



North American Society for Trenchless Technology
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Thermoformed & Thermoplastic Pipe Quality Assurance / Quality Control

A piping material that is defined as a thermoplastic means that the materials have plastic properties which means that they can be repeatedly softened by heating and hardened by cooling through a temperature range characteristic of the plastic and that in the softened state it can be shaped, molded or extruded. The two different types of thermoplastic pipe materials, e.g., Polyvinyl Chloride (PVC) and High Density Polyethylene (HDPE), each have their own unique set of physical properties and different installation options. Both PVC and HDPE pipe is manufactured in a controlled environment – often in facilities that are ISO 9000 certified - to known ASTM standards such as those listed below. As a result, variability in the quality and sizing of these pipe systems is virtually eliminated. Whether extruded into standalone pipes, sheets or strips, these materials offer outstanding chemical and corrosion resistance, a 50 – 100 year service life, and excellent durability.

PVC Materials Manufacture Standards

- ASTM D2122 – Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
- ASTM D2412 - Standard Test Method for Determination of External Loading
- Characteristics of Plastic Pipe by Parallel-Plate Loading
- ASTM F1871 – Standard Specification for Folded/formed Poly (Vinyl Chloride) Pipe Type A for Existing Sewer and Conduit Rehabilitation
- ASTM D2444 – Impact Resistance
- ASTM D790 – Flexural Properties
- ASTM D638 – Tensile Properties

HDPE Materials Manufacture Standards

- ASTM D2513 – Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings
- ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
- ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
- ASTM F1533 – Standard Specification for Deformed Polyethylene (PE) Liner
- AWWA C-901 & C-906 – Standard for PE Pressure Pipe and Tubing ...

Thermoplastic pipe such as HDPE is commonly used in Horizontal Directional Drilling (HDD) and Pipe Bursting trenchless applications. More information on HDPE, including fusion welding of joints, is included in those **Amazing Trenchless Experience** station

presentations. The Thermoplastic materials that are used in Thermoformed pipelining systems, generally used to rehabilitate a pipelines that have deteriorated, are generally known as “Fold & Form”, “Reform / Deform” and “Expanded in Place.” Thermoplastics extruded into sheets or strips are used to form a pipe that is constructed in place through mechanical means.

Installation Process

Preconstruction CCTV inspection is a critical component to properly collect data including:

- Size, length and condition of line(s)
- Pipe material(s)
- Size change(s)
- Line and grade
- Verify all necessary point repairs to be done in advance of lining
- Verify all active services
- Groundwater infiltration
- Flow

Precleaning activities should include the removal of any obstructions that could damage the liner. Lateral locations should be documented. Areas of excessive infiltration/inflow should be grouted and/or point repairs made to ensure proper inflation and execution of a thermoformed liner. The length of the line and the diameter should be verified.

Qualified contractors with proper equipment should be specified and used for installation. Bypass of existing flow is generally required to reline pipes with thermoformed systems. More information on bypass pumping and CCTV inspection is provided at the Assessment & Bypass **Amazing Trenchless Experience** station.

The methods and procedures for installation vary by manufacturer; however, established ASTM standards provide reference on accepted installation practices for thermoformed piping systems and field constructed systems including:

PVC Installation Standards

- ASTM F1867 - Standard Practice for Installation of Folded/formed Poly (Vinyl Chloride) (PVC) Pipe Type A for Existing Sewer and Conduit Rehabilitation
- ASTM F1947 - Standard Practice for Installation of Folded Poly (Vinyl Chloride) (PVC) Pipe into Existing Sewers and Conduits
- ASTM F1741 – Installation of Machine Spiral Wound Poly (Vinyl Chloride) (PVC)
- ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications

HDPE Installation Standards

- ASTM F1533 and 1606 - Standard Specification for Deformed Polyethylene (PE) Liner
- ASTM D2657 – Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings

QA/QC Material Verification

Thermoformed pipe is imprinted with the manufacturer, applicable ASTM standards, date of manufacturer, SDR, and may include a control number. The nomenclature found on the pipe can be recorded by an inspector for QA purposes, and provides the Owner with assurances that the pipe was manufactured to specification.

Information that should be provided by the manufacturer:

- Minimum temperature the liner needs to be processed.
- Maximum temperature the liner can handle without damage.
- The length of time the liner needs to be held at temperature.
- The liner cooling procedure before liner is removed from pressure.

Verification of Proper Thermoform Installation Practices

Due to the fact that thermoforming liners are inflated using steam and internal pressure, the values of these are verifiable to the inspector at time of execution. Appropriate and calibrated instrumentation is used to provide the installation crews and inspectors with empirical evidence that the parameters embodied in the respective ASTM standards have been achieved.

The current practice of installing thermoformed pipe liners is to pull a continuous length of pipe material, free from any discontinuity. However, with HDPE pipe liners, it is possible to thermal butt fuse lengths of pipes. PVC pipe liners can chemically and thermally join lengths of pipe, but thermoformed trenchless manufacturers do not generally include this practice in guidelines.

New technology and mechanical joining methods are being brought to market every day. When HDPE and PVC is used for directional drilling and pipe bursting applications, mechanical and thermal joining of discrete pipe joints can and is accomplished.

Post Installation Procedures and Practices

After the liner has been properly installed and allowed to cool, (and after an air test if required) the laterals are opened using remote controlled robotic cutters. This process generally involves the use of a wire brush but may also include the use of a cutter bit. The lateral openings are generally opened to 90% - 95% and should be free from ragged edges.

If required by specification, samples of the installed liner materials are marked and bagged for laboratory examination. The end connections in the manholes are made water tight. A post video inspection is completed, noting all required information, and a copy is made available to the inspector or Owners representative.

For Further Information on Thermoformed Pipeliners Please Visit

The logo for ULTRALINER features the word "ULTRALINER" in a bold, sans-serif font. "ULTRA" is in blue and "LINER" is in green.

Booth 528



Booth 208



Booth 519

For Further Information on Thermoplastic Pipe and Tools Please Visit



Booth 105

The logo for SEKISUI features the word "SEKISUI" in a large, bold, blue, sans-serif font.

Booth 222 & 224



Booth 412

CemPipe Americas

Booth 317



Booth 105



Booth 322



Booth 116



Booth 225



Booth 324