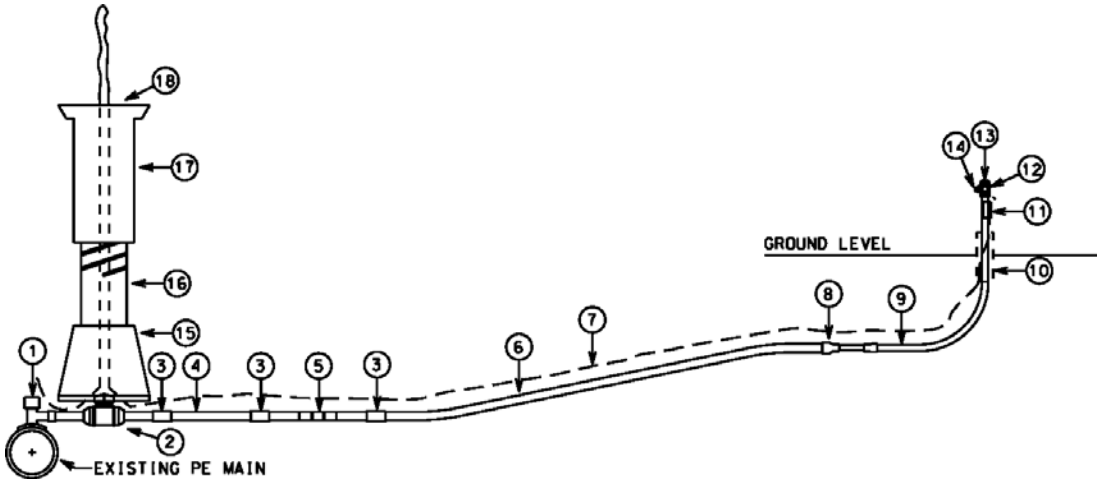
3.15 MULTI-FAMILY RESIDENTIAL AND COMMERCIAL SERVICES (60 PSIG MAOP – EFV REQUIRED)

3.15.1 New multi-family residential and commercial service lines shall have a minimum nominal diameter of 1 inch.

3.15.2 All multi-family residential and commercial service lines shall have a shut-off valve of matching nominal diameter installed at the tapping tee.

3.15.3 PE Multi-Family or Commercial Service Lines (60 PSIG MAOP – EFV Required)

a. 1 inch PE Multi-Family Residential or Commercial Service Line with a ¾ inch Riser – Figure 15345-I

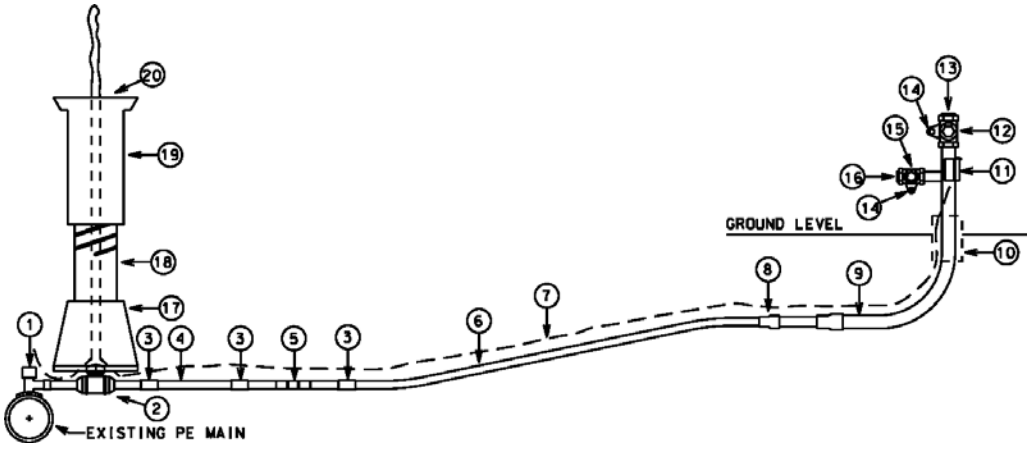


Material List for Figure 15345-I

Item	Quantity	KUB Item #	Description
1	1	386052	1-¼ inch x 1 inch PE Tapping Tee
		380949	2 inch x 1 inch PE Tapping Tee
		380964	4 inch x 1 inch PE Tapping Tee
		386789	6 inch x 1 inch PE Tapping Tee
		374876	8 inch x 1 inch PE Tapping Tee
		360902	12 inch x 1 inch PE Tapping Tee
2	1	371708	1 inch PE Valve
3	1	385013	1 inch PE Socket Fusion Coupling
4	12 inches	386060	1 inch PE Pipe
5	1	362057	1 inch 800 PE Excess Flow Valve
6	1-Lot	386060	1 inch PE Pipe
7	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
8	1	380931	1 inch x ½ inch PE Reducer
9	1	384057	¾ inch x ½ inch PE Anodeless Riser
10	1	-	Protective Sleeve
11	1	361980	¾ inch Tracer Wire Clip
12	1	362167	¾ inch Meter Valve

13	1	360354	¾ inch Plug
14	1	585971	Meter Valve Lock
15	1	294074	Valve Box Base Section
16	1	360440	Valve Box Middle Section
17	1	360451	Valve Box Top Section
18	1	383398	Valve Box Lid

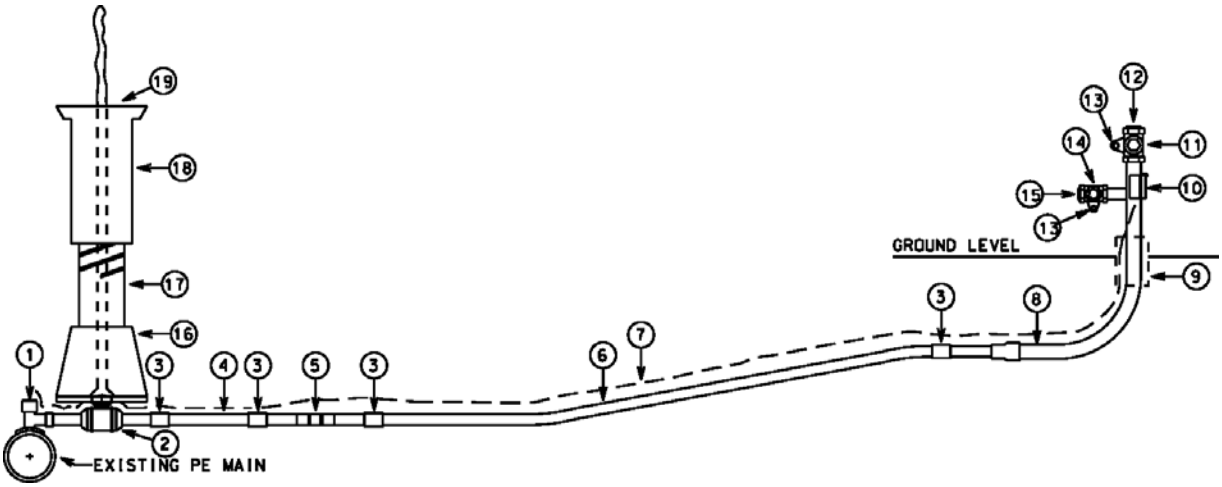
b. 1 inch PE Multi-Family Residential or Commercial Service Line with a 1 ¼ inch Riser – Figure 15345-J



Material List for Figure 15345-J

Item	Quantity	KUB Item #	Description
1	1	386052	1-¼ inch x 1 inch PE Tapping Tee
		380949	2 inch x 1 inch PE Tapping Tee
		380964	4 inch x 1 inch PE Tapping Tee
		386789	6 inch x 1 inch PE Tapping Tee
		374876	8 inch x 1 inch PE Tapping Tee
		360902	12 inch x 1 inch PE Tapping Tee
2	1	371708	1 inch PE Valve
3	1	385013	1 inch PE Socket Fusion Coupling
4	12 inches	386060	1 inch PE Pipe
5	1	362057	1 inch 800 PE Excess Flow Valve
6	1-Lot	386060	1 inch PE Pipe
7	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
8	1	382598	1-¼ inch x 1 inch PE Reducer
9	1	360627	1-¼ inch PE Anodeless Riser with Bypass
10	1	-	Protective Sleeve
11	1	362112	1-¼ inch Tracer Wire Clip
12	1	362189	1-¼ inch Meter Valve
13	1	363846	1-¼ inch Plug
14	2	585971	Meter Valve Lock
15	1	362178	1 inch Bypass Meter Valve
16	1	362814	1 inch Plug
17	1	294074	Valve Box Base Section
18	1	360440	Valve Box Middle Section
19	1	360451	Valve Box Top Section
20	1	383398	Valve Box Lid

c. 1 ¼ inch PE Multi-Family Residential or Commercial Service Line with a 1 ¼ inch Riser – Figure 15345-K



Material List for Figure 15345-K

Item	Quantity	KUB Item #	Description
1	1	373878	1-¼ inch x 1-¼ inch PE Tapping Tee
		380980	2 inch x 1-¼ inch PE Tapping Tee
		380956	4 inch x 1-¼ inch PE Tapping Tee
		386797	6 inch x 1-¼ inch PE Tapping Tee
		374892	8 inch x 1-¼ inch PE Tapping Tee
		360913	12 inch x 1-¼ inch PE Tapping Tee
2	1	371724	1-¼ inch PE Valve
3	3	384032	1-¼ inch PE Socket Fusion Coupling
4	12 inches	386003	1-¼ inch PE Pipe
5	1	362070	1-¼ inch 1800 PE Excess Flow Valve
6	1-Lot	386003	1-¼ inch PE Pipe
7	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
8	1	360627	1-¼ inch PE Anodeless Riser with Bypass
9	1	-	Protective Sleeve
10	1	362112	1-¼ inch Tracer Wire Clip
11	1	362189	1-¼ inch Meter Valve
12	1	363846	1-¼ inch Plug
13	2	585971	Meter Valve Lock
14	1	362178	1 inch Bypass Meter Valve
15	1	362814	1 inch Plug
16	1	294074	Valve Box Base Section
17	1	360440	Valve Box Middle Section
18	1	360451	Valve Box Top Section
19	1	383398	Valve Box Lid

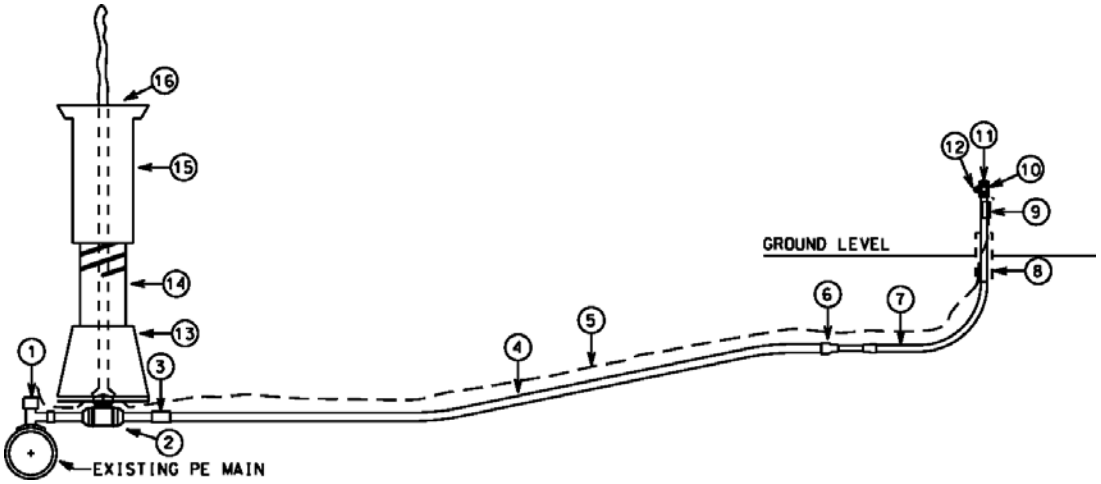
3.16 DOWNTOWN (10 PSIG MAOP), MULTI-FAMILY RESIDENTIAL, AND COMMERCIAL SERVICES (NO EFV REQUIRED)

3.16.1 New downtown, multi-family, and commercial service lines shall have a minimum nominal diameter of 1 inch.

3.16.2 All downtown, multi-family, and commercial service lines shall have a shut-off valve of matching nominal diameter installed at the tapping tee.

3.16.3 PE Downtown (10 PSIG MAOP) or Commercial Service Lines

a. 1 inch PE Downtown Service Line with a ¾ inch Riser – Figure 15345-L

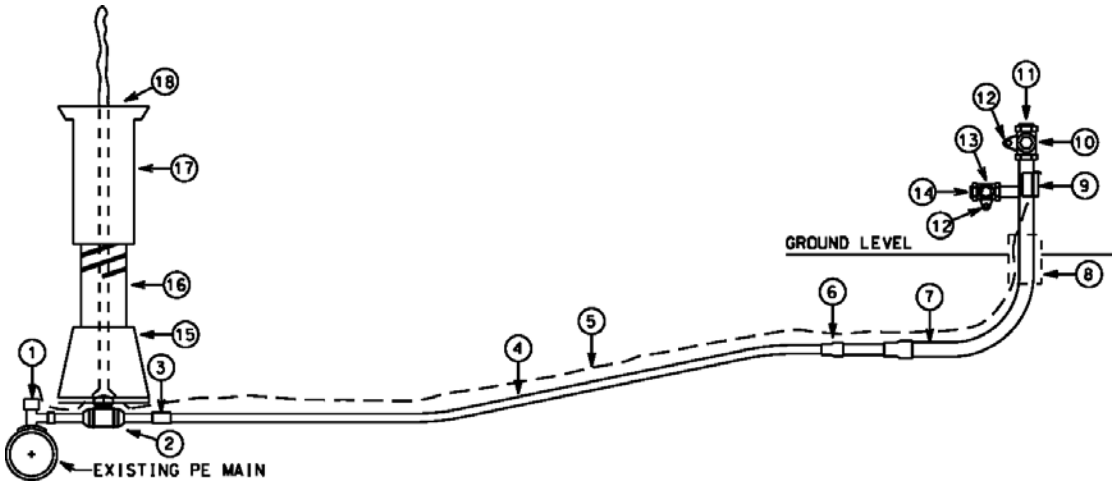


Material List for Figure 15345-L

Item	Quantity	KUB Item #	Description
1	1	386052	1-¼ inch x 1 inch PE Tapping Tee
		380949	2 inch x 1 inch PE Tapping Tee
		380964	4 inch x 1 inch PE Tapping Tee
		386789	6 inch x 1 inch PE Tapping Tee
		374876	8 inch x 1 inch PE Tapping Tee
		360902	12 inch x 1 inch PE Tapping Tee
2	1	371708	1 inch PE Valve
3	1	385013	1 inch PE Socket Fusion Coupling
4	1-Lot	386060	1 inch PE Pipe
5	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
6	1	380931	1 inch x ½ inch PE Reducer
7	1	384057	¾ inch x ½ inch PE Anodeless Riser
8	1	-	Protective Sleeve
9	1	361980	¾ inch Tracer Wire Clip
10	1	362167	¾ inch Meter Valve
11	1	360354	¾ inch Plug
12	1	585971	Meter Valve Lock
13	1	294074	Valve Box Base Section

14	1	360440	Valve Box Middle Section
15	1	360451	Valve Box Top Section
16	1	383398	Valve Box Lid

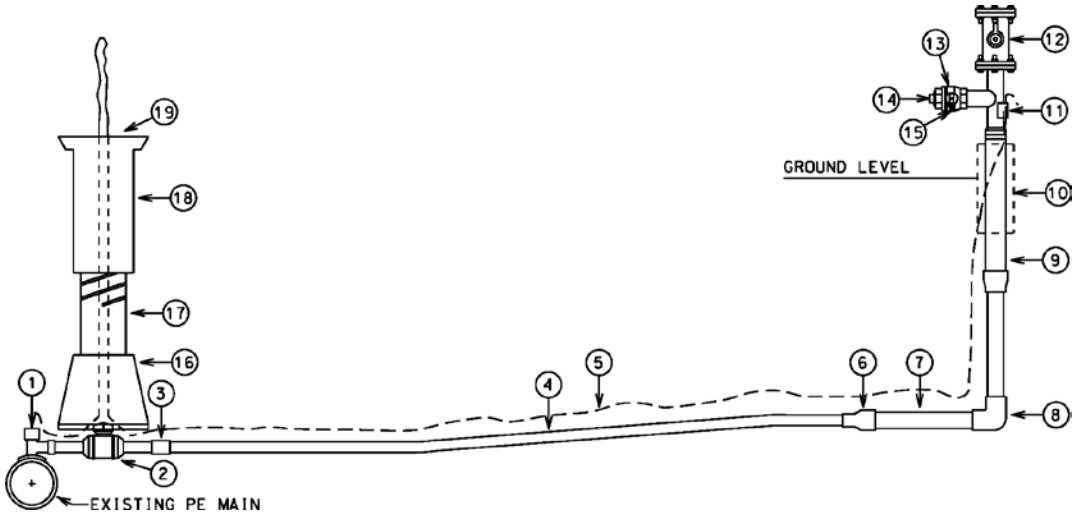
b. 1 inch PE Downtown, Multi-Family Residential, or Commercial Service Line with a 1 ¼ inch Riser – Figure 15345-M



Material List for Figure 15345-M

Item	Quantity	KUB Item #	Description
1	1	386052	1-¼ inch x 1 inch PE Tapping Tee
		380949	2 inch x 1 inch PE Tapping Tee
		380964	4 inch x 1 inch PE Tapping Tee
		386789	6 inch x 1 inch PE Tapping Tee
		374876	8 inch x 1 inch PE Tapping Tee
		360902	12 inch x 1 inch PE Tapping Tee
2	1	371708	1 inch PE Valve
3	1	385013	1 inch PE Socket Fusion Coupling
4	1-Lot	386060	1 inch PE Pipe
5	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
6	1	382598	1-¼ inch x 1 inch PE Reducer
7	1	360627	1-¼ inch PE Anodeless Riser with Bypass
8	1	-	Protective Sleeve
9	1	362112	1-¼ inch Tracer Wire Clip
10	1	362189	1-¼ inch Meter Valve
11	1	363846	1-¼ inch Plug
12	2	585971	Meter Valve Lock
13	1	362178	1 inch Bypass Meter Valve
14	1	362814	1 inch Plug
15	1	294074	Valve Box Base Section
16	1	360440	Valve Box Middle Section
17	1	360451	Valve Box Top Section
18	1	383398	Valve Box Lid

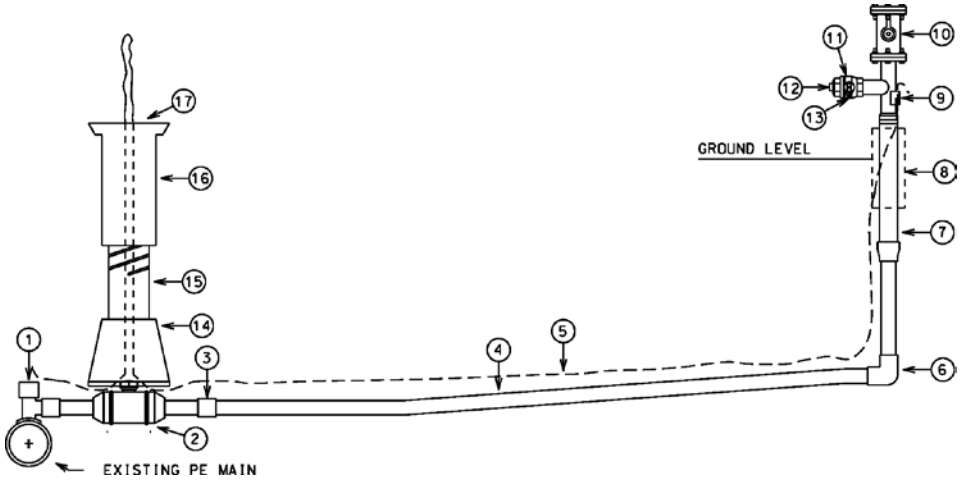
c. 1 ¼ inch PE Downtown, Multi-Family Residential, or Commercial Service Line with a 2 inch Riser – Figure 15345-N



Material List for Figure 15345-N

Item	Quantity	KUB Item #	Description
1	1	373878	1-¼ inch x 1-¼ inch PE Tapping Tee
		380980	2 inch x 1-¼ inch PE Tapping Tee
		380956	4 inch x 1-¼ inch PE Tapping Tee
		386797	6 inch x 1-¼ inch PE Tapping Tee
		374892	8 inch x 1-¼ inch PE Tapping Tee
		360913	12 inch x 1-¼ inch PE Tapping Tee
2	1	371724	1-¼ inch PE Valve
3	1	384032	1-¼ inch PE Socket Fusion Coupling
4	1-Lot	386003	1-¼ inch PE Pipe
5	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
6	1	382689	2 inch x 1-¼ inch PE Reducer
7	12 inches	381160	2 inch PE Pipe
8	1	382952	2 inch PE 90 Degree Bend
9	1	360616	2 inch PE Anodeless Riser with Bypass
10	1	-	Protective Sleeve
11	1	362123	2 inch Tracer Wire Clip
12	1	360872	2 inch Flange Valve
13	1	362200	2 inch Meter Valve
14	1	364174	2 inch Plug
15	1	585971	Meter Valve Lock
16	1	294074	Valve Box Base Section
17	1	360440	Valve Box Middle Section
18	1	360451	Valve Box Top Section
19	1	383398	Valve Box Lid

d. 2 inch PE Downtown, Multi-Family Residential, or Commercial Service Line with a 2 inch Riser – Figure 15345-O



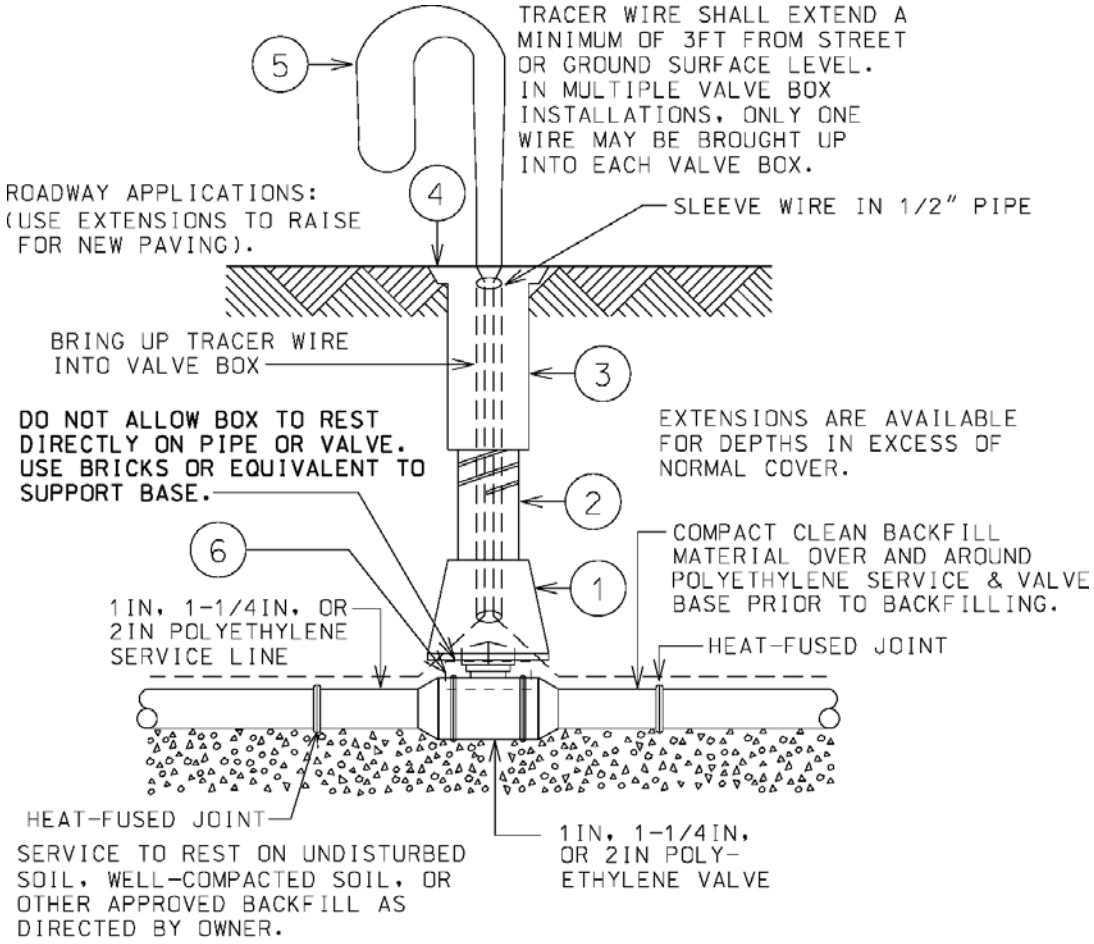
Material List for Figure 15345-O

Item	Quantity	KUB Item #	Description
1	1	300031	2 inch x 2 inch PE Tapping Tee
		380311	4 inch x 2 inch PE Tapping Tee
		380840	6 inch x 2 inch PE Tapping Tee
		374835	8 inch x 2 inch PE Tapping Tee
		360891	12 inch x 2 inch PE Tapping Tee
2	1	371740	2 inch PE Valve
3	1	383810	2 inch PE Socket Fusion Coupling
4	1-Lot	381160	2 inch PE Pipe
5	1-Lot	383448	#12 gauge Solid Copper Tracer Wire
		363069	#12 gauge Steel Copper-Clad Tracer Wire
6	1	382952	2 inch PE 90 Degree Bend
7	1	360616	2 inch PE Anodeless Riser with Bypass
8	1	-	Protective Sleeve
9	1	362123	2 inch Tracer Wire Clip
10	1	360872	2 inch Flange Valve
11	1	362200	2 inch Meter Valve
12	1	364174	2 inch Plug
13	1	585971	Meter Valve Lock
14	1	294074	Valve Box Base Section
15	1	360440	Valve Box Middle Section
16	1	360451	Valve Box Top Section
17	1	383398	Valve Box Lid

3.17 VALVES AND BOXES

3.17.1 Tracer wire shall be looped.

3.17.2 See the following figures and material lists for valve box installation – Figure 15345-P

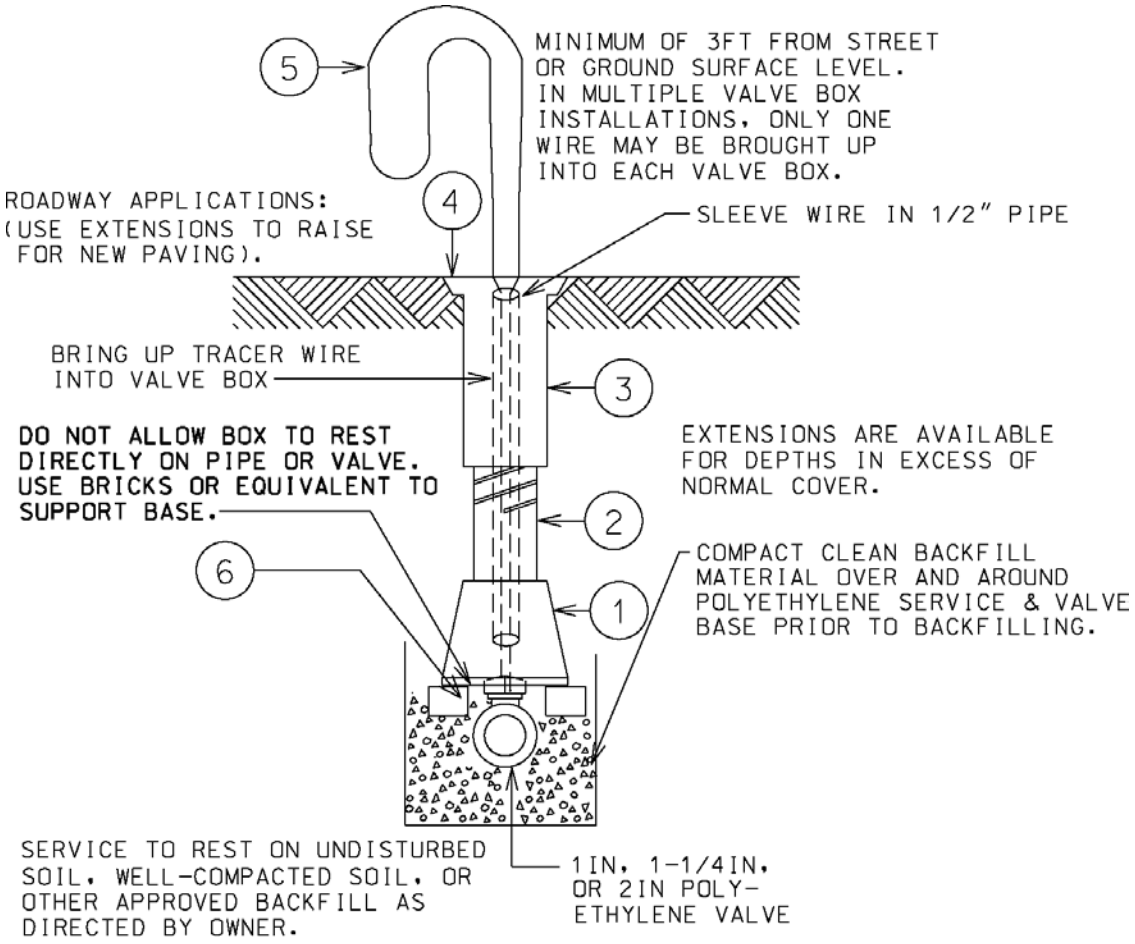


PROFILE VIEW
SINGLE VALVE INSTALLATION

Material List for Figure 15345-P

Item	Quantity	KUB Item #	Description
1	1	294074	Valve Box Base Section
2	1	360440	Valve Box Middle Section
3	1	360451	Valve Box Top Section
4	1	383398	Valve Box Lid
5	1-Lot	383448	Solid Copper Tracer Wire
		363069	Steel Copper-Clad Tracer Wire
6	1-Lot	290783	Bricks to Support Valve Box

3.17.3 Figure 15345-Q



CROSS SECTION VIEW
SINGLE VALVE INSTALLATION

Material List for Figure 15345-Q

Item	Quantity	KUB Item #	Description
1	1	294074	Valve Box Base Section
2	1	360440	Valve Box Middle Section
3	1	360451	Valve Box Top Section
4	1	383398	Valve Box Lid
5	1-Lot	383448	Solid Copper Tracer Wire
		363069	Steel Copper-Clad Tracer Wire
6	1-Lot	290783	Bricks to Support Valve Box

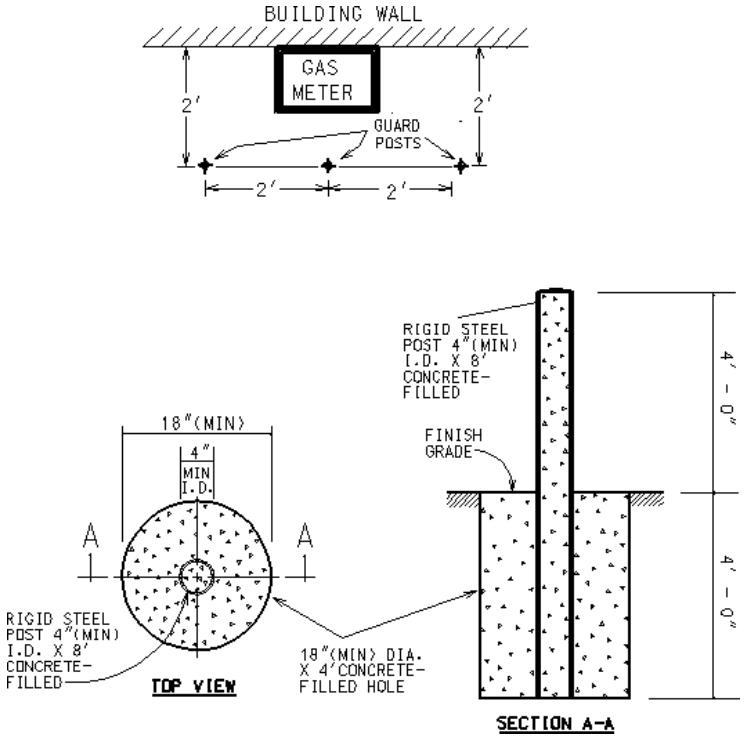
3.18 BOLLARDS

3.18.1 Bollards (protective posts) shall be installed in areas where vehicular damage to a riser or meter may occur.

3.18.2 The quantity and arrangement of bollards shall be based on size of the meter center and shall be installed according to the project drawings or as directed by OWNER.

3.18.3 Bollards shall be concrete filled 4 inch diameter schedule 40 steel, 8 feet long. Each bollard shall be installed 4 feet below grade in an 18 inch diameter concrete filled hole and 4 feet above grade and painted yellow. See Figure 15345-R below for bollard installation.

3.18.4 Figure 15345-R



3.19 CONDEMNATION

3.19.1 Service Lines

3.19.1.1 Service lines shall be condemned 26 to 30 inches from the gas main where possible. Condemned service line pipe length (i.e., point of disconnect to the riser location) and pipe length remaining shall be documented on a NGUS. The length remaining is measured from where the service line comes out of the tapping tee to the point where it is capped off.

3.19.1.2 Condemned service line pipe shall be purged of gas from the point of disconnect to the riser with air or inert gas.

3.19.1.3 The riser shall be cut off a minimum of 3 inches below ground and sealed with a cap from **TABLE 10** or hard stopper unless it is in pavement/concrete, then it shall be cut off at grade level and sealed with a hard stopper or foam pack.

3.19.1.4 Condemned service line pipe shall be sealed at the main end using a cap from **TABLE 10** below depending on material type.

TABLE 10: Approved Caps For Condemning Service Lines

Service Line Size and Type	KUB Item #	Description
⅞ inch XT Steel	363630	⅞ inch Stainless Steel Swage lock Cap
½ inch CTS PE	362101	½ inch CTS PE Socket Fusion Cap
½ inch IPS PE	383802	½ inch IPS PE Socket Fusion Cap
¾ inch IPS PE	372037	¾ inch IPS PE Socket Fusion Cap
1 inch IPS PE	370155	1 inch IPS PE Socket Fusion Cap
1 ¼ inch IPS PE	386011	1 ¼ inch IPS PE Socket Fusion Cap
2 inch IPS PE	383646	2 inch IPS PE Socket Fusion Cap
¾ inch Steel	372516	¾ inch Steel Compression Cap
1 inch Steel	362681	1 inch Steel Compression Cap
1 ¼ inch Steel	363770	1 ¼ inch Steel Compression Cap
2 inch Steel	364059	2 inch Steel Compression Cap

3.19.1.5 A 3M EMS 4” Extended Range 5 feet Ball Marker – Gas 1405-XR (KUB Item #363718) shall be placed at the end of the active service line remaining unless deeper than 5 feet deep. If active service line is deeper than 5 feet, the Ball Marker shall be placed 5 feet deep directly above the fused cap of the active service line.

3.19.1.6 All metallic mains exposed during a service line condemn shall be coated and cathodically protected prior to backfilling. In addition, corrosion observations shall be performed and documented. Refer to Section 15500 and 15560 for details.

3.19.2 Service Line Valves

3.19.2.1 If condemnation of service line valve is required, service line valves shall be condemned by removing the valve box lid, demolishing or removing the valve box top section and backfilling as required in **3.12 BACKFILL**.

3.20 CLEAN UP AND RESTORATION

3.20.1 Follow clean up and restoration requirements stated in Section 00700 General Conditions and Section 01560 Work In Easements and Right-Of-Ways.

3.21 RECORD KEEPING

3.21.1 Natural Gas Utility Sheet (NGUS)

3.21.1.1 A neat and legible NGUS is required for any work performed on a service line.

3.21.1.2 The NGUS for each service line shall be filled out in its entirety as applicable to the work completed. The drawing section of the NGUS shall contain measurements for pipe length, component locations, and using permanent structures to locate the pipe and components for future reference.

3.21.1.3 The NGUS shall be completed in its entirety and submitted in accordance with the NGUS procedure.

3.21.1.4 All deviations, approved by the RPR, from this Section shall be documented on the NGUS.

3.21.1.5 All pressure test documentation shall be signed by the qualified person responsible for performing the pressure test and attached to the NGUS for each individual service line.

3.21.2 Boring Profile

3.21.2.1 When pipe is installed outside of the specified requirements in **3.4 DEPTH**, a final boring profile (electronic is preferred) shall be submitted to RPR within 48 hours of a completed bore. The final boring profile shall consist of, at a minimum, a table illustrating pitch and depth for the length of every other rod.

END OF SECTION

SECTION 15720

NATURAL GAS POLYETHYLENE MAIN INSTALLATION

TABLE OF CONTENTS

PART 1 GENERAL

1.1 The work to be performed herein shall consist of the installation of new medium density polyethylene (MDPE or PE) mains operating at or below a maximum allowable operating pressure (MAOP) of 60 pounds per square inch gauge (psig), which includes, but is not limited to PE pipe and all appurtenances related to the construction of the main. All work shall be performed in accordance with this Section in conjunction with all additional project drawings and standards and specifications that may or may not be referred to in this Section.

1.2 KUB Standards and Specifications for Natural Gas Polyethylene Main 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 Federal Safety Standards (hereafter referred to as "MFSS").

1.3 DEFINITIONS:

1.3.1 **Butt Fusion** means 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 homogeneous bond.

1.3.2 **Depth** means the distance from the top of the distribution line to finished grade.

1.3.3 **Distribution Line** is a pipeline other than a gathering or transmission line.

1.3.4 **IPS** means Iron Pipe Size (for PE pipe nominal inside diameters).

1.3.5 **Main** means a distribution line that serves as a common source of supply for more than one service line.

1.3.6 **NGUS** means Natural Gas Utility Sheet: A document to be filled out by the person(s) responsible for: any work performed to a natural gas service line, work on a natural gas mains that is 50 feet or less in length, a temporary bypass, or a test station.

1.3.7 **Pipeline** means all parts of those physical facilities through which natural gas moves in transportation, including pipe, valves, and other appurtenances attached to PE pipe, compressor units, metering stations, regulator stations, delivery stations, holders, and fabricated assemblies.

1.3.8 **RPR** means the Gas Systems Engineering Representative(s) assigned to the site.

1.3.9 **Socket Fusion** means the method of joining PE 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 the inside surface of the coupling are heated to a molten state. The pipe is then pressed into the opening of the coupling.

PART 2 SAFETY

2.1 Refer to General Conditions 00700, 6.13. In addition to conditions noted in Section 00700, FR PPE is required during purging activities. All ignition sources shall be removed from the area during purging activities.

PART 3 EXECUTION

3.1 GENERAL MAIN INSTALLATION

3.1.1 Mains shall not be installed under buildings, permanent structures, or future/proposed structures.

3.1.2 Main shall be installed below ground.

3.1.3 Mains shall be installed in the most direct, shortest path feasible and in accordance with the project drawings.

3.1.4 Materials not supplied through KUB Storerooms shall be submitted for approval for use to KUB Gas Systems Engineering prior to construction of the pipeline.

3.1.5 All pipe fusion connections shall be allowed to cool as required by the pipe manufacturers' joining procedures for socket, saddle, butt fusion, and electrofusion prior to lowering the pipe into the trench and/or excavation to eliminate stress on the fused connections.

3.1.6 Installation methods placing a tensile load on the PE pipe shall be done in accordance with ASTM F1804, Standard Practice for Determining Allowable Tensile Load for Polyethylene (PE) Gas Pipe During Pull-in Installation.

3.1.7 Each main shall be installed with at least 5 feet clearance from any existing or proposed above ground structure including but not limited to buildings, retaining walls and any below grade footing and/or foundation(s). If 5 feet clearance cannot be obtained, the proposed clearance shall be approved and documented by RPR prior to installation.

3.1.8 All PE to PE main connections shall be made by socket, saddle, or butt fusion. Butt fusion shall be acceptable only for pipe larger than 2 inch nominal diameter. All electrofusion fittings not specified in the project drawings shall be approved for use, by the RPR, prior to installation.

3.1.9 PE pipe ends shall be temporarily sealed to prevent water and debris from entering the pipe. Materials used for temporarily sealing the pipe ends shall be approved by the RPR prior to use.

3.1.10 A fused on cap shall be installed when pipe ends are exposed for longer than one week. RPR reserves the right to require fused on end caps.

3.1.11 All main shall be pigged prior to pressure testing and introducing natural gas to the pipeline.

3.1.12 Above ground pipeline markers (KUB Item #362420) shall be installed directly over, where possible, or as close to the pipeline in areas where frequent excavation occurs, major intersections, railroad or railroad spur crossings, any type of water crossing such as a creek, stream, or river and/or per the RPR's requests.

3.1.13 After installation, all main shall be confirmed as locatable by tracer wire by RPR. Unlocatable natural gas main will not be accepted by OWNER.

3.1.14 All equipment shall be properly calibrated per the manufacturer's guidelines.

3.2 HANDLING OF MATERIALS

3.2.1 PE pipe and components shall be stored to prevent damage from ultraviolet (UV) rays. PE pipe and components with a print line dating back further than 729 calendar days shall not be installed.

3.2.2 For multiyear projects, CONTRACTOR shall submit, for approval, a pipe storage and protection plan to the OWNER. The pipe storage and protection plan shall address long term storage (greater than 729 calendar days) including how to protect pipe from UV degradation.

3.2.3 PE pipe may be stored by stacking, but only permitted if stacked pipe is lying flat.

3.2.4 When PE pipe is transported, it shall be loaded, transported and unloaded in a manner to prevent damage.

3.2.5 PE pipe shall be stored with manufacturer end caps in place.

3.2.6 When transporting pipe segments, pipe shall not be dragged across any type of hard surface such as pavement or rocks without protection from damage. RPR reserves the right to reject any pipe dragged across any type of pavement, rocks or other hard surfaces.

3.2.7 A self-performed, thorough inspection of the pipe and components shall be conducted to guarantee quality assurance prior to installation and backfilling. Any damages to the pipe shall be communicated to the RPR for review prior to installation. If found after installation, damages shall be reported immediately to the RPR. Natural gas shall not be introduced into the pipe without the RPR's approval after review of the damages. In the event damage (e.g., scratches, gouges, and deformation from stressing the pipe) is present and the pipe wall thickness is compromised greater than 10%, the damaged section shall be cut out and not used. RPR reserves the right to fail segments or sections of damaged pipe or components. These damaged sections shall be replaced with no additional cost to the OWNER.

3.2.8 CONTRACTOR shall not perform any repairs to existing pipe or new pipe that has been placed into service.

3.3 INSTALLATION METHODS

3.3.1 Open Trench

3.3.1.1 Main shall be laid and continuously supported on undisturbed or well-compacted soil. At a minimum, well compacted soil is defined as machine tamped. PE pipe shall not be laid on blocks, rocks or large dirt clods. Refer to **3.8 BACKFILL** for defined backfill requirements.

3.3.1.2 Main shall be installed along the bottom of the trench to accommodate for expansion and contraction. (PE pipe will contract 1 inch per 10 degrees F temperature drop for every 100 feet of unrestrained PE pipe.)

3.3.1.3 When fusing coil pipe to coil pipe, join the coils so the curvature of one coil is directly opposite to the curvature of the other coil to minimize bending stresses at the joint.

3.3.1.4 Prior to backfilling, the trench shall be examined to ensure the main is continuously supported at all points. #12-gauge solid copper tracer wire (KUB Item #383448) shall be installed directly above and within 6 inches of the main. Refer to Section 15105 for tracer wire requirements.

3.3.1.5 Warning tape (KUB Item #371534) shall be installed 12 to 18 inches below existing or proposed grade directly above the PE main.

3.3.1.6 The trench width shall be wide enough to allow for inspection once pipe is lowered into the trench as well as for proper compaction around the pipe to prevent trench settlement. The minimum requirements for trench width are in **TABLE 1: Minimum Trench Width**.

TABLE 1: Minimum Trench Width

	Trench Width (inches)	
Pipe Size (inches)	Soil (minimum)	Rock (minimum)
2	6	12
4	8	12
8	12	18
12	18	24

3.3.1.7 When lowering pipe and/or components into the trench and/or excavations, the pipe shall not be subjected to excessive twisting and/or bending stresses. At lower temperatures, flexibility of the pipe is greatly reduced and could potentially be damaged by excessive force. RPR reserves the right to reject any and all pipe and/or components that may have been compromised due to excessive stresses.

3.3.2 Horizontal Directional Drilling (Boring)

3.3.2.1 PE pipe installed by horizontal directional drilling shall have #12-gauge steel copper-clad tracer wire (KUB #363069) pulled with the pipe. Multiple tracer wires (no less than 2) can be pulled together in the event a tracer wire breaks during installation ensuring natural gas main is locatable after installation. Refer to Section 15105 for tracer wire requirements.

3.3.2.2 A frac-out plan shall be provided to RPR for review prior to boring. All materials and equipment to mitigate a frac-out, as stated in the frac-out plan, shall be readily available on site prior to beginning the bore. If a frac-out occurs, the frac-out plan shall be immediately implemented, followed by immediate notification to the RPR.

3.3.2.3 When pulling the pipe through reamed borehole, the tensile loads in **TABLE 2: Maximum Allowable Tensile Loads** shall not be exceeded. RPR shall be notified one full business day prior to pull back operations and may require on-site presence during pull back operations. An appropriately sized Condux International, Inc break away swivel weak link device shall be used during bull back activities. Break away weak link devices other than the Condux International products shall be submitted for approval to GSE prior to use.

TABLE 2: Maximum Allowable Tensile Loads

Nominal Pipe Size (inches)	Allowable Tensile Load (pounds)	Swivel Size (millimeters)	Pin Rating (pounds)	Pin Color
2	1,441	22	1,400	Green/Red
4	4,990	35	4,500	Slate/Yellow
6	10,832	51	10,000	Green
8	15,855	64	14,000	Brown
12	34,607	76	25,000	Blue

3.4 CLEARANCE FROM OTHER UTILITIES

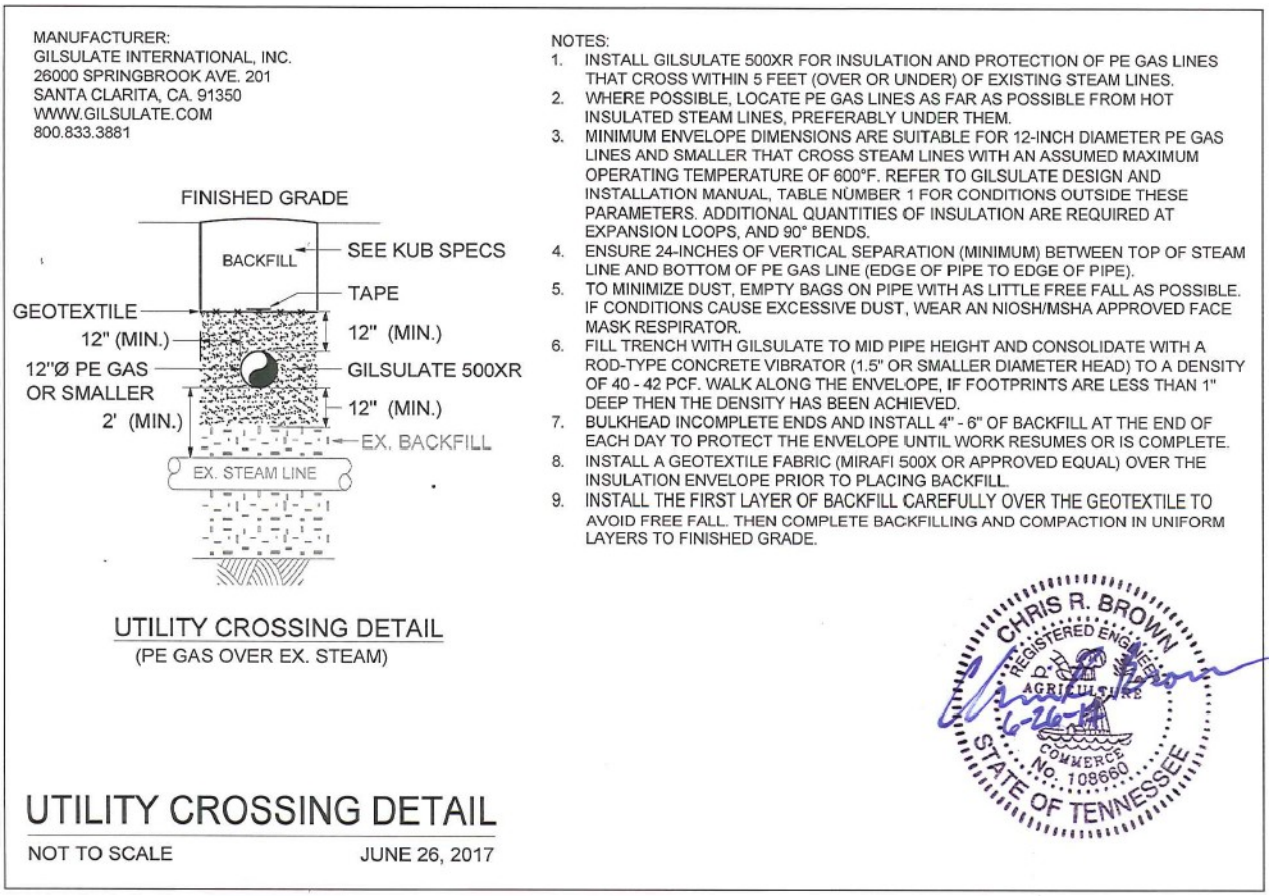
3.4.1 A minimum of 12 inches of clearance shall be maintained from all other utilities. If minimum clearance requirements cannot be met, additional protective measures shall be required and approved by RPR prior to installation.

3.4.2 Natural gas mains shall not be installed directly above or below any other underground utility in parallel sequence, even if 12 inches of clearance can be maintained.

3.4.3 Third party utility owners, such as natural gas, petroleum, steam and intercontinental utilities, have special requirements when crossing their infrastructure. When encountered, OWNER shall obtain written permission prior to crossing a third-party utility. Main shall be installed based on the third party special requirements.

3.4.4 When crossing a heat source, including, but not limited to a steam line, installation of PE pipe shall follow the utility crossing detail, **Detail 1: Crossing a Heat Source**, as shown below:

Detail 1: Crossing a Heat Source



3.5 DEPTH

3.5.1 Natural gas mains shall be installed at a depth between 36 inches and 60 inches from the top of the main to finished grade. If depth requirements cannot be met, approval shall be obtained from RPR prior to installation. Mains installed shallower than 36 inches may be required to have additional protective measures.

3.6 VALVES AND TEES

3.6.1 Valves shall not be installed in existing or proposed pavement, unless stated in project drawings or approved by RPR.

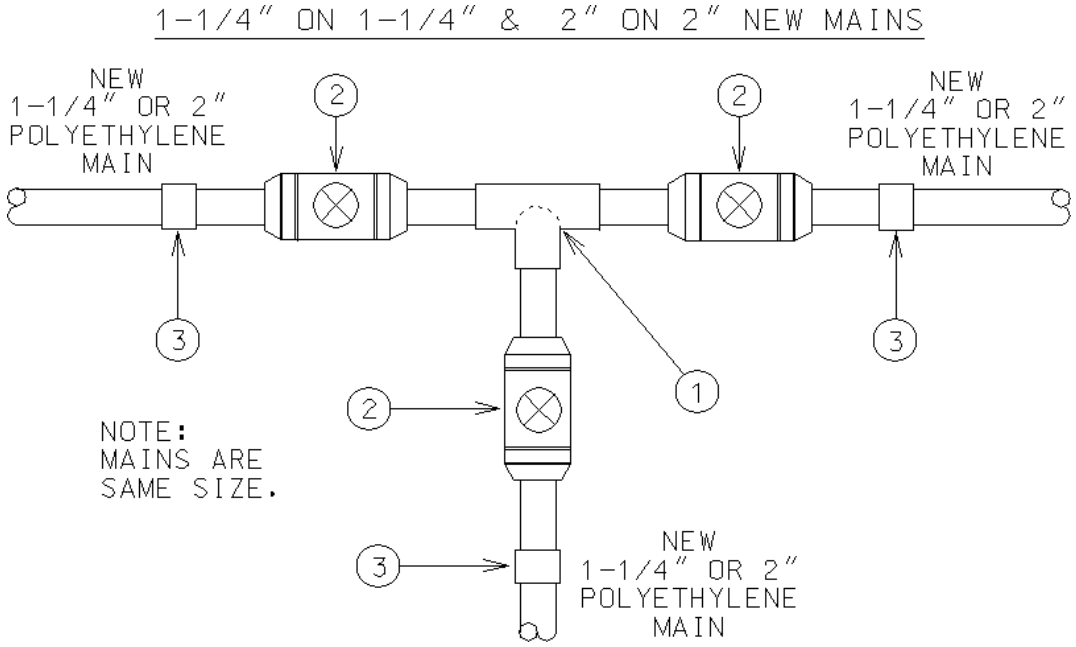
3.6.2 Valves shall be installed as close to the tee as possible, unless stated in project drawings or approved by RPR.

3.6.3 For clarity, tracer wire and connections are not shown in figures below but are required as per Section 15105.

3.6.4 New PE Main to New PE Main

3.6.4.1 See the following figures and material lists for New PE Main to New PE Main Tee Installations with 3 PE Valves:

a. 3-Valve Tee for New 1-1/4 inch or 2 inch PE Main – Figure15720-A



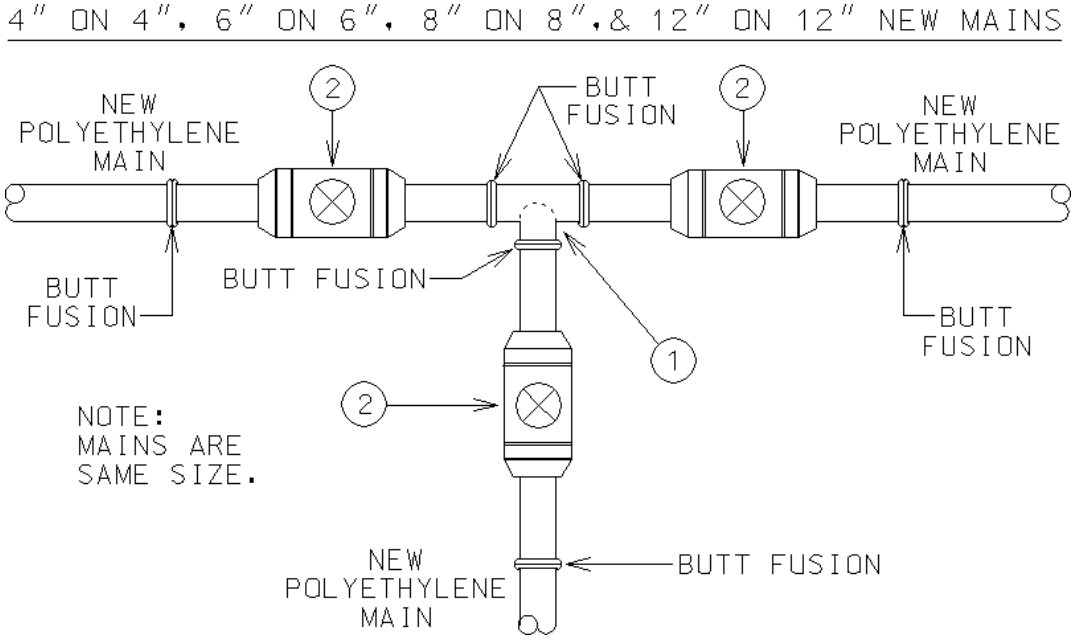
Material List for Figure 15720-A1

Item	Quantity	KUB Item #	Description
1	1	382739	1-1/4 inch PE Socket Fusion Tee
2	3	371724	1-1/4 inch PE Valve
3	3	384032	1-1/4 inch PE Socket Fusion Coupling

Material List for Figure 15720-A2

Item	Quantity	KUB Item #	Description
1	1	382978	2 inch PE Socket Fusion Tee
2	3	371740	2 inch PE Valve
3	3	383810	2 inch PE Socket Fusion Coupling

b. 3-Valve Tee for New 4 inch-12 inch PE Main – Figure 15720-B



Material List for Figure 15720-B4

Item	Quantity	KUB Item #	Description
1	1	370106	4 inch PE Butt Fusion Tee
2	3	360473	4 inch PE Valve

Material List for Figure 15720-B6

Item	Quantity	KUB Item #	Description
1	1	380824	6 inch PE Butt Fusion Tee
2	3	360693	6 inch PE Valve

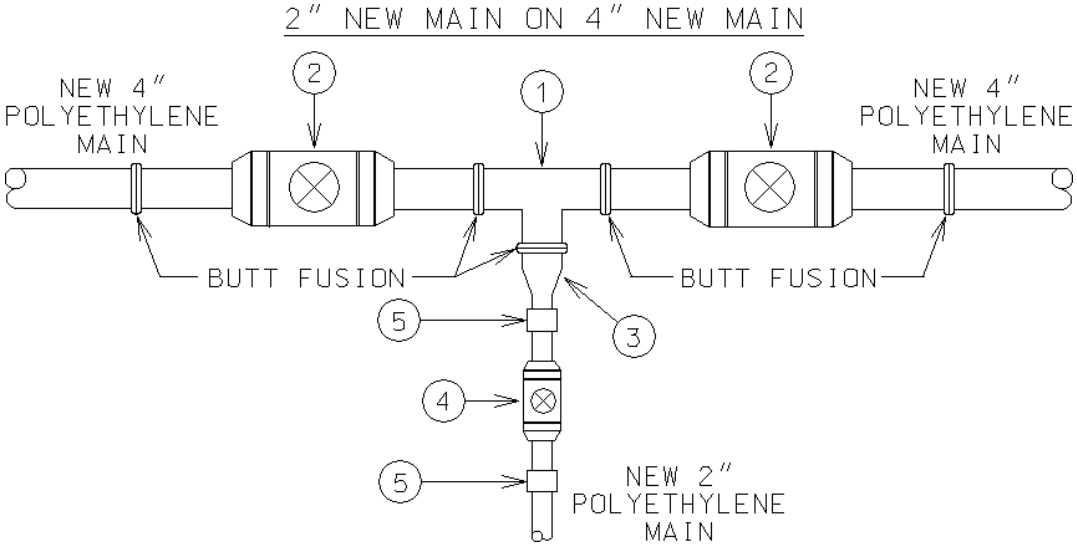
Material List for Figure 15720-B8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	3	361034	8 inch PE Valve

Material List for Figure 15720-B12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	3	361045	12 inch PE Valve

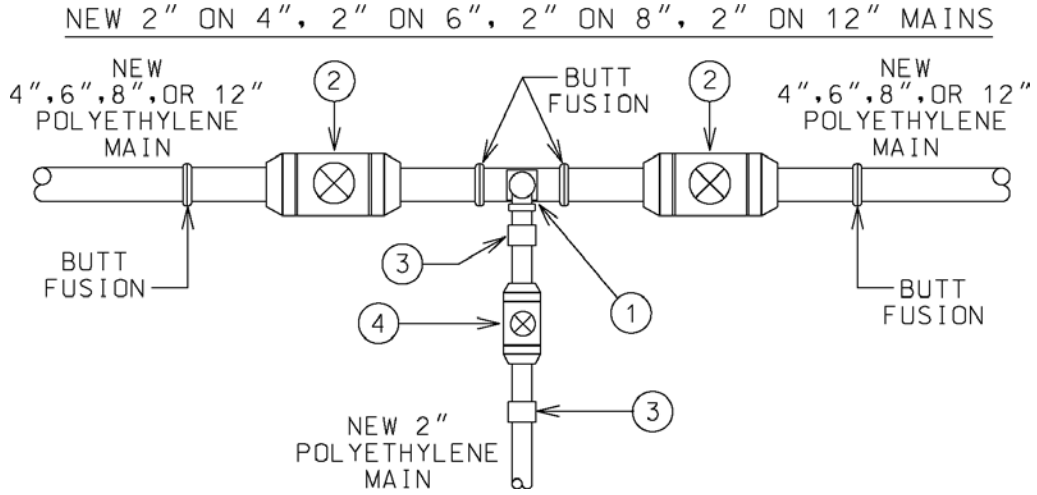
c. 3-Valve Tee for New 2 inch PE Main to New 4 inch PE Main – Figure 15720-C



Material List for Figure 15720-C

Item	Quantity	KUB Item #	Description
1	1	370106	4 inch PE Butt Fusion Tee
2	2	360473	4 inch PE Valve
3	1	380352	4 inch x 2 inch PE Reducer
4	1	371740	2 inch PE Valve
5	2	383810	2 inch PE Socket Fusion Coupling

d. 3-Valve Tee for New 2 inch PE Main to New 4 inch-12 inch PE Main – Figure 15720-D



Material List for Figure 15720-D4

Item	Quantity	KUB Item #	Description
1	1	380311	4 inch x 2 inch PE Tapping Tee
2	2	360473	4 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve

Material List for Figure 15720-D6

Item	Quantity	KUB Item #	Description
1	1	380840	6 inch x 2 inch PE Tapping Tee
2	2	360693	6 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve

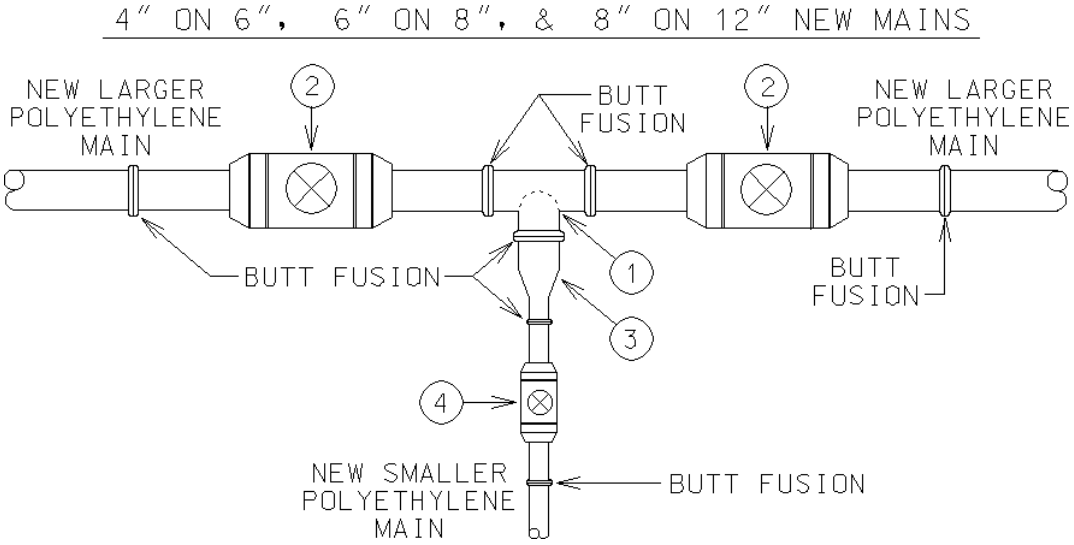
Material List for Figure 15720-D8

Item	Quantity	KUB Item #	Description
1	1	374835	8 inch x 2 inch PE Tapping Tee
2	2	361034	8 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve

Material List for Figure 15720-D12

Item	Quantity	KUB Item #	Description
1	1	360891	12 inch x 2 inch PE Tapping Tee
2	2	361045	12 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve

e. 3-Valve Tee for New 4 inch PE Main to New 6 inch PE Main, New 6 inch PE Main to New 8 inch PE Main, and new 8 inch PE Main to New 12 inch PE Main – Figure 15720-E



Material List for Figure 15720-E6

Item	Quantity	KUB Item #	Description
1	1	380824	6 inch PE Butt Fusion Tee
2	2	360693	6 inch PE Valve
3	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
4	1	360473	4 inch PE Valve

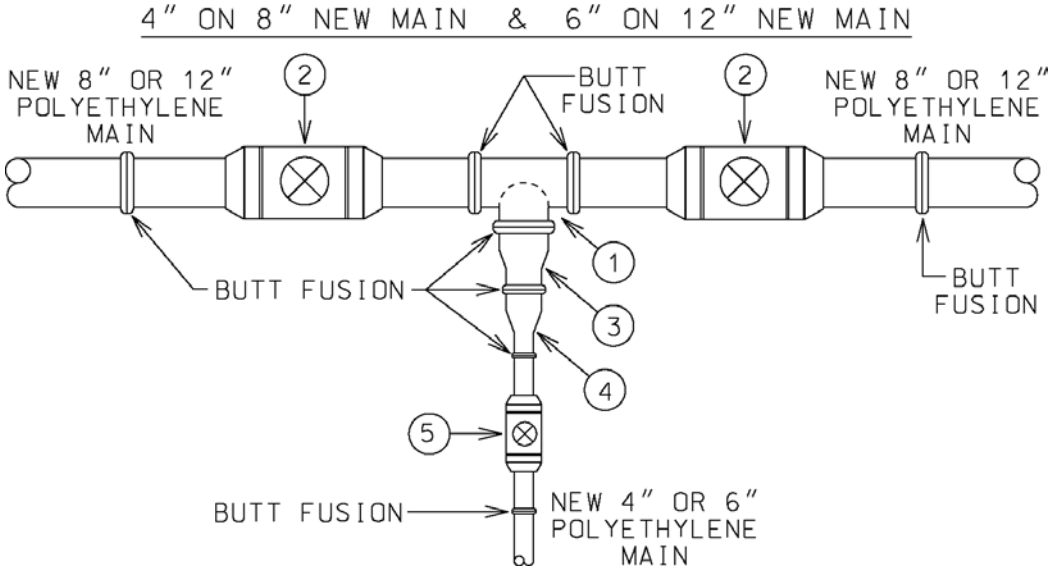
Material List for Figure 15720-E8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	2	361034	8 inch PE Valve
3	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
4	1	360693	6 inch PE Valve

Material List for Figure 15720-E12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	2	361045	12 inch PE Valve
3	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
4	1	361034	8 inch PE Valve

f. 3 -Valve Tee for New 4 inch PE Main to New 8 inch PE Main and New 6 inch PE Main to New 12 inch PE Main – Figure 15720-F



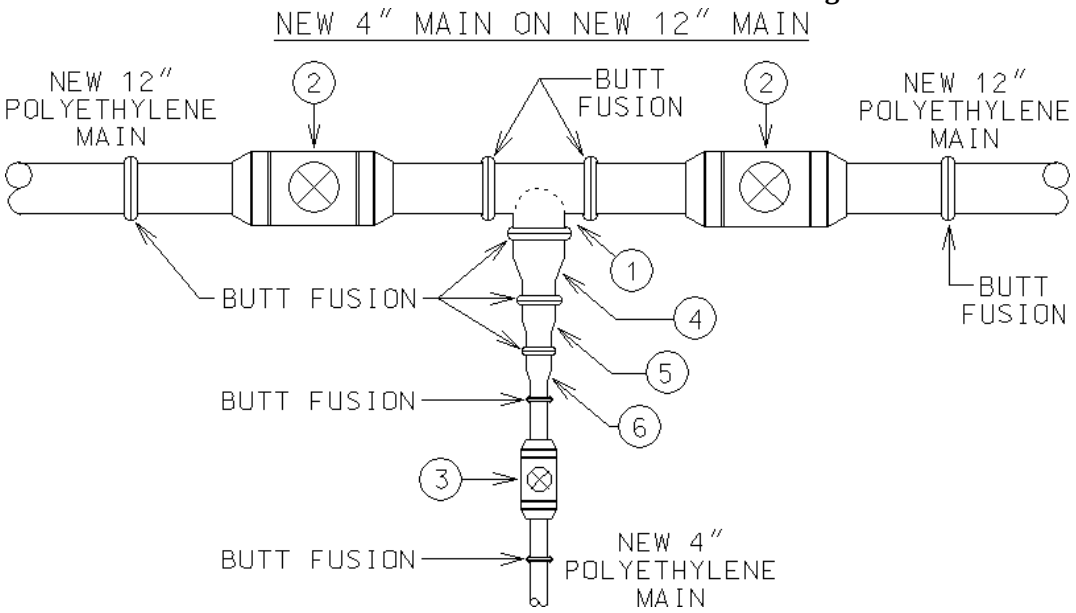
Material List for Figure 15720-F8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	2	361034	8 inch PE Valve
3	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
4	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
5	1	360473	4 inch PE Valve

Material List for Figure 15720-F12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	2	361045	12 inch PE Valve
3	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
4	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
5	1	360693	6 inch PE Valve

g. 3-Valve Tee for New 4 inch PE Main to New 12 inch PE Main – Figure 15720-G

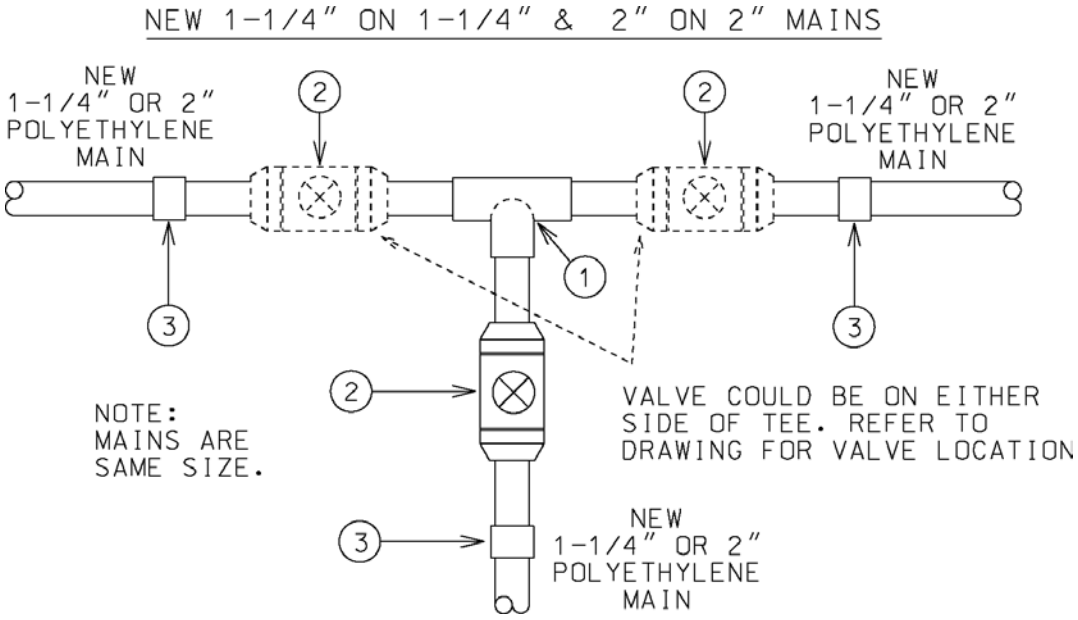


Material List for Figure 15720-G

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	2	361045	12 inch PE Valve
3	1	360473	4 inch PE Valve
4	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
5	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
6	1	372110	6 inch x 4 inch PE Butt Fusion Reducer

3.6.4.2 See the following figures and material lists for New PE Main to New PE Main Tee Installations with 2 PE Valves

h. 2-Valve Tee for New 1-1/4 inch or 2 inch PE Main – Figure 15720-H



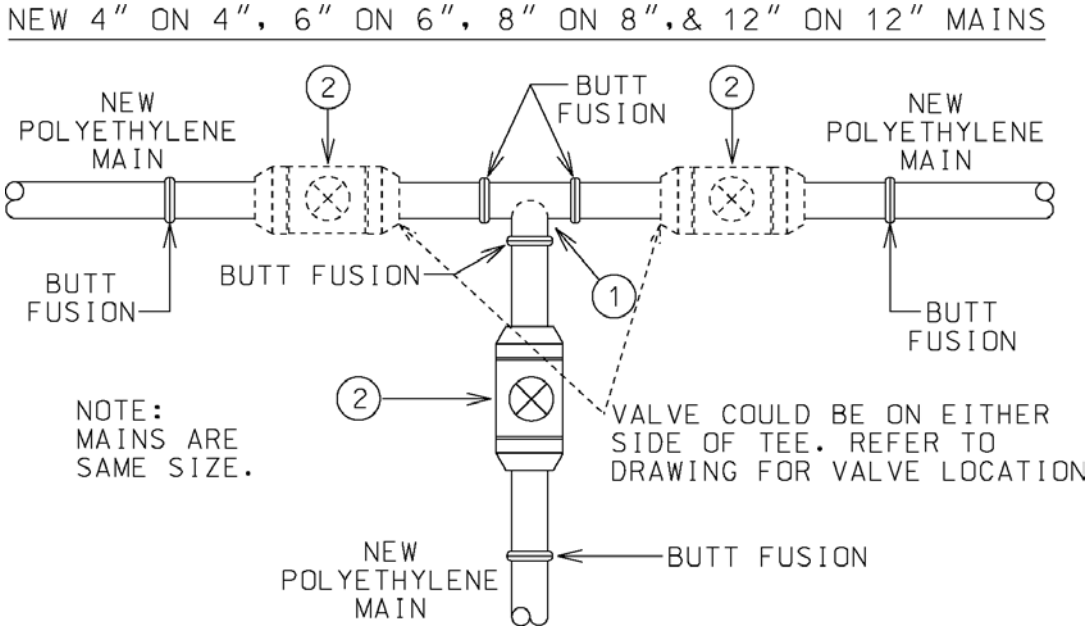
Material List for Figure 15720-H1

Item	Quantity	KUB Item #	Description
1	1	382739	1-1/4 inch PE Socket Fusion Tee
2	2	371724	1-1/4 inch PE Valve
3	3	384032	1-1/4 inch PE Socket Fusion Coupling

Material List for Figure 15720-H2

Item	Quantity	KUB Item #	Description
1	1	382978	2 inch PE Socket Fusion Tee
2	2	371740	2 inch PE Valve
3	3	383810	2 inch PE Socket Fusion Coupling

i. 2-Valve Tee for New 4 inch-12 inch PE Main – Figure 15720-I



Material List for Figure 15720-I4

Item	Quantity	KUB Item #	Description
1	1	370106	4 inch PE Butt Fusion Tee
2	2	360473	4 inch PE Valve

Material List for Figure 15720-I6

Item	Quantity	KUB Item #	Description
1	1	380824	6 inch PE Butt Fusion Tee
2	2	360693	6 inch PE Valve

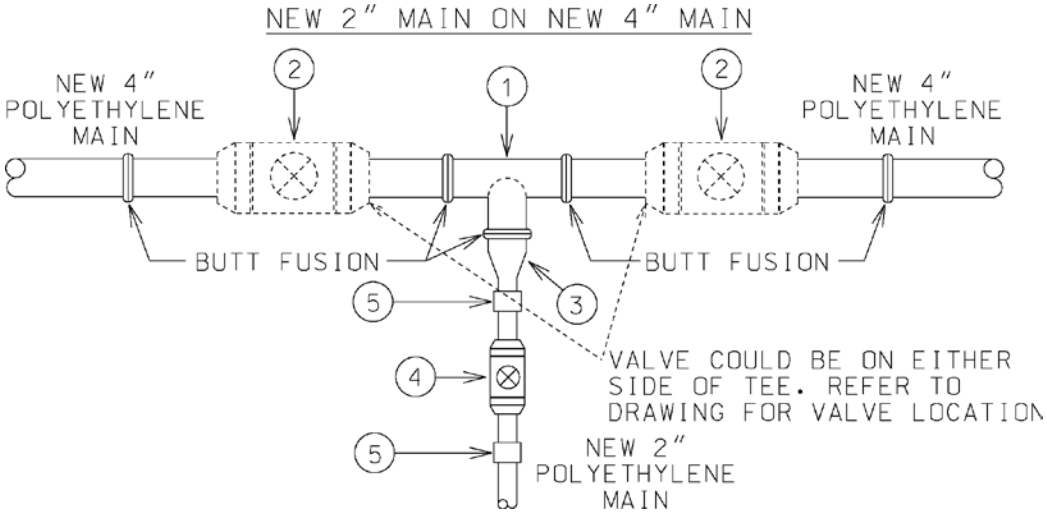
Material List for Figure 15720-I8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	2	361034	8 inch PE Valve

Material List for Figure 15720-I12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	2	361045	12 inch PE Valve

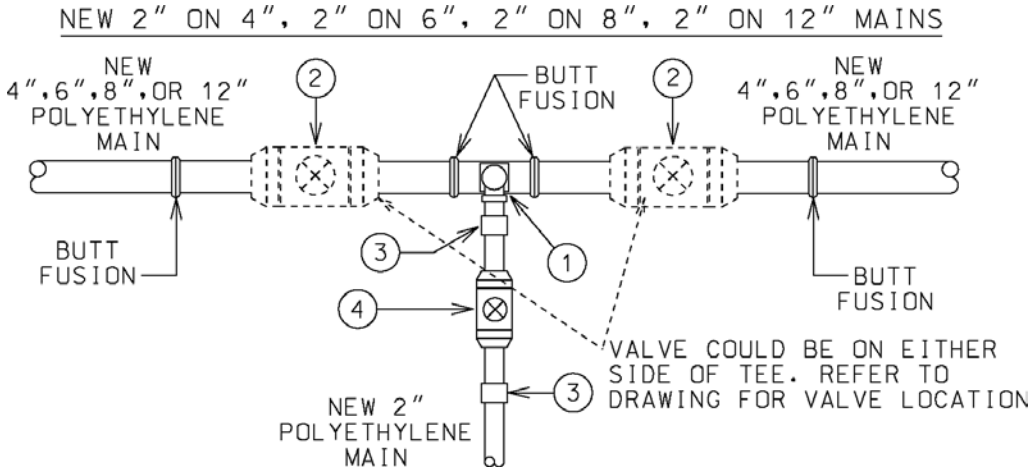
j. 2-Valve Tee for New 2 inch PE Main to New 4 inch PE Main – Figure 15720-J



Material List for Figure 15720-J

Item	Quantity	KUB Item #	Description
1	1	370106	4 inch PE Butt Fusion Tee
2	1	360473	4 inch PE Valve
3	1	380352	4 inch x 2 inch PE Reducer
4	1	371740	2 inch PE Valve
5	2	383810	2 inch PE Socket Fusion Coupling

k. 2-Valve Tee for New 2 inch PE Main to New 4 inch-12 inch PE Main – Figure 15720-K



Material List for Figure 15720-K4

Item	Quantity	KUB Item #	Description
1	1	380311	4 inch x 2 inch PE Tapping Tee
2	1	360473	4 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve

Material List for Figure 15720-K6

Item	Quantity	KUB Item #	Description
1	1	380840	6 inch x 2 inch PE Tapping Tee
2	1	360693	6 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve

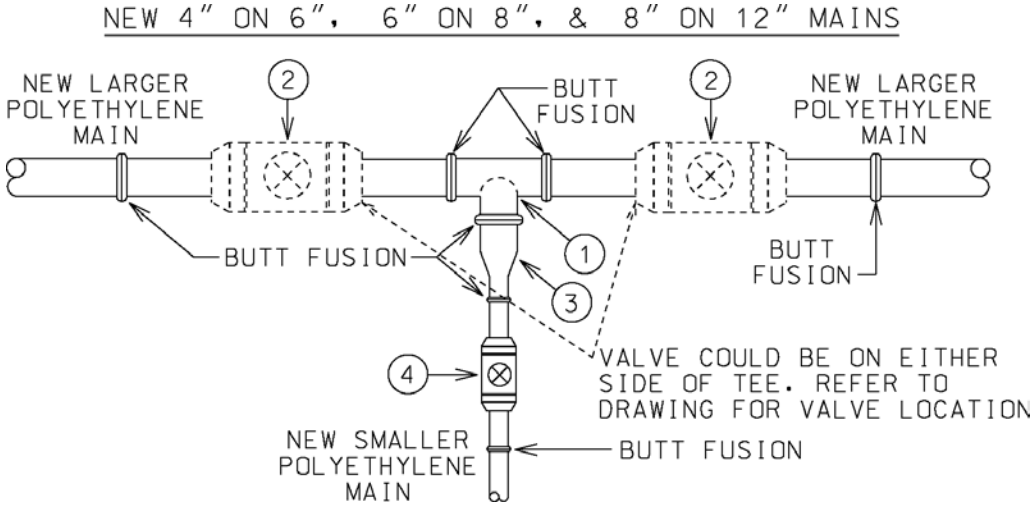
Material List for Figure 15720-K8

Item	Quantity	KUB Item #	Description
1	1	374835	8 inch x 2 inch PE Tapping Tee
2	1	361034	8 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve

Material List for Figure 15720-K12

Item	Quantity	KUB Item #	Description
1	1	360891	12 inch x 2 inch PE Tapping Tee
2	1	361045	12 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve

l. 2-Valve Tee for New 4 inch PE Main to New 6 inch PE Main, New 6 inch PE Main to New 8 inch PE Main, and new 8 inch PE Main to New 12 inch PE Main – Figure 15720-L



Material List for Figure 15720-L6

Item	Quantity	KUB Item #	Description
1	1	380824	6 inch PE Butt Fusion Tee
2	1	360693	6 inch PE Valve
3	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
4	1	360473	4 inch PE Valve

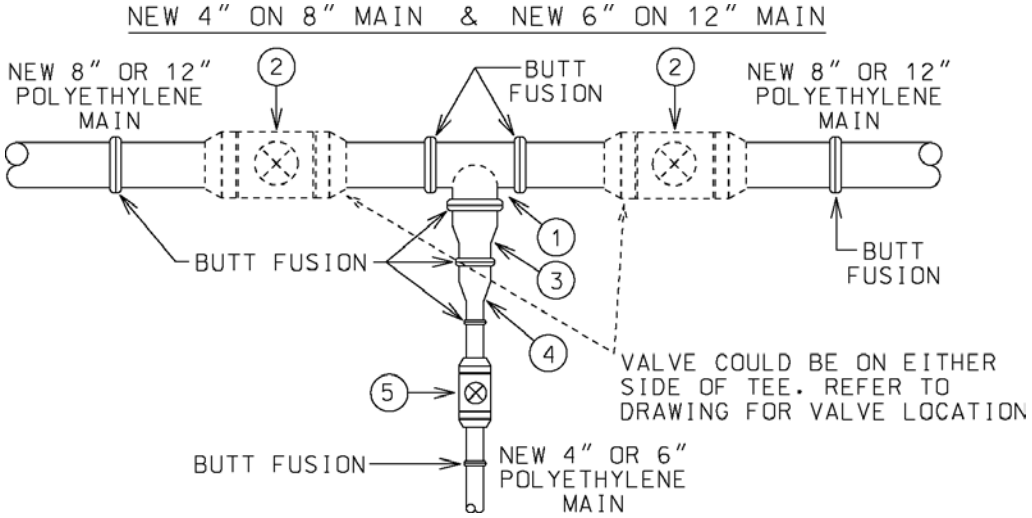
Material List for Figure 15720-L8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	1	361034	8 inch PE Valve
3	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
4	1	360693	6 inch PE Valve

Material List for Figure 15720-L12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	1	361045	12 inch PE Valve
3	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
4	1	361034	8 inch PE Valve

m. 2 -Valve Tee for New 4 inch PE Main to New 8 inch PE Main and New 6 inch PE Main to New 12 inch PE Main – Figure 15720-M



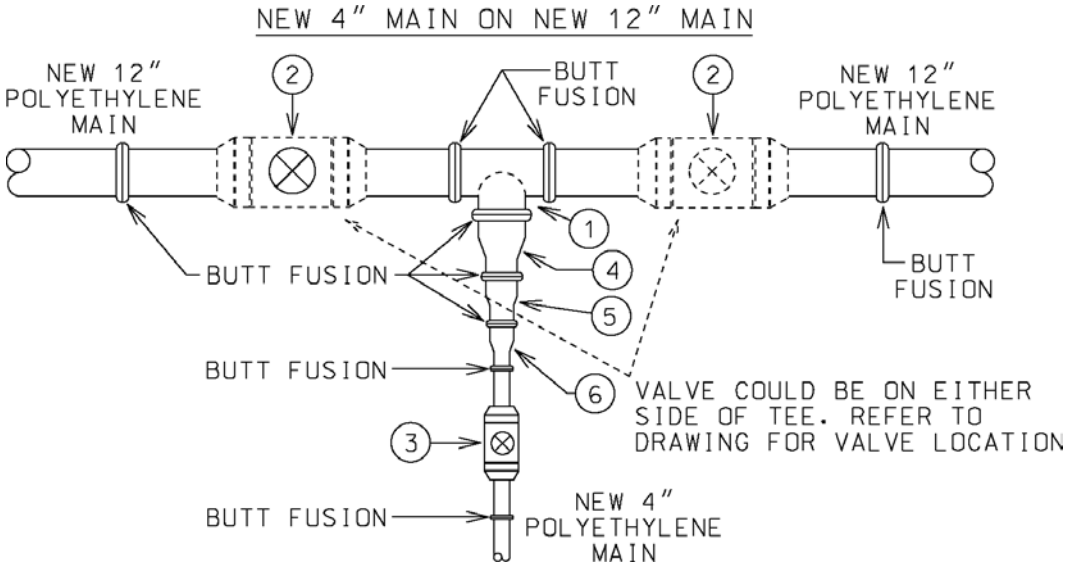
Material List for Figure 15720-M8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	1	361034	8 inch PE Valve
3	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
4	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
5	1	360473	4 inch PE Valve

Material List for Figure 15720-M12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	1	361045	12 inch PE Valve
3	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
4	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
5	1	360693	6 inch PE Valve

n. 2-Valve Tee for New 4 inch PE Main to New 12 inch PE Main – Figure 15720-N

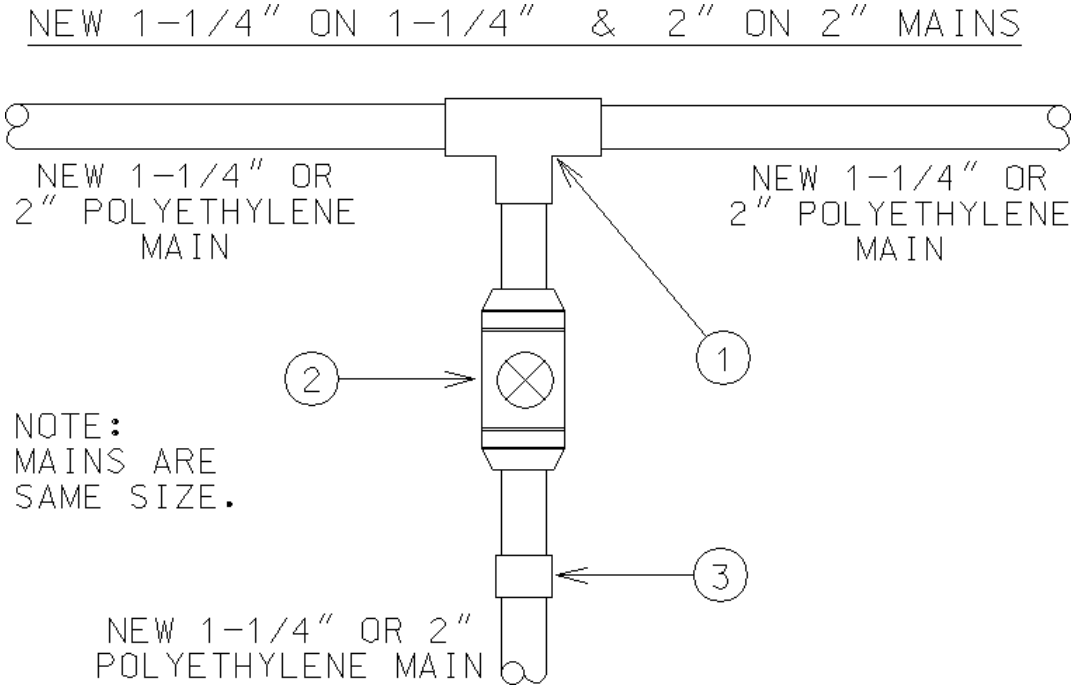


Material List for Figure 15720-N

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	1	361045	12 inch PE Valve
3	1	360473	4 inch PE Valve
4	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
5	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
6	1	372110	6 inch x 4 inch PE Butt Fusion Reducer

3.6.4.3 See the following figures and material lists for New PE Main to New PE Main Tee Installations with 1 PE Valve

o. 1-Valve Tee for New 1-1/4 inch or 2 inch PE Main – Figure 15720-O



Material List for Figure 15720-O1

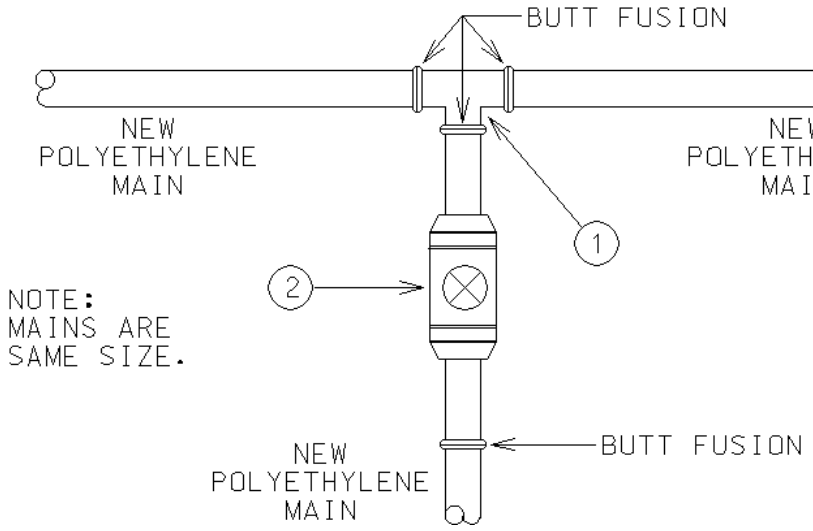
Item	Quantity	KUB Item #	Description
1	1	382739	1-1/4 inch PE Socket Fusion Tee
2	1	371724	1-1/4 inch PE Valve
3	1	384032	1-1/4 inch PE Socket Fusion Coupling

Material List for Figure 15720-O2

Item	Quantity	KUB Item #	Description
1	1	382978	2 inch PE Socket Fusion Tee
2	1	371740	2 inch PE Valve
3	1	383810	2 inch PE Socket Fusion Coupling

p. 1-Valve Tee for New 4 inch-12 inch PE Main – Figure 15720-P

NEW 4″ ON 4″, 6″ ON 6″, 8″ ON 8″, & 12″ ON 12″ MAINS



Material List for Figure 15720-P4

Item	Quantity	KUB Item #	Description
1	1	370106	4 inch PE Butt Fusion Tee
2	1	360473	4 inch PE Valve

Material List for Figure 15720-P6

Item	Quantity	KUB Item #	Description
1	1	380824	6 inch PE Butt Fusion Tee
2	1	360693	6 inch PE Valve

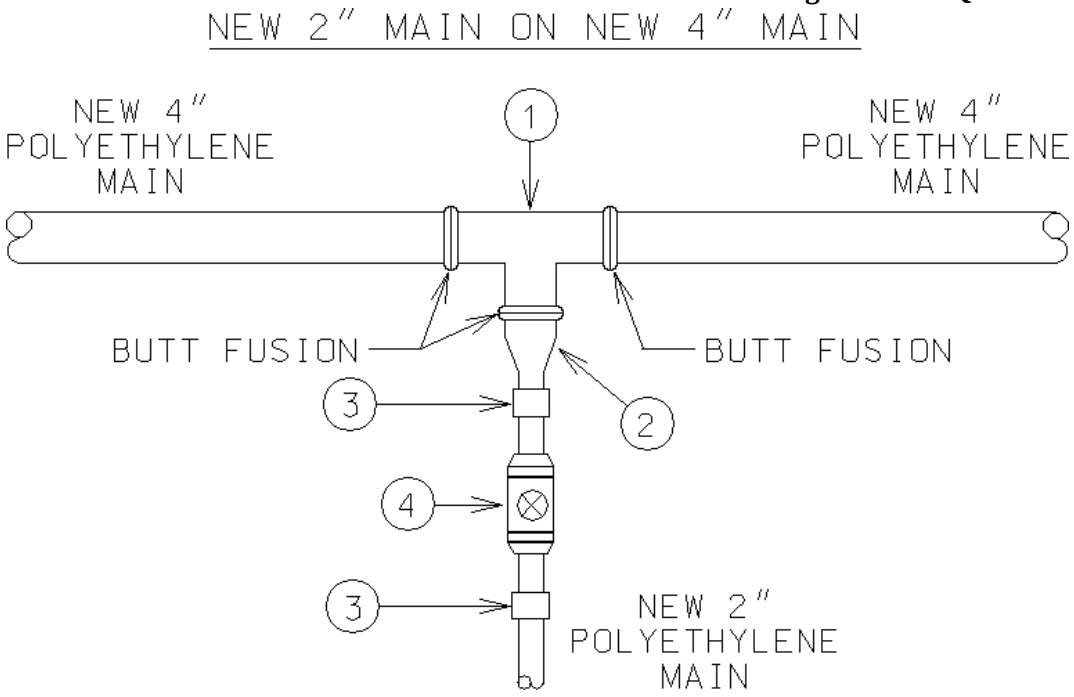
Material List for Figure 15720-P8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	1	361034	8 inch PE Valve

Material List for Figure 15720-P12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	1	361045	12 inch PE Valve

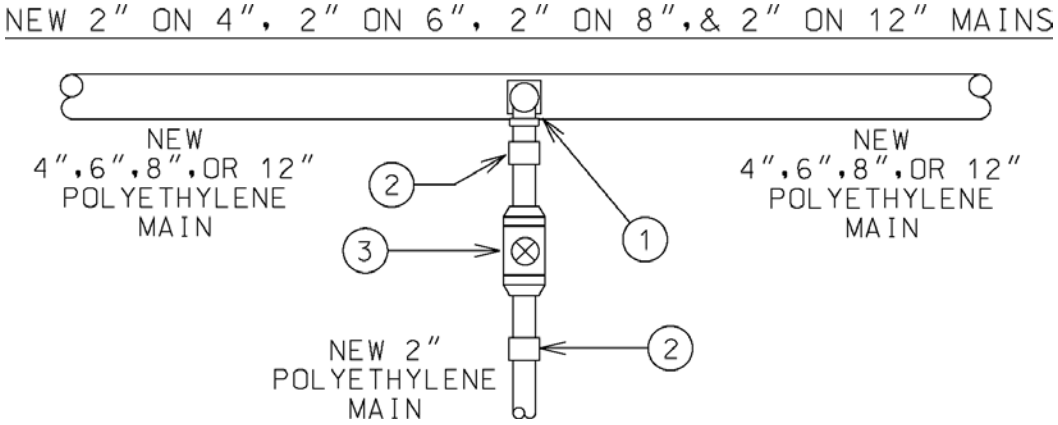
q. 1-Valve Tee for New 2 inch PE Main to New 4 inch PE Main – Figure 15720-Q



Material List for Figure 15720-Q

Item	Quantity	KUB Item #	Description
1	1	370106	4 inch PE Butt Fusion Tee
2	1	380352	4 inch x 2 inch PE Reducer
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve

r. 1-Valve Tee for New 2 inch PE Main to New 4 inch-12 inch PE Main – Figure 15720-R



Material List for Figure 15720-R4

Item	Quantity	KUB Item #	Description
1	1	380311	4 inch x 2 inch PE Tapping Tee
2	2	383810	2 inch PE Socket Fusion Coupling
3	1	371740	2 inch PE Valve

Material List for Figure 15720-R6

Item	Quantity	KUB Item #	Description
1	1	380840	6 inch x 2 inch PE Tapping Tee
2	2	383810	2 inch PE Socket Fusion Coupling
3	1	371740	2 inch PE Valve

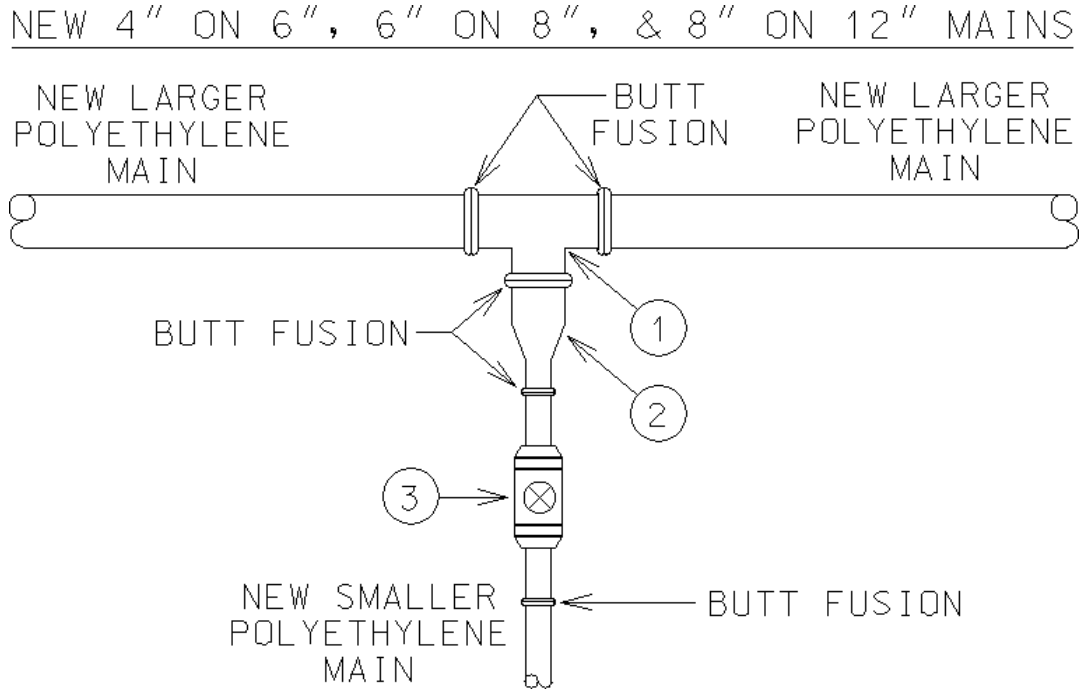
Material List for Figure 15720-R8

Item	Quantity	KUB Item #	Description
1	1	374835	8 inch x 2 inch PE Tapping Tee
2	2	383810	2 inch PE Socket Fusion Coupling
3	1	371740	2 inch PE Valve

Material List for Figure 15720-R12

Item	Quantity	KUB Item #	Description
1	1	360891	12 inch x 2 inch PE Tapping Tee
2	2	383810	2 inch PE Socket Fusion Coupling
3	1	371740	2 inch PE Valve

s. 1- Valve Tee for New 4 inch PE Main to New 6 inch PE Main, New 6 inch PE Main to New 8 inch PE Main, and new 8 inch PE Main to New 12 inch PE Main – Figure15720-S



Material List for Figure 15720-S6

Item	Quantity	KUB Item #	Description
1	1	380824	6 inch PE Butt Fusion Tee
2	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
3	1	360473	4 inch PE Valve

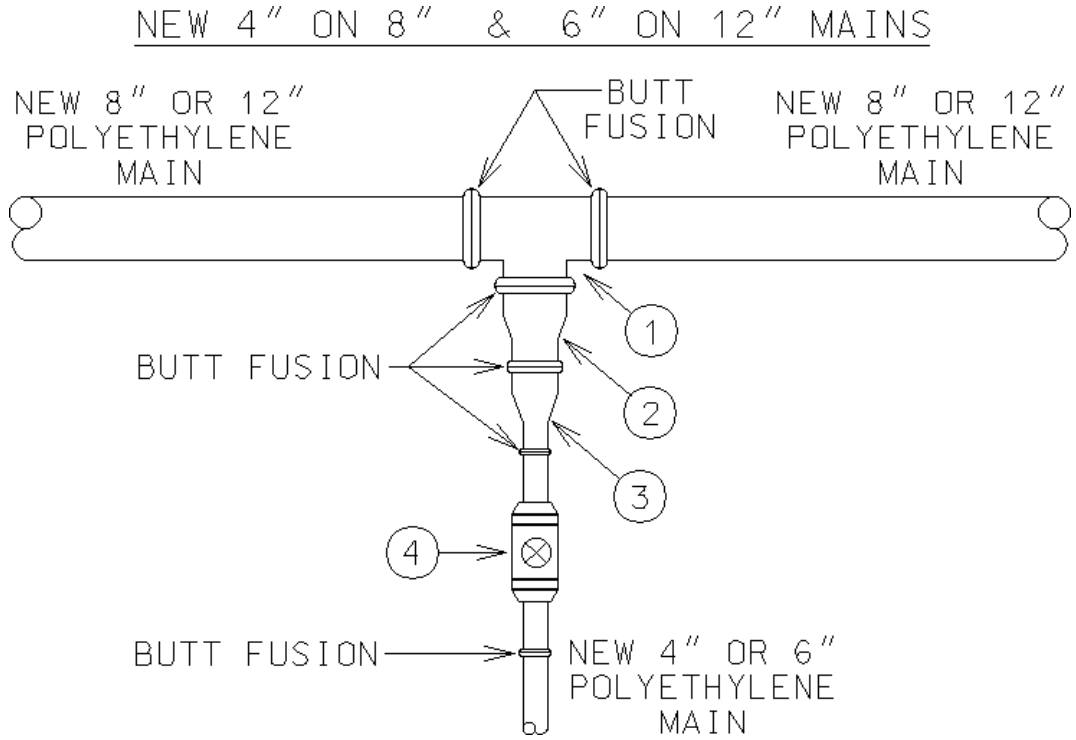
Material List for Figure 15720-S8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
3	1	360693	6 inch PE Valve

Material List for Figure 15720-S12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
3	1	361034	8 inch PE Valve

t. 1-Valve Tee for New 4 inch PE Main to New 8 inch PE Main and New 6 inch PE Main to New 12 inch PE Main – Figure 15720-T



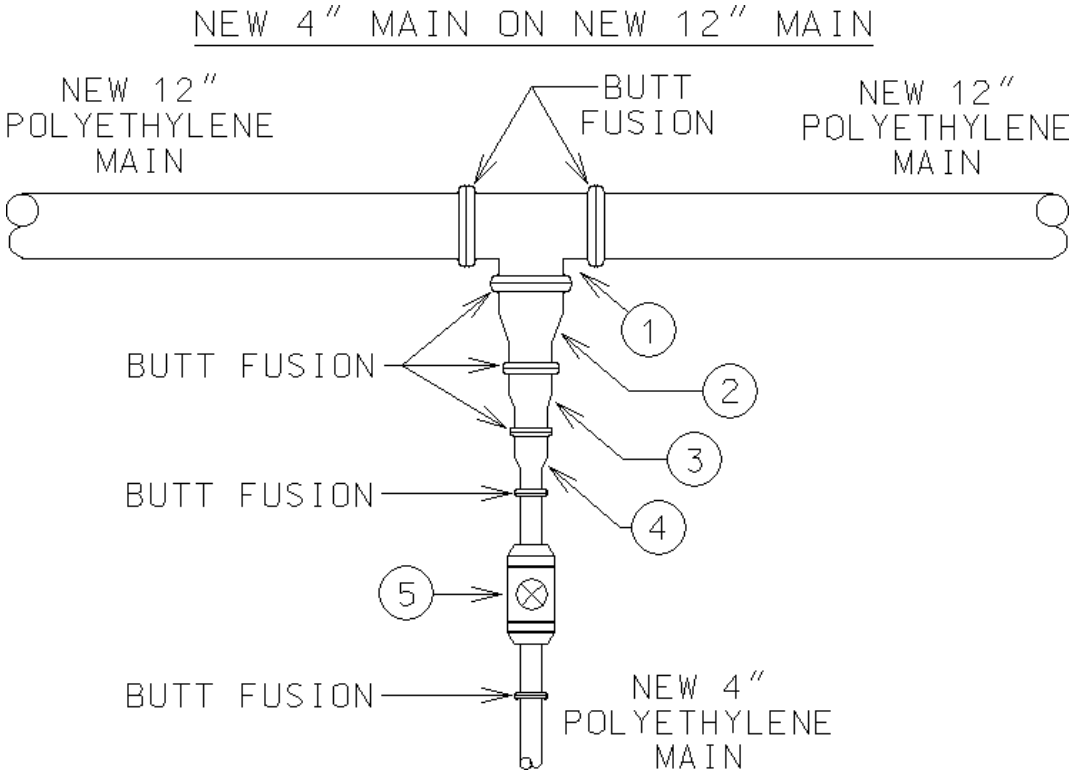
Material List for Figure 15720-T8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
3	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
4	1	360473	4 inch PE Valve

Material List for Figure 15720-T12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
3	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
4	1	360693	6 inch PE Valve

u. 1-Valve Tee for New 4 inch PE Main to New 12 inch PE Main – Figure 15720-U



Material List for Figure 15720-U

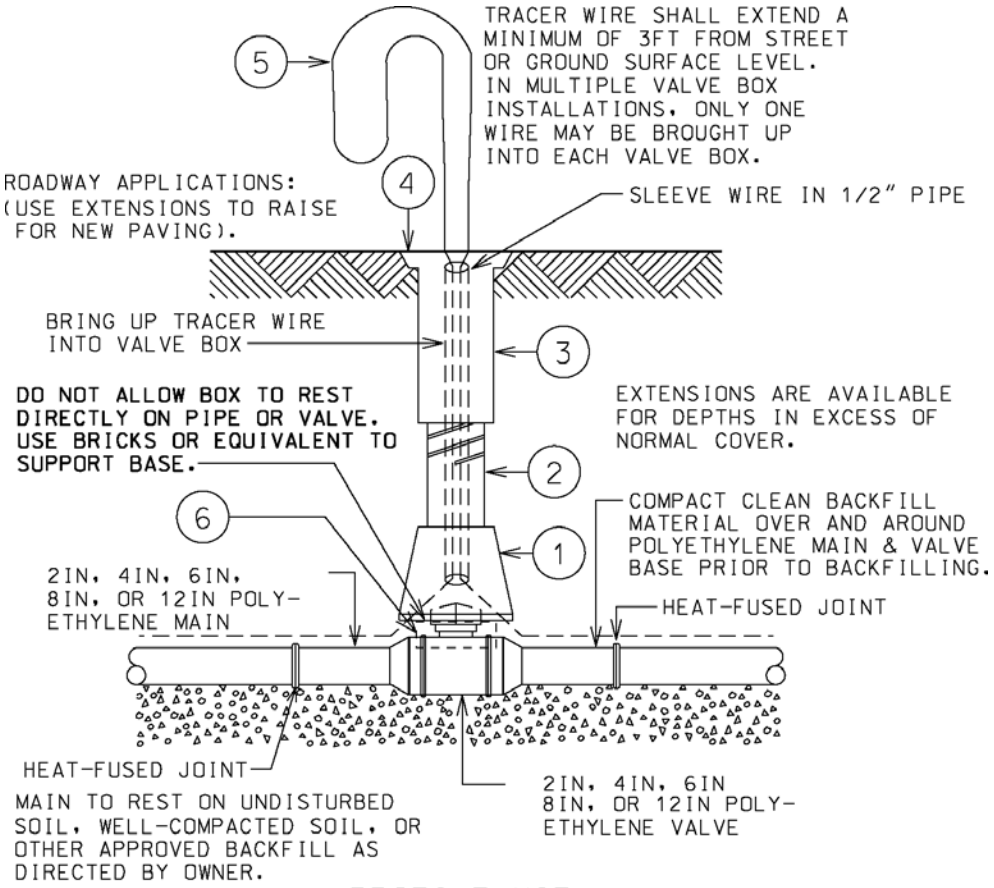
Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
3	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
4	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
5	1	360473	4 inch PE Valve

3.7 VALVE BOXES

3.7.1 Tracer wire shall be looped in multi-valve clusters.

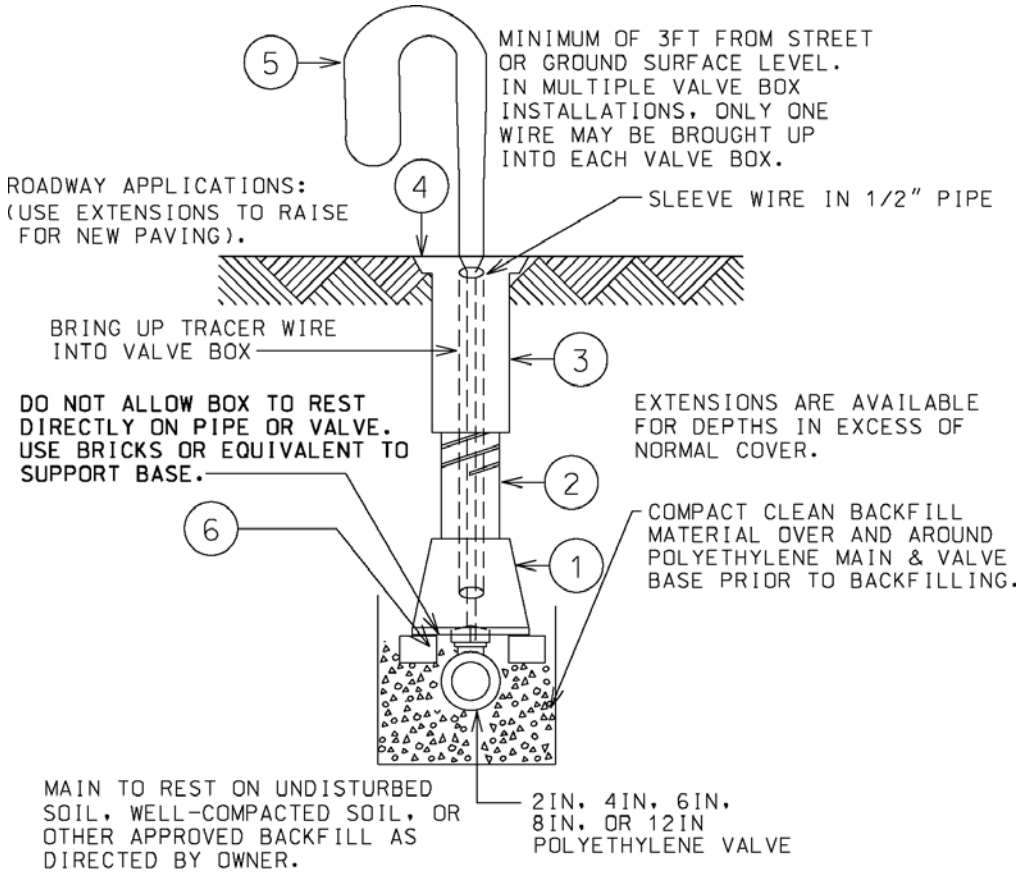
3.7.2 See the following figures and material lists for valve box installation – Figure 15720 - Refer to **3.3 INSTALLATION METHODS** and **3.8 BACKFILL** requirements.

a. Single Valve Installation Profile View – Figure 15720-V1



PROFILE VIEW
SINGLE VALVE INSTALLATION

b. Single Valve Installation Cross Section View – Figure 15720-V2



CROSS SECTION VIEW
SINGLE VALVE INSTALLATION

Material List for Figure 15720-V

Item	Quantity	KUB Item #	Description
1	1	294074	Valve Box Base Section
2	1	360440	Valve Box Middle Section
3	1	360451	Valve Box Top Section
4	1	383398	Valve Box Lid
5	1-Lot	383448* 363069*	Tracer Wire **Either Wire Is Acceptable In This Application*
6	1-Lot	290783	Bricks To Support Valve Box

3.8 BACKFILL

3.8.1 Backfill shall be free from any material that could cause damage to the pipe including, but not limited to: large rocks, sharp rocks, large dirt clods and/or any construction debris or trash.

3.8.2 In rocky excavation zones, a minimum of 6 inches of clean and compacted fill material shall be installed prior to the pipe being lowered into the trench. The pipe is then installed and side filled to the required trench width with clean and well-compacted fill material. Pipe shall be covered with a minimum of 6 inches of clean and well-compacted fill material prior to final backfill.

3.8.3 Clean backfill is defined as native materials, manufactured fill and/or delivered soil containing a maximum particle size as indicated in **TABLE 3: Maximum Particle Size For Backfill** below or approved by RPR.

TABLE 3: Maximum Particle Size For Backfill

Nominal Pipe Size (inches)	Maximum Particle Size Including Rocks (inches)
Up to 4	½
6-12	¾

3.8.4 Backfill shall be free from contaminants. If native material has smell, sheen, discoloration, debris or any uncommon substances, work shall stop immediately and RPR notified. All native materials shall be held on site in a manner to limit cross contamination.

3.8.5 Backfill and sidefill shall be well compacted around all pipe and components with special care taken not to damage the pipe and components during compaction. At a minimum, well compacted soil is defined as machine tamped.

3.8.6 Backfill shall be installed in manner that protects the main from damages including, but not limited to, bends, crushing, gouges, and punctures.

3.8.7 Large rock is defined as having a diameter greater than 2 inch. If large rock is discovered during the excavation process, CONTRACTOR shall use clean backfill as defined in 3.8.3.

3.8.8 Backfilling a trench/excavation in a non-paved area shall be well compacted in a manner to prevent future below grade settling. At a minimum, well compacted soil is defined as machine tamped in lifts no greater than 12 inch lifts.

3.8.9 Backfilling in a paved area shall be in compliance with TDOT, Town of Farragut, City of Knoxville and Knox County requirements as noted in the project drawings.

3.8.10 Tracer wire shall be installed as stated in 3.3.1.4.

3.8.11 Warning tape shall be installed as stated in 3.3.1.5.

3.9 STARTUP PLAN

3.9.1 CONTRACTOR is responsible for developing a startup plan for each project. The startup plan shall be submitted to and approved by the RPR.

3.9.2 The startup plan shall consist of a narrative and/or Gantt chart listing the practices that will be employed on site and proposed order of events including installation, pigging, temporary bypasses for one way feeds, pressure testing, purging natural gas into the new pipelines, performing final tie-ins to existing pipelines and condemning existing pipelines.

3.9.3 A startup plan is required 3 business days prior to pigging, pressure testing, installing temporary bypasses, purging, and performing tie-ins.

3.9.4 The startup plan shall be project specific and address the approach to the entire project or individual zones of the project. The project may be divided into zones to limit customer impact on larger projects by completing smaller sections of the project from start to finish. Project drawings will dictate the zone size and limits.

3.10 PIGGING

3.10.1 RPR shall be notified, at a minimum, one full business day prior to pigging main(s).

3.10.2 Main shall be pigged until proven to be clean and dry. Based on the last pig run, there shall be no loose debris and no free liquids. RPR reserves the right to require additional pigging. RPR may require additional pigs to be new and unused.

3.10.3 Pigging shall be planned and performed in a manner to minimize additional fittings and pipe connection points.

3.10.4 The pig shall be caught as it exits pipe in a manner that ensures prevention of property damage, injury to employees, and injury to the public.

3.10.5 If any main ends are not tied up, a fused on end cap shall be installed to assure main stays clean of debris and liquids.

3.11 PRESSURE TESTING

3.11.1 Pressure testing shall be performed for all main and appurtenances after installation.

3.11.2 Prior to pressure testing, pipe shall be restrained against possible movement. Backfill is appropriate restraint.

3.11.3 All main and appurtenances shall be pressure tested with inert gas or air free of contaminants to a minimum of 92 psig and a maximum of 96 psig. The pressure test shall establish an MAOP of 60 psig and detect any potentially hazardous leaks.

3.11.4 Pressure testing shall be performed with a Kuhlman Unit or RPR approved device.

3.11.5 Kuhlman unit or equivalent shall be labeled with last calibration date in a readily visible area. Units shall be calibrated within 365 calendar days from last calibration date unless required earlier by the manufacturer. Calibration verification shall be maintained for a minimum of 1 year.

3.11.6 Pressure testing durations vary depending upon nominal pipe size and length. For pressure testing duration requirements, follow **TABLE 4: Pressure Testing Durations for Mains**.

TABLE 4: Pressure Testing Durations for Mains

	Nominal Pipe Size (inch)			
Pipe Length (feet)	**2 and smaller**	**4**	**8**	**12**
0-50	15 min	15 min	15 min	30 min
51-250	15 min	30 min	1 hr	1 hr
251-500	30 min	30 min	2 hr	2 hr 15 min
501-1,000	30 min	1 hr	4 hr	4 hr at 1.5 x MAOP + 5 hr at 60 psig
1001-2,000	1 hr	2 hr	4 hr at 1.5 x MAOP + 4 hr at 60 psig	4 hr at 1.5 x MAOP + 14 hr at 60 psig
2,001-6,500	2 hr	7 hr	GSE Plan Required	GSE Plan Required
6,501-10,000	3 hr	GSE Plan Required	GSE Plan Required	GSE Plan Required

1. If the pipe length to be tested is not included in this Table, a plan for pressure testing shall be submitted to and approved by the OWNER as a part of the startup plan.
2. It is the OWNER's intent to limit pressure tests for 8-inch and 12-inch pipe to 2,000 feet or less. OWNER reserves the right to reject proposed pressure tests not within the limits of **TABLE 4**.
3. Pipe length includes the entire length to be tested in a single pressure test.

3.11.7 Pressure tests shall not be performed against active valves or squeeze-off tools.

3.11.8 Air or inert gas at 60 psig shall remain within mains prior to introducing natural gas to the pipe.

3.11.9 Pressure test records proving a passing test shall be submitted to and approved by RPR before natural gas is introduced into the main.

3.12 TIE-INS

3.12.1 Prior to performing a tie-in to existing main, the depth of the existing and newly installed main shall be confirmed to meet the MFSS minimum depth of 24 inches. The RPR shall be notified if the MFSS minimum depth is not met and additional protection may be required.

3.12.2 All squeeze-offs of PE pipe shall be in accordance with manufacturers' squeeze-off procedures. Squeeze-off tools shall comply with ASTM F1563, Standard for Tools to Squeeze-off Polyethylene (PE) Gas Pipe or Tubing.

3.12.3 For clarity, tracer wire and connections are not shown in figures below but are required as per Section 15105.

3.12.4 To prevent unintended customer outages, RPR shall check existing valve positions within the applicable areas to ensure system conditions are understood just prior to tie-in activities. RPR shall coordinate with System Operations on all valve operations and shall install pressure gauges as per the startup plan to monitor pressures during tie-in activities.

3.12.5 When performing a final tie-in, eliminate the tapping tee used for the purge whenever possible prior to connecting the new main to the existing main. When impossible, CONTRACTOR shall provide the location(s) of remaining tapping tee(s) to RPR for documentation as well as provide a completed NGUS on the tapping tee(s) and components.

3.12.6 Sidefill around all natural gas components shall be well compacted prior to final backfilling. At a minimum, well compacted soil is defined as machine tamped.

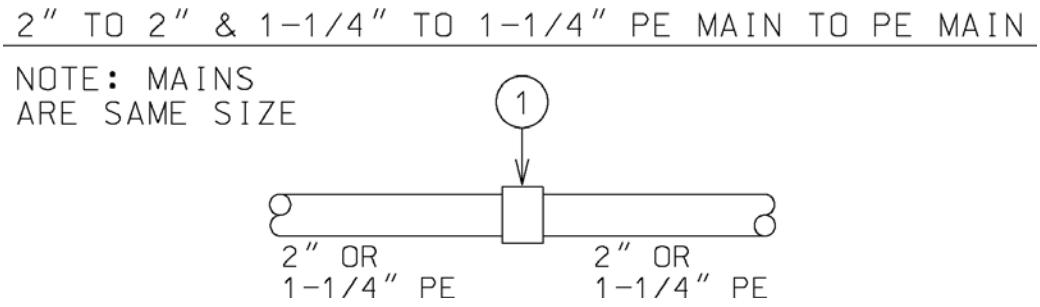
3.12.7 A minimum of one (1) 9-pound magnesium anode and test station shall be installed at a tie-in to existing steel natural gas main if project drawings do not specify installation. Anodes and test stations shall be installed per Section 15500.

3.12.8 All steel components shall be coated and cathodically protected prior to backfilling. Refer to Sections 15500 and 15560 for details.

3.12.9 All final tie-in connection points shall be soap tested at operating pressure.

3.12.10 See the following figures and material lists for Straight Tie-ins for PE Main to PE Main:

a. Straight Tie-in for 1-1/4 inch PE Main to 1-1/4 inch PE main or 2 inch PE Main to 2 inch PE Main – Figure15720-W



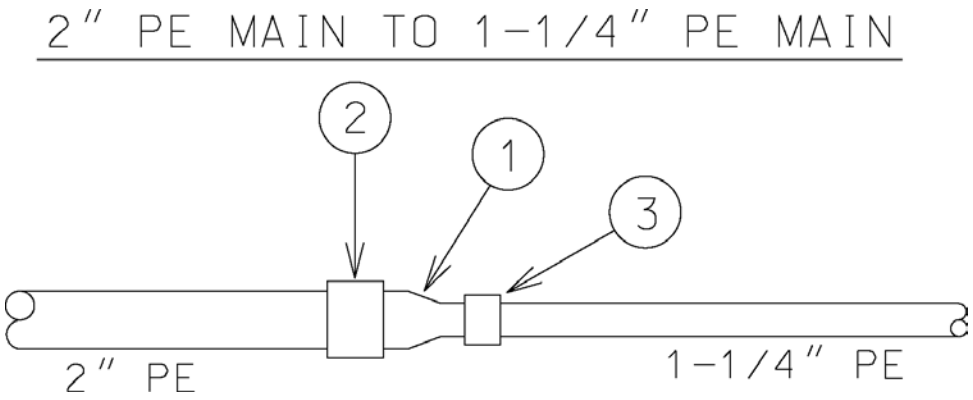
Material List for Figure15720-W1

Item	Quantity	KUB Item #	Description
1	1	384032	1-1/4 inch PE Socket Fusion Coupling

Material List for Figure 15720-W2

Item	Quantity	KUB Item #	Description
1	1	383810	2 inch PE Socket Fusion Coupling

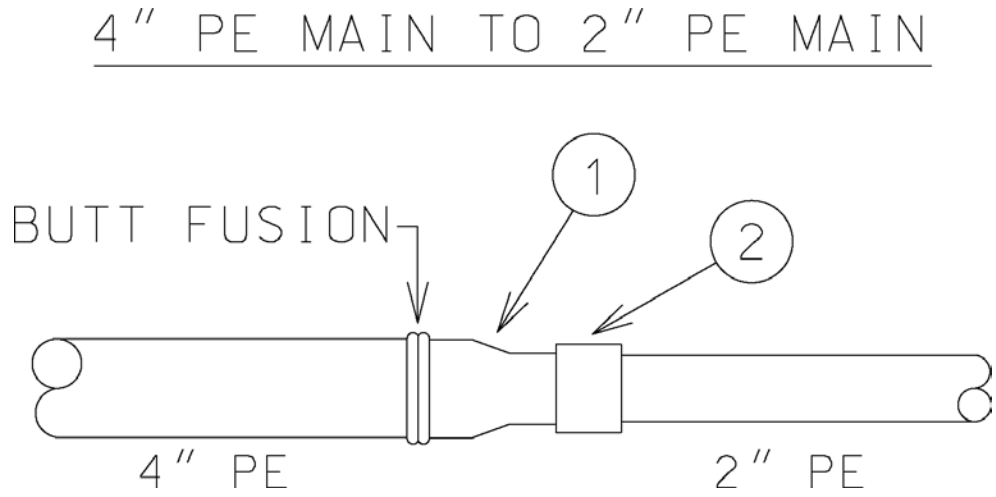
b. Straight Tie-in for 1-1/4 inch PE Main to 2 inch PE Main – Figure 15720-X



Material List for Figure 15720-X

Item	Quantity	KUB Item #	Description
1	1	382689	2 inch x 1-1/4 inch PE Socket Fusion Reducer
2	1	383810	2 inch PE Socket Fusion Coupling
3	1	384032	1-1/4 inch PE Socket Fusion Coupling

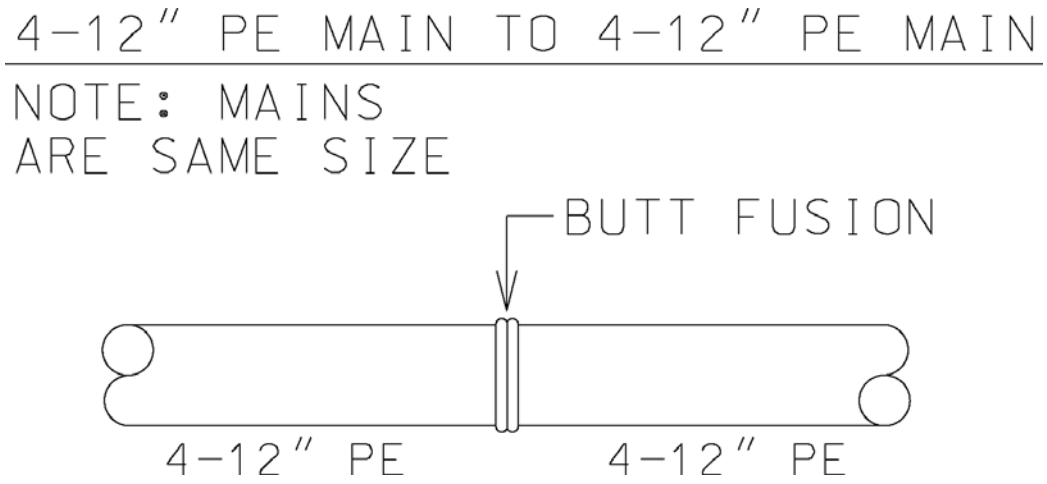
c. Straight Tie-in for 4 inch PE Main to 2 inch PE Main – Figure 15720-Y



Material List for Figure 15720-Y

Item	Quantity	KUB Item #	Description
1	1	380352	4 inch x 2 inch PE Reducer
2	1	383810	2 inch PE Socket Fusion Coupling

d. Straight Tie-in for 4 inch-12 inch PE Main to 4-12 inch PE Main – Figure 15720-Z



4 inch PE Main to 4 inch PE Main –Figure 15720-Z4

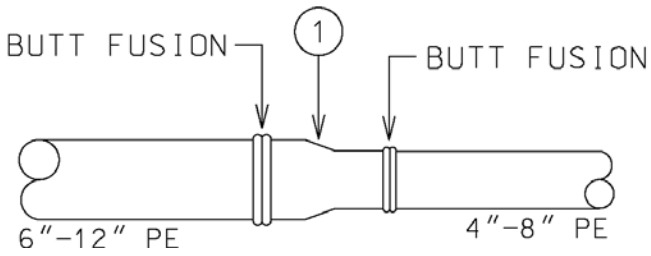
6 inch PE Main to 6 inch PE Main – Figure 15720-Z6

8 inch PE Main to 8 inch PE Main – Figure 15720-Z8

12 inch PE Main to 12 inch PE Main – Figure 15720-Z12

e. Straight Tie-in for 4 inch to 6 inch, 6 inch to 8 inch, and 8 inch to 12 inch PE Main to PE Main – Figure 15720-AA

4″ TO 6″, 6″ TO 8″, AND 8″ TO 12″ PE MAIN TO PE MAIN



Material List for Figure 15720-AA6

Item	Quantity	KUB Item #	Description
1	1	372110	6 inch x 4 inch PE Butt Fusion Reducer

Material List for Figure 15720-AA8

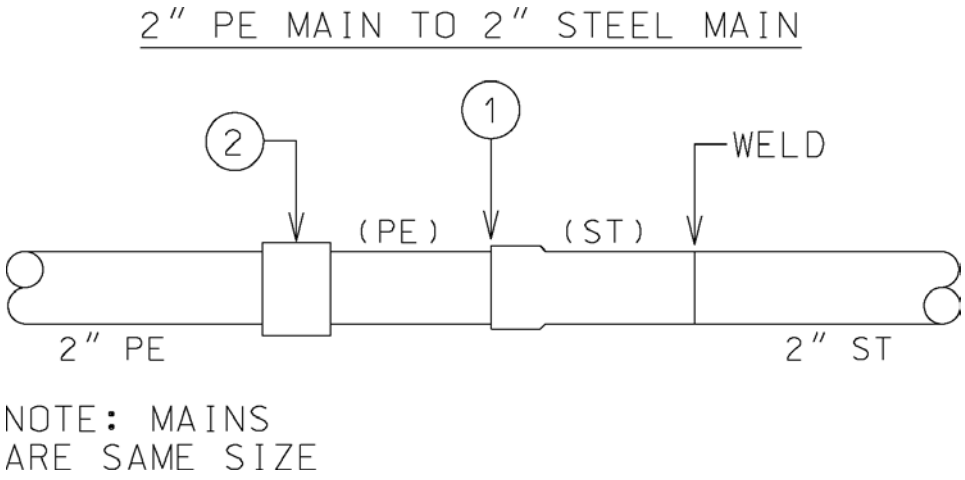
Item	Quantity	KUB Item #	Description
1	1	374710	8 inch x 6 inch PE Butt Fusion Reducer

Material List for Figure 15720-AA12

Item	Quantity	KUB Item #	Description
1	1	361012	12 inch x 8 inch PE Butt Fusion Reducer

4.1.1 See the following drawings and material lists for Straight Tie-ins for PE Main to Steel Main. Refer to 3.12.7 and 3.12.8 for additional steel requirements.

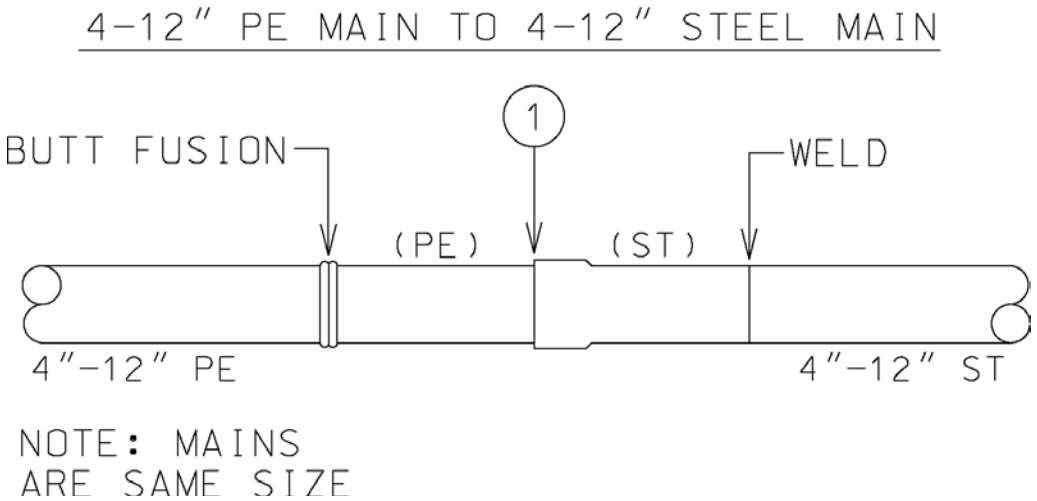
a. Straight Tie-in for 2 inch PE Main to 2 inch Steel Main – Figure 15720-BB



Material List for Figure 15720-BB

Item	Quantity	KUB Item #	Description
1	1	363256	2 inch PE x 2 inch Steel Transition Fitting
2	1	383810	2 inch PE Socket Fusion Coupling

b. Straight Tie-in for 4 inch-12 inch PE Main to 4 inch-12 inch Steel Main – Figure15720-CC. Refer to 3.12.7 and 3.12.8 for additional steel requirements.



Material List for Figure 15720-CC4

Item	Quantity	KUB Item #	Description
1	1	380337	4 inch PE x 4 inch Steel Transition Fitting

Material List for Figure 15720-CC6

Item	Quantity	KUB Item #	Description
1	1	374595	6 inch PE x 6 inch Steel Transition Fitting

Material List for Figure 15720-CC8

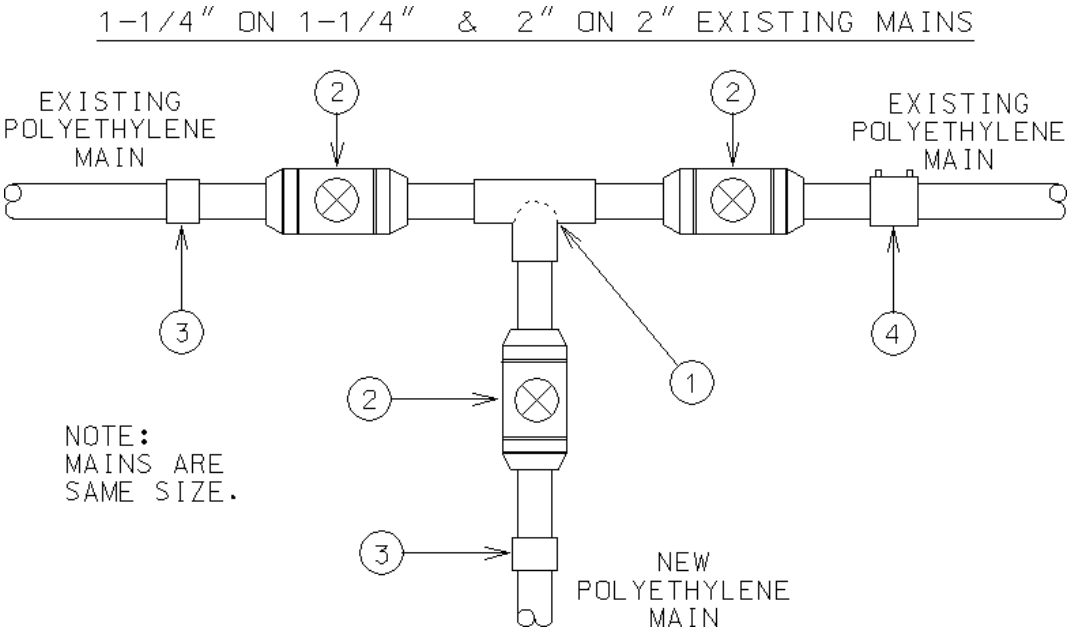
Item	Quantity	KUB Item #	Description
1	1	374819	8 inch PE x 8 inch Steel Transition Fitting

Material List for Figure 15720-CC12

Item	Quantity	KUB Item #	Description
1	1	360957	12 inch PE x 12 inch Steel Transition Fitting

4.1.2 See the following drawings and material lists for New PE Main to Existing PE Main Tee Installations with 3 PE Valves

a. 3-Valve Tee for New 1-1/4 inch or 2 inch PE Main to Existing 1-1/4 inch or 2 inch PE Main – Figure15720-DD



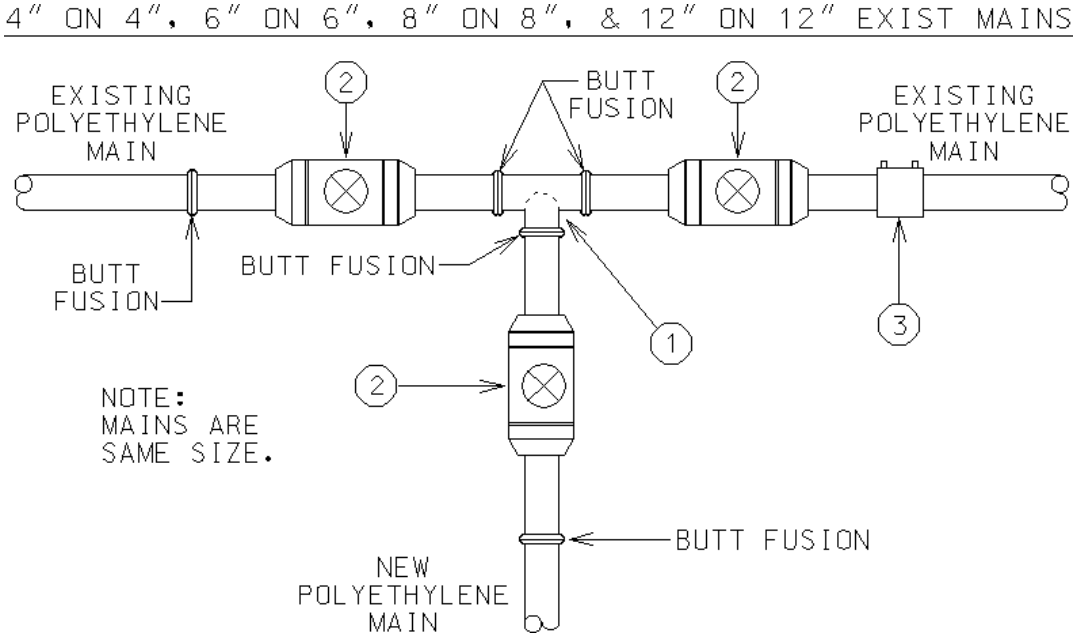
Material List for Figure 15720-DD1

Item	Quantity	KUB Item #	Description
1	1	382739	1-1/4 inch PE Socket Fusion Tee
2	3	371724	1-1/4 inch PE Valve
3	2	384032	1-1/4 inch PE Socket Fusion Coupling
4	1	361716	1-1/4 inch PE Electrofusion Coupling

Material List for Figure 15720-DD2

Item	Quantity	KUB Item #	Description
1	1	382978	2 inch PE Socket Fusion Tee
2	3	371740	2 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	361727	2 inch PE Electrofusion Coupling

b. 3-Valve Tee for New 4 inch-12 inch PE Main to Existing 4 inch-12 inch PE Main – Figure15720-EE



Material List for Figure 15720-EE4

Item	Quantity	KUB Item #	Description
1	1	370106	4 inch PE Butt Fusion Tee
2	3	360473	4 inch PE Valve
3	1	374439	4 inch PE Electrofusion Coupling

Material List for Figure 15720-EE6

Item	Quantity	KUB Item #	Description
1	1	380824	6 inch PE Butt Fusion Tee
2	3	360693	6 inch PE Valve
3	1	374454	6 inch PE Electrofusion Coupling

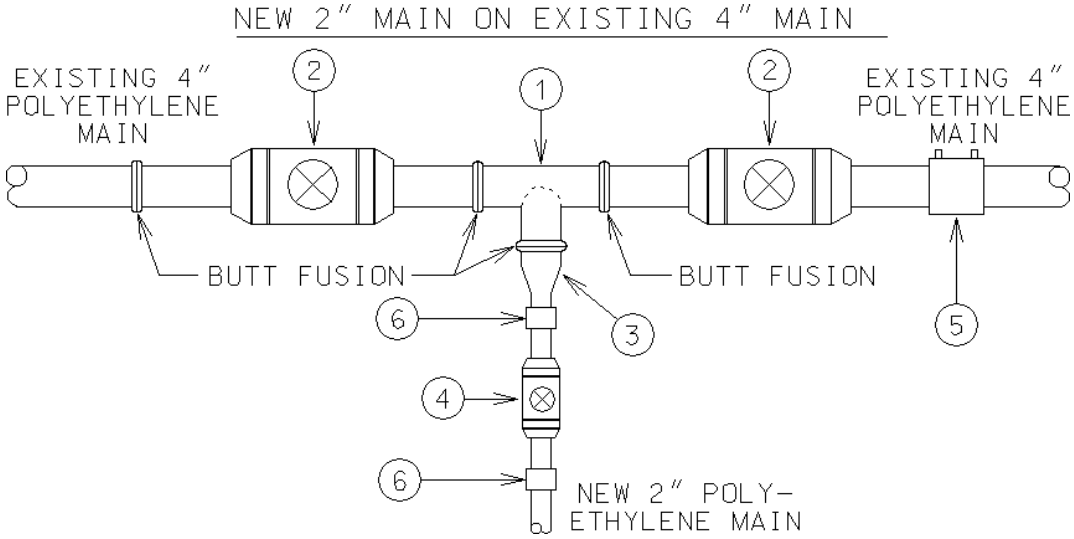
Material List for Figure 15720-EE8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	3	361034	8 inch PE Valve
3	1	374686	8 inch PE Electrofusion Coupling

Material List for Figure 15720-EE12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	3	361045	12 inch PE Valve
3	1	360979	12 inch PE Electrofusion Coupling

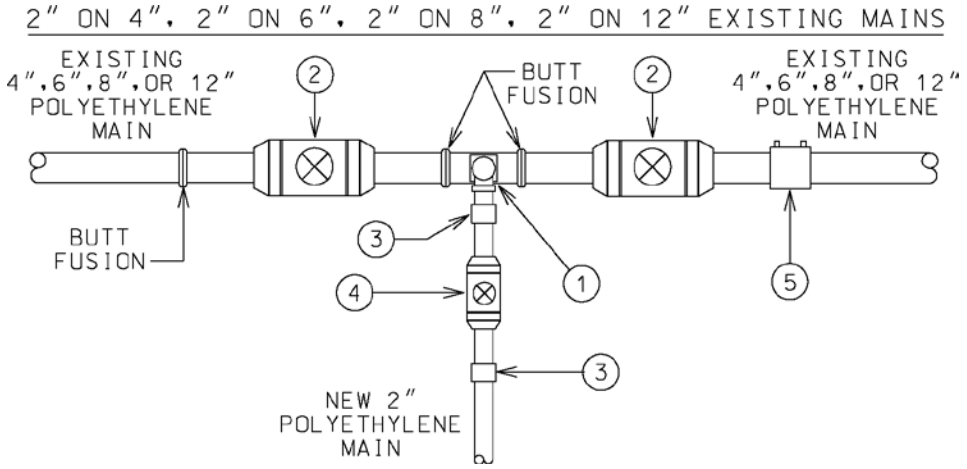
c. 3-Valve Tee for New 2 inch PE Main to Existing 4 inch PE Main – Figure 15720-FF



Material List for Figure 15720-FF

Item	Quantity	KUB Item #	Description
1	1	370106	4 inch PE Butt Fusion Tee
2	2	360473	4 inch PE Valve
3	1	380352	4 inch x 2 inch PE Reducer
4	1	371740	2 inch PE Valve
5	1	374439	4 inch PE Electrofusion Coupling
6	2	383810	2 inch PE Socket Fusion Coupling

d. 3-Valve Tee for New 2 inch PE Main to Existing 4 inch-12 inch PE Main – Figure15720-GG



Material List for Figure 15720-GG4

Item	Quantity	KUB Item #	Description
1	1	380311	4 inch x 2 inch PE Tapping Tee
2	2	360473	4 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve
5	1	374439	4 inch PE Electrofusion Coupling

Material List for Figure 15720-GG6

Item	Quantity	KUB Item #	Description
1	1	380840	6 inch x 2 inch PE Tapping Tee
2	2	360693	6 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve
5	1	374454	6 inch PE Electrofusion Coupling

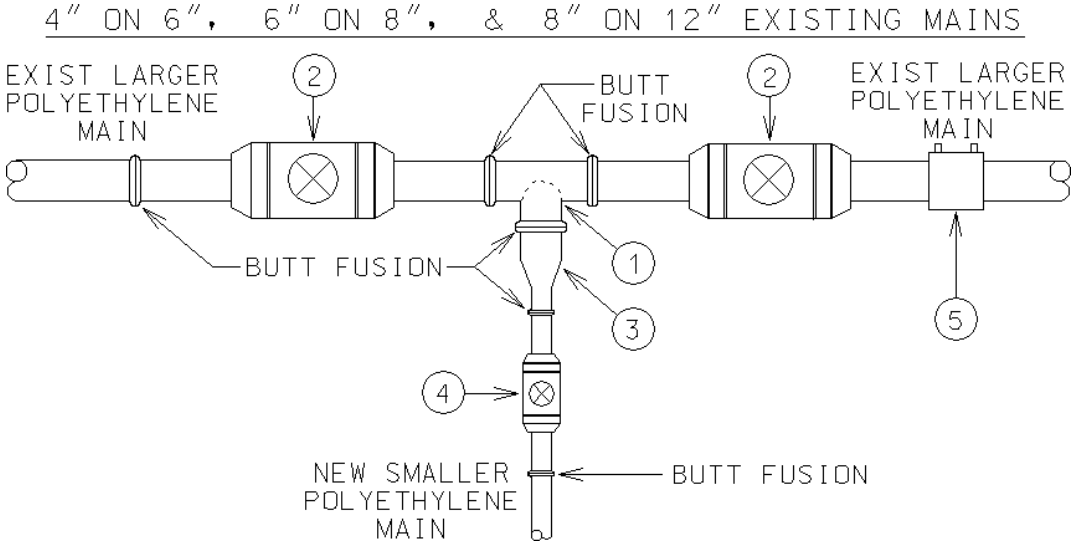
Material List for Figure 15720-GG8

Item	Quantity	KUB Item #	Description
1	1	374835	8 inch x 2 inch PE Tapping Tee
2	2	361034	8 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve
5	1	374686	8 inch PE Electrofusion Coupling

Material List for Figure 15720-GG12

Item	Quantity	KUB Item #	Description
1	1	360891	12 inch x 2 inch PE Tapping Tee
2	2	361045	12 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve
5	1	360979	12 inch PE Electrofusion Coupling

e. 3-Valve Tee for New 4 inch PE Main to Existing 6 inch PE Main, New 6 inch PE Main to Existing 8 inch PE Main, and new 8 inch PE Main to Existing 12 inch PE Main – Figure15720-HH



Material List for Figure 15720-HH6

Item	Quantity	KUB Item #	Description
1	1	380824	6 inch PE Butt Fusion Tee
2	2	360693	6 inch PE Valve
3	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
4	1	360473	4 inch PE Valve
5	1	374454	6 inch PE Electrofusion Coupling

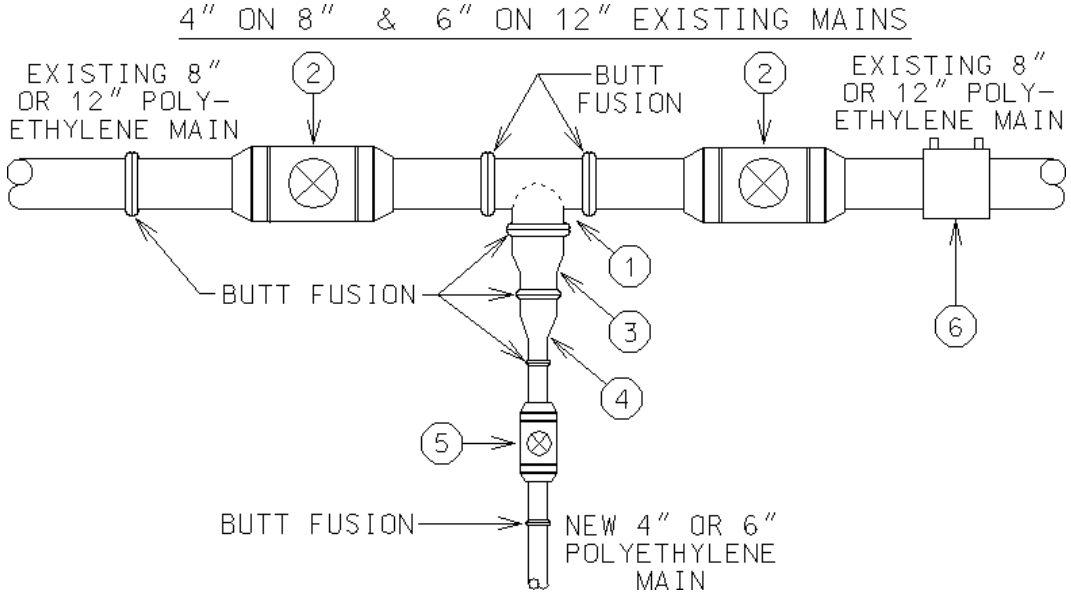
Material List for Figure 15720-HH8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	2	361034	8 inch PE Valve
3	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
4	1	360693	6 inch PE Valve
5	1	374686	8 inch PE Electrofusion Coupling

Material List for Figure 15720-HH12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	2	361045	12 inch PE Valve
3	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
4	1	361034	8 inch PE Valve
5	1	360979	12 inch PE Electrofusion Coupling

f. 3 -Valve Tee for New 4 inch PE Main to Existing 8 inch PE Main and New 6 inch PE Main to Existing 12 inch PE Main – Figure15720-II



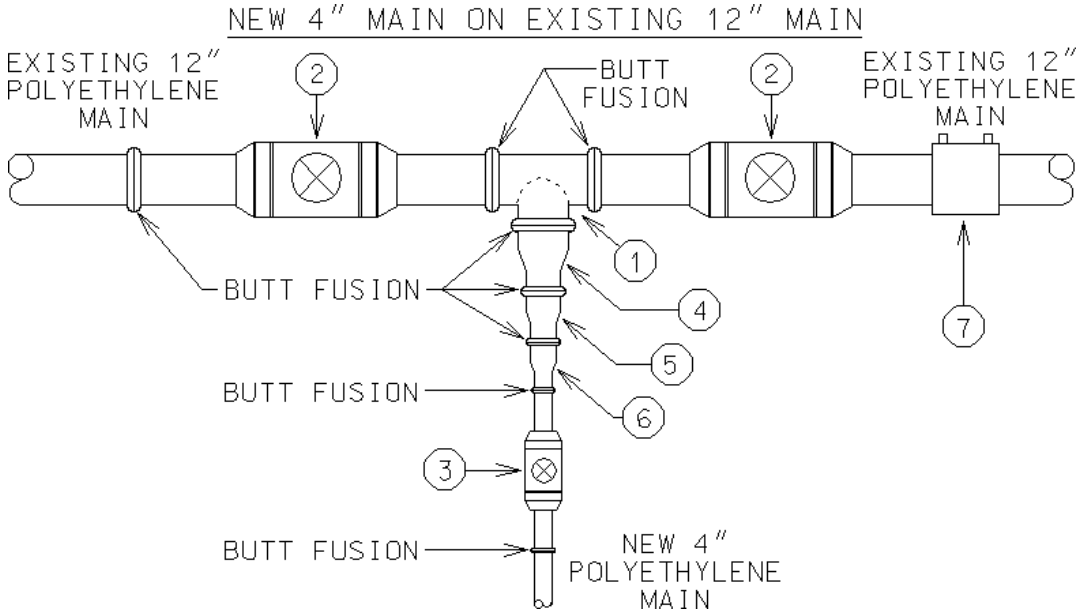
Material List for Figure 15720-II8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	2	361034	8 inch PE Valve
3	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
4	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
5	1	360473	4 inch PE Valve
6	1	374686	8 inch PE Electrofusion Coupling

Material List for Figure 15720-II12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	2	361045	12 inch PE Valve
3	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
4	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
5	1	360693	6 inch PE Valve
6	1	360979	12 inch PE Electrofusion Coupling

g. 3-Valve Tee for New 4 inch PE Main to Existing 12 inch PE Main – Figure 15720-JJ

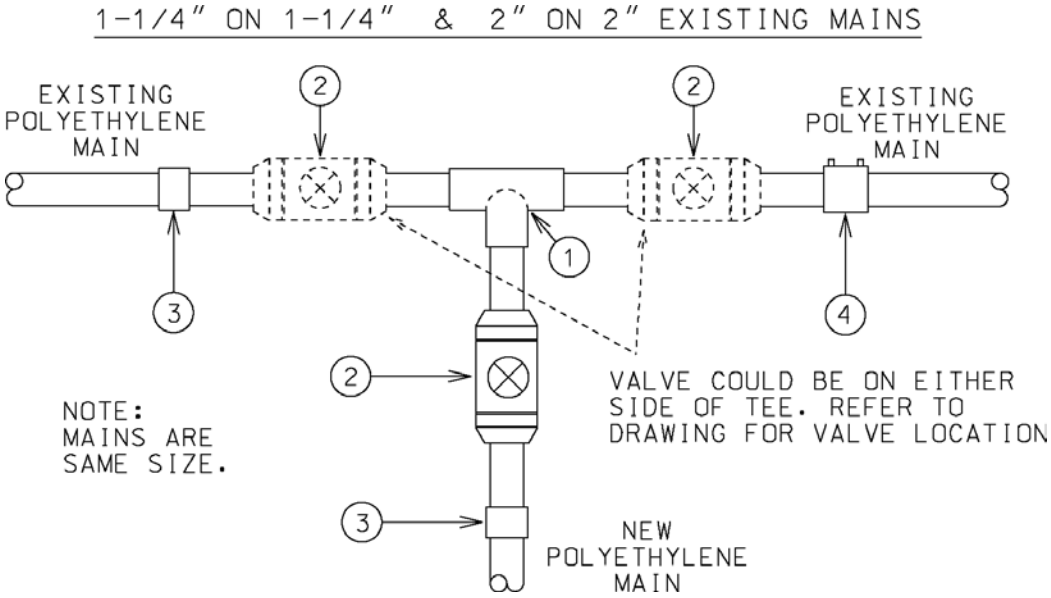


Material List for Figure 15720-JJ

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	2	361045	12 inch PE Valve
3	1	360473	4 inch PE Valve
4	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
5	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
6	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
7	1	360979	12 inch PE Electrofusion Coupling

4.1.3 See the following drawings and material lists for New PE Main to Existing PE Main Tee Installations with 2 PE Valves

a. 2-Valve Tee for New 1-1/4 inch or 2 inch PE Main to Existing 1-1/4 inch or 2 inch PE Main – Figure15720-KK



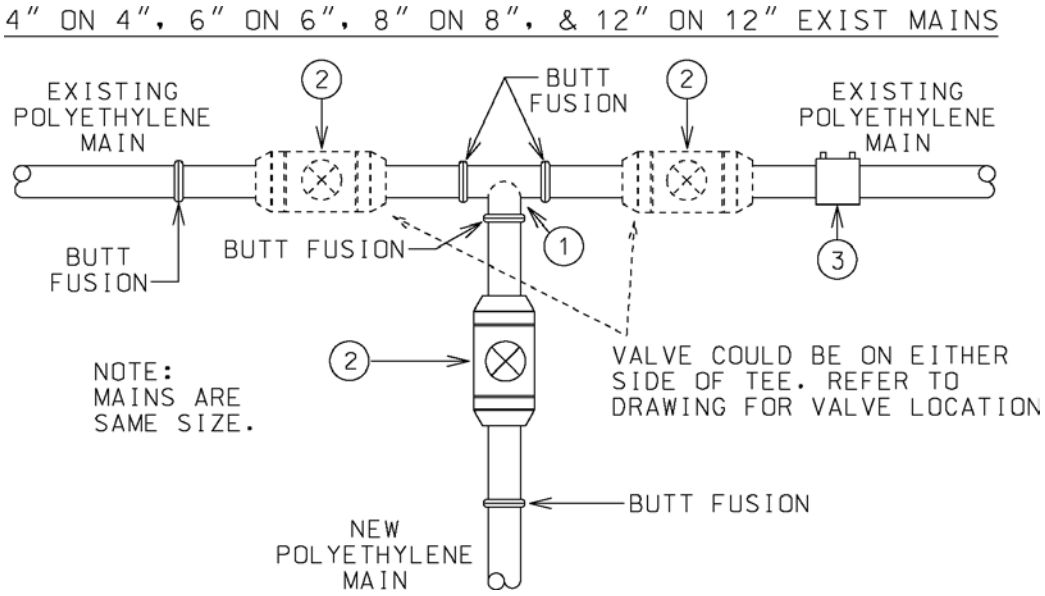
Material List for Figure 15720-KK1

Item	Quantity	KUB Item #	Description
1	1	382739	1-1/4 inch PE Socket Fusion Tee
2	2	371724	1-1/4 inch PE Valve
3	2	384032	1-1/4 inch PE Socket Fusion Coupling
4	1	361716	1-1/4 inch PE Electrofusion Coupling

Material List for Figure 15720-KK2

Item	Quantity	KUB Item #	Description
1	1	382978	2 inch PE Socket Fusion Tee
2	2	371740	2 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	361727	2 inch PE Electrofusion Coupling

b. 2-Valve Tee for New 4 inch-12 inch PE Main to Existing 4 inch-12 inch PE Main – Figure15720-LL



Material List for Figure 15720-LL4

Item	Quantity	KUB Item #	Description
1	1	370106	4 inch PE Butt Fusion Tee
2	2	360473	4 inch PE Valve
3	1	374439	4 inch PE Electrofusion Coupling

Material List for Figure 15720-LL6

Item	Quantity	KUB Item #	Description
1	1	380824	6 inch PE Butt Fusion Tee
2	2	360693	6 inch PE Valve
3	1	374454	6 inch PE Electrofusion Coupling

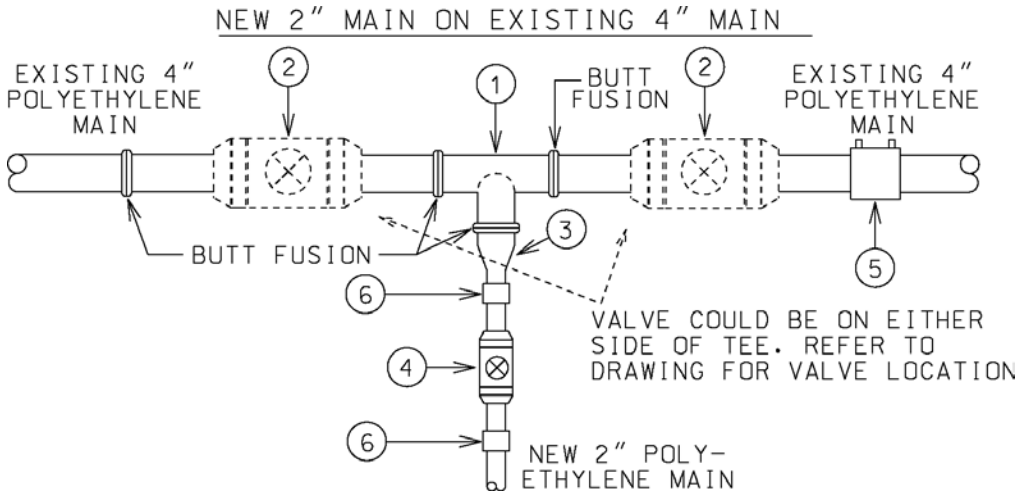
Material List for Figure 15720-LL8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	2	361034	8 inch PE Valve
3	1	374686	8 inch PE Electrofusion Coupling

Material List for Figure 15720-LL12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	2	361045	12 inch PE Valve
3	1	360979	12 inch PE Electrofusion Coupling

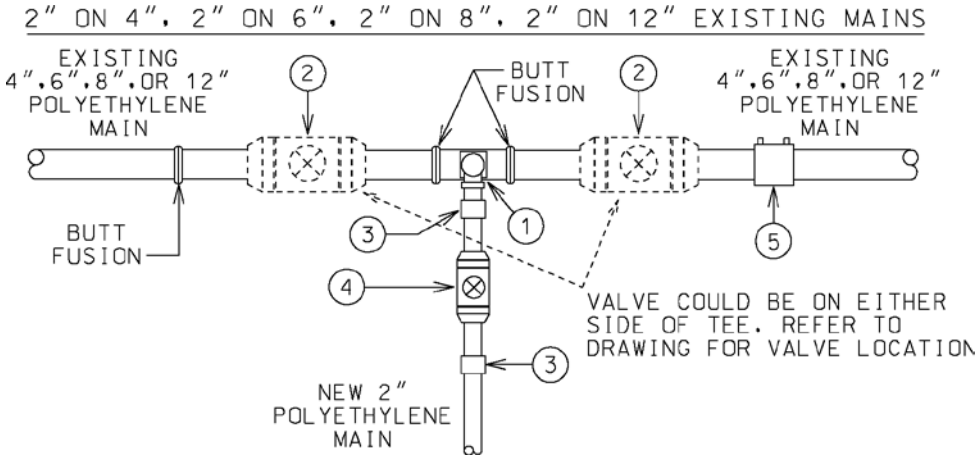
c. 2-Valve Tee for New 2 inch PE Main to Existing 4 inch PE Main – Figure 15720-MM



Material List for Figure 15720-MM

Item	Quantity	KUB Item #	Description
1	1	370106	4 inch PE Butt Fusion Tee
2	1	360473	4 inch PE Valve
3	1	380352	4 inch x 2 inch PE Reducer
4	1	371740	2 inch PE Valve
5	1	374439	4 inch PE Electrofusion Coupling
6	2	383810	2 inch PE Socket Fusion Coupling

d. 2-Valve Tee for New 2 inch PE Main to Existing 4 inch-12 inch PE Main – Figure15720-NN



Material List for Figure 15720-NN4

Item	Quantity	KUB Item #	Description
1	1	380311	4 inch x 2 inch PE Tapping Tee
2	1	360473	4 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve
5	1	374439	4 inch PE Electrofusion Coupling

Material List for Figure 15720-NN6

Item	Quantity	KUB Item #	Description
1	1	380840	6 inch x 2 inch PE Tapping Tee
2	1	360693	6 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve
5	1	374454	6 inch PE Electrofusion Coupling

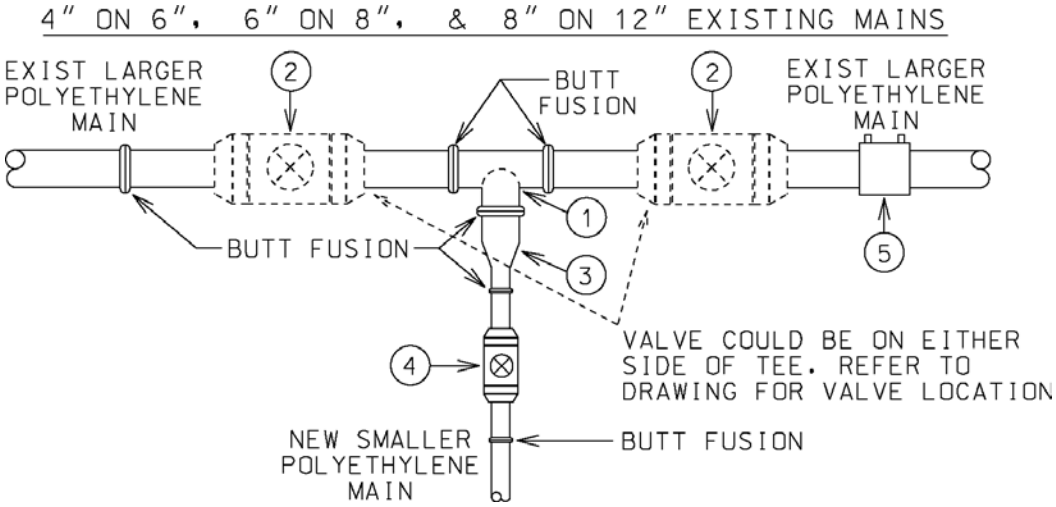
Material List for Figure 15720-NN8

Item	Quantity	KUB Item #	Description
1	1	374835	8 inch x 2 inch PE Tapping Tee
2	2	361034	8 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve
5	1	374686	8 inch PE Electrofusion Coupling

Material List for Figure 15720-NN12

Item	Quantity	KUB Item #	Description
1	1	360891	12 inch x 2 inch PE Tapping Tee
2	2	361045	12 inch PE Valve
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve
5	1	360979	12 inch PE Electrofusion Coupling

e. 2-Valve Tee for New 4 inch PE Main to Existing 6 inch PE Main, New 6 inch PE Main to Existing 8 inch PE Main, and New 8 inch PE Main to Existing 12 inch PE Main – Figure 15720-OO



Material List for Figure 15720-OO6

Item	Quantity	KUB Item #	Description
1	1	380824	6 inch PE Butt Fusion Tee
2	1	360693	6 inch PE Valve
3	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
4	1	360473	4 inch PE Valve
5	1	374454	6 inch PE Electrofusion Coupling

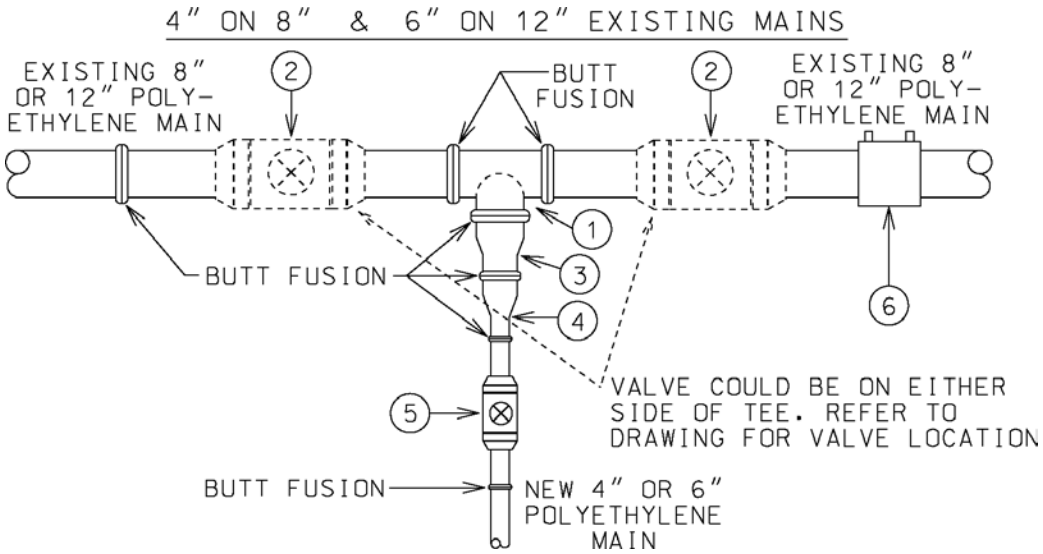
Material List for Figure 15720-OO8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	1	361034	8 inch PE Valve
3	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
4	1	360693	6 inch PE Valve
5	1	374686	8 inch PE Electrofusion Coupling

Material List for Figure 15720-OO12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	1	361045	12 inch PE Valve
3	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
4	1	361034	8 inch PE Valve
5	1	360979	12 inch PE Electrofusion Coupling

f. 2-Valve Tee for New 4 inch PE Main to Existing 8 inch PE Main and New 6 inch PE Main to Existing 12 inch PE Main – Figure15720-PP



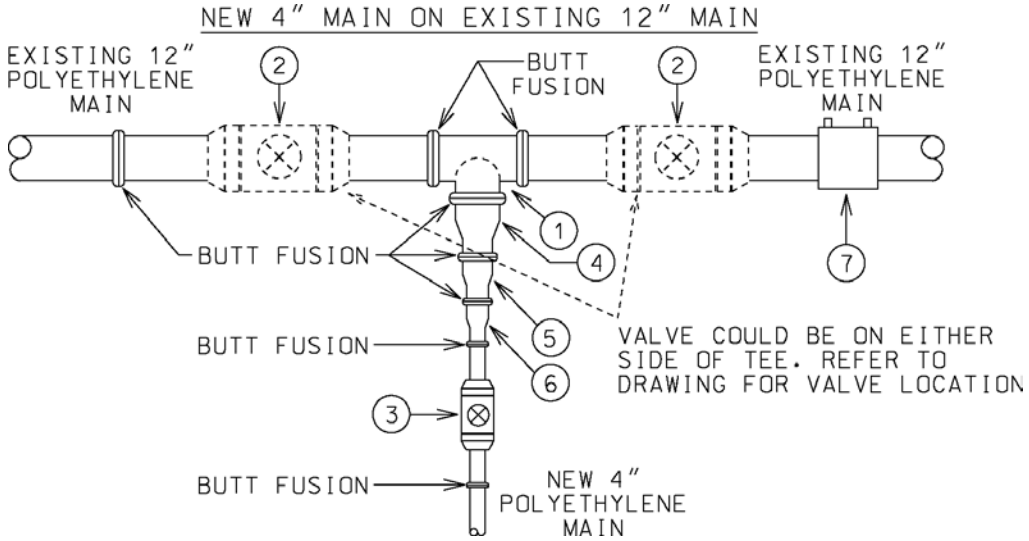
Material List for Figure 15720-PP8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	1	361034	8 inch PE Valve
3	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
4	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
5	1	360473	4 inch PE Valve
6	1	374686	8 inch PE Electrofusion Coupling

Material List for Figure 15720-PP12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	1	361045	12 inch PE Valve
3	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
4	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
5	1	360693	6 inch PE Valve
6	1	360979	12 inch PE Electrofusion Coupling

g. 2-Valve Tee for New 4 inch PE Main to Existing 12 inch PE Main – Figure 15720-QQ

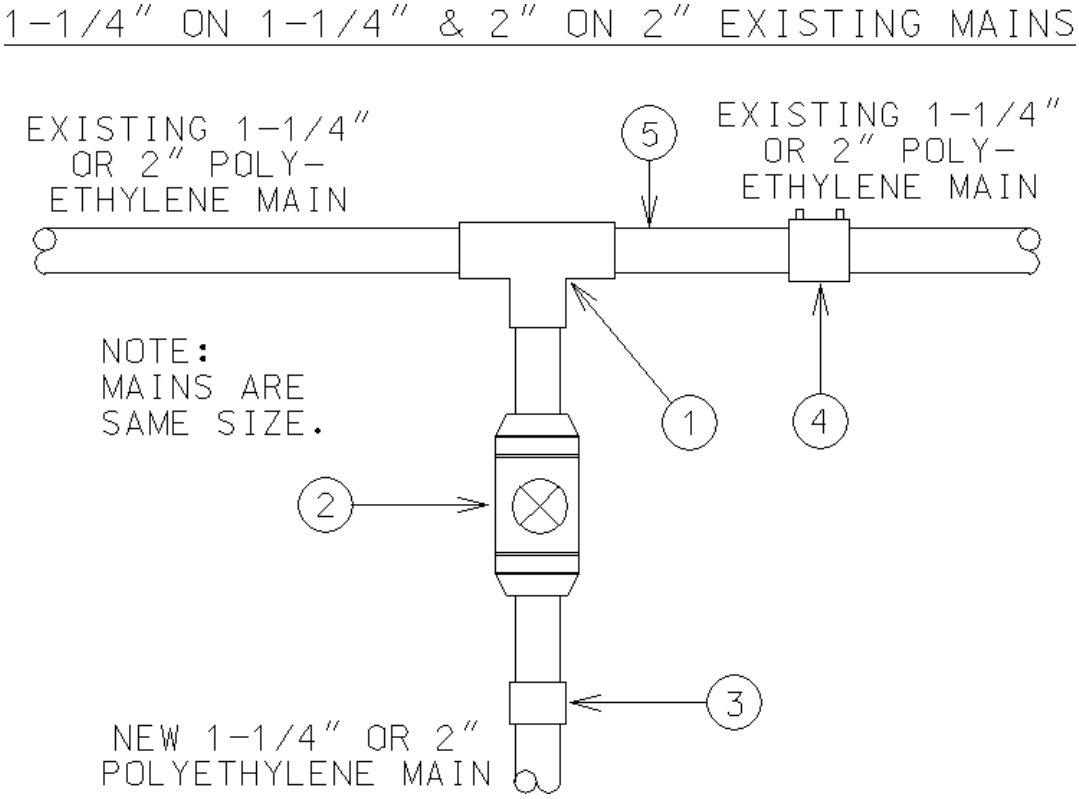


Material List for Figure 15720-QQ

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	1	361045	12 inch PE Valve
3	1	360473	4 inch PE Valve
4	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
5	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
6	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
7	1	360979	12 inch PE Electrofusion Coupling

4.1.4 See the following figures and material lists for New PE Main to Existing PE Main Tee Installations with 1 PE Valve

a. 1-Valve Tee for New 1-1/4 inch or 2 inch PE Main to Existing 1-1/4 inch or 2 inch PE Main – Figure15720-RR



Material List for Figure 15720-RR1

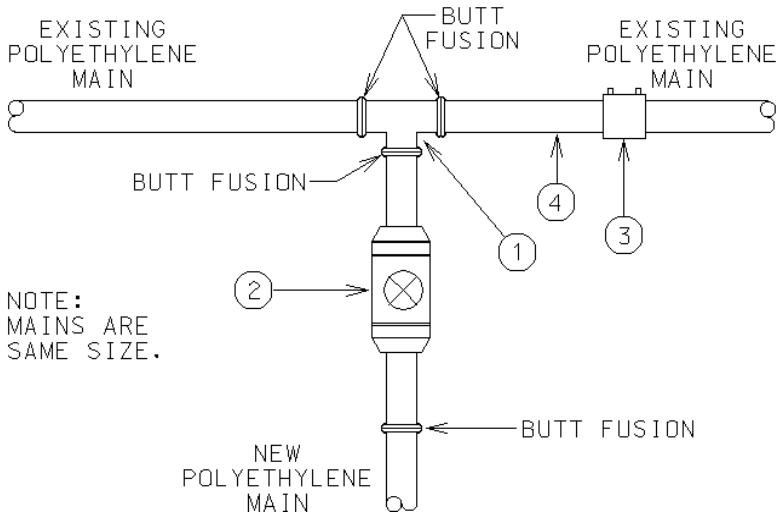
Item	Quantity	KUB Item #	Description
1	1	382739	1-1/4 inch PE Socket Fusion Tee
2	1	371724	1-1/4 inch PE Valve
3	1	384032	1-1/4 inch PE Socket Fusion Coupling
4	1	361716	1-1/4 inch PE Electrofusion Coupling
5	1-Lot	381200	1-1/4 inch PE Pipe

Material List for Figure15720-RR2

Item	Quantity	KUB Item #	Description
1	1	382978	2 inch PE Socket Fusion Tee
2	1	371740	2 inch PE Valve
3	1	383810	2 inch PE Socket Fusion Coupling
4	1	361727	2 inch PE Electrofusion Coupling
5	1-Lot	381175	2 inch PE Pipe

b. 1-Valve Tee for New 4 inch-12 inch PE Main to Existing 4 inch-12 inch PE Main– Figure15720-SS

NEW POLYETHYLENE MAIN TEE & VALVE ON EXISTING PE MAIN
4″ ON 4″, 6″ ON 6″, 8″ ON 8″, & 12″ ON 12″ MAINS



Material List for Figure 15720-SS4

Item	Quantity	KUB Item #	Description
1	1	370106	4 inch PE Butt Fusion Tee
2	1	360473	4 inch PE Valve
3	1	374439	4 inch PE Electrofusion Coupling
4	1-Lot	380998	4 inch PE Pipe

Material List for Figure 15720-SS6

Item	Quantity	KUB Item #	Description
1	1	380824	6 inch PE Butt Fusion Tee
2	1	360693	6 inch PE Valve
3	1	374454	6 inch PE Electrofusion Coupling
4	1-Lot	380808	6 inch PE Pipe

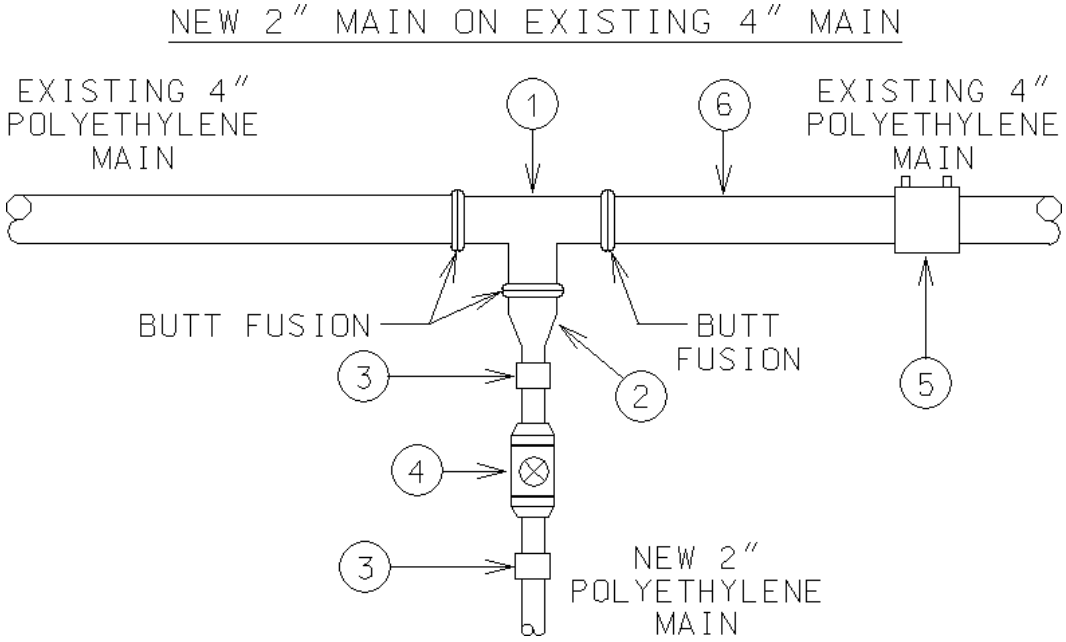
Material List for Figure 15720-SS8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	1	361034	8 inch PE Valve
3	1	374686	8 inch PE Electrofusion Coupling
4	1-Lot	374678	8 inch PE Pipe

Material List for Figure 15720-SS12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	1	361045	12 inch PE Valve
3	1	360979	12 inch PE Electrofusion Coupling
4	1-Lot	360880	12 inch PE Pipe

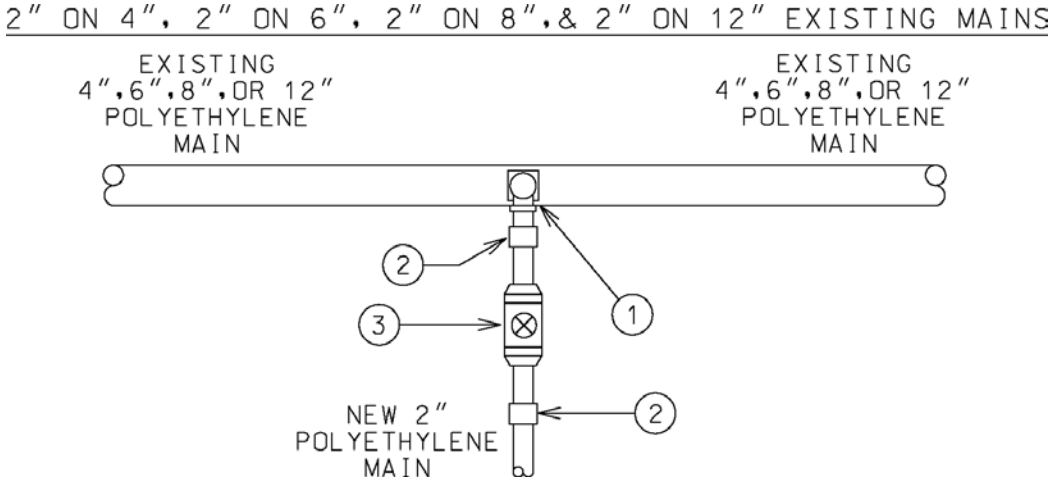
c. 1-Valve Tee for New 2 inch PE Main to Existing 4 inch PE Main – Figure 15720-TT



Material List for Figure 15720-TT

Item	Quantity	KUB Item #	Description
1	1	370106	4 inch PE Butt Fusion Tee
2	1	380352	4 inch x 2 inch PE Reducer
3	2	383810	2 inch PE Socket Fusion Coupling
4	1	371740	2 inch PE Valve
5	1	374439	4 inch PE Electrofusion Coupling
6	1-Lot	380998	4 inch PE Pipe

d. 1-Valve Tee for New 2 inch PE Main to Existing 4 inch-12 inch PE Main – Figure15720-UU



Material List for Figure 15720-UU4

Item	Quantity	KUB Item #	Description
1	1	380311	4 inch x 2 inch PE Tapping Tee
2	2	383810	2 inch PE Socket Fusion Coupling
3	1	371740	2 inch PE Valve

Material List for Figure 15720-UU6

Item	Quantity	KUB Item #	Description
1	1	380840	6 inch x 2 inch PE Tapping Tee
2	2	383810	2 inch PE Socket Fusion Coupling
3	1	371740	2 inch PE Valve

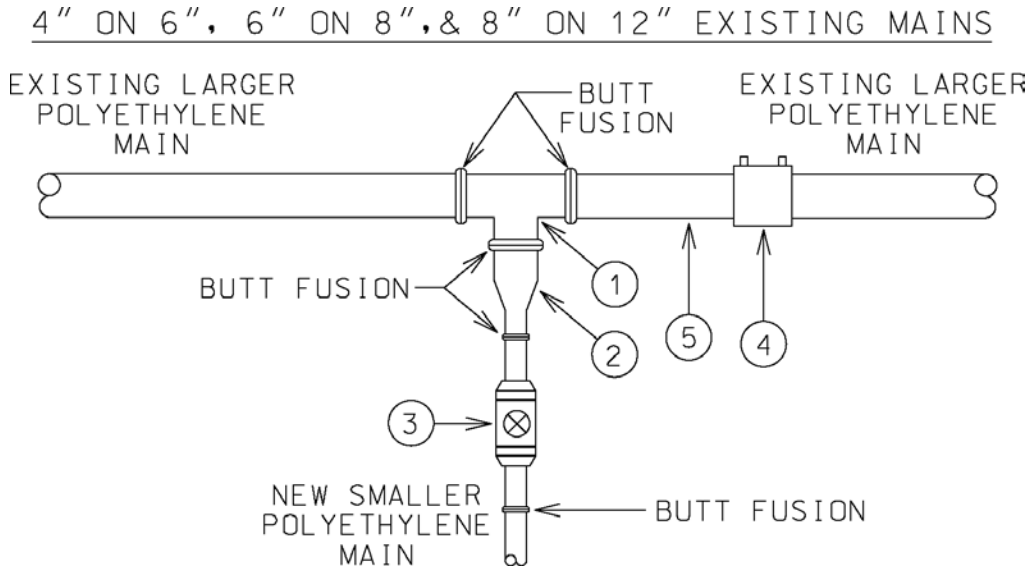
Material List for Figure 15720-UU8

Item	Quantity	KUB Item #	Description
1	1	374835	8 inch x 2 inch PE Tapping Tee
2	2	383810	2 inch PE Socket Fusion Coupling
3	1	371740	2 inch PE Valve

Material List for Figure 15720-UU12

Item	Quantity	KUB Item #	Description
1	1	360891	12 inch x 2 inch PE Tapping Tee
2	2	383810	2 inch PE Socket Fusion Coupling
3	1	371740	2 inch PE Valve

e. Valve Tee for New 4 inch PE Main to Existing 6 inch PE Main, New 6 inch PE Main to Existing 8 inch PE Main, and new 8 inch PE Main to Existing inch PE Main – Figure15720-VV



Material List for Figure 15720-VV6

Item	Quantity	KUB Item #	Description
1	1	380824	6 inch PE Butt Fusion Tee
2	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
3	1	360473	4 inch PE Valve
4	1	374454	6 inch PE Electrofusion Coupling
5	1-Lot	380808	6 inch PE Pipe

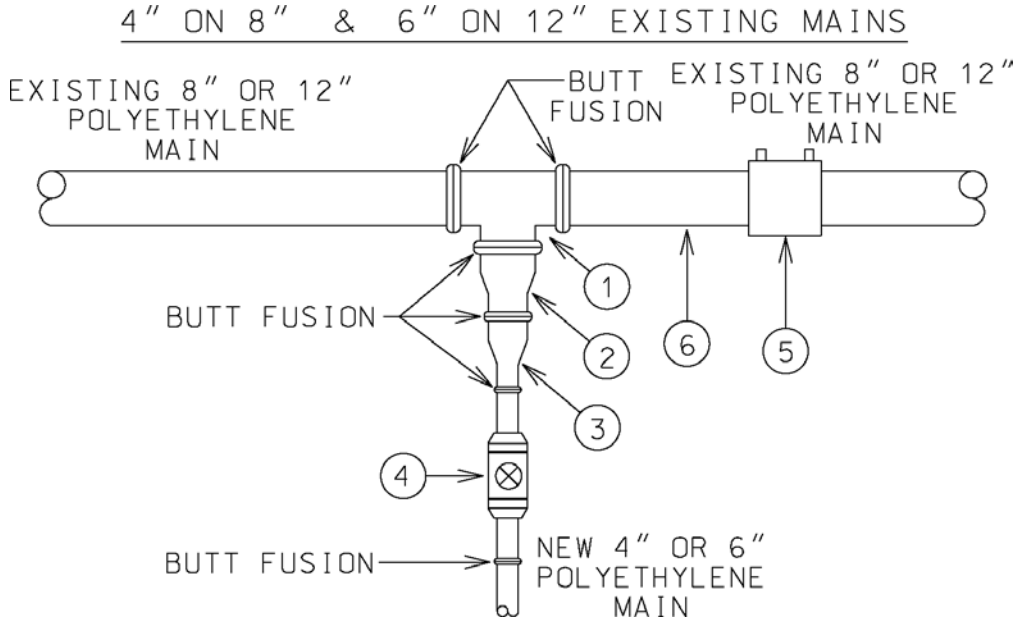
Material List for Figure 15720-VV8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
3	1	360693	6 inch PE Valve
4	1	374686	8 inch PE Electrofusion Coupling
5	1-Lot	374678	8 inch PE Pipe

Material List for Figure 15720-VV12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
3	1	361034	8 inch PE Valve
4	1	360979	12 inch PE Electrofusion Coupling
5	1-Lot	360880	12 inch PE Pipe

f. 1-Valve Tee for New 4 inch PE Main to Existing 8 inch PE Main and New 6 inch PE Main to Existing 12 inch PE Main – Figure15720-WW



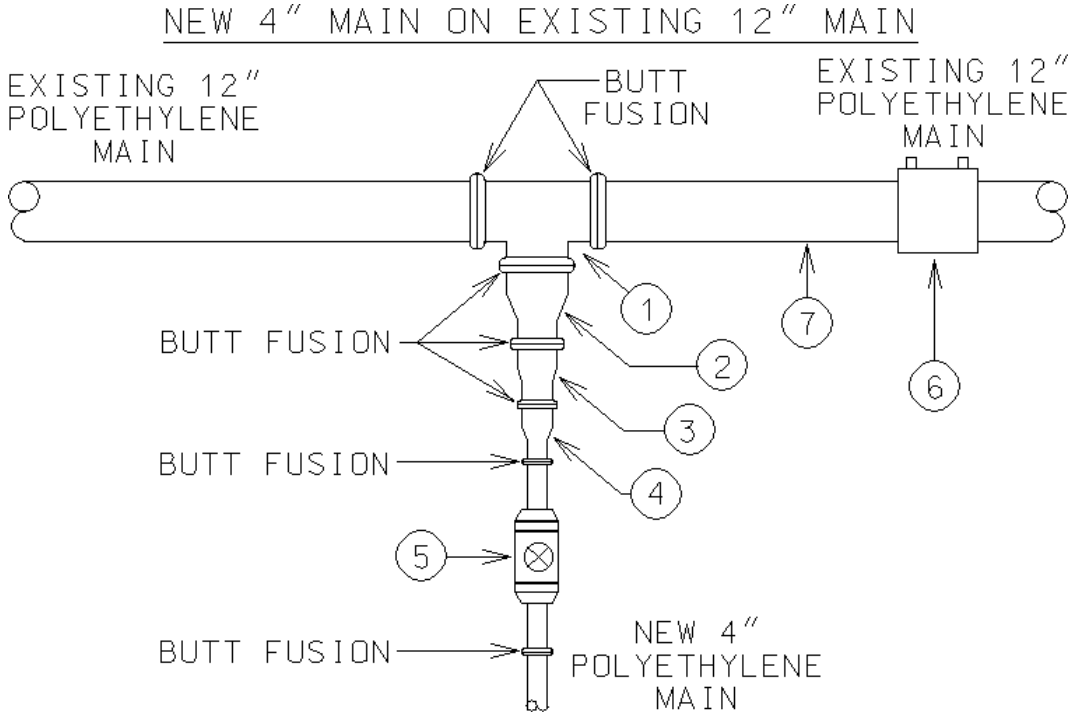
Material List for Figure 15720-WW8

Item	Quantity	KUB Item #	Description
1	1	374694	8 inch PE Butt Fusion Tee
2	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
3	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
4	1	360473	4 inch PE Valve
5	1	374686	8 inch PE Electrofusion Coupling
6	1-Lot	374678	8 inch PE Pipe

Material List for Figure 15720-WW12

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
3	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
4	1	360693	6 inch PE Valve
5	1	360979	12 inch PE Electrofusion Coupling
6	1-Lot	360880	12 inch PE Pipe

g. 1-Valve Tee for New 4 inch PE Main to Existing 12 inch PE Main – Figure 15720-XX



Material List for Figure 15720-XX

Item	Quantity	KUB Item #	Description
1	1	361023	12 inch PE Butt Fusion Tee
2	1	361012	12 inch x 8 inch PE Butt Fusion Reducer
3	1	374710	8 inch x 6 inch PE Butt Fusion Reducer
4	1	372110	6 inch x 4 inch PE Butt Fusion Reducer
5	1	360473	4 inch PE Valve
6	1	360979	12 inch PE Electrofusion Coupling
7	1-Lot	360880	12 inch PE Pipe

4.1.5 Temporary Bypasses

4.1.5.1 Temporary bypasses shall be installed per the project drawings to prevent customer outages when performing a tie-in to a one-way natural gas feed.

4.1.5.2 Temporary bypasses shall be submitted as a part of the startup plan.

4.1.5.3 Temporary bypasses shall be installed as per the figures in this Section. If a temporary bypass is required but cannot conform to the figures in this Section, an additional design is required and must be submitted for approval prior to installation.

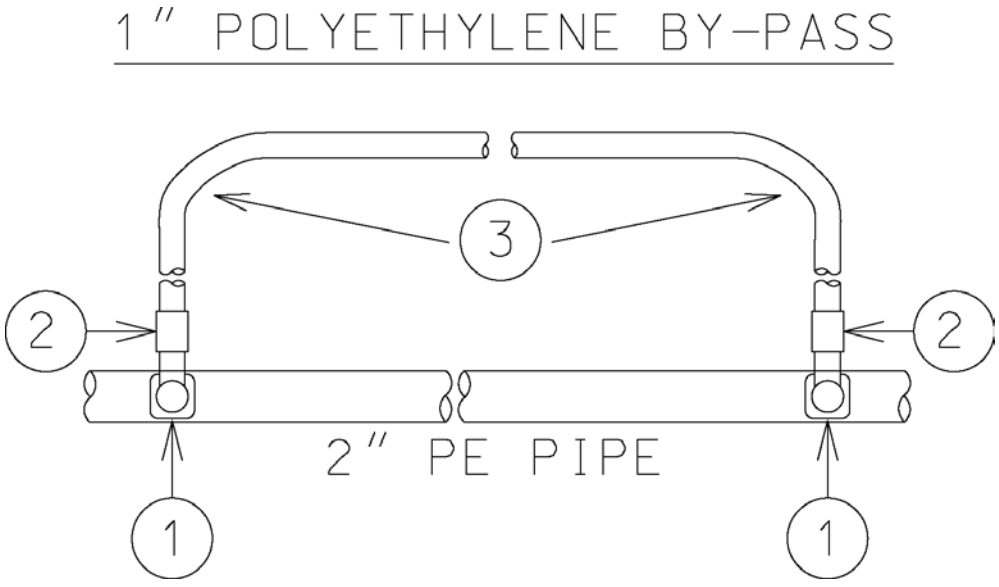
4.1.5.4 The temporary bypass shall be pressure tested in its entirety, including the taps. The requirements in **3.11 PRESSURE TESTING** shall be followed for the installation of all temporary bypass units.

4.1.5.5 To prevent unintended customer outages, RPR shall check valves within the applicable areas to ensure system conditions are understood just prior to installing a temporary bypass. RPR shall coordinate with System Operations on all valve operations. RPR shall install pressure gauges as per the startup plan to monitor pressures during tie-in activities. Temporary bypasses shall be condemned per 3.14.5 after the tie-in is complete.

4.1.5.6 All temporary bypasses shall have a NGUS submitted for record keeping once the tie-in is complete and the bypass has been condemned. The NGUS shall have proof of pressure testing (receipt printed from a Kuhlman Unit or RPR approved equivalent) for the pipe segment and tap tee that remains in service.

4.1.5.7 Refer to the following figures and material lists for a temporary bypass on a one-way natural gas feed for PE Pipe.

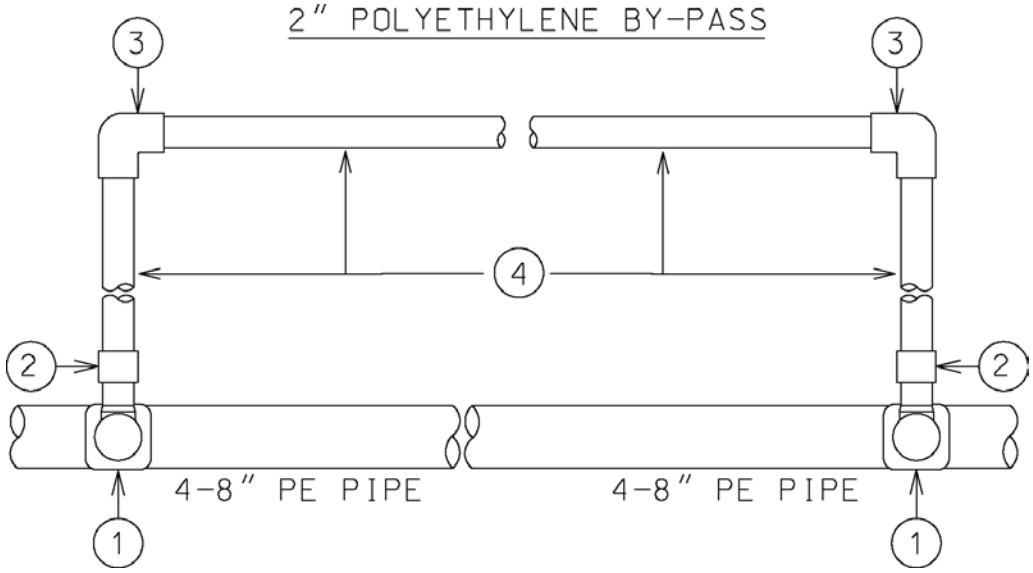
a. 1 inch PE Temporary Bypass – Figure 15720-YY



Material List for Figure 15720-YY

Item	Quantity	KUB Item #	Description
1	2	380949	2 inch x 1 inch PE Tapping Tee
2	2	385013	1 inch PE Socket Fusion Coupling
3	1-Lot	386060	1 inch PE Pipe

b. 2 inch PE Temporary Bypass – Figure15720-ZZ



Material List for Figure 15720-ZZ4

Item	Quantity	KUB Item #	Description
1	2	380311	4 inch x 2 inch PE Tapping Tee
2	2	383810	2 inch PE Socket Fusion Coupling
3	2	382952	2 inch PE Socket 90 Degree Ell
4	1-Lot	381175	2 inch PE Pipe

Material List for Figure 15720-ZZ6

Item	Quantity	KUB Item #	Description
1	2	380840	6 inch x 2 inch PE Tapping Tee
2	2	383810	2 inch PE Socket Fusion Coupling
3	2	382952	2 inch PE Socket 90 Degree Ell
4	1-Lot	381175	2 inch PE Pipe

Material List for Figure 15720-ZZ8

Item	Quantity	KUB Item #	Description
1	2	374835	8 inch x 2 inch PE Tapping Tee
2	2	383810	2 inch PE Socket Fusion Coupling
3	2	382952	2 inch PE Socket 90 Degree Ell
4	1-Lot	381175	2 inch PE Pipe

3.13 PURGING ACTIVITIES

3.13.1 Purging activities and purge point locations shall be performed as per the startup plan.

3.13.2 A fire extinguisher shall be manned and positioned, upwind if possible, from the purge point at all times during purging activities.

3.13.3 Natural gas shall be vented in a manner that is directed away from all ignition sources and done so to prevent natural gas from entering a structure.

3.13.4 Weather conditions shall be approved by RPR for purging activities. Factors will include rain and wind conditions that could make purging unsafe for employees or the public.

3.13.5 Natural gas shall be vented using a vent no larger than 1 inch without prior approval from OWNER. Vents shall extend between 5 and 6 feet above ground surface for safe venting.

3.13.6 Piping shall be grounded to eliminate static discharge.

3.13.7 RPR must be notified no less than three full business days prior to the start of any purging activities and RPR must approve the request to purge.

3.13.8 RPR shall be present for all purging activities. Using a calibrated combustible gas indicator, RPR shall confirm purge is complete.

3.13.9 RPR shall contact Systems Operations no less than 30 minutes prior to starting purging activities.

3.13.10 Natural gas shall be purged from lowest elevation point using air or inert gas to the highest elevation point when possible.

3.13.11 The requirements in this Section shall be followed when purging natural gas from the main as well as introducing natural gas into main.

3.13.12 Tapping tee(s) and pipe used as purge points stall be pressure tested to the requirements in **3.11 PRESSURE TESTING**. All purge points and components that remain in service after the purge is complete shall have a NGUS submitted for record keeping. The NGUS shall have proof of pressure testing (receipt printed from a Kuhlman Unit or RPR approved equivalent) for the pipe segment(s) and tap(s) that remain(s) in service.

3.13.13 After natural gas has been introduced into the pipeline, all valve box lids shall be painted yellow to designate the main is now active.

3.14 CONDEMNATION

3.14.1 Mains

3.14.1.1 CONTRACTOR shall perform condemnation activities per the RPR reviewed startup plan. Condemnation activities shall be performed in a manner to prevent customer outages. Condemnation shall occur only after proper purging as per Section **3.13 PURGING ACTIVITIES**.

3.14.1.2 Excluding KUB holidays and weekends, RPR shall be notified three full business days prior to condemning a natural gas main.

3.14.1.3 To prevent unintended customer outages, RPR shall coordinate with System Operations to check and confirm the position of all valves within the applicable areas and system conditions are understood just prior to condemnation activities. RPR shall install pressure gauges as per the startup plan to monitor pressures during condemnation activities.

3.14.1.4 Once natural gas has been purged from the main, a mechanical, weld or fusion cap sealing the pipe shall be installed. Cap shall be of the same material as the main being condemned, i.e. PE cap for PE main, metallic cap for metallic main, etc.

3.14.2 Valves and Valve Boxes

3.14.2.1 Valves shall be condemned in place with the main, and the valve boxes shall be condemned by removing the valve box lid, demolishing or removing the valve box top section and backfilling as required in **3.8 BACKFILL**.

3.14.2.2 If valve boxes are not immediately demolished or removed when natural gas is purged from the main, valve box lids shall be painted white until demolishing per 3.14.2.1.

3.14.3 Test Stations

3.14.3.1 Test stations shall be condemned by cutting wires and removing test station housing.

3.14.3.2 If test station is housed in a valve box, the valve box shall be condemned by removing the valve box lid, demolishing or removing the valve box top section and backfilling as required in **3.8 BACKFILL**.

3.14.3.3 If test stations housed in a valve box are not immediately demolished when the steel gas main is taken out of service, the valve box lids shall be painted white until demolishing per 3.14.3.2

3.14.4 Mains on Bridges

3.14.4.1 Mains on bridges shall be condemned by physically removing all above ground main and its components. Fused, mechanical, or welded end caps shall be installed on the pipeline that is abandoned below ground.

3.14.5 Temporary Bypasses

3.14.5.1 Temporary bypasses shall be condemned in closest proximity to the gas main while in accordance with manufacturers' squeeze off procedures (no less than 26 inches from the outlet of the tee unless a valve is present) with a fusion end cap and an OWNER supplied marker ball (KUB Item #363718) placed at the end of the piping.

3.14.5.2 Bypass piping shall be removed from the trench or have end caps fused on each end if abandoned in place.

3.15 CLEAN UP AND RESTORATION

3.15.1 Follow clean up and restoration requirements stated in Section 00700 General Conditions and Section 01560 Work In Easements and Right-Of-Ways.

3.16 RECORD KEEPING

3.16.1 Pressure Test Records

3.16.1.1 Proof of pressure testing (receipt printed from a Kuhlman Unit or approved equivalent) shall be submitted to the RPR after testing requirements have been completed for approval. Upon approval, natural gas may be introduced to the main.

3.16.1.2 Documentation shall be provided to the RPR that properly illustrates the segments of main tested as a single unit.

3.16.1.3 All pressure test documentation shall be signed by the qualified person responsible for performing the pressure test.

3.16.2 Test Station Natural Gas Utility Sheet (NGUS)

3.16.2.1 A Natural Gas Utility Sheet (NGUS) shall be completed for every test station installed or condemned within the project scope.

3.16.2.2 Test station NGUS's shall be submitted to the RPR within two business days of completed installation or condemnation.

3.16.3 Boring Profile

3.16.3.1 A final boring profile (electronic is preferred) shall be submitted to RPR within two business days of completed bore.

3.16.3.2 The electronic format shall consist of, at a minimum, a table illustrating pitch and depth for the length of every other rod for crossings including, but not limited to, creeks, railroads, railroad spurs, intersections, road crossings and/or when pipe is installed outside of the specified requirements in **3.5 DEPTH**

END OF SECTION