SECTION 15720

NATURAL GAS POLYETHYLENE PIPE INSTALLATION

PART 1. GENERAL

Proper installation of polyethylene piping is imperative for a long and trouble-free service life. Since polyethylene has less inherent strength than steel, special care must be taken to minimize external stresses in polyethylene pipelines. It is especially important for construction personnel to carefully examine the installation and be able to recognize and correct potential stress points. Since polyethylene pipe will contract 1 inch per 10 degree F. temperature change per 100 feet of unrestrained pipe, it is also imperative that allowances be made during construction for pipe contractions. This is especially critical when using mechanical couplings or inserting polyethylene pipe through abandoned pipe. In warm weather, polyethylene should be allowed to cool to ground temperature before making final tie-ins. When possible keep pipe in a compressive mode. **No polyethylene pipe shall be installed above ground whether exposed or inserted in an above ground casing.**

PART 2. PARTS

Not Used.

PART 3. EXECUTION

3.1 TRENCHING, LAYING, AND BACKFILLING - DIRECT BURIAL

A. When trenching, an appropriate trench width shall be provided in order to perform a close examination of sidewalls and contour of trenchline.

B. Polyethylene pipe shall be laid and continuously supported on undisturbed or well-compacted soil. Do not use blocks or allow pipe to rest on rocks or large clods of dirt because this will set up shearing stresses in the pipe during backfilling.

C. In rock excavation, pad the trenchline with at least 4 inches of clean fill material.

D. Normal cover for polyethylene mains within the street right-of-way shall be as listed in 3.9. Normal cover for service lines shall be as required in Section 15345. Any installation at less than the normal cover shall be approved by the OWNER.

E. When fusing coil ends, join the coils so that the curvature of one coil is directly opposite the curvature of the other coil. This will minimize bending stresses at that joint.

F. Allow fusion joints to cool as required in the pipe manufacturer's joining procedures before stressing pipe either by lowering into trench or pressure testing.

G. When lowering pipe in trench, pipe shall not be subjected to excessive twisting and bending stresses. At low temperatures, flexibility of the piping is greatly reduced and could be damaged by excessive force.

H. Allow for contraction by "snaking" pipe from one side of the trench to the other.

I. Prior to beginning backfilling, the entire trench shall be examined to make sure the pipe is continuously supported at all points on undisturbed or well-compacted soil.

J. Initial backfill material should be placed and compacted in layers. Backfill material within 6 inches of the pipe shall be free from refuse, large rocks, sharp rocks, large dirt clods, construction debris, stumps, trash, or any material that could cause damage to the pipe. The particle size shall not exceed the following: ½ inch for pipe to 4 inch, ¾" for pipe 6 to 8 inch, 1 inch for pipes 10 to 16 inch and 1 ½" for larger pipes.

K. Backfill material at least 6 inches from the polyethylene pipe should be placed and spread in approximately uniform layers in a manner as to fill the trench completely. Large rocks, clods and other debris greater than 3 inches in diameter shall be removed. When compacting backfill, special care shall be exercised to prevent damage to the polyethylene pipe. When heavy equipment (such as hydrohammers, vehicle wheels, etc.) is used to compact backfill, provide a cushion of at least 12-inches of backfill. Pressurizing the pipe prior to backfill will also help prevent crushing of the pipe.

L. Backfill materials and practices should be in compliance with ASTM D2774, "Standard Practice for Installation of Thermoplastic Pressure Piping".

M. A tracer wire of #12 coated copper clad steel (KUB Item # 300362) shall be installed with all buried polyethylene mains and services. The tracer wire shall be laid within 6-inches of the polyethylene pipe where practical and directly above if possible.

N. When transporting welded pipe segments to open trench, special care should be taken not to drag pipe over rough ground or roadway that can damage pipe.

O. Special care should be given during construction to keep debris out of the pipeline. Sealing the ends of the pipeline or fusing caps on the ends of the pipeline during construction should be done at a minimum to keep debris out of the pipeline.

P. All installations methods which place a tensile load on polyethylene 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".

3.2 SERVICE LINES

See Section 15345

3.3 BORING

See Section 02200, Auger Boring and Alternative Tunneling
See Section 02201, Directional Boring

3.4 REPLACEMENT BY INSERTION

A. General Considerations

Main replacement by insertion of polyethylene pipe into abandoned steel, cast iron, or ductile iron pipe is a widely used technique. Frequently, the cost for this type replacement is less than for direct burial. However, there are several disadvantages associated with insertion. First, it reduces the flow capacity of the pipeline segment. Second, inserted pipe is more susceptible to contraction stress due to temperature change. Third, it is more difficult to add a future service since you have to cut through the casing pipe.

B. Insertion Standards

The most critical problems with insertion are possible contraction of the pipe due to temperature changes and external stresses where inserted polyethylene pipe leaves the casing. To minimize these problems, the following standards shall be followed for insertion renewal:

1. The casing openings shall be reamed to remove sharp edges. Use plastic casing bushings at each end of the casing pipe. If a bushing cannot be used, take other precautions such as taping to protect the inserted pipe from the casing edge.

2. If necessary, the casing pipe shall be blown with compressed air to remove dirt, slag, etc. For excessive build-up of foreign material, it may be necessary to use a "cleaning pig" or other mechanical cleaning device.

3. The starting trench should be of sufficient length to permit insertion without buckling or kinking the polyethylene pipe.

4. Close the leading end of the pipe to be inserted to prevent dirt or water from entering. After insertion, examine the leading edge of the inserted pipe for damage due to obstructions in the casing.

5. Normally, the pipe should be pushed through the casing rather than be pulled. This will put the pipe in a compression mode and minimize pipe contraction.

Where necessary to pull pipe through casing, take care not to stretch pipe beyond its tensile strength, by use of a weak link.

6. To minimize the stresses caused by thermal contraction, pipes inserted in warmer weather should be allowed to cool down to ground temperatures before tie-ins are made.

7. Use only heat fusion to make tie-ins.

8. Polyethylene pipe shall be continuously supported from the end of the casing to the tie-in point.

9. When cutting away steel casing pipe for service connection, leave the bottom half of the casing intact so that the inserted pipe will be continuously supported. If unable to leave the bottom portion of the casing intact, bridge the gap in the casing pipe with a polyethylene sleeve split to fit around casing and service tee. The bridging sleeve shall be strapped together.

10. When inserting service lines, seal the service riser end of the casing with cold applied tape to keep gas from migrating through the casing pipe to the house.

11. Tracer wire shall be installed as required in section 15105

3.5 CATHODIC PROTECTION OF METALLIC COMPONENTS IN POLYETHYLENE SYSTEMS

All metallic valves, couplings, and other metallic fittings used in polyethylene systems shall be factory or field coated and cathodically protected. Anodes shall be installed to protect these metallic fittings.

3.6 TIE-INS

A. When tying into an existing polyethylene system, the preferable tie-in method shall be by heat fusion. All tie-ins using mechanical fittings shall be Approved by the Owner.

B. Normally, when tying into existing steel systems, the preferable tie-in method shall be to use a factory-fabricated transition fitting that is arc-welded to the steel pipe and heat-fused to the polyethylene. The transition between steel and polyethylene shall rest on undisturbed or well-compacted soil. Precautions need to be taken to prevent excessive heat build-up on transition fitting during arc welding to protect integrity of polyethylene portion.

C. All squeezing-offs of polyethylene pipe shall be in accordance with acceptable industry standards and manufacturer recommendations as approved by the OWNER.

Squeeze off tools shall comply with ASTM F1563, "Standard for Tools to Squeeze-off Polyethylene (PE) Gas Pipe or Tubing".

3.7 USE OF CLEANING "PIGS"

Cleaning pigs shall be used on all main extensions prior to final tie-in to ensure that no debris is in the pipeline. OWNER'S Resident Project Representative shall be on site when pigging to ensure that all debris has been removed from pipeline.

3.8 TESTING

A. All mains shall be tested at a minimum of 100 psig for the duration required in 3.8C.

B. The test procedure shall insure discovery of all leaks in the segment being tested. If required by OWNER, CONTRACTOR shall submit a plan detailing the proposed test, which would include a sketch of the main to be tested, valve locations and the location of test gages and pressure recording charts. The plan must be approved by OWNER prior to testing.

C. Test duration:

Pipe size	150 feet or less	151 feet to 500 feet	Greater than 500 feet
2"	1 hour	2 hours	4 hours
4"	2 hours	4 hours	8 hours
6"	8 hour	12 hours	24 hours
8"	8 hour	12 hours	24 hours
12"	12 hour	24 hours	24 hours

D. A pressure recording chart may be required by OWNER's Resident Project Representative. All mains larger than 2" or longer than 1000 feet shall be tested using a pressure recording chart in addition to appropriately located gages.

E. The gauge used for testing shall be 160 psi maximum measured in no more than 2 pound increments.

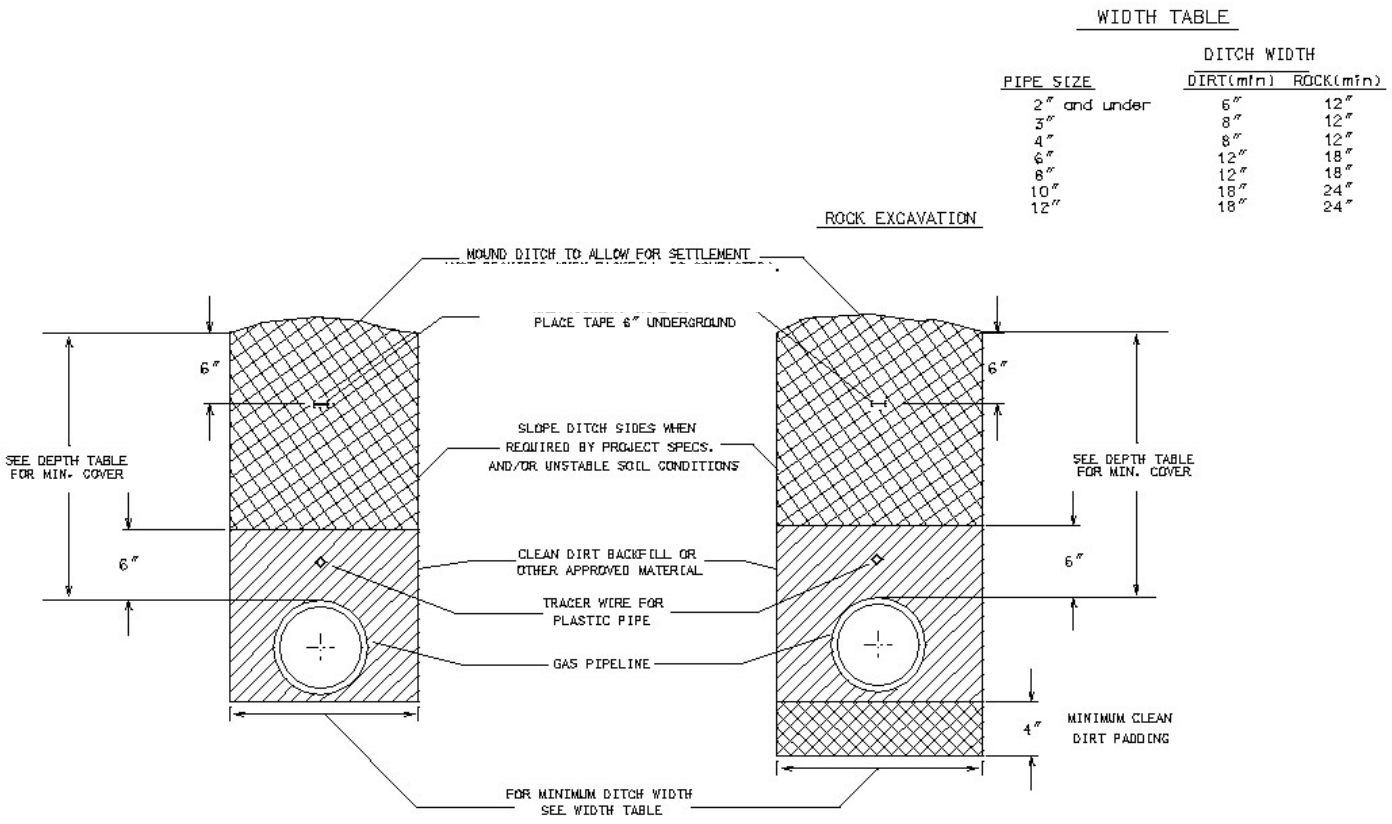
F. No testing shall be conducted against active valves.

G. The final tie-in joint shall be soap-tested at system operating pressure.

3.9 Installation Depths

A. Mains shall be installed to the standard depth as listed in the following table. Depth shall be measured from ground level to the top of the main.

	State Right-of-Way	Knoxville / Knox County Right-of-Way	Customer Property / KUB Easement
Standard Depth	36”	30”	36”
MFSS Minimum Depth	24”	24”	24”
Maximum Depth	60”	60”	60”

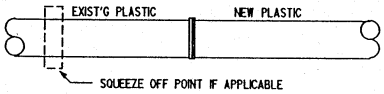


Notes :

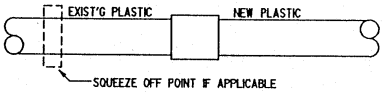
I. Trench to be backfilled and compacted in accordance with local governing body and/ or project specifications.

II. Warning tape shall be installed directly above the gas main or service, 6 inches below the finished grade.

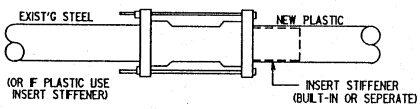
BUTT FUSION:



SOCKET COUPLING FUSION:



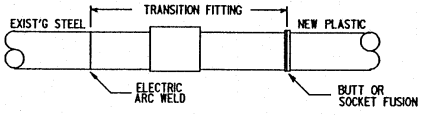
PULLOUT RESISTANT MECHANICAL COUPLING:



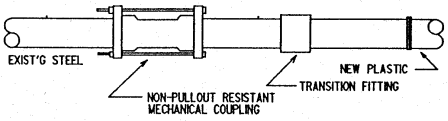
NOTES:

1 - TIE-INS NEED TO REST ON UNDISTURBED OR WELL COMPACTED SOIL.
2 - SIDEFILLS AROUND TIE-INS TO BE WELL COMPACTED AFTER TIE-IN.
3 - FOR VALVE INSTALLATION AT TIE-IN SEE GSC-1132.
4 - INSTALL DRESSER 118 OR SIMILAR CLAMP ON SQUEEZE-OFF POINT.

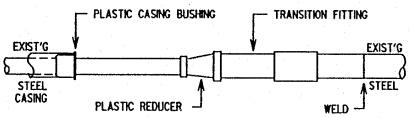
TRANSITION FITTING:



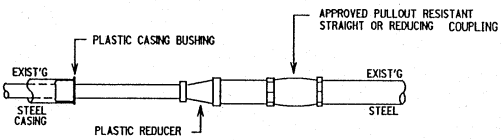
TRANSITION FITTING WITH NON-PULLOUT RESISTANT COUPLING:



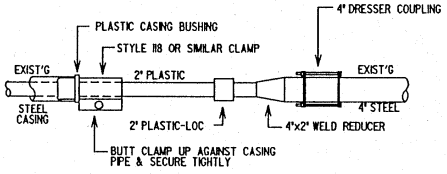
ALL FUSED AND WELDED TIE-IN



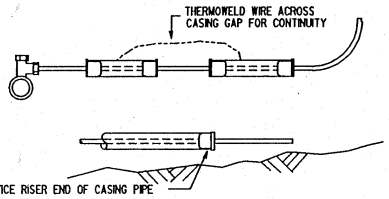
APPROVED PULLOUT RESISTANT MECHANICAL COUPLING TIE-IN



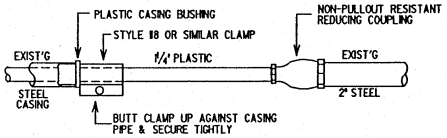
TYPICAL APPROVED APPLICATION OF NON-PULLOUT RESISTANT MECHANICAL COUPLING FOR SLEEVING 4" MAIN WITH 2" PLASTIC



TYPICAL INSERTED SERVICE LINE

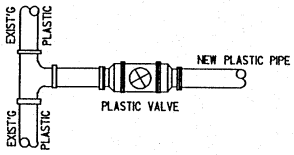


TYPICAL APPROVED APPLICATION OF NON-PULLOUT RESISTANT MECHANICAL COUPLING FOR SLEEVING 2" MAIN WITH 1¼" PLASTIC

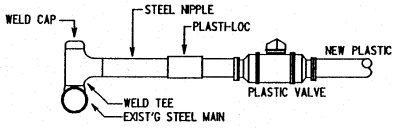


NOTES:
1- COMPACT SIDEFILLS AROUND PROTECTIVE BRIDGING SLEEVE.

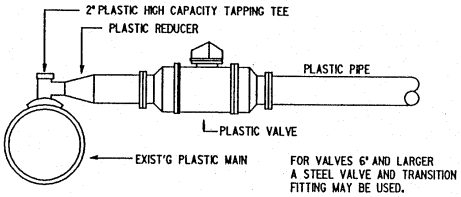
LATERAL CONNECTION TO PLASTIC MAIN OF SAME DIAMETER



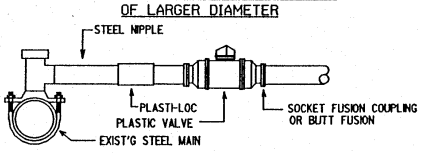
LATERAL CONNECTION TO STEEL OF SAME DIAMETER



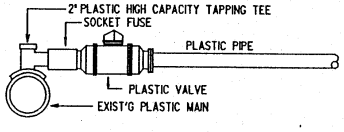
LATERAL CONNECTION TO PLASTIC MAIN OF LARGER DIAMETER

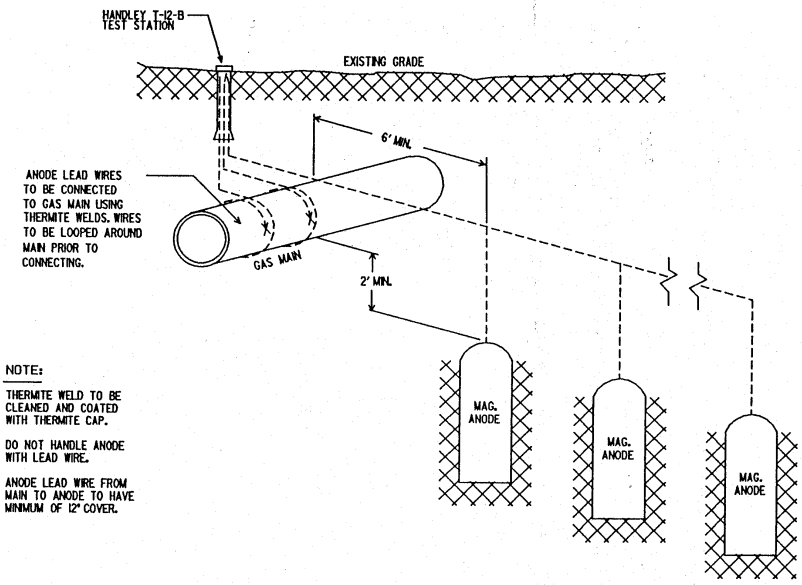


LATERAL CONNECTION TO STEEL MAIN OF LARGER DIAMETER



2" LATERAL CONNECTION TO PLASTIC MAIN OF SAME OR LARGER DIAMETER





END OF SECTION