PROCESS: **CONSTRUCTION**

Standard Operating Procedure

BUSINESS: **UTEN**

CHAPTER: **N/A**

SOP.P.U.10.02AC

SUBCHAPTER: **N/A** REV.: 0 DATE: **xx/xx/2025**

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1. BASIC INFORMATION

PURPOSE: To give guidance and requirements covering the design and construction of service line piping.

SCOPE: This standard applies to thermal energy systems piping, including valves, enclosures, and equipment at Avangrid.

RELATED DOCUMENTS:

- AWWA C 901 and 906
- AWWA Manual of PE Pipe Design and Installation
- ASTM D 696
- PP901 Field Handbook
- SOP.P.U.10.02G Plastic Pipe Design
- SOP.P.U.10.02H Plastic Pipe Fittings
- SOP.P.U.10.02U Direct Bury Trenching
- SOP.P.U.10.02W Field Bends
- SOP.P.U.10.02Z Auger Boring
- SOP.P.U.10.02AB Pipe Supports – Foundations
- SOP.P.U.10.02AD Tracer Connections and Test Stations
- SOP.P.U.10.02AF Pneumatic Piercing
- SOP.P.U.10.02AJ As Built Documentation

ABBREVIATIONS:

- GIS: Geographic Information System
- HDPE: High Density Polyethylene
- HMWPE:
- NYSDPS: New York State Department of Public Service
- ROW: Right of Way
- UTEN: Utility Thermal Energy Network

DEFINITION:

Consolidated Rock: A continuous layer of solid rock that extends below the surface of the earth. Also known as bedrock.

Double Header Service: A service line where one service tap and common pipe serve two different buildings and transfer enclosures.

Return: The portion of the service downstream of the customer heat exchanger.

Service Return Pipe: The portion of the service downstream of the customer heat exchanger.

Service Source Pipe: Fittings and pipe that transport thermal energy from the tap on the main to the transfer enclosure outside of the building wall.

Service – Main End: Fittings and pipe that transport thermal energy from the tap on the main to the municipal taking for the purpose of supplying two or fewer customers.

Service – House End: All fittings and pipe for the supply of thermal energy to two or fewer customers located on customer property starting at the property line and ending at the transfer enclosure(s) outside the building wall(s).

Supply: The portion of the service upstream of the customer heat exchanger.

Transfer Enclosure: The above grade box at the customer end of a service containing pipe, fittings, filters, pumps, expansion tanks, and valves at the user end of the service

2. RESPONSIBILITIES

2.1 Engineering

Engineering is responsible for:

- Collaborating with Real Estate to secure ROW and verify the presence of an active franchise or approved pilot where mains will be installed.
- Coordinating any easements that may be required for installation of thermal energy service.
- Obtaining and required municipal highway permits.
- Providing pipe sizing for service installations or extensions.
- Providing design specifications for the heat exchanger, valves, air bleeds, expansion tanks, and all other equipment at the delivery point of the service.
- Providing the location of the edge of municipal taking (buried valve location) for both the supply and return line.
- Analyzing local thermal energy distribution system capacity whenever the aggregate new connected building sizes are greater than 3000 sq ft, or when any non-residential loads are added.
- Identifying the typical direction of flow in the thermal energy main.

2.2 Operations and Installation Contractors

Operations and Installation Contractors are responsible for:

- Installing services in accordance with minimum depth of cover and clearance requirements.
- Installing metallic tracer wire and marker balls (at the tap).
- Installing warning tape over all services installed using direct bury trenching.
- Installing service valves at the property line for both the supply and return lines.

2.3 Real Estate Department

Real Estate is responsible for:

- Securing required private property easements.
- Fulfilling the real estate task in SAP when an active thermal energy franchise exists.

3. GENERAL REQUIREMENTS

Only polyethylene plastic pipe shall be used for services. Plastic services shall be designed in accordance with SOP.P.U.10.02G Plastic Pipe Design

Steel may be utilized if a site-specific design is created, stamped, and approved by engineering.

Service pipe shall be buried in accordance with one of the following standards:

- SOP.P.U.10.02U Direct Bury Trenching
- SOP.P.U.10.02AF Pneumatic Piercing
- SOP.P.U.10.02Z Auger Boring

Bends and changes in direction for plastic services shall be made by using fittings or field bends in accordance with the following standards:

- SOP.P.U.10.02H Plastic Pipe Fittings
- SOP.P.U.10.02W Field Bends

Undesirable forces or moments at connections to equipment, anchors, or supports shall be limited in accordance with standard SOP.P.U.10.02AB Pipe Supports - Foundations.

4. ROW AND FRANCHISES

Engineering shall work with Real Estate to obtain or verify that real estate rights exist for all double header services being designed. This shall be documented using the real estate task in the SAP work order for the project. Acceptable real estate includes:

- An easement for private property.
- An occupancy permits for the public ROW, railroads, or canals.
- Company owned property.

Services shall only be installed where the company either has an active franchise with both the NYSDPS and municipality to provide thermal energy distribution services or where the company has a defined scope pilot project approved by NYSDPS and the local municipality. The company's GIS mapping system contains information regarding franchises within New York.

- The presence of existing company thermal energy facilities within a municipality does not necessarily indicate that an active franchise exists.
- Limited Pilot Projects allowing installation of thermal energy distribution facilities within certain locations, or which limit the extension of existing facilities may exist.

5. SYSTEM PLANNING

Network analysis shall be requested from Engineering (Planning) when service installation projects involve:

- Three or more residential units.
- Load additions for any residential space greater than 3000 square feet.
- Work related to nonresidential customers.

6. DEPTH OF COVER

Regardless of the method of installation, Operations and Installation Contractors shall install all services in accordance with the depth of cover requirements of this section.

Depths of cover for all services being newly installed shall be measured from the top of the pipe run. The minimum depth of cover for service laterals is 60 inches. When installing services, branches tapped off of the top of the main such as 1.25- or 2-inch plastic high volume tapping tees shall have not less than 54 inches of cover. Outlet piping from these tees can transition to 60 inches of cover in a gradual fashion but in no case can have less than 54 inches of cover.

The main at the branch location may need to be installed with increased depth of cover. For existing mains with insufficient depth of cover for a top tapping fitting, a side or bottom tapping fitting should be used.

Where short runs of offset piping are required in order to avoid conflicts, the preferred method is to increase cover depth. Where that option is not practical, pipe cover of the offset shall be not less than 36 inches, and the length of shallow depth piping shall be minimized.

7. CLEARANCES, SLACK AND PROTECTION

7.1 Clearance and Protection

Operations and Construction Contractors shall install all services with appropriate clearance from other underground structures or utilities. This ensures that Avangrid facilities are afforded reasonable protection from:

- Electrical arcing that could damage plastic piping.
- Mechanical damage from the operation and maintenance of a third-party facility.
- Heat in the instance where a pipeline will cross or be parallel to buried heating pipes.

The minimum clearance distance to other underground structures or utilities is 6 inches without protection and 2 inches with protection. Where protection is needed, fiberglass sheets or shims shall be used.

7.2 Slack and Cooling

Plastic pipe should be installed with sufficient slack to accommodate contraction during cooling. Snaking the pipe in the trench should be sufficient in most direct bury installations. Prolonged exposure to high ambient temperatures over 100°F in conjunction with direct sunlight on, for example, black plastic piping, may require additional consideration such as allowing the pipe to cool, or calculating the amount of thermal expansion that needs to be mitigated as per ASTM D 696.

8. TRACER WIRE – SERVICES

Metallic tracer wire use for installation with plastic services shall meet one of the following material specifications:

#12 AWG Solid Copperclad Steel Wire

- Annealed solid steel core coated with copper.
- Minimum tensile strength of 200 pounds.
- Coated with 30 mils HDPE or HMWPE yellow insulating jacket.

#10 AWG Stranded Stainless Steel Wire

- Stranded wire made using stainless steel.
- Minimum tensile strength of 1400 pounds.
- Coated with 30 mils HDPE or HMWPE yellow insulating jacket.

Operations and Installation Contractors shall install metallic tracer wire with all plastic services to allow future locating of the pipe.

Tracer wire connections and test stations shall be installed in accordance with SOP.P.U.10.02AD Tracer Connections and Test Stations.

9. MARKER BALLS

Marker balls shall be installed 6 inches under the pipe at each property line isolation valve and next to the supply and return tap; six inches away from the tap on the street side.

10. WARNING TAPE

Warning tape used by the company shall consist of a 3-inch-wide polyethylene ribbon.

The tape shall contain language stating, “Non-Potable Water” or, alternatively, other language communicating the line as a thermal energy non-potable water containing pipeline and be colored purple.

Operations and Installation Contractors shall install warning tape over all piping installed by direct bury trenching.

Warning tape shall be placed directly over the pipe. Care should be taken during backfill to prevent movement of the warning tape to the side of the trench.

The desired depth of cover for warning tape is at least 12 inches above the top of the pipe. Where services are installed under pavement the warning tape shall be placed under the subbase course of the pavement.

11. ENERGY TRANSFER EQUIPMENT AND ENCLOSURES

Energy Transfer Enclosures, equipment, and piping will be individually designed and specified for each customer by engineering.

12. RECORDING

Construction details shall be recorded in accordance with SOP.P.U.10.02AJ As Built Documentation.

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1. BASIC INFORMATION

PURPOSE: To provide design and installation criteria covering the placement of tracer wire along plastic mains, the locations to install tracer wire boxes and acceptable practices for making tracer wire connections.

SCOPE: This standard applies to all plastic pipe installations on the thermal energy network system except for piping used in vertical energy wells.

RELATED DOCUMENTS:

- AWWA Manual of PE Pipe Design and Installation
- Performance Pipe Bulletin PP901
- F5.40.60A
- SOP.P.U.10.02X General Main Construction
- SOP.P.U.10.02AC General Service Construction
- SOP.P.U.10.02AJ As Built Documentation

ABBREVIATIONS:

- AWG: American Wire Gauge
- GPS: Global Positioning System

DEFINITION:

Continuity Test: A test that electric current can travel from one point to another point. This is used to verify that tracer wires and connections are intact.

Pipeline Marker: A visual means for indicating that pipeline facilities are in the area. Pipeline markers are also used to assist in locating pipeline and pipeline features.

Tracer Wire: A copper, copper clad, or stainless-steel wire installed along with direct buried plastic service and main piping. It is used as a signal conductor to allow location of non-metallic underground facilities.

Tracer Wire Box: A plastic or metal receptacle used to house and protect tracer wire and tracer wire connections. Tracer wire boxes assist in accessing tracer wires for the purposes of applying signals to enable locating non-metallic pipelines.

2. RESPONSIBILITIES

2.1 Engineering

Engineering is responsible for:

- Placing tracer wire box locations onto project drawings.
- Including the Tracer Wire Box Form in the as build records sent to the Master Data Department.

2.2 Operations and Construction Contractors

Operations and Construction Contractors are responsible for:

- Installation of tracer wire and tracer wire boxes.
- Recording the final location measurements of tracer wire boxes on the Tracer Wire Box form.
- Returning the completed Tracer Wire Box Form to Engineering.

3. GENERAL REQUIREMENTS

Tracer wire shall be installed alongside all plastic mains and plastic services for locating purposes in accordance with SOP.P.U.10.02X General Main Construction and SOP.P.U.10.02AC General Service Construction.

All installed tracer wire shall be protected from moisture and damage.

At no time shall tracer wire be electrically interconnected with any other below grade metallic structure, including electrical grounds, customer water piping, natural gas facilities of any type, municipal or private water lines or sewer lines, foundational rebar, signs, or transportation facilities. Tracer wire may be connected to thermal energy network casing pipes.

4. TRACER WIRE BOXES

Tracer wire boxes allow access to tracer wires so that the plastic main can be located.

Tracer wire boxes may either be an ‘at grade’ style box or an ‘above grade’ style box.

- ‘At grade’ boxes should be installed where possible.
- ‘Above grade’ tracer wire boxes are recommended to be used where locating an ‘at grade’ box would be difficult, or where existing ‘above grade’ boxes are already installed.
- ‘Above grade’ test stations may double as pipeline markers.

All tracer wire boxes shall protect tracer wire and tracer wire connections from damage.

Descriptions of tracer wire boxes and their material numbers can be found below:

Two configurations of at 'grade box' are available depending on installation location:

- The Bingham & Taylor P445 test station box is used for off road locations.
- The 4.25-inch diameter plain cast-iron box is used in areas where paving around the box is necessary as the cast iron does not melt.

5. PLACEMENT AND INSTALLATION

Tracer wire boxes shall be shown on the project drawings and placed in the following locations:

- At the end of mains.
- At least every 1000 feet along the main.
- A pipeline marker may be installed at tracer wire boxes to aid in locating the tracer wire box in the future.

To assist in locating the box, tracer wire boxes should be located near utility poles or other aboveground structures.

Whenever possible, tracer wire boxes shall be located outside of the pavement to reduce the risk of damage.

During construction:

- All 'at grade' tracer wire boxes shall be placed 6 inches 'above grade'.
- A pipeline marker shall be placed at the tracer wire box to raise the level of awareness that underground facilities are present and prevent the tracer wire box from damage.
- The tracer wire box shall be moved to the final grade position as soon as final grading is complete.

6. CONNECTIONS

All tracer wire connections shall be made using:

- Silicon filled wire nuts.
- Waterproof tap connectors.
- Spilt bolt connectors.

Silicon filled wire nuts shall be used for making end to end tracer wire connections outside of a tracer wire box.

A waterproof tap connector shall be used for making branch connections, such as connecting tracer wire for a thermal energy service to the tracer wire along the main.

Split bolt connectors shall only be used to join wires inside a tracer wire box.

Silicon filled wire nuts may also be used to make tracer wire connections inside a test station box.

Tracer wire connections shall not be subjected to any tensile loads.

- When wire is being rolled out between boxes during a direct bury installation care shall be taken not to pull on any connections.
- Connections shall not be used on lengths of wire being pulled through a directional drill or hole hog installation.

To facilitate making locate connections and future maintenance extra wire shall be brought up into test station boxes:

- 'At grade' tracer wire boxes shall have 3 feet of slack wire inside of the box.

A list of approved tracer wire and connection material can be found below:

MID	Description
750070	TRACER WIRE CU CLAD # 12 SOLID 500'
750280	TRACER WIRE STLESS # 10 STRAND 1000'
750062	TRACER WIRE NUT LCK WATERPROOF
756765	TRACER WIRE TAP CONN 10-14 AWG
751531	TRACER WIRE SPLIT BOLT CONNECT 10-12

7. AFTER INSTALLATION

Operations and Construction Contractors shall complete continuity testing of tracer wire.

- Continuity testing shall be completed for all direct bury plastic pipe installations.
- Continuity testing shall be completed where safe and practical for all plastic pipe installed using trenchless methods. Examples of situations where it would be unsafe or impractical to complete the continuity test are pipe installed underneath waterways and pipe installed underneath limited access highways.

A failed continuity test shall be repaired and retested until 100 percent continuity is achieved.

The individual who completes the continuity test shall document the successful test using the Tracer Wire Box Form.

The installation location of the tracer wire boxes shall be recorded using swing measurements and survey grade GPS coordinates in the measurements and remarks section of the Tracer Wire Box Form in accordance with SOP.P.U.10.02AJ As Built Documentation.

PROCESS: **CONSTRUCTION**

Standard Operating Procedure

BUSINESS: **UTEN**

CHAPTER: **N/A**

SOP.P.U.10.02AE

SUBCHAPTER: **N/A** REV.: 0 DATE: **xx/xx/2025**

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1. BASIC INFORMATION

PURPOSE: To provide a standard procedure giving guidance and requirements covering the design, construction, and placement of line markers on thermal energy network piping systems.

SCOPE: This procedure applies to installation of line markers on all thermal energy network mains at Avangrid.

RELATED DOCUMENT

- SOP.P.U.10.02B Locating and Protection of Underground Facilities

DEFINITION:

Main: A pipeline that is located outside the confines of a thermal energy bore field, thermal energy transfer station, or pump station that serves as a common source of supply for one or more thermal energy services.

Navigable Waterway: A body of water (lake, pond, stream, or river) wide and deep enough and free enough of obstructions to be traveled on by vessels larger than a canoe.

Public Highway: Any municipally owned or operated roadway.

2. RESPONSIBILITIES

2.1 Engineering

Engineering is responsible for:

- Noting where to place line markers on construction drawings.
- Determining when to install line markers on new construction projects.

2.2 Operations and Installation Contractors

Operations and Installation Contractors are responsible for:

- Installing line markers wherever appropriate.
- Replacing existing line markers when appropriate.

3. GENERAL REQUIREMENTS

Installation of line markers helps prevent third party damage and identifies the location of company facilities.

Line markers are not required for buried mains in locations where a damage prevention program as described in procedure SOP.P.U.10.02B Locating and Protection of Underground Facilities is utilized.

Installation of a line marker shall be completed over each main for any of the following conditions:

- At each crossing of a public road, railroad, or navigable waterway where specifically required by the permitting agency.
- Wherever necessary to identify the location of the main to reduce the possibility of damage or interference from third party.
- Other Locations may include, but are not limited to, drainage ditch crossings and dead-end locations of pipelines.

Four types of line markers are discussed in this standard:

- Flat style for marking mains.
- Decals for marking aboveground facilities or updating old markers.
- Valve markers used to locate valve boxes where aboveground structures for swing measurements are not available.
- Waterway crossing signs.

4. LINE MARKERS FOR THERMAL ENERGY MAINS

The lettering requirements for all line markers except waterway crossing signs include:

- All lettering shall be legible on a background of a sharply contrasting color.
- The wording “Warning,” or “Danger” followed by the words “Thermal Energy Pipeline” shall be in letters at minimum of one inch high with one-quarter inch stroke.
- In specialized cases lettering may be larger and shall be determined by Engineering for such requirements.

Lettering should be printed on a decal and attached to the marker. Painted lettering on the marker is acceptable.

Flat style signs may be special ordered when necessary to mark above ground facilities.

- Signs should be constructed on 80 Mil. (0.080 inch) thick aluminum plate.
- Signs may be used on but not limited to fenced in facilities.

Decals can be used as a standalone line marker when applied to Company property such as doors, buildings, cabinets for minor facilities, or enclosures at service termination points.

- A decal can also be used to replace faded or out of date existing line markers or placed on test stations without any markings.
- A typical decal can be seen in figure 1 on the following page.

5. NAVIGABLE WATERWAY CROSSING SIGNS

Waterway crossing signs shall be installed on each side of a navigable waterway.

Lettering size shall be adequate so that the sign is visible in overcast daylight and can be viewed from the opposing shoreline or 3500 feet whichever is less.

Design specifics such as dimensions of the sign, coloring, lettering, mounting mode and the like for each location shall be provided by Engineering on a case-by-case basis.

PROCESS: **CONSTRUCTION**

BUSINESS: **UTEN**

CHAPTER: **N/A**

SUBCHAPTER: **N/A**

Standard Operating Procedure

SOP.P.U.10.02AF

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1. BASIC INFORMATION

PURPOSE: To give guidance and requirements for design and construction of plastic pipe installed by pneumatic piercing.

SCOPE: This standard applies to design and construction activities for thermal energy mains and services.

RELATED DOCUMENTS:

- AWWA Manual of PE Pipe Design and Installation
- PP901 Field Handbook
- 16 NYCRR 753.3.
- SOP.P.10.02A Excavating in Proximity to Underground Facilities
- SOP.P.10.02X General Main Construction
- SOP.P.U.10.02AC General Service Construction

ABBREVIATIONS:

- NPS: Nominal Pipe Size
- PE: Polyethylene

DEFINITION:

Hand Dug Test Hole: Excavations performed for designing, testing, or verification purposes which are dug by the use of non-mechanized tools or equipment including hand tools and vacuum excavation.

Hole Digging: An alternate term for pneumatic piercing.

Missiling: An alternate term for pneumatic piercing.

Pneumatic Piercing: A trenchless technology which uses an air powered ram to bore a hole.

2. RESPONSIBILITIES

2.1 Operation and Construction Contractors

Operations and Construction Contractors are responsible for:

- Installing facilities using pneumatic piercing in accordance with the construction requirements of this standard.
- Inspecting completed pneumatic piercing installations in accordance with this standard.

3. GENERAL REQUIREMENTS

Pneumatic piercing may be used to install PE plastic.

Pneumatic piercing is a trenchless installation method. Restoration is required only at sending and receiving pits and any hand dug test holes for underground facility verification.

Pneumatic piercing is most often used to install piping sizes NPS 2 inch and smaller. Larger pipe could be installed however the larger machines are not as popular with contractors.

Common applications for pneumatic piercinginclude:

- Crossing underneath driveways or sidewalks without hard surface restoration.
- Avoiding damage to trees or landscaping.

The length of a bore is most often limited by:

- The length of the air hose supplying the machine; however, it is possible to stitch together bores.
- Pullback force available. More pullback force is required for bores that are not smooth or straight.

Pneumatic piercing can be an efficient tool for shorter runs of main or service but might not work for certain underground soil conditions.

Very loose and/or dry sandy soil might not hold a bore hole open to allow the pipe to be pulled back.

Excessively rocky soil might deflect the machine as it bores.

The machine is aimed in the sending pit and the rise or fall of the terrain along the bore path must be taken into consideration.

At locations where third-party facilities are being crossed the piercing shall be observed as it crosses the foreign facility to assure that damage does not occur.

4. SAFETY

All third party or company utilities crossed shall be located and exposed in accordance with procedure SOP.P.U.10.02A Excavating in Proximity to Underground Facilities and 16 NYCRR 753.3.

When the tool is in operation there shall be at least one person monitoring its progress.

The air hose supplying the machine shall have markings at least every 10 feet to monitor bore progress. Tape marking is acceptable.

The receiving pit shall be excavated before the bore attempt.

Services should be initially bored in a direction away from the building.

Investigation must be completed whenever it is suspected that a pneumatic piercing bore has inadvertently gone through drainage or wastewater piping.

5. COMPLETING PNEUMATIC PIERCING INSTALLATION

Plastic pipe shall have tracer wire installed and inspected in accordance with SOP.P.U.10.02X General Main Construction and SOP.P.U.10.02AC General Service Construction.

At locations where third-party utilities were crossed and verification excavations were done backfill shall be completed with care in order to assure that separation distance is maintained between the two utilities. Soil between the two facilities shall be placed and compacted by hand in order to prevent voids or settlement which could cause contact between the buried facilities.

In locations where less than 6 inches of clearance exists, consideration should be given to installing a protective sleeve or rock shield to protect the facility being installed.

PROCESS: **CONSTRUCTION**

Standard Operating Procedure

BUSINESS: **UTEN**

CHAPTER: **N/A**

SOP.P.U.10.02AG

SUBCHAPTER: **N/A** REV.: 0 DATE: **xx/xx/2025**

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1. BASIC INFORMATION

PURPOSE: To provide guidance and criteria covering the design and installation of steel casing pipes to be used to protect and support mains or services.

SCOPE: This standard provides the requirements for installations of thermal energy network mains and services.

RELATED DOCUMENTS:

- Plastic Pipe Institute Handbook of Polyethylene Pipe
- AWWA Manual of PE Pipe Design and Installation
- SOP.P.U.10.02AD Tracer Connections and Test Stations
- SOP.P.U.10.02G Plastic Pipe Design

ABBREVIATIONS:

- CP: Corrosion Prevention
- NYS: New York State
- PE: Polyethylene
- ROW: Right of Way
- SOP: Standard Operating Procedure

DEFINITION:

Carrier Pipe: The pressurized thermal energy transporting pipe located inside a casing.

Spacers: Position material fastened around the carrier pipe to separate and center the carrier pipe inside the casing pipe.

End Seal: A boot that seals from the OD of the casing pipe to the OD of the carrier pipe to create a watertight seal.

2. RESPONSIBILITIES

2.1 Engineering

Engineering is responsible for:

- Obtaining any permits and ensuring the design complies with permit requirements.
- Selecting or determining the design of steel casings and related components.

2.2 Operation and Construction Contractors

Operations and Construction Contractors are responsible for:

- Insertion of carrier pipe and construction of the casing in accordance with this standard.

3. GENERAL REQUIREMENTS

Casings are not a preferred installation technique because maintaining wire continuity on the tracer wire may require additional ongoing maintenance.

Casings shall not be installed unless usage is:

- Required by crossing permit.
- Required to withstand a superimposed traffic load.
- Associated with the use of auger bore installations.

For calculations related crossing design, Technical Services maintains a central copy of Technical Toolboxes pipeline calculation software to complete this work.

All casings shall be installed below grade and the ends shall be sealed to prevent the entry of water and debris. Sealing shall be accomplished by using end seals. End seals should be installed in accordance with manufacturer instructions.
Each casing installation shall be vented aboveground to atmosphere.

There shall be at least one vent pipe. For installations with one vent, the vent shall be positioned on the downhill end of the casing if a slope is present.

Two vent pipes should be installed with one vent located on each end of the casing installation.

Casing vents shall be protected from the weather to prevent water ingress by:

- Installing elbows or a miter bend to position the vent opening downward.
- Using a manufactured casing vent top for 2-inch vent pipes in SAP as MID: 30930653 CASING VENT TOP 2" YEL.
- Manufactured casing vents may be repainted purple.

CP test stations should be installed on both ends in accordance with SOP.P.U.10.02AD Tracer Connections and Test Stations where field conditions allow.

A minimum of one test station shall be installed on one end of the casing to allow locating of the steel casing pipe.

Casing pipe diameter shall be two nominal sizes larger than the carrier pipe.

All carrier pipes installed within casings shall be designed in accordance with standard SOP.P.U.10.02G Plastic Pipe Design.

Each casing installation shall be indicated on as built documents and be mapped.

Casing pipe material may include any of the following:

- Plastic
- Bare steel
- Coated steel

Casing insulators are not required for all plastic carrier pipe installations. However, they should be used for 6 inch and larger plastic pipe to reduce installation force and possibility of damage to the plastic pipe.

When the plastic pipe is inserted into the casing the open end of the pipe shall be closed to prevent the entry of debris. Closing may be completed using bullnose plugs or shipping caps received with new plastic stick pipe.

Casing filler is not required.

4. PERMITTING AGENCY STANDARDS

Each casing installed as a condition of a crossing permit shall be installed in accordance with the permitting agency standards.

Crossing permits are typically required when crossing ROW or property owned by other transportation agencies such as the NYS Thruway Authority, NYS Canal Corporation, and railroads.

Permitting agency casing standards are usually focused on the casing pipe and vents. The inspection and installation of the carrier pipe and components shall be in accordance with Avangrid SOPs.

The permitting agency standard with date and/or revision should be noted on the construction plans. (e.g., NYS Thruway Authority Design and Construction Requirements for Underground Crossings of Mainline Pavement and Shoulders TAP-421B 1/2010).

Typical design elements to look for in permitting agency standards are:

- Casing pipe wall thickness and diameter
- Casing pipe depth of cover
- Casing length and limits
- Casing vent location
- Line marker or signage requirements
- Valve requirements
- Emergency procedure requirements
- Corrosion prevention requirements

5. CASING DESIGN

The length of the casing shall be kept as short as possible and still comply with crossing permit or load carrying requirements.

The wall thickness of the casing pipe shall be determined by crossing permit or traffic load carrying requirements.

Design for traffic loading is based on the casing diameter, depth of cover, soil type and the amount of weight being supported.

Computational software to complete traffic loading calculations should be utilized.

The vent pipe shall be a minimum 2-inch nominal diameter steel pipe, and the vent hole cut into the casing shall be a minimum 1.5 inches in diameter. The vent pipe shall be installed prior to carrier insertion. The vent hole shall not have any edges or sharp surface which would be detrimental to the carrier pipe.

The casing vent hole may be either tapped or burned in.

Root passes are not required on casing girth welds.

The preferred vent configuration is a vent on the 12:00 position on the high elevation side of the casing and another vent on the 6:00 position on the low elevation side of the casing.

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1. BASIC INFORMATION

PURPOSE: To provide guidance and criteria covering qualification requirements for joining of plastic pipe.

SCOPE: This standard provides the requirements for qualifying and testing of individuals who perform plastic pipe joining on the UTEN system.

RELATED DOCUMENTS:

- ASTM D638-14 Standard Test Method for Tensile Properties of Plastics
- ASTM F2620-19 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
- SOP.P.U.10.02T Plastic Joining General Information and Guidelines
- SOP.P.U.10.02K Plastic Pipe Joining
- SOP.P.U.10.02I Pressure Testing of Network Distribution Piping
- CF Form 3250A Plastic Pipe Joining Qualification Report
- CF Form 3250B Plastic Pipe Disqualification Report

ABBREVIATIONS:

- CTS: Copper Tubing Size
- DR: Dimension Ratio
- HDPE: High Density Polyethylene
- ITS: Industrial Testing Services
- IPS: Iron Pipe Size
- MAOP: Maximum Allowable Operating Pressure
- NYSEG: New York State Electric & Gas
- O&M: Operation and Maintenance
- OQ: Operator Qualification
- PE: Polyethylene
- PPE: Personal Protective Equipment
- PSI: Pounds Per Square Inch
- RG&E: Rochester Gas & Electric
- SME: Subject Matter Expert
- SOP: Standard Operating Procedure
- UTEN: Utility Thermal Energy Network

DEFINITION:

Fuser: A qualified individual who is responsible for fabricating plastic joints by use of butt fusion or electrofusion. Refer to SOP.P.U.10.02T Plastic Joining General Information and Guidelines.

Fusion Inspector: A qualified individual who is responsible for inspecting plastic joints made by butt fusion or electrofusion.

Hydraulic Butt Fusion Machine: A plastic butt fusion machine which uses a powered hydraulic pump and piston in order to bring the ends of the pipe together and make a finished joint.

Manual Butt Fusion Machine: A plastic butt fusion machine which uses manual mechanical advantage such as a lever in order to bring the ends of the pipe together and make a finished joint.

2. RESPONSIBILITIES

2.1 Trainers are responsible for:

- Providing training and testing to Operation SMEs responsible for training other Operations employees to perform plastic joining processes.
- Submitting qualification updates as needed to the Training database.

2.2 Operations is responsible for:

- Providing training and annual testing to Operations employees.
- Identifying employees and contractors disqualified from a joining process through construction inspection activities.
- Submitting qualification updates as needed to the training database.
- Maintaining calibration of fusion equipment utilized for training and qualification purposes.
- Verification of Construction Contractors knowledge and hands-on performance testing for plastic joining.

2.3 Construction Contractors are responsible for:

- Completing plastic pipe training, testing, and hands-on performance testing.
- Submitting qualification updates as needed to the training database.
- Informing Operations whenever a plastic joint is completed that fails visual, pressure, or destructive testing.

3. GENERAL QUALIFICATION GUIDELINES

All individuals completing plastic joining or inspecting plastic joining in the NYSEG or RG&E UTEN system shall be qualified by successfully completing:

- Written tests for each plastic joining process that the individual is authorized to complete and/or inspect.
- Hands on performance testing for each plastic joining process that the individual is authorized to complete and/or inspect.

The written tests shall be satisfactorily completed and documented:

- Before the individual completes any plastic joining process or inspects any plastic joints in the UTEN system.
- Every three years not-to-exceed 39 months between written qualification tests.

The hands-on performance testing shall be satisfactorily completed and documented on a three year not-to-exceed 39 months basis before the individual completes any plastic joining process or inspects any plastic joints in the UTEN system.

The results of all required hands-on performance testing shall be recorded on the NYSEG or RG&E Plastic Pipe Joining Qualification Report (CF#3250A), or electronic equivalent.

The plastic joining processes, qualifications, and required performance testing for each joining process is shown in Table 1 at the end of this procedure.

Prior to qualifying, individuals shall be familiar with all joining related SOP O&M procedures.

Failing the written tests or hand-on performance testing shall prohibit the individual from making joints under any plastic joining process until successfully requalified.

4. QUALIFICATION HANDS-ON PERFORMANCE TESTING

During any hands-on performance testing, the Plastic Pipe Joining Qualification Report (form #3250A) or electronic equivalent shall be checked off by the instructor as each individual qualifying completes a joining process. The Plastic Pipe Joining Qualification Report or electronic equivalent can be utilized to populate the training database.

All training and hands-on performance testing shall be conducted using fusion equipment and pyrometers that have been inspected and calibrated in accordance with SOP.P.U.10.02T Plastic Joining General Information and Guidelines.

The parameters for the butt fusion process qualification shall follow those contained within ASTM F2620 and the pipe manufacturer manuals contained in SOP.P.U.10.02K Plastic Pipe Joining.

- Heater temperatures for fusions shall be between 400 and 450 degrees Fahrenheit in accordance with SOP.P.U.10.02T Plastic Joining General Information and Guidelines.
- Melt bead sizes and cooling times shall be in accordance with the manufacturer fusion procedures in SOP.P.U.10.02K Plastic Pipe Joining and ASTM F2620.
- Interfacial pressure for the joint shall fall within the range of 60-90 psi. This value may be maintained in accordance with the hydraulic machine gauge pressure tables contained in SOP.P.U.10.02T Plastic Joining General Information and Guidelines.

The techniques used for electrofusion and all mechanical joining processes shall follow those provided by the fitting manufacturer manuals contained in SOP.P.U.10.02K Plastic Pipe Joining.

Each test joint created during the hands-on performance testing shall be visually inspected during the joining process and after the joint is made:

- Visual inspection during the joining process shall be considered successful if the individual qualifying successfully follows the applicable manufacturers joining procedure contained in SOP.P.U.10.02K Plastic Pipe Joining.

- Visual inspection after the joint is completed shall be considered successful if the finished joint has the same appearance as a successfully completed joint or photograph of the same.
- Photographs of acceptable joints are shown in the manufacturer manuals contained in SOP.P.U.10.02K Plastic Pipe Joining.

All butt fusion and electrofusion joints created during the hands-on performance testing shall be inspected to test their soundness using one of the three following methods:

1. By cutting into at least three longitudinal straps and:
    - Visually examining each cut joint surface to verify there are no voids or discontinuities.
    - Bending torque (twisting) or impacting the joint in each strap. If any failure occurs, it shall not initiate from the joint area.
2. Ultrasonically testing the joint in order to verify the absence of any voids or discontinuities.
3. For manual butt fusions, hydraulic butt fusions, and electrofusion couplings, tensile testing of the joint in accordance with ASTM D638 with the following requirements:
    - Testing is permitted to be completed at ambient temperature and humidity.
    - The joint being tested shall elongate no less than 25 percent, or failure shall initiate outside the joint area.

5. FAILURE AND DISQUALIFICATION REQUIREMENTS

The Fuser or Fusion Inspector shall immediately stop using a plastic joining process, or stop performing inspection of plastic joints if a joint for which they performed the role of Fuser or Fusion Inspector:

- Fails visual inspection by another qualified person; or,
- Fails a destructive test; or,
- Fails during pressure testing at or below design test pressures performed in accordance with SOP.P.U.10.02I Pressure Testing of Network Distribution Piping.

In the event a Fuser or Fusion Inspector is disqualified, the Plastic Pipe Joining Disqualification Report (form CF#3250B), or electronic equivalent, shall be completed.

Contractors who self-identify a visual, destructive or pressure test failure shall immediately notify Operations and update their employee's fusion qualification records.

Upon receiving a Plastic Pipe Joining Disqualification Report for a company employee, Human Resources or Operations shall update the training database.

Requalification of hands-on performance testing is recorded in accordance with Section 3. This requirement applies to both the company and contractors.

- At least 48 hours shall pass between making the disqualifying plastic joint and completing requalification performance testing.
- Completion of the written test in Section 3 is not required during this requalification.
- Lines for the written test and all plastic joining processes that were not tested shall be crossed out.

6. RECORDS DATA

For the Plastic Pipe Joining Qualification Report, use Form #3250A (sample paper medium), an electronic equivalent or the ITS record keeping system.

The Plastic Pipe Joining Disqualification Report shall document the following data on either paper, electronic medium, or ITS record keeping system.

Reference Number	Data Point	Data Record
1	Inspection Date	Select Date
2	Project Name	Text Box
3	Division	Select Division
4	Town	Text Box
5	Street	Text Box
6	Unit Number	Text Box
7	Joiner/Inspector Fuser ID	Text Box
8	Employee Name	Text Box
9	Joint Location or Project	Text Box
10	Plastic Joint Type	Select Joint Type
11	Joint Sized and Notes	Text Box
12	Form Identified By	Pressure Test / Visual Inspection / Destructive Test
13	Form Submitted By	Text Box

7. HANDS-ON PERFORMANCE TESTING REFERENCE CHART

Plastic Joining Process	Hands-on Performance Test Joint(s)	Testing Required	Qualifies Individual For
Butt Fusion – Manual Machine	One 2" Coiled Pipe Butt Fusion Using a Manual Machine	Visual Inspection and Longitudinal Strap Test	Butt Fusion any Size Straight or Coiled Pipe (Any Manual Machine)
Butt Fusion – Hydraulic 28 Machine	One 4" or 6" Pipe Butt Fusion Using the 28 Hydraulic Machine	Visual Inspection and Longitudinal Strap Test	Butt Fusions Size 2" to 8" on 28 Machine
Butt Fusion– Hydraulic 618 Machine	One 12" or larger Pipe Butt Fusion using a 618 Hydraulic Machine or One 4" or 6" Pipe Butt Fusion Using the 28 Hydraulic Machine	Visual Inspection and Longitudinal Strap Test	Butt Fusions Size 6" to 16" on 618 Machine
Electrofusion –Coupling	One 2" Electrofusion Coupling	Visual Inspection and Longitudinal Strap Test	Any Size Electrofusion Coupling
Electrofusion – Saddle	One Electrofusion Saddle on 2" Pipe	Visual Inspection and Longitudinal Strap Test	Any Size Electrofusion Service Tee, High Volume Tee, Branch Saddle, or Sleeve
Mechanical – Stab Fitting	One Stab Coupling on Plastic Pipe	Visual Inspection	Any Size Stab Fitting
Mechanical – Compression Fitting	One Compression Fitting on Plastic Pipe	Visual Inspection	Any Size Compression Fitting
Mechanical – Bolted Coupling	One Bolted Coupling on Plastic Pipe	Visual Inspection	Any Bolted Coupling
Mechanical – Nut Follower	One Nut Follower Fitting on Plastic Pipe	Visual Inspection	Any Size Nut Follower Fitting
Mechanical – Tee	One 2" x 1/2" Bolt-On Self-Tapping Tee	Visual Inspection	Any Bolt-On Self Tapping Tee

PROCESS: **CONSTRUCTION**

Standard Operating Procedure

BUSINESS: **UTEN**

CHAPTER: **N/A**

SOP.P.U.10.02AJ

SUBCHAPTER: **N/A** REV.: 0 DATE: **xx/xx/2025**

REVISION CONTROL

REV.	DATE	REASON	MODIFIED PAGES
0	xx/xx/2025	Initial Release	-

Prepared	Reviewed	Approved
Quality	Senior Quality Manager/ Senior Director Technical Services	Steering Committee

INDEX

1. BASIC INFORMATION

PURPOSE: To provide a standard procedure giving guidance and criteria covering preparation of as built documentation of Thermal Energy System assets.

SCOPE: This standard applies to plastic mains, services, energy transfer stations, thermal energy bores, and pump stations used to transport thermal energy.

RELATED DOCUMENTS:

- ASCE 75-22 Standard Guidelines for Recording and Exchanging Utility Data
- SOP.P.U.10.02N Map and Record Maintenance

ABBREVIATIONS:

- GIS: Geographic Information System
- NAD: North American Datum
- NAVD: North American Vertical Datum
- NDE: Non-Destructive Examination
- NYSEG: New York State Electric and Gas
- RG&E: Rochester Gas and Electric
- ROW: Right of Way
- UTEN: Utility Thermal Energy Network

DEFINITION:

Asset: A Thermal Energy System main, service, pump station, valve, energy transfer station or bore.

As Built Drawings: Electronic drawings or hand drawn sketches created by Engineering depicting the job as it was installed.

Construction Plans: Detailed drawings of asset installations, replacements, relocations, or retirements, created by Engineering.

Division: Field offices of NYSEG and RGE involved in the day-to-day operations, maintenance, and design of the UTEN system.

Field Notes: Legibly handwritten notes and sketches created by Operations, written on a copy of a construction plan or supplemental documents to a construction plan showing all field changes to a job.

Main: A pipeline that serves as a common source of supply for one or more thermal energy services.

Service: Those fittings and pipe that transport thermal energy from the tap on the main to the customer interface heat exchanger.

Operating/Quad Maps: Maps depicting the systems within NYSEG and RGE UTEN pilot or franchise areas.

House End: The length of a service located on private property.

Main End: The length of a service located in the public ROW. A service located entirely on private property has no main end length.

Pipeline: All parts of those physical facilities through which thermal energy is moved in transportation, including pipe, valves, pumps, heat exchangers, bores, and other attached appurtenances.

2. RESPONSIBILITIES

2.1 Engineering

Engineering is responsible for:

- Preparing Construction Plans.
- Using field notes in order to create final as built drawings

2.2 Operations and Installation Contractors

Operations and Installation Contractors are responsible for:

- Taking measurements for and creating field notes for all constructed projects.
- Filing original copies of as built documents in operations storage locations.
- Creating survey data for all installed assets.

2.3 Corporate Mapping

Corporate Mapping is responsible for:

- Using as built drawings in order to enter and update information into the company's GIS mapping database.
- Filing original copies of as built documents and survey data in Operations storage locations.

3. GENERAL REQUIREMENTS

As built drawings shall be created for all construction projects in order to sufficiently document the location and type of the company's UTEN facilities.

All measurements shall be made with a survey tape or measuring wheel. Accuracy of measurements shall be by type:

- Linear measurements shall be to the nearest foot.
- Depth below final grade measurements shall be made to nearest inch.

Whenever possible measurements should be referenced to objects shown in the project drawing(s) as those are already in the company's GIS mapping system.

Survey grade measurements shall be referenced to NAD 83 and NAVD 88 and be of positional accuracy of Level 1 at 95% confidence interval quality.

Field notes on construction plans shall be neat and precise in order to preserve clarity.

When additional or changed information is added, the previous information shall be crossed out.

Revisions shall be made in blue or black ink in order to allow digital scanning.

Types of measurements used in making field notes commonly include:

- Single Offset Measurements, shown in figure 1, which use a single distance measurement to locate offsets typically along a parallel ROW.
- Double Offset Measurements, shown in figure 2, use two offset distance measurements to locate exact positions. These measurements are especially helpful for locating tie in locations at intersections.
- Depth Measurements, shown in figure 3, use a single distance measurement to describe the depth of bury of a pipe.

Swing measurements shall be taken according to the following guidelines:

All measurements shall be taken to fixed permanent points such as:

- Building foundation corners.
- Company owned electric poles or cabinet transformers.
- Fire hydrants.
- Government survey monuments.

When taking measurements pull the survey tape tight.

Offset measurements shall be completed according to the following guidelines:

Offset measurements may be referenced to:

- Roadway centerlines.
- Edge of pavement or curb line.
- Property lines.
- Sidewalks.

The measurement shall always be taken perpendicular to the to the feature being measured to, such as roadway centerline.

Measurements to roadway centerlines shall be taken to the painted centerline of the pavement, or the center of the paved area if the road is not painted.

Depth measurements shall always be taken from the top of the pipe to the final finished and restored grade.

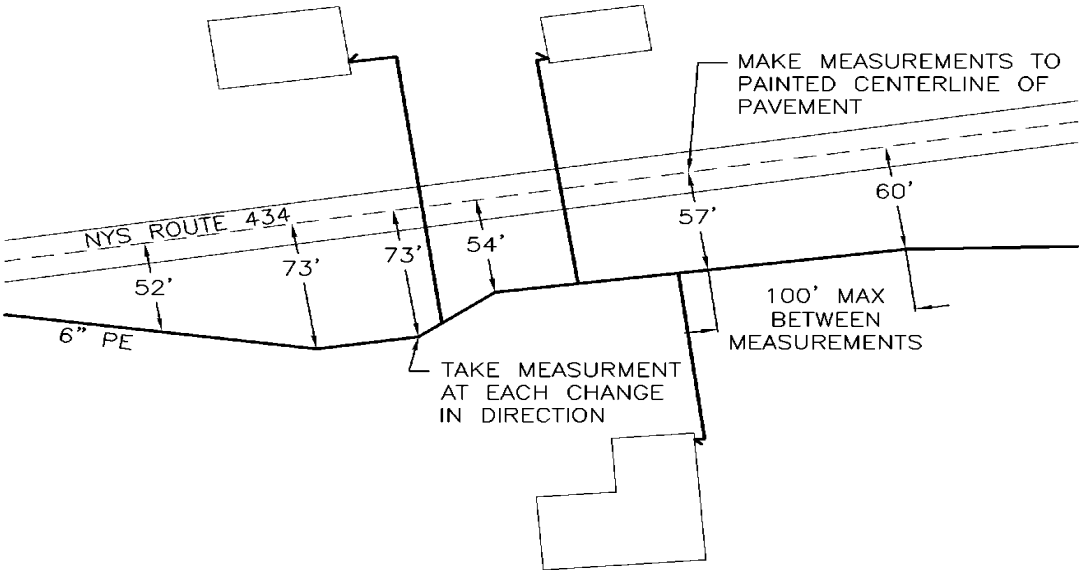

Figure 1 Single Offset Measurements Used to Describe a Thermal Energy Main Parallel to a Road or Other ROW

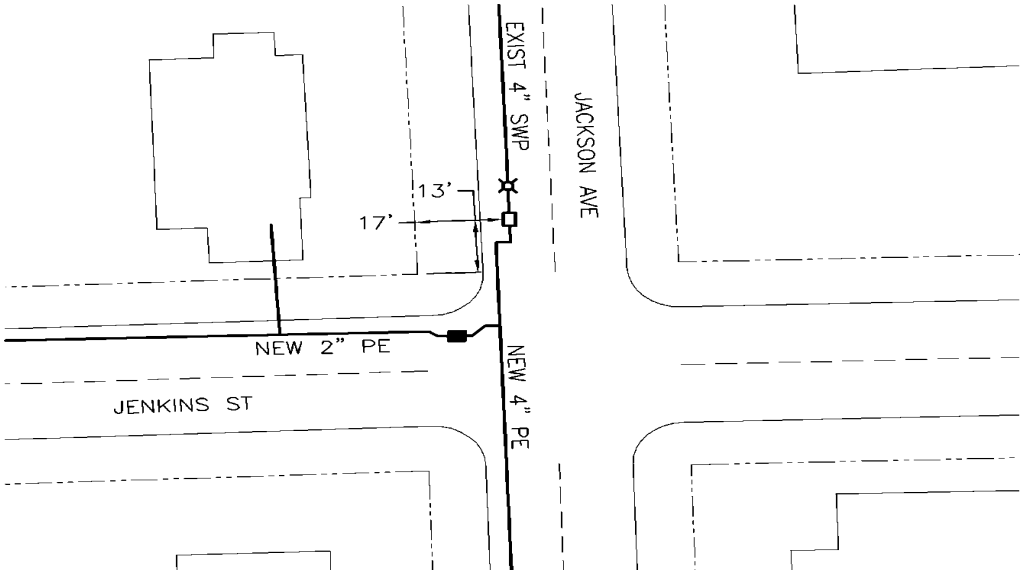

Figure 2 Double Offset Measurements from Property Lines Used to Describe Tie In Location Between New and Existing Piping

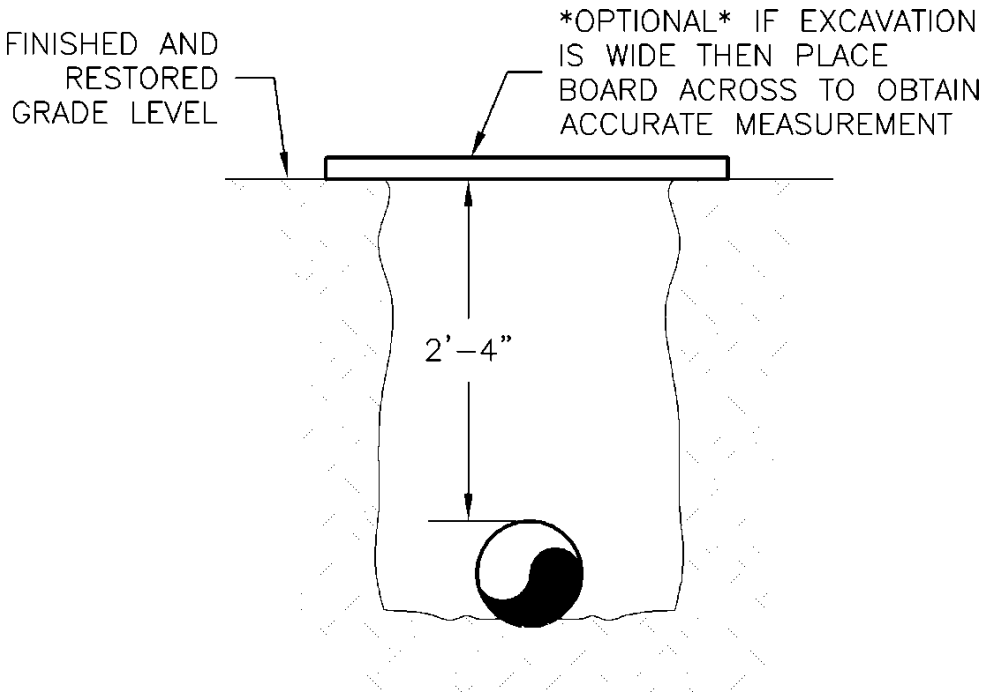

Figure 4 Pipe Depth of Cover Measurement

4. RECORDING OF GEO POSITIONAL DATA

Survey grade measurements of Latitude, Longitude, and Elevation shall be recorded at each of the following locations:

- At the center of the top of each pipe fusion joint
- At the center of the top of each pipe weld
- Each structure corner at the centerline of the structure wall thickness
- At 10-foot intervals for all coiled pipe installations
- At the ends of all casings
- At the center of the top of each thermal energy bore
- At the center of the top of each buried valve

Survey grade measurements shall be referenced to NAD 83 and NAVD 88 and be of positional accuracy of Level 1 at 95% confidence interval quality in accordance with Standard Guidelines for Recording and Exchanging Utility Data ACSE 75-22.

5. SERVICE DOCUMENTATION

As built information for each thermal energy service shall be documented to allow the service pipe to be located and maintained in the future.

- Engineering shall prepare service cards as part of the construction plans.
- Operations or the Construction Contractor shall complete remaining information on the service card and update information as needed at the completion of construction.
- All completed service cards shall be returned to Operations to be retained in the division's As built file.
- A copy of completed service cards shall also be sent to mapping.

Text information that shall be on the service card includes:

- SAP work order number.
- Service address including house number, street, and municipality.
- Operating/quad map number.
- Service pipe nominal diameter and material.
- House end and main end pipe lengths.
- Test pressure and length of time for the pressure test.
- Installation date.
- The name or initials of the installing crew leader.

Service cards shall also contain a sketch describing the following attributes of the service:

- The location of the tap on the main based upon swing measurements to points on the building receiving thermal energy service or an offset measurement from the side of the building receiving thermal energy service.
- The location of curb end supply and return valves using swing or double offset measurements.
- The location of the heat exchanger enclosure (service termination point) as an offset measurement from a corner of the building.
- The location and measurement of any changes in direction to the service pipe.

6. THERMAL ENERGY MAIN DOCUMENTATION

Thermal energy main as built drawings shall be maintained for all new installations, replacements, and retirements. The basic documentation package consists of both written information and measured drawings.

A cover sheet shall be attached to all projects showing the following minimum information:

- SAP work order number.
- Operating/quad map number(s).
- Listings of thermal energy mains installed, retired, or modified by street location expressed by nominal pipe size, pipe material, and installation year.
- Installation date.

All main piping shall be described on the drawings.

1. Actual footage of pipe installed shall be broken down by:
   - Street, then
   - Installation location whether public ROW or private property.
2. Piping retired shall also be broken down by street and footage. If only part of an existing pipe segment is retired, then remaining footage shall be noted. The location of retired piping shall be shown on the drawings by using a specific line type.
3. Locations of all casings shall be shown on the drawings.
4. The following measurements shall also be shown on drawings in order to locate the installation location of piping:
   - Offset measurements at each change in direction or no less than one measurement per 100 feet of main. If fittings were used to change direction, then those should be noted on the drawings.
   - Double offset or swing measurements to show the exact location of all main piping branches or intersections. The type of fittings used for the branch takeoff should also be noted on the drawings.
   - Double offset or swing measurements to show the exact location of end points of mains.
   - Depth measurements for all road crossings.
5. All valves shall be described on the project drawings or standalone valve cards with copies in the as built package. Items recorded shall include:
   - Valve size, material, and type.
   - Operating information such as direction and number of turns required to close or open.
   - Swing measurements to at least two permanent aboveground structures visible in winter for each valve.
   - Latitude Longitude and Elevation of the center of the top of the valve.
6. All tie ins shall be described on the project drawings:
   - Double offset or swing measurements shall be used to locate the point where the new main connects to the existing main.
   - Other fittings used during the tie in may be shown as measured relative to the tie in point between the new and existing pipe.
7. The size and material of all fittings used in the tie in shall also be noted on the project drawings.
8. All of the following other items shall be recorded on the project drawings:
   - Transition fittings.
   - Tracer wire test boxes.
   - Marker Balls.

7. ENERGY TRANSFER STATION, PUMP STATION, AND BOREFIELD DOCUMENTATION

Each energy transfer station, pump station, or bore field installed or reconstructed shall be adequately described on as built drawings and maintained for all new and replacement stations.

- Unique identification numbers shall be given to each station or bore field.
- Stations contained within the same enclosure shall be documented under a single station number.
- Each thermal energy bore shall be given a unique identification number.

The as built drawings for energy transfer stations, pump stations, and bore fields shall include the following elements:

- Inlet and outlet flow arrows showing the normal flow of thermal energy.
- All station valves, with normally closed valves indicated.
- All station strainers, heat exchangers, pumps, expansion tanks and any other equipment attached to or supporting the functionality of the station or bore field.
- All sensors and control equipment.
- All backup power generators.
- All electric, communication, and water connection details to municipal and public utilities.

The work order package shall also contain originals of all equipment manufacturer cut sheets and operating and maintenance recommendations. Copies of these shall be shared with and kept available in local operations centers.

REVISION CONTROL

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0	xx/xx/2025	Initial Release	-

Prepared	Reviewed	Approved
Quality	Senior Quality Manager/ Senior Director Technical Services	Steering Committee

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1. BASIC INFORMATION

PURPOSE: To provide a standard procedure giving guidance and requirements covering inspection and maintenance of metal surfaces exposed to the atmosphere.

SCOPE: This procedure applies to all exposed metallic surfaces on thermal energy systems at Avangrid.

RELATED DOCUMENT

- SOP.P.U.10.02AM Priorities for Correcting Deficiencies Found During Inspections and Surveys

ABBREVIATIONS:

O&M: Operations and Maintenance

SOP: Standard Operating Procedure

DEFINITION:

Casings- Good: For example: Casing is coated, shows no corrosion and is electrically isolated from the carrier pipe and bridge.

Casings- Fair-Good: For example: Casing electrically shorted with the bridge. Casing may have some coating holidays and minor pitting, but it is protecting the carrier pipe.

Casings- Fair: For example: Casing is bare steel or is coated steel with three or fewer corrosion holes. Corrosion holes are small enough that the casing can still protect the carrier pipe.

Casings- Fair-Poor: For example: Casing is questionably structurally sound and may not be able to provide protection to the carrier pipe.

Casings- Poor: For example: Casing is so corroded that the carrier pipe is supporting the casing pipe. Casing is not performing as intended.

Deck Penetration & Splash Zones- Good: For example: No deck penetrations exist where water drains onto the pipe.

Deck Penetration & Splash Zones- Fair-Good: For example: Drainage points onto the pipe do exist; however, the pipe is adequately coated and protected.

Deck Penetration & Splash Zones- Fair: For example: Water drainage has damaged the pipe coating, slight surface corrosion on the piping.

Deck Penetration & Splash Zones- Fair-Poor: For example: Water drainage has damaged the pipe coating and has caused corrosion.

Deck Penetration & Splash Zones- Poor: For example: A carrier pipe is leaking, or a casing is corroded through as a result of water drainage onto the pipe.

Distribution Line: A pipeline outside of the confines of a well bore field or energy transfer station.

Energy Transfer Station: Facilities including a heat exchanger, moving energy from bore field piping to distribution line piping.

Bore Field: A series of thermal energy bores (wells) and associated piping providing thermal energy to an Energy Transfer Station.

General Corrosion: Closely grouped pitting that may affect the overall strength of the pipe, resulting in potential leakage.

Hangers and Rollers- Good: For example: All hanger(s) or roller(s) are present, in good repair, of appropriate design, is holding the pipe in proper alignment, and allows the pipe to move freely.

Hangers and Rollers- Fair-Good: For example: All hanger(s) or roller(s) are present, has structurally insignificant corrosion, pipe is not properly resting on the hanger, or hanger does not allow pipe to move freely.

Hangers and Rollers- Fair: For example: More than one hanger or roller is missing.

Hangers and Rollers- Fair-Poor: For example: More than one hanger or roller is missing, has multiple structurally significant corrosion locations.

Hangers and Rollers- Poor: For example: More than one hanger or roller missing, has multiple broken hanger(s) or roller(s), has multiple structurally significant weakened by corrosion locations, cannot be expected or trusted to hold the pipe.

Headwall Penetration and Soil-Air Interface- Good: For example: Pipe is centered in and electrically isolated from the headwall penetration. or penetration directly into the ground has adequate coating and mechanical protection.

Headwall Penetration and Soil-Air Interface- Fair-Good: For example: Coating is complete for headwall or ground penetrations; headwall penetrations are electrically isolated. Structure pipe is resting on headwall or casing but isolated with fiberglass shielding. Some sealant material missing from pipe-casing penetration area.

Headwall Penetration and Soil-Air Interface- Fair: For example: Damaged coating or electrical shorts are found at the headwall or ground penetrations. Structure pipe structurally sound, no pipe wall loss at contact location, 10% or less of seal missing.

Headwall Penetration and Soil-Air Interface- Fair-Poor: For example: The headwall or ground penetration exhibits signs of coating damage with corrosion. Corrosion or pitting has less than 70% structure piping wall loss, greater than 10% seal missing.

Headwall Penetration and Soil-Air Interface- Poor: For example: Corrosion or pitting has greater than 70% structure piping wall loss, pipe is leaking at the headwall or ground penetration, most or all seals missing.

Line Markers- Good: For example: Both sides of pipe crossing have clear, updated identification markers.

Line Markers- Fair-Good: For example: Both sides of pipe crossing have identification that is legible but faded or discolored.

Line Markers- Fair: For example: Both sides have an indication there is a pipe crossing, but clear identification is questionable, or information is outdated.

Line Markers- Fair-Poor: For example: One side is missing a marker.

Line Markers- Poor: For example: No pipe identification present.

Line Markers- Not Needed: For example: Pipeline markers not needed due to public inaccessibility.

Main: A pipeline that is located outside the confines of a thermal energy bore field, thermal energy transfer station, or pump station that serves as a common source of supply for one or more thermal energy services.

Pipe Coating- Good: For example: Complete pipe coating with no patches except for at welds of mill coated pipe, or complete pipe coating that contains previous good condition repairs.

Pipe Coating- Fair-Good: For example: Less than 25% of the pipe has areas of missing/damaged coating which is causing the corrosion.

Pipe Coating- Fair: For example: More than 25% of the pipe has areas of missing/damaged coating which is causing some corrosion.

Pipe Coating- Fair-Poor: For example: Most coating areas still applied but dis-bonded in some fashion, pipe corrosion present in multiple locations.

Pipe Coating- Poor: For example: All coating dis-bonding and/or missing, corrosion apparent at multiple locations.

Pipe Metal Corrosion- Good: For example: No surface corrosion, no pitting.

Pipe Metal Corrosion- Fair-Good: For example: Some surface corrosion, pitting less than 10% deep into the pipe wall.

Pipe Metal Corrosion- Fair: For example: Moderate surface corrosion, some pitting 10-70% deep into the pipe wall.

Pipe Metal Corrosion- Fair-Poor: For example: Moderate to severe surface corrosion, numerous pitting 10-70% deep into pipe wall.

Pipe Metal Corrosion- Poor: For example: Severe surface corrosion, or any pitting over 70% wall loss

2. RESPONSIBILITIES

2.1 Operations and O&M Contractors

Operations and O&M Contractors are responsible for:

- Ensuring that Company or Contractor personnel conducting inspections are trained and qualified to meet applicable Company requirements.
- Inspecting exposed piping for atmospheric corrosion with either Company or Contractor personnel.
- Remediation of deficiencies found during atmospheric corrosion inspections with either Company or contractor personnel.

3. GENERAL REQUIREMENTS

Exposed casing and carrier piping facilities shall be inspected for atmospheric corrosion and coating damage within the timeframes specified in Sections 4, 5, and 6 of this procedure.

A detailed inspection shall be conducted to assess the entire condition of the exposed piping including all casings, fittings, hangers, supports, and brackets.

During the inspection, the Inspector shall give particular attention to:

- Soil to air interface (remove loose soil, rocks, and leaves)
- Pipe surfaces under thermal insulation
- Contact points at pipe supports
- Splash and frequently submerged zones
- Deck penetrations (bridges)
- Abutment or wall penetrations
- Expansion joints

Specific inspection requirements are described in sections 4, 5, and 6 of this procedure.

4. PIPELINES ON BRIDGES

(This section reserved)

5. ENERGY TRANSFER STATION PIPING

Energy transfer station piping is usually located in below grade structures (manholes or vaults) but may also be located in buildings on occasion. The following requirements apply in either case.

- Exposed energy transfer station piping shall be inspected for atmospheric corrosion and coating damage at least once every calendar year for stations located inside of buildings and each 6 months for stations located in manholes or vaults.

- Exposed piping shall include all above grade valve clusters, custody transfer points, heat exchangers, strainers, expansion tanks, make-up reservoirs, and all other exposed piping within the limits of the station.
- Exposed piping at pump stations shall be inspected at least once each calendar year.

6. OTHER EXPOSED METALLIC PIPELINES AND COMPONENETS

Other exposed casings and carrier piping facilities that are not inspected in accordance with sections 4 or 5 shall be inspected for atmospheric corrosion and coating damage at least once every three calendar years.

Examples of other exposed pipelines that require an inspection for atmospheric corrosion include but are not limited to water bath or auxiliary heaters and customer interface energy transfer enclosures.

7. REMEDIATION

Whenever coating defects, pitting damage, or any other deficiencies requiring remediation are found during the inspection of exposed piping, a maintenance order identifying the need for recoating, repair, or recommended replacement shall be completed prior to the next schedule inspection to identify and schedule remedial work in accordance with SOP.P.U.10.02AM Priorities for Correcting Deficiencies Found During Inspections and Surveys. The description and configuration of any pitting shall be included with the maintenance order.

8. FORMS, REPORTING, AND DATA

(This section reserved)

PROCESS: **CONSTRUCTION**

Standard Operating Procedure

BUSINESS: **UTEN**

CHAPTER: **N/A**

SOP.P.U.10.02AQ

QSUBCHAPTER: **N/A** REV.: 0 DATE: **xx/xx/2025**

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BASIC INFORMATION

PURPOSE: To provide a standard procedure giving guidance for selection, design, and construction criteria covering valves.

SCOPE: This standard applies to main; service, energy transfer station, and thermal energy bore piping and equipment on the Avangrid UTEN system.

RELATED DOCUMENTS:

- ASTM D2513
- API D6 (Specification for Pipeline Valves)
- AWWA C 901 and 906
- AWWA Manual of PE Pipe Design and Installation
- SOP.P.U.10.02G Plastic Pipe Design
- SOP.P.U.10.02AR Steel Flanges and Fittings

ABBREVIATIONS:

- SDR: Standard Diameter Ratio
- SOP: Standard Operating Procedure
- UTEN: Utility Thermal Energy Network

DEFINITION:

Energy Transfer Station: Wells, heat exchangers, pumps, valves, meters, and gauges including their associated piping, access roads, buildings, fencing, wiring, communications, and other miscellaneous UTEN related assets in the general confines of the site.

Main: Piping that serves more than 1 service line and that is downstream of source energy transfer stations.

Pump Station: A location that includes a pump other than a bore field, service, or energy transfer station.

Service Line: Piping that supplies thermal energy not more than 2 customer and which consists of a supply pipe and return pipe to a main.

Pressure Class: A numerical representation of the maximum sustained internal pressure capabilities of the pipe, defined by pipe material, SDR, and weighted average water temperature.

1. RESPONSIBILITIES

1.1 Operations and Construction Contractors

Operations and Installation Contractors are responsible:

- For installing valves and valve boxes in accordance with this standard.

1.2 Engineering

Engineering is responsible:

- Determining the types and locations of all valves installed and adding those to work orders.

2. GENERAL REQUIREMENTS

Valves are commonly used in mains to sectionalize a portion of the system for construction, maintenance, and emergency shutdowns. They may also be used for tie-in points. Valves are also used as isolation points for service lines.

Inside of Energy Transfer Stations or Pump Stations, valves are used to isolate equipment, sections of station piping and entire station piping assemblies inside of vaults and buildings.

The standard operator for all buried valves installed in mains shall be the 2-inch square head. For Energy Transfer Station and pump station valves 4 inches or larger in nominal size, a 2-inch square head, hand wheel, or lever operator is acceptable.

3. VALVE TYPES

Basic valve types allowed for use in mains and services are limited to butterfly, gate, and ball valves. Gate valves are to be used wherever possible due to their inherent multiple turn operation to close, the corresponding improved control in the speed that a valve is closed and reduction in resulting surge pressures. Butterfly valves are commonly used in stations for ease of operation and throttling as well as length (size).

Engineering shall select valve types to add to work orders based upon the following guidance:

- For plastic mains gate valves shall be used.
- For low diameter (less than 4 inches nominal) piping, either ball valves or gate valves may be used.
- Butterfly valves are acceptable inside energy transfer stations.

Pressure ratings for valves shall be determined according to the valve material:

- Plastic valve pressure ratings shall be calculated in accordance with standard SOP.P.U.10.02G Plastic Pipe Design using the SDR of the valve end connection and plastic material type the valve is molded from.

- Steel valve pressure ratings shall be determined in accordance with standard SOP.P.U.10.02AR Steel Flanges and Fittings.
- Ceilings and walls shall be inspected for cracks or spalling of the concrete. Cracks or spalling of the concrete more than ¼ inch deep or resulting in more than ¼ inch of concrete loss shall be reported.

4. INSTALLATION

Valves shall be handled with care during transportation and installation.

Valves being hoisted by machine shall be lifted using manufacturer provided lifting lugs. Where manufacturer lifting lugs are not available, the valve shall be lifted in accordance with Figure 1 below.

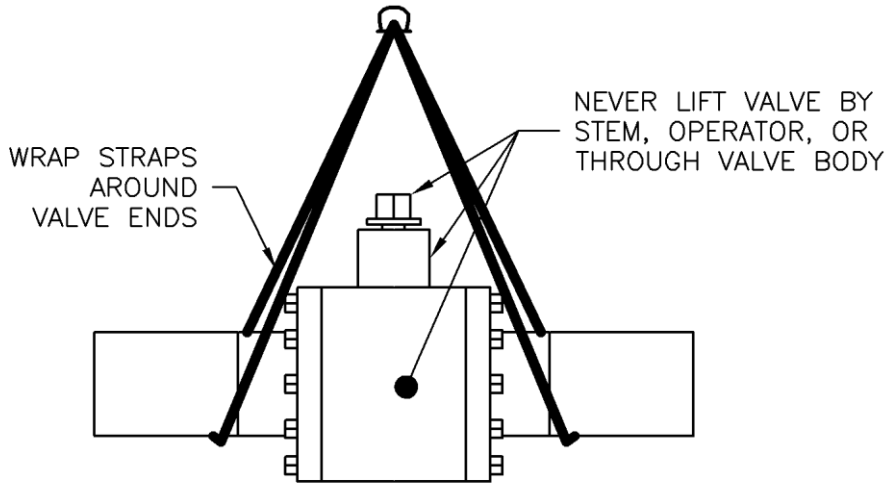

Figure 1 – Lifting of Valves Where Manufacturer Provided Lifting Lugs are NOT Available

Gate valves should be stored in the slightly open position in order to protect the valve seats while removing pressure from any sealing rubber.

Ball valves should be stored and handled with manufacturer provided end caps in place. Where end caps are not present, the valve shall be kept in the open position in order to minimize the risk of damage to the valve seats.

Before installation, all valves should be operated in order to verify proper operation. Operations or Construction Contractors should verify and record the number of turns and direction of operation to open the valve during this check.

5. VALVE BOXES

The three parts of a valve box shown in Figure 2 include:

- Bell or base.
- Extension shaft.
- Rim and lid.

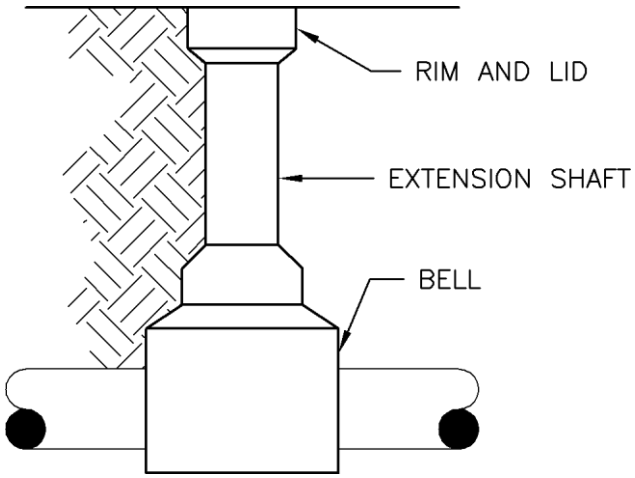

Figure 2: Parts of a Valve Box

The standard valve box for mains is the 5.25-inch shaft plastic valve box with cast iron rim and lid.

For larger diameter valves or valves with gear operators 7 or 18 inch shaft valve boxes are available.

Additionally cast iron valve boxes with plain bells are available for non-standard valve installations.

Valve box bells or bases shall be rested against soil or blocked in order to prevent transmitting forces to the buried main or valve.

Plastic valves shall be installed with a valve box which supports the valve during actuation in order to protect the main from shearing forces. This is shown in Figure 3.

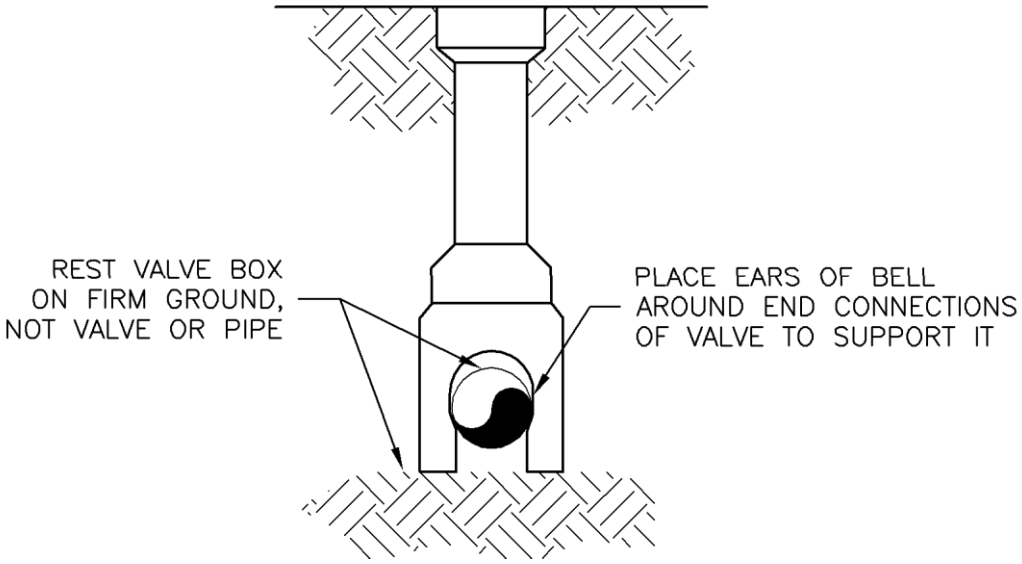

Figure 3: Valve Installation Details to Reduce Shear on Plastic Pipe

The covers of finished valve boxes shall be painted with purple paint.

Where applicable to facilitate protection of new facilities in active construction sites, line markers, purple painted stakes, or ground markings should be used adjacent to valve boxes to locate and identify valve locations.

6. FORMS

(This section reserved.)

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1. BASIC INFORMATION

PURPOSE: To provide guidance and criteria covering the inspection of new pipe during construction to assure pipe is capable of long service life prior to being tested and accepted for service.

SCOPE: This standard provides the requirements for inspection and remedial actions of pipe for damage during new construction before it is energized or placed into service.

RELATED DOCUMENTS:

- ASTM D2774
- ASTM F1668
- Plastic Pipe Institute Handbook of Polyethylene Pipe
- AWWA Manual of PE Pipe Design and Installation
- Performance Pipe Bulletin PP901

ABBREVIATIONS:

- SDR: Standard Diameter Ratio
- UV: Ultraviolet
- UTEN: Utility Thermal Energy Network

DEFINITION:

Imperfection: Slight damage to the pipe which does not represent a condition requiring repair by cut out.

Injurious Defect: Damage which impairs serviceability or strength of the pipe and must be repaired by cut out.

Pipe: Any pipe, fitting, or tubing used for the distribution of non-potable water in thermal energy systems.

2. RESPONSIBILITIES

2.1 Operations and Installation Contractors

Operations and Installation Contractors are responsible for inspecting (during construction) all pipe installed for imperfections and injurious defects and remediation before acceptance testing or being placed into service.

3. GENERAL REQUIREMENTS

All pipe and fittings installed for mains and services shall be inspected for imperfections and injurious defects.

Factory coated pipe and fittings shall be inspected before lowering the pipe into the ditch or setting assemblies in place.

Pipe and fittings to be coated shall be inspected before coating.

3.1 Imperfections include any:

- Gouges, scratches, grooves, or nicks in the pipe wall which are less than 10 percent of the wall thickness deep.
- Dents less than 0.125 inches deep that contain no wall loss on steel pipe.

Imperfections shall be handled by pipe material type.

Imperfections in steel pipe may be removed by grinding or filing.

Imperfections in plastic pipe shall be left in place.

3.2 Injurious defects include any:

- Gouges, scratches, grooves, or nicks on plastic pipe deeper than 10 percent of the wall thickness.
- Any dents that contain wall loss on steel pipe.
- Arc burns.
- Any wrinkles, buckles, or split seams in steel pipe.
- Any kinks, creases, fold overs, or incorrect SDR in plastic pipe.
- Girth welds or plastic fusions which do not meet visual inspection criteria.

All injurious defects shall be repaired by cutting the damaged area out as a cylinder.

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1. BASIC INFORMATION

PURPOSE: To provide a standard procedure giving guidance and design criteria covering the handling and storage of plastic pipe used on the UTEN system.

SCOPE: This standard applies to all plastic pipe intended for use on the UTEN system which may be energized with water or glycol mix.

RELATED DOCUMENTS:

- AWWA Manual of PE Pipe Design and Installation
- Performance Pipe Bulletin PP901
- SOP.P.U.10.02E Inspection of Pipe New Construction
- SOP.P.U.10.02T Plastic Joining General Information and Guidelines

ABBREVIATIONS:

- HDPE: High Density Polyethylene
- PE: Polyethylene
- SDR: Standard Diameter Ratio
- UTEN: Utility Thermal Energy Network

DEFINITION:

Pipe: Any pipe used for the distribution of non-potable water in thermal energy systems.

Standard Diameter Ratio: The Standard Diameter Ratio, (sometimes referred to as “SDR” or “DR”), is the ratio of pipe diameter to wall thickness.

2. RESPONSIBILITIES

2.1 Stores

Stores is responsible for:

- Inspecting pipe upon receipt.
- Checking print lines for the date of manufacture before issuing pipe for construction work.
- Rotating pipe inventory to prevent pipe expiration.
- Storing pipe in accordance with this standard.

2.2 Operations and Construction Contractors

Operations and Construction Contractors are responsible for inspecting pipe at the job site.

3. GENERAL REQUIREMENTS

- When handling plastic pipe:
  - Care should be exercised to avoid rough handling which could cause damage.
  - Plastic pipe shall not be dropped or have other objects dropped on it.
  - Plastic pipe shall not be pushed or pulled over sharp edges or rough surfaces.
  - Precautions to prevent damage to plastic pipe and shall be exercised at all times including when:
- Loading and unloading.
- Transporting to the job site.
- Installing plastic pipe shall be stored in the original packaging as long as possible.

4. SAFETY

While handling or storing plastic pipe consideration shall be made to handle and store pipe in a safe manner.

Storage and handling techniques for plastic pipe shall follow this standard in order to prevent toppling or rolling of pipe stacks which could result in injury or death.

When handling pipe, the operator shall be aware to avoid striking permanent and non-permanent structures.

- Examples of permanent structures include fences, utility poles, and geographic features.
- Examples of non-permanent structures include vehicles, personnel, and pedestrians.

Pipe shall not be handled above people's heads.

5. INSPECTION

All pipes shall be inspected upon receipt to detect obvious damage (caused by shipping).

All pipes shall be inspected at the job site in accordance with:

- SOP.P.U.10.02T Plastic Joining General Information and Guidelines.
- SOP.P.U.10.02E Inspection of Pipe New Construction

6. TRANSPORTATION

During the transportation of plastic pipe:

- Racks shall be covered with padding and vehicle beds shall be free of any sharp projections that could cause damage to the pipe.
- Plastic pipe shall not overhang the vehicle by more than 3 feet. A red flag shall be secured to any length that overhangs the vehicle. The stacking height during transportation of pipe shall not cause the overhanging pipe to bend.
- The pipe shall be secured tightly to the vehicle with cloth or nylon straps to prevent movement.
- Chains shall not be used.
- At no time shall loading cause the pipe to be forced out of round.

7. LOADING AND UNLOADING

Coiled or bundles of stick pipe shall never be rolled or pushed off a truck.

The pipe may be lifted by hand or by an approved pipe lifting device such as:

- Front End Loader.
- Forklift.
- Backhoe/Excavator.
- Crane - using nylon or cloth straps.
- Wire rope, chain slings, chains and cables shall not be used to lift or secure plastic pipe.

The following rules shall be utilized when completing under-the-load lifting, such as when using a forklift, front end loader, or any other piece of equipment that uses forks to handle the pipe:

- The equipment used shall have sufficient capacity to safely move and transport the plastic pipe without tipping the machine or dragging the ends of the stick pipe along the ground.
- Forklift forks shall be free of sharp edges. The use of forklift pads/mittens is permitted but not required.
- While handling plastic pipe with a forklift, forks shall be spread as far as possible and extended quickly under the load. Care should be taken to minimize the pipe ends from sagging because this will cause the bundle straps to dig into and damage the pipe.

- The use of forklift extensions is permissible. Fork extensions shall be free of sharp edges that may cause damage to plastic pipe.

Above-the-load lifting requirements:

- Cranes, extension boom cranes, and side boom tractors shall use wide fabric choker slings that are secured around the pipe.
- When feasible, a spreader bar may be used to minimize pipe sagging. It is recommended that for lengths of pipe greater than 30 feet a spreader bar be used.

8. STORAGE

General storage requirements:

- Plastic pipe shall be stored to minimize the possibility of damage by crushing or piercing.
- Any surface on which plastic pipe is stored shall be free of objects that may cause damage to the pipe.
- At no time shall stacking or storage cause any portion of the pipe to be forced out of round.
- Regardless of the method used to stack sticks or coils of pipe, adequate support shall be maintained to prevent damage.

Stick pipe storage requirements:

- Bundled plastic stick pipe shall be stored on stringers to allow for lifting with a forklift. Wooden stringers shall be free of protruding nails that may damage the pipe. The maximum distance between stringers shall not exceed 20 feet.
- Loose plastic stick pipe shall be laid straight. Individual sticks shall not cross over or become entangled with each other since this may cause a hazard during future movement.
- Unintended movement or toppling of plastic stick pipe during storage shall be inhibited by keeping the pipe secured in factory bundle packaging, placing wedges at the end of stringers, and using uprights to support the pipe stack.

- Loose stick pipe stacked in a pyramid pile shall be limited to the following heights based upon pipe diameter:

Nominal Pipe Size	Maximum Number of Tiers High
2”	12
3”	12
4”	8
6”	7
8”	6
10”	5
12”	3

Table 1: Maximum stacking height for plastic pipe

Coiled pipe storage requirements:

- Loose coiled pipe shall be placed on wooden pallets. Pallets shall be free of nails.
- When stacking coiled pipe, the stack height shall be a maximum of 86 inches.
- Horizontal storage of coiled pipe is allowed.
- Coiled pipe shall be stored on a surface that will not damage the pipe.

Plastic pipe shall be stored in a manner that minimizes damage during snow removal.

Pipe shall be located in areas where pipe will be protected from snow removal equipment; or plastic pipe shall be elevated to a level so that it will be protected from snow plowing equipment as well as snow and debris that are being pushed by the equipment.

Any pipe that is found to be damaged or deficient shall be placed in an area of the yard or storage facility so that it is not used during construction or maintenance of the system, and/or clearly marked to be deficient or damaged so that it is not used during construction or maintenance of the system.

9. SHELF LIFE

Plastic pipe, regardless of whether stored indoors or outdoors, based on the date of manufacture on the print line of the pipe shall only be used in accordance with the shelf life limitations of SOP.P.U.10.02T Plastic Joining General Information and Guidelines. Stores shall rotate inventory to assure that no plastic pipe exceeds its expiration date. Any plastic pipe with an expired shelf life shall be removed from inventory.

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1. BASIC INFORMATION

PURPOSE: To provide a standard procedure giving guidance and design criteria covering the selection of plastic pipe materials, diameters, and wall thicknesses.

SCOPE: This standard applies to main, service, energy transfer station, and thermal energy bore plastic piping design on the UTEN system.

RELATED DOCUMENTS:

- ASTM D2237, D2239, and D2837
- ASTM F714
- AWWA C 901 and 906
- AWWA Manual of PE Pipe Design and Installation
- Performance Pipe Bulletin PP501
- Performance Pipe Bulletin PP507
- PPI TR-3
- SOP.P.U.10.02T Plastic Joining General Information and Guidelines

ABBREVIATIONS:

- DF: Design Factor
- DIP: Ductile Iron Pipe
- F_t: Temperature derating factor
- HDPE: High Density Polyethylene
- HDB: Hydrostatic Design Basis
- MID: Material Identification Number
- N: Cycles to failure
- NYSEG: New York State Electric and Gas
- PC: Pressure Class
- P_{os}: Pressure during occasional surge
- P_{rs}: Pressure during recurring surge
- PSIG: Pounds per Square Inch Gauge
- RG&E: Rochester Gas and Electric
- SDR: Standard Diameter Ratio
- UV: Ultraviolet
- UTEN: Utility Thermal Energy Network
- WP: Working Pressure
- WPR: Working Pressure Rating

DEFINITION:

Design Factor: Design factor is a multiplier used for water service of the Minimum strength of PE 4710 material used by industry when specifying pipe for water service. This factor equates to 0.63.

Hydrostatic Design Basis: The long-term strength value for plastic pipe material in the circumferential (hoop) direction which will result in rupture after 100,000 hours of static pressure.

Hydrostatic Design Stress: The HDB altered to account for the temperature of the energy transfer fluid (75%water 25% Glycol Mix).

Pressure Class: A numerical representation of the maximum sustained internal pressure capabilities of the pipe, defined by pipe material, SDR, and weighted average water temperature.

Energy Transfer Station: Wells, heat exchangers, pumps, valves, meters, and gauges including their associated piping, access roads, buildings, fencing, wiring, communications, and other miscellaneous UTEN related assets in the general confines of the site.

Temperature Derating Factor: The impact multiplier for HDS determination of elevated fluid operation temperature.

Working Pressure: The maximum sustained operating pressure to be applied to the pipe exclusive of transient pressures.

Working Pressure Rating: The working pressure adjusted to account for recurrent and/or occasional surge pressures. In no case can the working pressure rating exceed the pressure class of the pipe.

2. RESPONSIBILITIES

2.1 Operations

Operations are responsible for the following:

- Identifying and reporting field discovered contaminated soils.
- Installing the nominal pipe size, SDR and material as specified by Engineering.

2.2 Engineering

Engineering is responsible for the following:

- Providing designs for HDPE pipe for installation on UTEN mains, services or in Energy Transfer Stations

3. GENERAL REQUIREMENTS

All below grade UTEN piping shall be of HDPE plastic material. Pipe and resin shall be PE 4710 and manufactured in accordance with (meeting or exceeding) Performance Pipe Bulletin PP 507 sections 2.1 through 2.5. Dutile Iron Pipe (DIP) sized pipe shall not be used. Procured HDPE shall be colored using a minimum 2% carbon black and rated to withstand exposure to UV (sunlight) for 10 years. Black pipe manufactured with purple stripes extending into the pipe wall not more than 10% of the wall thickness may also be used.

All pipe systems shall be hydraulically modeled by Engineering (or consulting engineers) prior to pipe section design. Pipes shall be sized to assure that non-emergency maximum (peak) flow velocities do not exceed 4 fps and typical flow speeds are less than 2 fps. Burial depths as well as heat sources and sinks shall be sized and located sufficient to limit normal operational peak fluid temperatures to less than 73 degrees F and temperatures during short term peak periods or emergency operations to lower than 100 degrees F anywhere on the plastic system.

Pipe installed under H-20 or higher loaded travel lanes, including crossings as well as rail crossings shall be specifically designed by Engineering to meet site requirements and be adequate for expected earth loading. Wetland and stream crossings shall also be specifically engineered to meet site requirements. In all other locations, pipe can be designed and installed using the design procedure for typical installations that follows.

4. DESIGN PROCEDURE FOR TYPICAL INSTALLATIONS

4.1 Design of Main and Service Pipe

Plastic pipe stocked in the Company's storerooms has already been designed to meet the minimum requirements of this standard. Only new, never used or fused, plastic pipe shall be used for new or replacement installations. Reactivation of a service off an existing UTEN plastic pipeline is allowed.

HDPE pipe in Table 1 below may be used for UTEN service. SDR 11 pipe, not currently stocked, is expected to be used for thermal energy well vertical piping.

MID	Description
xxxxxxxx	PP HDPE 0.5" CTS SDR 11 COIL
xxxxxxxx	PP HDPE 1.25" CTS SDR 11 COIL
xxxxxxxx	PP HDPE 2" IPS SDR 11 STICK 40'
xxxxxxxx	PP HDPE 4" IPS SDR 11 STICK 40'
xxxxxxxx	PP HDPE 6" IPS SDR 11 STICK 40'
xxxxxxxx	PP HDPE 8" IPS SDR 11 STICK 40'
xxxxxxxx	PP HDPE 12" SDR 11 STICK 40'

Methods for obtaining a list of available HDPE plastic pipe, material description and/or Material ID numbers (MID) include:

- SAP application.
- NYSEG/RG&E UTEN Construction Material Catalog located on the Technical Services SharePoint site.

Permanent installations of plastic pipe shall only be for buried service or installed in an insulated steel casing if the pipe is to be above ground.

4.2 Above Grade Installations

Uncased plastic pipe may be installed temporarily aboveground in order to serve as a bypass under the following conditions:

Installation shall be made in an area protected from damage by external forces. Examples of external forces which may damage or affect the installation include:

- Vehicle traffic.
- Flooding and other natural forces.
- Tampering.

Temporary above ground installations shall be designed within the temperature and UV exposure limitations of plastic pipe:

- Engineering evaluation shall be made by Technical Services when plastic pipe will be installed above grade and anticipated service temperatures are outside of the 40 to 100 degrees Fahrenheit temperature range.
- Cumulative duration of UV exposure shall be in accordance with SOP.P.U.10.02T Plastic Joining General Information and Guidelines. The basis for determining exposure duration shall be the manufacture date stamped on the plastic pipe.
- Above grade installations which will be in service for more than 5 days shall be reviewed and approved by Technical Services. In no case shall installations above grade remain in service for longer than 120 days.
- Installations which will remain in service for more than 7 days shall be checked each 7 days. The check shall be by Operations and will be to determine that the installation has not been damaged by a third party or natural resources.

4.3 Design Basis for Plastic Pipe – Typical Installations

According to the publication *AWWA M55 PE Pipe – Design and Installation*, "The parameters that control design of PE 4710 pipe for water distribution are the sustained internal pressure, the intermittent or transient surges that may occur during operation, and the temperature of operation."

For UTEN design:

- WP (working pressure): Distribution and thermal energy well piping systems shall be designed and modelled using a maximum near grade pump outlet pressure of 70 PSIG.
- F_t (temperature factor) = 0.8. Both distribution and well piping systems shall be designed and modelled using a maximum short term (emergency) operating temperature of any system component of 100 degrees Fahrenheit.
- HDS = DF X F_t X 1600 PSI (base strength of material) = 0.63*0.80*1600= 800 psi (approximate).

Pressure Class (PC) of 4710 material is governed by the following equation.

$$PC = 2(HDS)/(SDR-1)$$

Table 1 below shows the resulting Pressure Class for various 4710 pipe SDRs.

Pressure Class of PE 4710 Pipe Sizes		
SDR	**PC (psi)**	**HDS**
7	267	800
11	160	800
13.5	128	800
17	100	800

Table 1: Pressure Class of PE 4710 Pipe by SDR

In short, the Pressure Class (PC) is the design limit of the pipe for maximum sustained operating pressure with surge pressure allowances at operational temperatures up to 100 degrees Fahrenheit and varies by SDR selection.

The surge pressure allowances for pipes of various Pressure Class are defined in ANSI/AWWA C901 and C906 in terms of recurring surge pressure (P_{rs}) and occasional surge pressure (P_{os}).

These surge pressure allowances are (for SDR 11 4710 Pipe):

$$P_{rsa} = 0.5 * PC = 80 \text{ psi for SDR 11 pipe}$$
$$P_{osa} = 1.0*PC = 160 \text{ psi for SDR 11 pipe}$$

The maximum pressure that can be applied to 4710 PE pipe is the lesser of PC + P_{osa} or the PC + P_{rsa}. These numbers define the design limits used when specifying UTEN pipe.

For specific pipe designs, the surge pressures should be calculated directly if typical fluid velocities are anticipated to be greater than 2 fps or if maximum velocities are anticipated to be greater than 4 fps.

Surge pressure is caused by sudden changes to the flow velocity of the water in a pipeline and is linearly connected to the change in velocity.

If the pressure wave velocity for water during surge is "A", then:

A= 4660/ SQRT (1+(K(SDR-2)/E_d)) where:

K = 300,000 psi = the bulk modulus of the fluid (Water)

E_d = 150,000 psi = the dynamic instantaneous effective modulus of the pipe material (150,000 for PE 4710 material)

SDR = the standard diameter ratio

In summary, factor "A" for the UTEN system is driven by and varies with selection of pipe SDR for plastic pipe.

Surge pressure for a 1 fps change in fluid velocity is controlled by the following equation:

P_s = A/(2.31*g)

Where: g = gravitational acceleration (32.2 fps/s)

Table 2 below can be used to calculate the recurrent and occasional surge pressures for pipes carrying fluids at non-standard design velocities.

SDR	A	Surge Pressure (psi per 1 fps vel delta)	Typical Max Velocity	Recurrent Surge psi	Occasional Surge psi
7	1405.0	18.90	4	37.8	75.6
9	1203.2	16.19	4	32.4	64.8
11	1069.1	14.38	4	28.8	57.5
13.5	951.2	12.80	4	25.6	51.2
17	837.0	11.26	4	22.5	45.0

Table 2: Surge Pressures of PE 4710 Pipe by SDR and Unit Velocity Change

The maximum allowable static pressure (WP), typically pump pressure at no flow, coupled with typical and maximum fluid flow rates defines the required system Working Pressure Rating WPR).

For typical thermal energy systems operating at pump outlet pressures of 70 psig or less, SDR 11 PE piping with a PC (Pressure Class) of 160 psig should be used. All piping system additions should be flow modeled before approval of design to assure that typical flow velocities do not exceed 2 fps, and max velocities are expected to be below 4 fps. For systems sized with velocities that exceed these parameters the following limits must be satisfied.

WP (pump outlet pressure) + P_{rs} is less than 1.5*PC and

WP (pump outlet pressure + P_{os} is less than 2.0*PC

As long as the intended maximum pipe operating pressure (emergency) is below the posted PC in Table 1 and the fluid velocities and temperatures remain within the limits noted above, the pipe can be used.

4.4 Design Basis of Plastic Pipe – Energy Transfer Stations

The working pressure horizontal piping is expected to be subject to is calculated the same as for piping outside of well fields and energy transfer stations. The limits and equations in Section 4.3 apply.

Other considerations for near grade piping in energy transfer stations are:

- The temperature derating factor shall be set to either 1.0 (80-degree Fahrenheit Max) or 0.8 (100-degree Fahrenheit Max) based upon the simulated temperatures of fluid returns from the system heat exchanger, nearby piping, and source well temperatures.
- Piping and flows inside energy transfer stations shall be modelled to establish velocity, pressure, and temperature anticipated in the fluid.
- Pumps shall be slow start and specifically limit pipe pressure surges.

For open bottom well fields utilizing separate supply and return thermal energy bores, vertical piping design is subject to head pressure differentials between the water table and the pressure inside of the well piping. For any wells in a field where the water table is found to be more than 25 feet below grade the design equations in 4.3 shall be adjusted as follows:

WP (pump outlet pressure) + (Water Table Depth*0.43) + P_{rs} is less than 1.5*PC

and

WP (pump outlet pressure) + (Water table depth*0.43) +P_{os} is less than 2.0*PC

As long as WP (pump outlet pressure) + (Water table depth*0.43) is below the posted PC in Table 1 and the fluid velocities and temperatures remain within the limits noted above, the pipe can be used.

4.5 Installation in Petroleum Contaminated Soils

In the presence of soils contaminated with petroleum hydrocarbons, plastic pipe may experience absorption of petroleum products. This absorption makes the installed pipe unsuitable for future plastic fusion joint connections and softens and slightly weakens the plastic pipe.

Petroleum contaminated soils shall be identified by Environmental Testing. Third party results such as plans for a highway improvement project in the area may be used. Presence of above ground or underground fuel storage tanks alone shall not be used to determine that contaminated soil is present.

Engineering shall endeavor to layout piping to avoid known or suspected contaminated areas.

When plastic pipe must be installed in petroleum contaminated soils, the Pressure Class noted in section 4.3 of the pipe shall be reduced by 50%.

Other options available for installing plastic pipe in petroleum contaminated soils include casing the pipe inside of steel.

Environmental Health and Safety shall be consulted to determine any additional requirements for excavating inside of contaminated areas.

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1. BASIC INFORMATION

PURPOSE: To provide a standard procedure giving guidance and requirements covering fitting selection and use of installation on the UTEN system.

SCOPE: This standard describes allowable fittings for use with plastic pipe when constructing gas mains and services. All plastic fitting fusion and joining shall be completed in accordance with SOP.P.U.10.02.K Plastic Joining Procedure and SOP.P.U.10.02.S Plastic Joining General Information and Guidelines

RELATED DOCUMENTS:

- ASTM D3261, F1055, D3350
- AWWA C 901 and 906
- AWWA Manual of PE Pipe Design and Installation
- PPI TR-4
- PPI TR-3
- SOP.P.U.10.02K Plastic Joining Procedure
- SOP.P.U.10.02S Plastic Joining General Information

ABBREVIATIONS:

- HDPE: High Density Polyethylene
- SDR: Standard Diameter Ratio
- UTEN: Utility Thermal Energy Network

DEFINITIONS:

Manufactured Transition: Factory made fitting which uses a combination of crimping, fusion, or rubber seals in order to create a restraining fitting with plain steel pipe stub on one end and plastic pipe on the other end.

Mechanical Fitting: Means a mechanical device used to connect and seal two sections of pipe. The term “mechanical fitting” applies to stab type fittings, bolted type fittings, or other compression type fittings.

2. RESPONSIBILITIES

2.1 Operations

Operations and Installation Contractors are responsible for installation of plastic fittings in accordance with manufacturer's instructions and this standard.

2.2 Engineering

Engineering is responsible for selecting and adding fittings for plastic pipe to work orders in order to make piping changes in direction, connections, or tie ins.

3. GENERAL REQUIREMENTS

No fitting shall be used that requires solvent, glue, or a threaded pipe joint to affect a gas tight seal.

Mechanical fittings other than stab type fittings on pipe sizes 1.25 and smaller are not acceptable for use.

All pipe fittings made from or containing polyethylene plastic shall be marked with the manufacturer's name, trademark, nominal size, material, and SDR.

4. BUTT FUSION FITTINGS

All butt fusion fittings used in the company's UTEN system shall meet the requirements of ASTM D3261 and D3350. Plastic used to mold the fittings shall be PE4710.

Butt fusion fittings are available in the following configurations:

45-and 90-Degree Elbows.
Straight tees.
Concentric Reducers.
End caps, with and without Purge Connections.

Butt fusion fittings are the only approved fitting for use when:

Making direction changes or offsets in mains of all sizes.
Making direction changes or offsets in services greater than 1.25 inches in nominal diameter.
Making lateral branch connections to mains.

SDR for butt fusion fittings should be matched to the SDR of the pipe or fitting being joined to.

Where a specific fitting SDR is not manufactured, a thicker wall thickness (lower SDR number) fitting shall be used in order to maintain the pressure rating of the piping being installed.

Pressure ratings for plastic butt fusion fittings shall be calculated in accordance with SOP.U.10.02G Plastic Pipe Design. The calculation shall be based on the plastic material type the fitting is molded from and the SDR of the end connections of the fitting.

5. ELECTROFUSION FITTINGS

All electrofusion fittings used in the company's UTEN system shall meet the requirements of ASTM D2513 and F1055.

Electrofusion fittings are available in the following configurations:

Couplings to match all pipe sizes used.
Self-tapping tees with outlet pipe sizes up to 2 inches nominal diameter.

Electrofusion couplings are the preferred method for:

Making tie in connections between mains 2 inches and larger in nominal diameter.
Making joints between two sections of plastic pipe where a butt fusion connection is not possible or is impractical.
Making joints between two sections of plastic pipe in situ (in a trench).

Proper clamps shall be used during all electrofusion fitting installations:

Pipe alignment clamps for couplings.
Under clamps or straps/saddles included with the fitting for tapping tees.

6. MECHANICAL FITTINGS

Allowable mechanical fittings used on the UTEN systems include:

Plastic body mechanical joining systems up to 1.25 inches nominal diameter:
Elster Perfection Permasert plastic push in or stab fittings up to 1.25 inches in diameter.

Mechanical fittings which may be used only for emergency service restoration, and which must have site specific use approved in advance by Engineering as well as being replaced within 90 days include:

Dresser Style 711 metal body couplings.
Smith Blair EZ metal body couplings.
Elster Perfection Permasert XL plastic body couplings.

All mechanical fittings shall be packaged with installation instructions and installed in accordance
with those instructions.

7. MANUFACTURED TRANSITION FITTINGS

The following manufactured transition fittings are acceptable for use:

Central Plastics transition fitting.
Elster Perfection transition fitting.

Manufactured transition fittings are acceptable for use in situations where a mechanical coupling to transition between steel and plastic pipe is not available. Specifically, this is limited to pump stations and energy transfer stations inside the containment/access area.

PROCESS: **CONSTRUCTION**

Standard Operating Procedure

BUSINESS: **UTEN**

CHAPTER: **N/A**

SOP.P.U.10.02K

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1. BASIC INFORMATION

PURPOSE: To provide a standard location for manufacturer installation procedures for plastic pipe and fittings.

SCOPE: This procedure contains manufacturer installation procedures manuals for plastic fittings and butt fusion procedures. Pipe fitting and manufacturer's information should be checked for cooling times and slack requirements to accommodate contraction while cooling.

RELATED DOCUMENTS:

- Performance Pipe Heat Fusion Joining Procedure
- Polypipe Heat Fusion Joining Procedures
- Charter Plastics Fusion Procedures Manual
- JM Eagle HDPE Technical and Installation Guide
- George Fischer (Central Plastics) Electrofusion Installation Procedures Manual
- Uponor EF2000 Electrofusion Joint Assembly Procedures
- Perfection Permasert Coupling System
- Uponor Metfit Coupling Joining Procedure
- Central Plastic's Electrofusion Installation Procedures Manual
- SOP.P.U.10.02.K Plastic Pipe Joining Procedures
- NGA Plastic Pipe Joining Manual

ABBREVIATIONS:

- HDPE: High Density Polyethylene

2. ATTACHMENTS

The following documents are attached.

- Performance Pipe Heat Fusion Joining Procedure
- Polypipe Heat Fusion Joining Procedures
- Charter Plastics Fusion Procedures Manual
- JM Eagle HDPE Technical and Installation Guide
- George Fischer (Central Plastics) Electrofusion Installation Procedures Manual
- Uponor EF2000 Electrofusion Joint Assembly Procedures
- Perfection Permasert Coupling System
- Uponor Metfit Coupling Joining Procedure
- Central Plastic's Electrofusion Installation Procedures Manual
- NGA Plastic Pipe Joining Manual

3. GENERAL REQUIREMENTS

The listed documents in the Related Documents list are attached.

PROCESS: **CONSTRUCTION**

Standard Operating Procedure

BUSINESS: **UTEN**

CHAPTER: **N/A**

SOP.P.U.10.02M

SUBCHAPTER: **N/A** REV.: 0 DATE: **xx/xx/2025**

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1. BASIC INFORMATION

PURPOSE: To provide guidance and criteria covering the use of blasting during installation of pipe and other below grade facilities.

SCOPE: This standard describes the use of blasting as a rock removal method during the installation of facilities. Further, it describes precautions the Company should implement during blasting to reduce the likelihood of damage claims.

RELATED DOCUMENTS:

- 29 CFR 1910.109
- 29 CFR 1926 Subpart U
- 12 NYCRR 61-4.7
- 16 NYCRR 753.3
- SOP.P.U.10.02A Excavating in Proximity to Underground Facilities
- SOP.P.U.10.02V Blasting Near Facilities
- NYSDOT Gem 22 Procedures for Blasting

ABBREVIATIONS:

- ATF: Alcohol, Tobacco and Firearms
- MS: Millisecond
- NYS: New York State
- NYSDOT: New York State Department of Transportation
- PPE: Personal Protective Equipment
- OSHA: Occupational Safety and Health Administration
- PPE: Personal Protective Equipment
- PPV: Peak Particle Velocity
- ROW: Right of Way
- UDigNY: 811 Call Center for the upstate NY geographical area
- USDA: United States Department of Agriculture
- UTEN: Utility Thermal Energy Network

DEFINITION:

Blast(ing) area: An area near any blasting operation in which concussion, flying material or debris, or gases resulting from a detonation of explosives can reasonably be expected to cause injury or property damage.

Blast mat: Wire rope or rubber tire mat used to contain flyrock and diffuse gases.

Blast(ing) site: The specific place defined by the blaster-in-charge where explosives are used in blasting operations and where only the blaster-in-charge and authorized blasting assistants are permitted to work. A blast site is part of the blasting area.

Blaster-in-charge: The individual who has overall responsibility for the conduct and safety of a detonation of explosives within a blast area.

Fly Rock: Any material propelled from the blast area by the force of the blast.

2. RESPONSIBILITIES

Engineering is responsible for assigning third parties to perform seismographic monitoring and other third-party damage monitoring if applicable. Seismographic monitoring responsibility may be assigned to blasting contractors and including in that contractual agreement.

Operations is responsible for planning in accordance with SOP.P.U.10.02V Blasting Near UTEN Facilities if blasting will be within 300 ft of Company facilities, including:

- Attending pre-job briefing
- Developing emergency plans as required
- Assigning standby as required

Blasting Contractors are responsible for assuring the blaster-in-charge is familiar with and complies with applicable Federal (ATF, OSHA) and NY rules and regulations even if they are not referenced in this document. Among these are an Explosives Purchase/Own/Possess/Transport License and a Blasters Certificate of Competence.

3. GENERAL

Blasting is an acceptable means of rock removal but should only be considered when absolutely necessary, or where the cost of blasting is less than realigning the pipeline route. Blasting may be undertaken in order to:

- Open lengths of trench where a pipeline will be installed through an area of shallow bedrock.
- Remove or break up large boulders which cannot be moved in one piece using excavation equipment.

Blasting should only be undertaken in areas where work can be safely completed.

When planning to open trench using blasting, Engineering should gather geotechnical information about the extent and type of rock to be blasted. This will ensure that accurate quotes or bids can be requested for the work. The following resources may be consulted for geotechnical information:

- The NYSDOT regional office for existing soil borings related to bridge or highway work near the project area.
- USDA Soil Survey Maps (available online).
- Soil borings contracted by Avangrid.

When planning for the amount of rock to be removed, an allowance of 12 inches on all sides of the pipe shall be included. This is necessary in order to allow sufficient padding during pipe installation.

For breaking boulders in populated areas where close proximity to the public or buildings would make using traditional blasting difficult, the use of non-explosive

expanding grout should be considered in place of blasting. Trade names include Bustar, Dexpan, and Ecobust.

When blasting near existing UTEN facilities, those facilities shall be protected in accordance with operating and maintenance procedure SOP.P.U.10.02V Blasting Near Facilities.

The blasting contractor completing work shall hold a NYS Certificate of Competence.

The blasting plan shall be designed with criteria for maximum vibration amplitude at the nearest monitored structure or facility of 0.006 inches or less, unless the structure or facility is supported on the same rock being blasted and then the maximum amplitude shall be less than 0.002 inches.

The maximum PPV shall be 2 inches/second.

The maximum vibration amplitude and PPV limits can be increased if the blaster-in-charge can make a case for the unusual nature of the blast and can describe what controls are in place to prevent damage to existing structures or facilities.

Blasting and related operations that could cause nuisance noise levels at nearby properties shall be limited to the hours of 8:00 AM through 7:00 PM and shall be suspended on Sundays.

Suitable blast mats shall be used when blasting through agricultural areas and any time third party persons or property could be damaged by flyrock debris or escaping gases.

4. SAFETY

All drilling and blasting shall be executed in a manner to avoid injury and damage to people, livestock, utility facilities, buildings, and other third-party property.

The Company shall have the authority to stop work on safety grounds including general unsafe practices, electrical storms, fly rock.

A pre-blast briefing shall be held each day prior to blasting activities and shall include:

- Hazards associated with the work
- Procedures involved
- Special precautions and PPE

The general public shall be excluded from the blast site through the use of signs, traffic cones, or flagmen at roads or trails.

Warning signals shall be sounded before a blast.

All-clear signals shall be sounded after the blast site is determined by the blaster-in-charge to be safe.

5. NOTIFICATIONS

Engineering shall keep Public Affairs informed about the planning of any blasting activities.

The blaster is required as an excavator to provide notice to the one-call notification system (UDig-NY 811) in accordance with 16 NYCRR 753-3.1.

The blaster shall notify the Company at least 72 hours before a test blast.

The blaster shall notify the owner of any third-party facility which could be damaged at least 72 hours before any blast.

The blaster shall notify police, fire, and town supervisor's office that have jurisdiction over the blast area at least 1 day before any blast.

Each third-party notification shall be logged by the blaster for submittal to the Company at the end of the project.

If the blasting is on NYDOT ROW, the contractor is required to submit a plan to NYSDOT in accordance with NYSDOT GEM-22 (Procedures for Blasting).

6. BLASTING PLAN

The blaster-in-charge will use information and requirements from bore samples, geotechnical reports, and pipe size to complete a blasting plan. The blasting plan will detail the technical execution of the rock cut and will include:

- Borehole diameter
- Test blast details
- Drill hole layout, spacing, and stemming
- Pounds per hole
- Holes per shot
- Explosive product, detonator type
- Prediction of overburden
- Direction of flyrock
- Need for matting

The blasting plan may be adjusted after a test blast.

7. POST-BLAST SUMMARY REPORT

Within 24 hours after the start of blasting, the blaster-in-charge shall complete and submit a copy of a Blasting Plan to the Company that contains at least the items that are required by 12 NYCRR 61-4.7:

- Name of blasting company or contractor.
- Name of company or person for who the blast was performed.

- Physical location of where that blast took place.
- Name and certificate number of the blaster-in-charge.
- Type of material blasted.
- Maximum amount of explosives per delay period of 8 ms or greater.
- Exact number and type of detonators used.
- Quantity and type of explosives used.
- Exact number and type of packaged products used.
- Quantity of bulk explosives used in pounds.
    - Method of firing and type of circuit.
    - The delay timings used.
- Direction and distance in feet to nearest structure not owned or leased by the person for whom the blasting is being performed.
- Local time of the blast accurate to the minute.
- Weather conditions at the time of the firing of the blast.
- Where seismographs are used:
    - Readings of ground vibrations to include three component readings with frequency.
    - Frequency readings of air blast.
    - Location of the seismograph.
    - Distance from the blast.
    - Name and signature of the person monitoring the seismograph.
- For blasts using drilled holes:
    - The burden and spacing of holes.
    - The number and diameter of holes.
    - The height or length of stemming.
    - The drilling logs.
    - Description of the shot pattern, including number of holes per delay period of 8 ms or greater.
- A list of names of all individuals present at the blast site during the loading operation including visitors.
- Notation of any unusual or suspicious activity.

8. MONITORING FOR THIRD PARTY DAMAGE

The Company shall retain a consultant to provide seismological monitoring equipment and personnel.

Seismological monitoring equipment shall be placed at all structures including utility facilities within 500 ft of the blast site.

The monitoring consultant may use their experience and knowledge to add structures to the monitoring list that may experience damage or otherwise make a claim against the Company.

Each point monitored shall be inspected before, monitored during, and inspected after blasting operations.

The consultant shall submit a summary report of:

- Monitoring equipment information including make, model, serial number, and calibration date
- Peak values at each monitored site
- Damage found during post-blast inspection
- Any other information that could be relevant during a damage claim against the Company or its contractors

The Company shall establish the health of domestic, agricultural, or thermal energy wells or springs before and after blasting operations with landowner permission. The water source health may be established by factors such as pump inspection, flow rate, or bacteriological culture.

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1. BASIC INFORMATION

PURPOSE: To provide a description of the process and requirements for maintaining and updating the thermal energy GIS system, master data records, and flow modeling software.

SCOPE: This procedure applies to all fixed UTEN (Utility Thermal Energy Network) drawings, plans, field notes, and maps.

RELATED DOCUMENTS:

- ASCE 75-22_Standard Guidelines for Recording and Exchanging Utility Data

ABBREVIATIONS:

- GIS: Geographic Information System
- NYSEG: New York State Electric & Gas
- O&M: Operations and Maintenance
- RG&E: Rochester Gas & Electric
- UTEN: Utility Thermal Energy Network

DEFINITION:

As-Built Drawings: Electronic drawings or hand-drawn sketches created by Engineering depicting the job as it was installed.

Construction Plans: Detailed drawings of main, service, energy transfer station, pump station, or bore field extensions, replacements, relocations, or retirements, created by Engineering.

Field Notes: Legible notes and/or detailed sketches created by Operations, written on a copy of a construction plan or supplemental documents to a construction plan showing all field changes to a job. Field notes are the basis for creating as-built records.

Operating/Quad Maps: Paper maps produced from the GIS system depicting the thermal energy systems within NYSEG and RGE pilot projects and franchise areas.

Energy Transfer Station: Thermal energy bores, bore field piping, controls, pumps, and back-up systems included in a UTEN facility location.

Thermal Energy Bore: A drilled hole, piping and pumps used to source geothermal energy.

2. RESPONSIBILITIES

2.1 Engineering

Engineering is responsible for:

- Providing as-built drawings within the timeframes described in this procedure.

2.2 Operations

Operations are responsible for:

- Providing field notes to Engineering within the timeframes described in this procedure.
- Update of routine Thermal Energy (UTEN) service master data records when identified.
- Maintaining interim records of completed construction projects for the purposes of line locating and O&M activities prior to being identified in the GIS.

2.3 SAP Mater Data Department

SAP Master Data Department is responsible for:

- Updating SAP master data records for all mains and services where Division Operations has not done so.

2.4 GIS and Mapping Department

GIS and Mapping Department is responsible for:

- Updating the gas GIS system within the timeframes described in this procedure.

2.5 System Planning

System Planning is responsible for:

- Updating flow modeling load information (customer attachments) on a periodic basis.

3. GENERAL REQUIREMENTS

GIS updates shall utilize Company approved standardized symbols and abbreviations.

All construction plans, field notes, as-built drawings, corrosion maps, and operating/quad maps shall be retained for the life of the main segment plus six years.

4. PROCEDURE FOR UPDATING RECORDS FOR PLANNED/ENGINEERED JOBS

At the completion of each job, field notes shall be generated by Operations using the original construction plans to show all field changes. Operations shall complete the field notes and submit them to Engineering within five working days after completion of the project (all main tie-ins completed and thermal energy flowing), excluding restoration.

Engineering shall review the field notes, create as-built drawings, and submit them to the SAP Master Data Department and the GIS and Mapping Department within 30 days after receipt from Operations.

SAP master data records related to the as-built drawings shall be updated within 30 days.

- Operations shall update service master data when delegated to by the Master Data Department.
- The Master Data Department shall update main master data and service master data not updated by Operations.

The GIS and Mapping Department shall use the as-built drawings to update the UTEN GIS system.

- The GIS system shall be revised by the GIS and Mapping Department within 90 days after receiving as-builts from the Engineering department.
- If GIS and Mapping Department requires additional information in order to accurately update the GIS system, Engineering shall submit the required information within five working days.
- After the gas GIS system has been revised, the changes shall be reviewed by a second individual to confirm accuracy.

Paper gas operating/quad maps generated from the gas GIS system that has been revised shall be distributed to Division offices that require a hardcopy record on a monthly basis according to the following process:

- The GIS and Mapping Department shall provide electronic files to the Engineering Records Department representing all maps that have undergone a change in the previous month.
- The Engineering Records Department shall print and then distribute the paper maps to the appropriate Division personnel within 30 days of receipt of the electronic files from the GIS and Mapping department.
- Operations shall update revised paper map within one week after receipt from the Engineering Records.
- Minor changes on maps, such as but not limited to re-lined services, abandoned services, or newly discovered fuel lines will be incorporated into the gas GIS system by the GIS and Mapping Department and will not require distribution of updated paper maps until there is a major change. Operating/quad maps, located at the Division office, shall be marked-up by Division Operations to identify these minor changes.

Each Division (both Engineering and Operations) shall verify the accuracy of all recently revised hardcopy maps. This includes rewriting any notes from the old operating maps that are not included on the revised map, initialing and dating the revised operating map, and replacing the old operating map with the revised map. When discrepancies are found, Operations shall notify the Master Data Department and/or GIS and Mapping Department. The Master Data Department shall complete the changes and issue updated prints. Minor changes may be noted on the operating/quad map by Division personnel prior to receipt of corrected records.

The original as-built drawings shall be filed (hardcopy or electronically) in each Division by the work order and shall be retained for the life of the pipeline segment.

5. PROCEDURE FOR NOTIFYING LOCATORS OF PLANNED/ENGINEERED JOBS UNDER CONSTRUCTION

Operations shall maintain a marked up copy of operating/quad maps showing the current status of the UTEN system and the location of planned work.

Construction plans, field notes, or as-built drawings shall be made available (hardcopies or electronically) to Operations while a job is under construction and prior to the Division receiving revised operating/quad maps. Copies shall be made available to company and contractor Locators for stakeout requests that come in through the one-call system (UDig NY).

Engineering shall submit the construction plans, field notes, and as-built drawings to Operations.

Operations shall notify their personnel of these proposed changes. The master copies on the operating/quad maps shall be marked up to indicate the planned job.

6. SYSTEM PLANNING RECORDS

System Planning shall update the flow modeling piping network files on a periodic basis.

System Planning shall update all flow modeling load information (customer attachments) on a periodic basis.

7. UPDATES TO GIS AFTER UNPLANNED WORK OR FOR CORRECTION AND MODIFIACTIONS.

Operations are responsible for supplying construction mark-up grade drawings (essentially field notes or drawings showing the changes to be made) to the SAP Master Data Department and one copy to the GIS and Mapping Department.

The SAP Master Data Department and the GIS and Mapping Departments will then follow procedures detailed in Section 5 above.

Plastic Joining General Information and Guidelines

PROCESS: **CONSTRUCTION**

Standard Operating Procedure

BUSINESS: **UTEN**

CHAPTER: **N/A**

SOP.P.U.10.02T

SUBCHAPTER: **N/A** REV.: 0 DATE: **xx/xx/2025**

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1. BASIC INFORMATION

PURPOSE: To provide a standard procedure giving guidance and requirements for joining polyethylene pipe.

SCOPE: This standard applies to all plastic piping joints used to transport thermal energy.

RELATED DOCUMENTS:

- ASTM F2620-19 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
- ASTM F3565-23 Standard Practice for Electrofusion Joining Polyethelyne (PE) Pipe and Fittings for Pressure Pipe Service
- ASTM F1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene
- SOP.P.U.10.02F Plastic Pipe Handling
- SOP.P.U.10.02K Plastic Pipe Joining
- SOP.P.U.10.02AH Plastic Pipe Joining Qualifications
- SOP.P.U.10.02AK Equipment Control and Calibration

ABBREVIATIONS:

- CTS: Copper Tubing Size
- DR: Dimension Ratio
- HDPE: High Density Polyethylene
- IPS: Iron Pipe Size
- IR: Infrared
- NYSEG: New York State Electric & Gas
- PE: Polyethylene
- PPE: Personal Protective Equipment
- PSIG: Pounds Per Square Inch Gauge
- RG&E: Rochester Gas & Electric
- UTEN: Utility Thermal Energy Network

DEFINITION:

Standard Dimension Ratio (SDR or DR): The SDR/DR is the ratio of pipe diameter to wall thickness.

- SDR=D/t where D is the outside pipe diameter and t is the pipe wall thickness.

2. RESPONSIBILITIES

2.1 Operations and Installation Contractors

Operations and Installation Contractors are responsible for:

- Joining PE pipe
- Maintaining plastic fusion equipment

3. GENERAL REQUIREMENTS

Plastic pipe shall be cut using a pipe ratchet cutter, pipe scissor shears or a guillotine cutter for (in service) tie-ins and maintenance jobs. On new construction four inches and greater nominal diameter an electric, oil-free chainsaw, reciprocating saw, or a handsaw may be used.

An electrically driven cutting device shall not be used where a gaseous atmosphere is present or is anticipated

A reciprocating saw requires a woodcutting blade to cut plastic pipe.

Approved PPE shall be utilized during mechanical pipe cutting activities.

The pipe cutting tool blade shall be free of dirt, oil, and foreign debris during pipe cutting.

At no time, shall a mechanical coupling (Metfit, Lycofit, Permasert) be installed on an injection molded fitting. Does not apply to pipe/fitting manufacturer produced fittings

Socket and saddle heat fusion joints are not approved NYSEG/RG&E construction methods. Does not apply to pipe/fitting manufacturer produced joints.

No person shall make production fuses who has not been qualified in accordance with SOP.P.U.10.02AH Plastic Pipe Joining Qualifications.

All plastic fusion machines, including electrofusion processors shall be inspected annually, and visually inspected before each use in accordance with the manufacturer's instructions. All fusion machines shall have an equipment certification sticker affixed to the machine and/or processor.

An annual inspection and calibration of pyrometers, both contact and infrared, shall be completed in accordance with the manufacturer's instructions, and SOP.P.U.10.02AK Equipment Control and Calibration.

Heater temperatures for fusions shall be between 400 and 450 degrees Fahrenheit verified with a pyrometer, IR Gun, or other approved temperature monitoring equipment.

Care must be taken when performing fusions in inclement weather to protect the fusion area from contamination of water or dirt.

Cold weather considerations must be considered when performing plastic fusions and may require the heating time cycle to be increased to obtain the proper melt patterns. Refer to Section 10 of this procedure.

Refer to manufacturer butt fusion procedures for minimum bead size.

Only factory-made miter joints are permitted. In no case shall a miter joint be made in the field.

4. PLASTIC PIPE MATERIALS

Only Company approved manufacturers and materials shall be used for system construction.

Regrind or reworked materials shall not be allowed in plastic UTEN piping.

Only HDPE material for plastic pipe shall be used:

- HDPE (PE 4710)
- Black or Black w Purple Stripe
- Shelf life of ten years

5. PLASTIC FITTINGS

Plastic PE fittings have a shelf life of equal to that of HDPE when stored outdoors. There is no shelf-life restriction for PE fittings stored indoors.

Plastic fittings shipped in a plastic bag shall remain in the bag for as long as practical to minimize contamination. Prior to installation, all parts, especially seals and O-rings, shall be checked to be sure they are intact, not damaged, or contaminated. A clean, dry, lint-free cloth shall be used to remove dust, dirt, moisture, and other contaminants from the fitting.

6. MECHANICAL FITTINGS

Current fitting installation manuals will be included in SOP.P.U.10.02K Plastic Pipe Joining as those fittings are identified and approved for purchase.

Mechanical fitting installation shall be according to the manufacturer's procedure.

Mechanical fittings shall utilize chamfering tools and stiffeners that correspond with the pipe SDR and specific fitting manufacturer.

7. PIPE INSPECTION AND PREPARATION

All plastic pipes shall be inspected for cuts, gouges, deep scratches, and other imperfections prior to use.

Minor scratches and scuffs 10% or less in depth of the pipe wall are acceptable and do not require removal.

Any defect that is found that exceeds 10% in depth of the pipe wall thickness, shall be removed.

A suitable measuring tool may be used to determine the depth of scratches and gouges.

If the depth of the defect cannot be measured the defect shall be cut out.

To minimize the possibility of damage, the pipe shall be handled in accordance with SOP.P.U.10.02F Plastic Pipe Handling.

A clean, dry, lint-free cloth or paper towel shall be used to remove dust, dirt, moisture, and other contaminants from the pipe. The pipe can further be cleaned off by using a cloth wetted with clean water. The pipe must be dried completely prior to beginning any joining procedure.

Butt fusions of dissimilar materials shall not be made in the field. An electrofusion coupling or a mechanical coupling shall be used.

- Cross-fusions of dissimilar materials shall only be made/joined in a controlled environment by a qualified person.
- If correct restraint clamp tooling is available, joining pipe to a molded butt fusion fitting by an electrofusion coupling is allowed.

Butt fusion joining of pipe and fittings of different SDRs shall not be greater than one SDR difference as identified below.

Pipe or fittings with different SDRs can be joined in the field using an electrofusion coupling or a mechanical coupling. The stiffener that is compatible with each SDR shall be used.

The difference in SDR is determined as follows:

- One SDR difference is considered: 9 to 11 or 11 to 13.5.
- A one-half step SDR difference is considered: 10 to 11, 11 to 11.5, and 11.5 to 13.5.

8. FUSION EQUIPMENT MAINTENANCE

An equipment calibration sticker shall be affixed to the primary fusion machine. The calibration sticker, although affixed to the primary fusion machine, implies that all peripheral machine accessories necessary to complete a fusion are present and are in acceptable condition.

The equipment calibration sticker shall contain: the date the calibration was performed, the date the next calibration is due, and identify the person who performed the calibration.

The pyrometer shall be calibrated/tested annually in accordance with the manufacturer's instructions and in accordance with SOP.P.U.10.02AK Equipment Control and Calibration. The calibration shall be recorded on either paper or electronic medium.

Heaters shall have faces that are clean with no scrapes or gouges. Heaters shall be placed in their pouches when not being used to prevent damage and to maintain the desired temperature.

Temperature checks shall be made before the first fusion in the morning and afternoon of each day and every time power is interrupted to the heater. Several points on the heater face shall be checked to ensure even distribution of heat.

A calibrated pyrometer, or an infrared thermometer shall be used for temperature verification.

Never use the built-in thermometer on the heater for temperature verification. The thermometer only provides a range of temperatures and indicates the iron is heating.

Acceptable heater temperatures for fusions are between 400 and 450 degrees Fahrenheit.

Electrofusion processors and generators shall be maintained according to the manufacturer's recommended maintenance cycles.

9. INSPECTION OF FIELD JOINTS

Each constructed plastic pipe joint shall be visually inspected before being placed into service.

Every plastic joint shall be visually inspected by the individual who made the plastic joint.

In the event the individual who completed the plastic joint considers the joint is unacceptable, the plastic joint shall be removed and replaced prior to placing the line into service.

Each butt fusion and electrofusion may also be inspected by a second qualified individual who did not make the fusion. In the event that the second qualified individual finds that the joint is unacceptable, the plastic joint shall be removed and replaced prior to placing the line into service.

All individuals completing the visual inspection on plastic fusions shall record the following minimum information in an electronic database:

- Fuser Identification.
- Inspector Identification.
- Visual Inspection Results.
- GPS location of each plastic fusion.

At a minimum, each visual inspection shall evaluate fusion suitability for the following points as applicable:

- Acceptable melt patterns (butt fusion and electrofusion joints).
- High/low alignment (butt fusion joints).
- Pipe alignment.
- Proper scrape patterns (electrofusion joints).

- Depth marks (mechanical and electrofusion joints).
- Positioning of the pipe or fitting.
- Stab depth achieved.
- Torque specifications (mechanical joints).

Each completed butt fusion and electrofusion joint that has been inspected shall be identified on the pipe or fitting after it has passed visual inspection:

- Permanent affixed identification shall visually contrast the color of the pipe and/or fitting or be readily visible.
- Both the joiner (Plastic Fuser) and second inspector (if applicable) shall identify the inspected joint with their Fuser Identification adjacent to the inspected joint.

10. PLASTIC FUSION IN INCLEMENT WEATHER

If fusing is performed during periods of rain or snow, precautions must be taken to ensure that no moisture is allowed to contact the melted surfaces. Moisture contact will cause spot cooling and result in a void in the joined material. Adequate work area controls shall be provided to protect the fusion area from adverse conditions such as wind, rain, snow, and blowing dirt.

During cold weather conditions, PE has a reduced impact resistance. Avoid dropping the pipe and after unloading the pipe, inspect the pipe for damage.

Frost and ice on the pipe will interfere with the joining procedure. Be sure it is removed from the fusion area and wipe the inside and outside surfaces of the pipe with a clean dry cloth to ensure the pipe ends are clean and dry.

Frost and ice shall also be removed from any surface that will be clamped. The outside diameter of the PE pipe and fittings will contract in cold weather and may result in pipe slippage in the ring clamp. To prevent this, a thin shim layer (tape or metal) can be placed on the pipe, under the clamp, to provide clamping restraint to the pipe.

Do not adjust the heating iron temperature or joining pressure during cold weather conditions. Increased heating time, until the proper size melt bead forms, shall be used in order to compensate for cold weather conditions.

Sample fusions should be made under field conditions using various heat times to obtain the correct melt pattern.

If the wind chill factor is below zero degrees Fahrenheit, a shelter, space heater, or similar measures shall be provided during the fusion process as appropriate. Refer to **Error! Reference source not found.** below for calculation of the wind chill factor.

Wind Velocity (MPH)	Air Temperature (°F)					
	30	20	10	0	-10	-20
	Wind Chill Factor (°F)					
	30	20	10	0	-10	-20
5	25	13	1	-11	-22	-34
10	21	9	-4	-16	-28	-41
15	19	6	-7	-19	-32	-45
20	17	4	-9	-22	-35	-48
25	16	3	-11	-24	-37	-51

Table 1 – Wind Chill Factor Table

11. HYDRAULIC FUSION MACHINE GAUGE PRESSURE RANGES

PIPE SIZE Outside Dia		MACHINE MANUFACTURER AND MODEL NUMBER			
		McElroy # 618 MF		McElroy # 28 HF	
Nom Dia	SDR	Low	High	Low	High
2” IPS	9	NA	NA	52	63
4” IPS	9	NA	NA	110	150
6” IPS	9	166	234	203	290
8” IPS	9	260	376	324	471
10” IPS	9	388	567	NA	NA
12” IPS	9	534	785	NA	NA
14” IPS	9	637	941	NA	NA
16” IPS	9	823	1219	NA	NA
NOTE: This pressure chart is intended only as a guide for making heat fusion joints. Conditions at the job site may affect hydraulic system pressures, requiring minor adjustments to produce consistently acceptable fusions at the job site.					

Table 2 – Hydraulic Fusion Machine Gauge Pressure Ranges (psig) for HDPE pipe.

Note: The values obtained above on table 2 were developed using the McElroy Calculator App using an interfacial pressure range of 60 psi to 90 psi and a drag of 30 psi.

12. RECORDS DATA

Annual Pyrometer Calibration Data collected on paper or electronic medium stored in a Company database. There are two electronic record platforms available for this procedure, one is the Locusview System and the other being an SAP/GIS based alternative. Two electronic platforms are listed to facilitate the transition from Locusview to the SAP/GIS based platform. Both electronic platforms meet the regulatory requirements of this procedure, however only one platform should be filled out to complete the record.

Some data fields may not be applicable for all upgrades. Where specific data fields are not applicable, data will not be collected or maintained in the Company records system. For

Section 16.4 (Alternative to Locusview), all required fields are noted with an asterisk (*), except in cases where there is an exception (i.e. a “no” or continuing response) from a preceding corresponding data point (same reference number with additional fields containing a letter (i.e. 20 and 20a). Fields labeled as "Auto Populated" are typically Populated by Company Records and Asset data which include but are not limited to SAP Data and GIS Data but may be entered manually where SAP or GIS data is not available.

Locus view, only one record platform is required.

Reference Number	Data Point	Data Record
1	Pyrometer/IR GUN Manufacturer	Manufacturer Name
2	Device ID Number	Equipment Serial Number
3	Calibration/Test Interval	12 Months
4	Range (def.)	Provide range information for equipment
5	Equipment Type	Is equipment a Pyrometer or an Infrared Gun
6	Test Standard Used	Factory Certification or Ice/Boiling Water test
	Calibration/Test Data	
7	Date	Date completed
8	Inspector	Name of person
9	Factory Calibration	Yes/No; if yes attach certificate from Manufacturer; if no collect Ice/Boiling Water Data
	Ice & Boiling Water Test Data	
10a	Freezing Adjust setting Temperature (deg F) as found	As found temperature
10b	Freezing Adjust setting Temperature (deg F) as left	As left temperature
10c	Boiling Adjusted Temperature (deg F) as found	As found temperature
10d	Boiling Adjusted Temperature (deg F) as left	As left temperature

Table 3 - Annual Pyrometer Calibration Data – Locus View

SAP/GIS Based Alternative to Locusview, only one record platform is required.

Sort Order	Label	Data Type
1	Inspector ID*	Auto Populated
2	Inspector Name*	Auto Populated
3	Equipment Type*	Auto Populated
4	Manufacturer*	Auto Populated / N/A
5	Serial Number*	Auto Populated / N/A
6	Equipment Description*	Auto Populated
7	Calibration/Test Interval*	Auto Populated
8	Range (Deg F) *	Auto Populated
9	Device Action*	Calibration / Taking Out of Service
9a	Reason for taking out of service* (Mandatory when a Device Action is Taking Out of Service)	Needs to be sent to third party for calibration / Needs to be repaired / Device not Accessible / Waiting for Supervisor to retire device
10	Calibration Date / Out of Service Date*	Date
11	Test Standard Used*	Factory Certification / Ice / Boiling Water Test
11a	Picture of Factory Certification* (Mandatory when the Test Standard Used is Factory Certification)	Picture
11b	Freezing Adjust Setting - As Found (Deg F) * (Mandatory when the Test Standard Used is Ice/Boiling Water Test)	Number
11c	Boiling Adjust Setting - As Found (Deg F) * (Mandatory when the Test Standard Used is Ice/Boiling Water Test)	Number
11d	Freezing Adjust Setting - As Left (Deg F) * (Mandatory when the Test Standard Used is Ice/Boiling Water Test)	Number
11e	Boiling Adjust Setting - As Left (Deg F) * (Mandatory when the Test Standard Used is Ice/Boiling Water Test)	Number
12	Remarks	Text Box / N/A

Table 4- Form 3150 Temperature Indicating Device Calibration (Excluding Locusview Platform)

PROCESS: **CONSTRUCTION**

Standard Operating Procedure

BUSINESS: **UTEN**

CHAPTER: **N/A**

SOP.P.U.10.02U

SUBCHAPTER: **N/A** REV.: 0 DATE: **xx/xx/2025**

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1. BASIC INFORMATION

PURPOSE: To provide guidance and criteria covering the installation of plastic pipe via the direct burial installation method, including minimum burial depths, sand padding, and backfill requirements.

SCOPE: This standard provides the requirements for Utility Thermal Energy Network (UTEN) piping installation using the direct bury trench excavation method.

RELATED DOCUMENTS:

- ASTM D2774
- ASTM F1668
- ASTM D2488
- ANSI/CSA/IGSHPA/C448 Series 16
- Plastic Pipe Institute Handbook of Polyethylene Pipe
- AWWA Manual of PE Pipe Design and Installation
- Performance Pipe Bulletin PP901
- ANHS-SOP-045 Excavation Safety Program
- SOP.P.U.10.02A Excavating in Proximity to Underground Facilities

ABBREVIATIONS:

- OSHA: Occupational Health and Safety Administration
- ROW: Right of Way
- UTEN: Utility Thermal Energy Network

DEFINITION:

Padding Sand: Sandy mineral soil containing only rounded rocks. The maximum rock size allowed in Padding Sand shall be in accordance with the construction contract governing the work, however, shall always be no larger than ¼ inches (100% passes a 1/4-inch screen).

Bedding Sand: Bedding sand shall match Padding Sand in definition.

Backfill Layer: The trench space between the Padding Sand (6 inches above the pipe) extending to the surface restoration layer.

2. RESPONSIBILITIES

2.1 Operations and Installation Contractors

Operations and Installation Contractors are responsible for conducting direct bury trenching activities in accordance with the requirements of this standard.

2.2 Engineering

Engineering is responsible for obtaining any state, county, or municipal highway work permits for the work being conducted.

3. GENERAL REQUIREMENTS

The primary and preferred method of main and service installation is direct bury trenching.

Installation requirements for UTEN mains and services such as depth of cover, offsets or clearances to other underground facilities and locating tracer wires are covered in the main and service installation SOPs.

Before any excavation work begins, a one call notification to UDig NY, in accordance with SOP.P.U.10.02A Excavating in Proximity to Underground Facilities, shall be made.

The UDig NY telephone number is 811 or 1-800-962-7962.

Engineering shall identify and obtain any required state, county, or municipal highway work permits prior to installation of new facilities in the public ROW. Maintenance of existing facilities may take place under blanket agreements.

Any requirements more stringent than this standard, which are included as or by highway work permit conditions, shall be followed.

Any trench or excavation shall be dewatered and free of standing water before pipe installation and backfill takes place.

Figure 1 describes the different parts of the trench backfill, and key points for a successful direct bury trench installation.

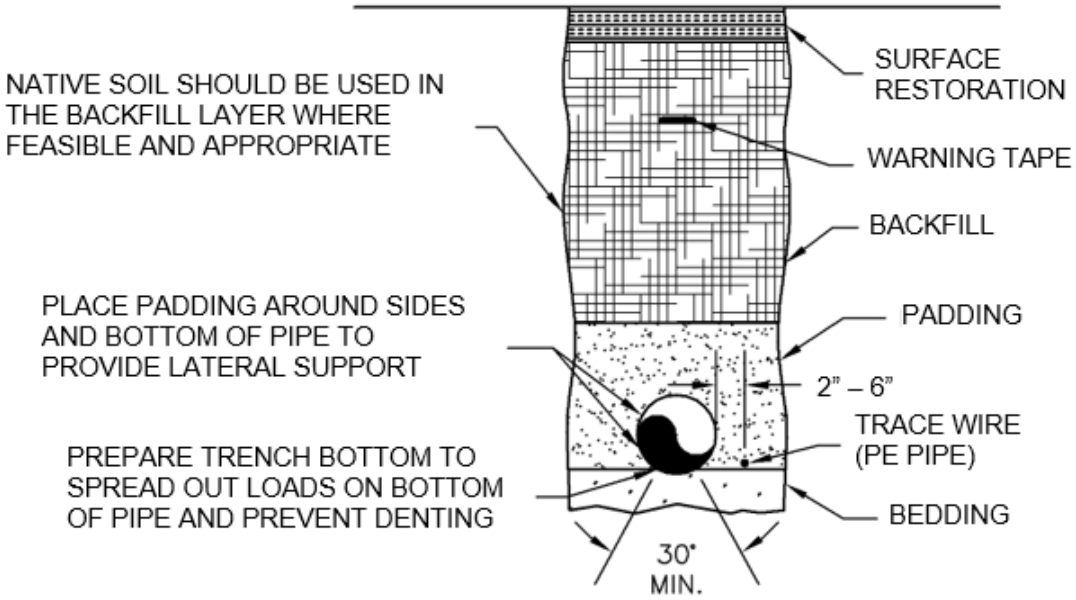

Figure 1: *Pipe installation by direct bury trenching is shown in the sketch above. The different parts of the trench backfill are shown on the right side of the sketch. The left side of the sketch describes craftsmanship points which provide proper pipe support and protection of the gas facility being installed. The bottom of the trench shall be prepared so that there is at least 30 degrees of contact between the pipe and a firm trench bottom for proper pipe support*

4. SAFETY

Safety measures to prevent excavation collapse shall be implemented in accordance with the Excavation Safety Program (ANHS-SOP-045, October 2017) and OSHA regulations.

Excavations in unstable soils, and all excavations 5 feet and deeper, shall include shoring or the trench wall shall be benched or sloped to prevent collapse.

Where excavations are opened in areas accessible to the public, traffic, and pedestrian protection measures such as warning signs or barricades shall be placed in the work area.

Any trench or excavation left open during nonworking hours shall be protected with cover plates, temporary fencing, warning signs, or barricades to prevent injury to the public.

5. EXCAVATION OF TRENCH

Trenching shall be completed in a neat and efficient manner with the least amount of existing pavement or landscape disturbed as possible.

Final cuts to existing hard surface pavements shall be clearly marked and created using a saw or asphalt cutting wheel to provide a neat appearance to the surface restoration.

Care should be taken to protect existing trees and shrubs during excavation. Tree roots greater than 2 inches in diameter within the trench line shall not be cut. Hand digging shall be provided where required around tree roots in order to prevent damage to the tree.

6. BEDDING AND PADDING OF PIPE

Support and protection for pipe installed by direct bury trenching begins with proper bedding and padding of the pipe.

Pipe shall be continuously supported along the bottom of the trench and protected from damage by rock impingement. This shall be accomplished by using padding sand as shown in Figure 2 below. Using the native excavated soil as padding sand where conditions allow is acceptable. In all cases, only material with rounded rocks of less than ¼ inch size is allowed.

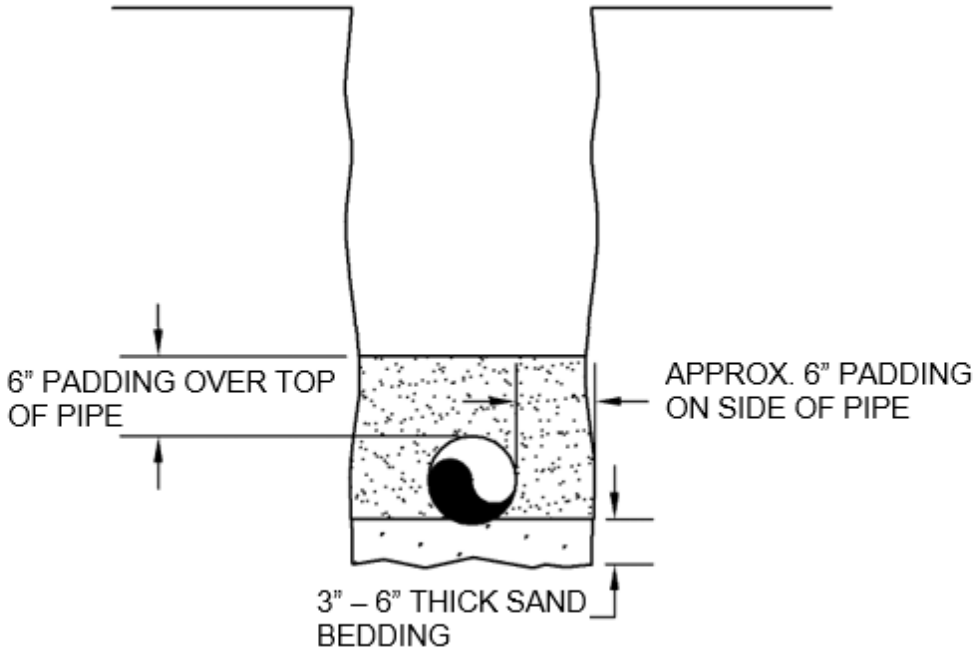

***Figure 2:** Bedding and padding for continuous support and protection of pipe installations*

7. BACKFILL AND COMPACTION

The material allowed for use as backfill can be described in the following manner:

> *Acceptable backfill materials are any combination of durable granular soils. Durable granular soils are those which will drain water freely and not decay over time such as sand, gravel, mineral soils, broken or crushed rock less than 6 inch in diameter, topsoil, and organic silts (for surface restoration at the top of the trench)*

Organic or corrosive soils such as peat, composts, manure, industrial wastes or sludges, and cinders shall not be used to backfill trenches in order to prevent corrosion or excessive settlement.

The condition of backfill material used should be suited to achieve acceptable trench compaction. In cold weather, frozen earth (or wet or frozen soil) should not be utilized as backfill material, when possible, due to the likelihood of excessive settlement if the soil drains after backfilling. Rocks greater than 6 inches in size shall not be used within backfill material and should be disposed of off-site.

All trenches located under roads or driveways shall be compacted in 12-inch lifts or in accordance with the requirements of the highway permit obtained for the work.

Compaction around existing tree and shrub roots shall be completed by hand were required to prevent air voids, which could be detrimental to the health of the plant.

All surfaces shall be restored to their original contours. Surfaces shall be returned to preconstruction conditions or better where required by:

- Project contract documents
- Highway work permits
- The company's service tariff or
- Agreements with landowners

PROCESS: **CONSTRUCTION**

Standard Operating Procedure

BUSINESS: **UTEN**

CHAPTER: **N/A**

SOP.P.U.10.02W

SUBCHAPTER: **N/A** REV.: 0 DATE: **xx/xx/2025**

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1. BASIC INFORMATION

PURPOSE: To provide a standard procedure and requirements for making direction changes in plastic pipe without imposing undue stresses during open trench construction. These requirements will help to ensure the pipe is made to fit and match the profile of the trench including any changes in trench direction or elevation.

SCOPE: This standard applies to construction and installation activities associated with installation of thermal energy mains and services.

RELATED DOCUMENTS:

- Performance Pipe PP901 Field Handbook
- PPI Polyethylene Field Manual for Municipal Water Systems
- SOP.P.U.10.02U Direct Bury Trenching

ABBREVIATIONS:

- OD: Outside Diameter
- SDR: Standard Diameter Ratio
- SOP: Standard Operating Procedure
- UT: Ultrasonic Testing
- UTEN: Utility Thermal Energy Network

DEFINITION:

Bend: Any change in horizontal or vertical direction or offset of pipe.

Energy Transfer Station: Thermal energy bores, bore field piping, controls, pumps, and back-up systems included in a UTEN facility location.

Overbend: A bend at a high point “over” the top of a feature used at the crest of a hill or at a quick change in declining slope elevation.

Sag bend: A bend in the pipe in the vertical plane which goes towards the bottom of the trench and is used at the bottoms of hills, utility crossings and depressions.

Side bend: A bend in the horizontal plane used to change direction of the pipe left or right.

Thermal Energy Bore: A drilled hole, piping and pumps used to source geothermal energy.

2. RESPONSIBILITIES

2.1 Operation and Operations Contractors

Operations and Construction Contractors are responsible for:

- Providing all engineering and quality control necessary for bending operations.
- Determining the grade profiles, trench alignment, and making calculations necessary to assure compliance with bending restrictions.
- Repair or replacement of completed bends that are inspected and found not in compliance with this standard.

3. GENERAL REQUIREMENTS

All pipe installed in a ditch shall be made to fit the contour of the ditch in order to minimize stresses on the pipe and damage such as gouges or dents. Stresses from backfill operations can compromise the integrity of the pipe. Pipe shall be laid in trench in a manner that follows the contours of the trench per SOP.P.U.10.02U Direct Bury Trenching, minimizing the resultant stresses.

Sudden changes in direction or elevation shall be accomplished by utilizing manufactured elbows.

All bends shall be free from buckling, wrinkles, cracks, thinning of pipe wall or other evidence of mechanical damage.

4. PROCEDURE

Bends shall not damage, kink or reduce the flow of water (thermal energy fluid) in the pipe. Any damage to a bent section of pipe shall be removed and replaced as a cylinder.

No mechanical joint shall be installed within a bend or within 20 pipe diameters on either side of a bend.

Pipe SDR	Minimum Bend Radius
7	20 times pipe OD
9, 11, 13.5	25 times pipe OD
17	27 times pipe OD

Table 1 Minimum Bend Radius – Plastic Pipe – by SDR

Pipe Diameter	SDR	Bend Radius
1.25 Inch	7	25 inches
2 Inch	7	40 inches
2 Inch	9,11,13.5	50 inches
4 Inch	9, 11, 13.5	8’ 4”
6 Inch	11,13.5	12’ 6”
8 Inch	11,13.5	16’ 8”
12 Inch	11,13.5	25’

Table 2 – Minimum Bend Radius – Plastic Pipe – By Pipe Diameter

If the required bend radius is less than the minimum radius listed above, elbows shall be used.

5. INSPECTION OF FIELD WELDS

Field bends may be inspected after completion by either Operations, Engineering, or the Construction Inspection Contractor if utilized.

There shall be no wrinkling, kinking, outside pipe diameter changes or buckling of the inner radius.

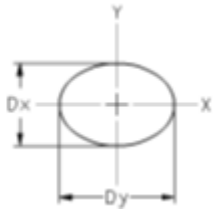
The pipe shall be measured for ovality with a caliper or equivalent tool. Ovality shall not exceed 2.5% of the pipe outer diameter.

$$\frac{D_y - D_x}{D} \leq 0.025\ (D)$$

$D = Nominal\ outside\ diameter$

$D_y = Largest\ OD\ from\ bending\ operation$

$D_x = Smallest\ OD\ from\ bending\ operation$



When pipe deformation or changes in wall thickness are suspected, the wall thickness may be inspected with a UT gauge. Bending of the pipe shall not reduce the wall thickness at any point to a thickness less than 90% of the nominal wall thickness.

The bend radius if measured shall be greater than dictated by Section 4 Procedure of this SOP.

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1. BASIC INFORMATION

PURPOSE: To provide a standard procedure giving guidance and requirements covering the design and construction of thermal energy network piping systems.

SCOPE: This procedure applies to all thermal energy network mains at Avangrid.

RELATED DOCUMENTS:

- ASTM D 696
- AWWA C 901 and 906
- AWWA Manual of PE Pipe Design and Installation
- PP901 Field Handbook
- SOP.P.10.02G Plastic Pipe Design
- SOP.P.10.02U Direct Bury Trenching
- SOP.P.10.02W Field Bends
- SOP.P.U.10.02Y Horizontal Directional Drilling
- SOP.P.U.10.02Z Auger Boring
- SOP.P.U.10.02AA Bridge Crossings
- SOP.P.U.10.02AB Pipe Supports – Foundations
- SOP.P.U.10.02AC General Service Construction
- SOP.P.U.10.02AD Tracer Connections and Test Stations

ABBREVIATIONS:

- GIS: Geographic Information System
- HDPE: High Density Polyethylene
- HMWPE: High Molecular Weight Polyethylene
- NYSPSC: New York State Public Service Commission
- PSIG: Pounds per Square Inch Gauge
- ROW: Right of Way

DEFINITION:

Consolidated Rock: A continuous layer of solid rock that extends below the surface of the earth. Also known as bedrock.

Main Bore: A pipeline that is located outside the confines of a thermal energy bore field, thermal energy transfer station, or pump station that serves as a common source of supply for one or more thermal energy services.

2. RESPONSIBILITIES

2.1 Engineering

Engineering is responsible for:

- Collaborating with Real Estate to secure ROW and verify that presence of an active franchise or approved pilot project where mains will be installed.
- Preparing easement exhibit drawings when needed for private property easements
- Identifying actively cultivated agricultural fields and navigable waterways on project design drawings.
- Where required by project scope, providing network analysis studies and pipe sizing for main installations or extensions.

2.2 Operations and Installation Contractors

Operations and Installation Contractors are responsible for:

- Installing mains in accordance with minimum depth of cover and clearance requirements.
- Installing metallic tracer wire and marker balls with all plastic mains.
- Installing warning tape over all mains installed using direct bury trenching.

2.3 Real Estate

Real Estate is responsible for:

- Securing required private property easements.
- Fulfilling the real estate task in SAP when an active thermal energy franchise exists.

3. GENERAL REQUIREMENTS

Only polyethylene plastic pipe shall be used for mains. Plastic mains shall be designed in accordance with SOP.P.U.10.02G Plastic Pipe Design.

Steel may be utilized if a site-specific design is created, stamped, and approved by engineering.

Main pipe shall be buried in accordance with one of the following standards.

- SOP.P.U.10.02U Direct Bury Trenching
- SOP.P.U.10.02Y Horizontal Directional Drilling
- SOP.P.U.10.02Z Auger Boring

Bends and changes in direction for plastic mains shall be made by using fittings or field bends in accordance with the following standards:

- SOP.P.U.10.02H Plastic Pipe Fittings
- SOP.P.U.10.02W Field Bends

Design of bridge crossings to prevent thermal expansion and contraction shall be done in accordance with SOP.P.U.10.02AA Bridge Crossings.

Undesirable forces or moments at connections to equipment, anchors, or supports shall be limited in accordance with SOP.P.U.10.02AB Pipe Supports – Foundations.

4. ROW AND FRANCHISES

Engineering shall work with Real Estate to obtain or verify that real estate rights exist for all mains being designed. This shall be documented using the real estate task in SAP work order for the project.

Acceptable real estate includes:

- An easement for private property.
- An occupant permit for public ROW, railroads, or canals.
- Company owned property.

Mains may be installed on existing company owned property where it is available, however, as a general practice, easements and occupancy permits are the preferred method for use rather than purchased property.

Mains shall only be installed where the company either has an active franchise with both the NYSPSC and municipality to provide thermal energy distribution services or where the company has a defined scope pilot project approved by NYSPSC and the local municipality. The company's GIS mapping system contains information regarding franchises within New York.

- The presence of existing company thermal energy facilities within a municipality does not necessarily indicate that an active franchise exists.
- Limited Pilot Projects allowing installation of thermal energy distribution facilities within certain locations, or which limit the extension of existing facilities may exist

5. SYSTEM PLANNING

Network analysis shall be requested from Engineering when main installation or replacement projects involve:

- Three or more residential units.
- Load additions for any residential space greater than 3000 square feet.
- Work related to nonresidential customers.

6. DEPTH OF COVER

Regardless of the method of installation, Operations and Installation Contractors shall install all mains in accordance with the depth of cover requirements of this section. Exceptions to this section require review and approval of Engineering.

Depths of cover for all mains being newly installed shall be measured from the top of the pipe run. The minimum depth of cover for mains shall be 60 inches. The minimum depth of cover for service laterals is also 60 inches (see SOP.P.U.10.02AC General Service Construction).

When installing services or mains, branches tapped off of the top of the pipe such as 2-inch plastic high volume tapping tees shall have not less than 54 inches of cover. Outlet piping from these tees can transition to 60 inches of cover in a gradual fashion but in no case can have less than 54 inches of cover.

The main at the branch location may need to be installed with increased depth of cover. For existing mains with insufficient depth of cover for a top tapping fitting, a side or bottom tapping fitting should be used.

Where short runs of offset piping are required in order to avoid conflicts, the preferred method is to increase cover depth. Where that option is not practical, pipe cover of the offset shall be not less than 36 inches, and the length of shallow depth piping shall be minimized.

During the project design process Engineering shall identify whether any mains being installed will be located within a navigable waterway.

Mains buried under the bottom of a navigable waterway shall be installed with a minimum depth of cover of 48 inches unless consolidated rock is present. If consolidated rock is present, then 24 inches of cover is acceptable.

7. CLEARANCES, SLACK, COOLING, AND PROTECTION

7.1 Clearance and Protection

Operations and Installation Contractors shall install all mains with appropriate clearance from other underground structures or utilities. This ensures that Iberdrola USA's facilities are afforded reasonable protection from:

- Electrical arcing that could damage plastic mains.
- Mechanical damage from the operation and maintenance of a third-party facility.
- Heat in the instance where a pipeline will cross or be parallel to buried heating pipes.

The minimum clearance distance to other underground structures or utilities is 6 inches without protection and 2 inches with protection. Where protection is needed,

fiberglass sheets or shims shall be used.

Where mains may be subjected to natural hazards that may cause movement or abnormal loads on the pipeline, protection measures shall be taken to protect the pipeline. This may include, but is not limited to:

- Increasing wall thickness
- Preventing erosion using revetments, which are reinforced sloping embankments
- Preventing erosion using water bars to slow surface water.

7.2 Slack and Cooling

Plastic pipe should be installed with sufficient slack to accommodate contraction during cooling. Snaking the pipe in the trench should be sufficient in most direct bury installations. Prolonged exposure to high ambient temperatures over 100°F in conjunction with direct sunlight on, for example, black plastic piping, may require additional consideration such as allowing the pipe to cool, or calculating the amount of thermal expansion that needs to be mitigated as per ASTM D 696.

8. TRACER WIRE - MAINS

Metallic tracer wire use for installation with plastic mains shall meet one of the following material specifications:

#12 AWG Solid Copperclad Steel Wire

- Annealed solid steel core coated with copper.
- Minimum tensile strength of 200 pounds.
- Coated with 30 mils HDPE or HMWPE yellow insulating jacket.

#10 AWG Stranded Stainless Steel Wire

- Stranded wire made using stainless steel.
- Minimum tensile strength of 1400 pounds.
- Coated with 30 mils HDPE or HMWPE yellow insulating jacket.

Operations and Installation Contractors shall install metallic tracer wire with all plastic mains to allow future locating of the main. Installation of either tracer wire or marker balls is required and can only be waived after review with both engineering, operations, and locate supervisory personnel.

Tracer wire connections and test stations shall be installed in accordance with SOP.P.U.10.02AD Tracer Connections and Test Stations.

9. MARKER BALLS - MAINS

Marker balls shall be installed 6 inches under the pipe at each fitting, valve, service tap, in-line tee, reducer, or end cap.

10. WARNING TAPE

Warning tape used by the company shall consist of a 3-inch-wide polyethylene ribbon.

The tape shall contain language stating, “Non-Potable Water” or, alternatively, other language communicating the line as a thermal energy non-potable water containing pipeline and be colored purple.

Operations and Installation Contractors shall install warning tape over all mains installed by direct bury trenching.

Warning tape shall be placed directly over the main. Care should be taken during backfill to prevent movement of the warning tape to the side of the trench.

The desired depth of cover for warning tape is at least 12 inches above the top of the main. Where mains are installed under pavement the warning tape shall be placed under the subbase course of the pavement.

Auger Boring

PROCESS: **CONSTRUCTION**

Standard Operating Procedure

BUSINESS: **UTEN**

CHAPTER: **N/A**

SOP.P.U.10.02Z

SUBCHAPTER: **N/A** REV.: 0 DATE: **xx/xx/2025**

REVISION CONTROL

REV.	DATE	REASON	MODIFIED PAGES
0	xx/xx/2025	Initial Release	-

Prepared	Reviewed	Approved
Quality	Senior Quality Manager/ Senior Director Technical Services	Steering Committee

INDEX

1. BASIC INFORMATION

PURPOSE: To provide a standard procedure giving guidance and design criteria covering the installation of plastic pipe by use of auger boring, including the protection of buried facilities.

SCOPE: This standard applies to plastic mains and services used to transport thermal energy.

RELATED DOCUMENTS:

- SOP.P.10.02A Excavating in Proximity to Underground Facilities
- SOP.P.10.02X General Main Construction
- SOP.P.U.10.02AG Casing Construction

ABBREVIATIONS:

- HDD: Horizontal Directional Drilling
- NYSDOT: New York State Department of Transportation
- UDig NY: 811 Call Center
- USDA: United States Department of Agriculture

DEFINITION:

Auger Boring: A trenchless pipe or conduit installation method where an auger is run inside of a casing pipe, and then the casing advanced forward as soil is moved back out the casing.

Cohesive Soils: Stable soils that do not crumble readily when compacted. An example of a cohesive soil is a soil that when compacted into a ball by hand stays in that shape.

Horizontal Directional Drilling: A trenchless pipe or conduit installation method where the path of the drill is steerable.

UDig NY Ticket: The notification and record provided by UDig NY of a proposed or emergency excavation that may affect Avangrid facilities.

2. RESPONSIBILITIES

2.1 Engineering

Engineering is responsible for:

- Determining whether auger boring is a feasible installation method.
- Designing auger boring installations.

2.2 Operations and Installation Contractors

Operations and Installation Contractors are responsible for:

- Joining sections of the casing pipe in accordance with this standard.
- Ensuring the casing is clean of any soil/debris before inserting the carrier pipe.

2.3 Technical Services

Technical Servies is responsible for:

- Corrosion design of the casing pipe.

3. GENERAL REQUIREMENTS

The auger boring method is a trenchless pipe installation technique that may be used to install plastic mains.

Figure 1, below, is a schematic of a typical auger boring installation.

Major points of the process are:

- For main installations, the auger boring process always results in installation of a casing pipe.
- An entrance pit is excavated which the boring machine will sit in, and the casing pipe will be fed into the bore from this pit.
- The auger bit fits inside the casing pipe and drills out the soil. Spoil is directed back through the casing pipe.
- As the auger bit advances, the casing pipe is pushed forward.
- After the casing pipe is cleaned out, the main being installed is inserted into the casing.

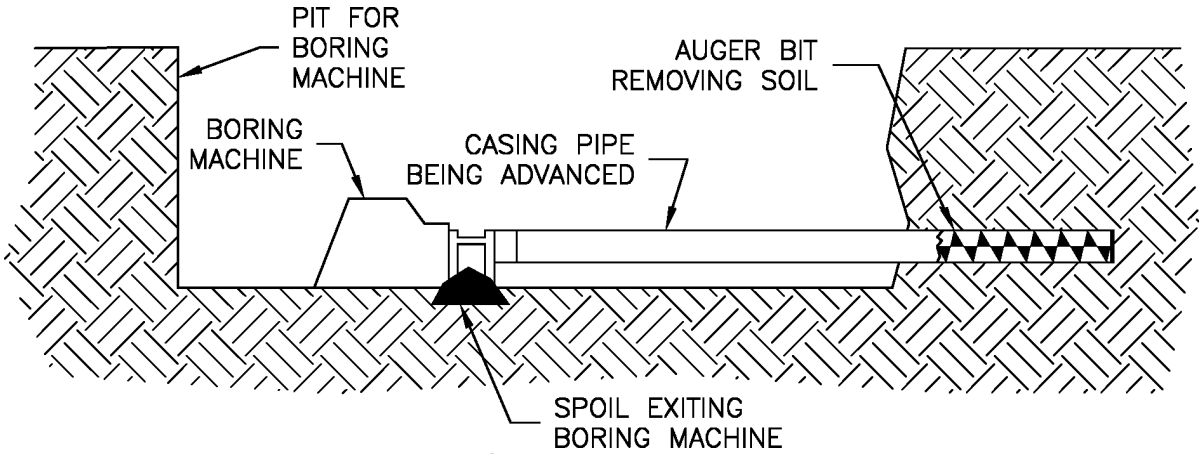

Figure 1 Basic set up of pipe installation using an auger bore

Differences between auger boring and horizontal directional drilling include:

- The pipe path during an auger bore is straight versus the curved steerable path possible with HDD.
- The total distance able to be crossed using auger boring is less than HDD.
- Auger boring cannot be generally used for installation of plastic pipe less than 4 inches in diameter whereas all sizes of pipe may be installed with HDD.
- The diameter of soil hole drilled during a bore is roughly equivalent to the casing pipe diameter. During an HDD, the diameter of the hole is larger than the pipe being installed. This reduces forces, and stress, on the pipe when it is pulled through the drill hole and provides more protection to the plastic.

Auger boring should be considered for the following types of installations:

- Situations where a trenchless installation is absolutely required, however, there is not sufficient space to use HDD.
- Installations where a casing is required due to occupancy permit requirements or to provide external loading protection to the pipe being installed.
- Cases where soil settlement due to the larger diameter bore hole created by an HDD pipe is of particular concern, such as at railroad crossings.

4. PLANNING FOR AUGER BORES

When a planned project is initiated, Engineering shall determine whether use of auger boring will be feasible.

- Casing sizes which may typically be installed using boring are 8 to 36 inches in nominal diameter.
- Smaller casing diameters are not compatible due to the fact that spoil is transferred from the drilling head back through the casing.
- In rocky soils, smaller casings may prove problematic due the inability to handle rocks.

- The total distance that can be traversed with an auger bore is approximately 30-250 feet.
- Space must be available for the pit that the boring machine will sit in. An allowance of 12 feet by 40 feet should be planned; however, the actual size will be based upon the installation contractor's machine. Excavation depth of the pit should be approximately 3 feet deeper than the casing depth.
- Auger boring can typically only be used to make straight line installations.

Where the boring machine and pit will extend onto private property, Engineering shall coordinate acquisition of temporary easement(s) in order to complete the work.

Due to the short lengths of bores, creation of an elevation profile is not absolutely necessary. Engineering should consider having a surveyor complete an elevation profile in the event that any of the follow complications are present in the planned bore:

- Significant land elevation changes are present such as:
- Raised roadbeds or railways
- Drainage ditches more than 2 feet deep.
- The intent is to start and end the bore at different elevations.
- There are other utilities or structures in the path of the bore that need to be avoided.

Soils and third-party utility information for the project location shall be obtained by Engineering using any of the following options:

- A UDIG-NY design ticket to identify third party buried utilities in the proposed project.
- Consulting with a NYSDOT regional office for existing soil borings related to bridge or highway work near the project area.
- USDA Soil Survey Maps available online.
- Soil borings contracted by the Company.

Regarding soils:

- Auger boring works best in cohesive clay or silt soil types due to the soil's stability.
- Boring is possible in sandy soils and consolidated rock or hardpan, however.
- Boring is generally not possible in gravels or other soils containing boulders/cobbles that are larger than 1/3 times the casing diameter.

5. ENGINEERNG DESIGN FOR AUGER BORES

Engineering shall coordinate obtaining any temporary permits or easements required to excavate the entrance pit.

Steel pipe shall be used for construction of all auger bore casings.

- Standard wall thickness pipe should be used unless a heavier wall thickness is required to support external loads placed upon the casing.

A profile drawing of the bore shall be prepared by Engineering showing the following information:

- Pipe elevations for the start and end of the casing.
- Depth of cover required.
- Relationship or measurements to any existing utilities the bore will cross or parallel. Separation distances maintained shall be no less than 1 foot for utilities being crossed or 2 feet for utilities being paralleled:

To complete main installation inside the casing, construction materials and drawing details shall be included by Engineering in accordance with standard SOP.P.U.10.02AG Casing Construction. This includes but is not limited to:

- Sizing of the casing diameter.
- Casing spacers.
- End seals.
- Corrosion protection details.

6. CONSTRUCTION OF AUGER BORES

Each segment of the casing pipe being pushed into the bore shall be joined using welding:

- All joints shall be butt welds.
- Since the casing is not pressure containing, root passes on the girth welds are not required. Leaving out the root pass will make insertion of the carrier pipe easier.
- All other weld passes shall be completed to ensure that the casing is watertight.

Before the main being installed is inserted into the casing, the casing shall not contain any loose soil/debris from the boring operation. Cleaning shall be completed by:

- Running a pipe brush on rope through the casing.
- Running a wire brush pig through the casing.