FEDERAL & MILITARY • DISTRICT ENERGY

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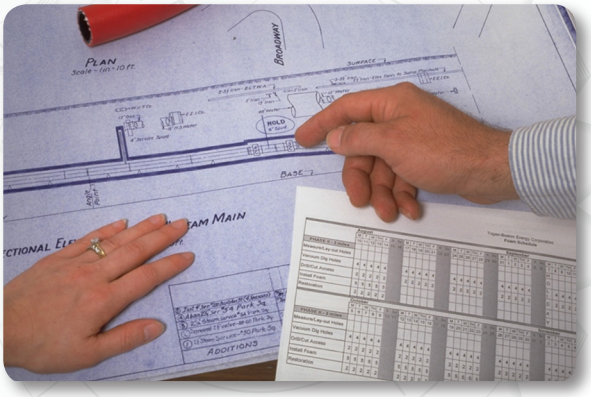
ConduFill®

Thermally Restore Buried Steam & Hot Water Distribution Piping

5-Step ConduFill® Restoration Process



Step 1: Evaluate Piping System

Examine drawings and physically inspect the distribution system to determine its construction and if a void exists. If so, develop technical and field parameters by which the piping system will be accessed and restored.

Step 2: Access Piping System

Small 18"-24" diameter vac digs at intermediate points above the line may be required to gain access the piping system. Small access points are opened up in the steel, concrete, terra cotta or HDPE outer casing to gain access to the void that is to be insulated. Manholes and vaults are also instrumental in providing additional access points.

Step 3: Strategize Application

Teflon® tubing is inserted into the void space either at vac dig access points or manhole access points. Planning, strategies and measurements of tubing within the system ensure complete coverage when ConduFill® is pumped into the target void.

Step 4: Inject ConduFill®

The rigid insulation is injected into the target void in between the carrier pipe and the outer casing, expanding 30 times its own volume. A Mobile Pumping Unit (MPU) equipped with pumps, metering equipment, generators, heaters, chillers and holding tanks will establish critical temperatures and pressures before dispensing the polyisocyanurate formulation into the piping system.

Step 5: Restore Surfaces

Any necessary vac digs will be backfilled and street, sidewalk, grass and other surfaces will be restored to specification.

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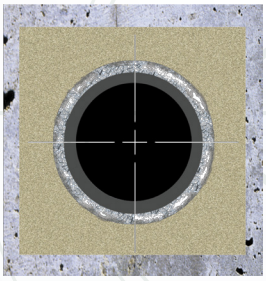
THERMAL SCIENCE TECHNOLOGIES
Saving Energy with Innovative Insulation Solutions

Technical Data & Piping Profiles

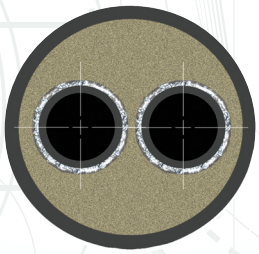
ConduFill® Technical Data (HT-450)	
Density:	3.0pcf
Service Temperature:	400˚F
Closed-Cell Content:	>95%
Compressive Strength:	16-17.5 psi
K-factor:	.18 Btu-in/hr-ft²-°F
Dimensional Stability:	-0.20% (by volume)
Water Absorption:	<2% (by volume)

*The above data is based on ASTM testing of in-service ConduFill® samples. All samples were tested by an independent laboratory and have met or exceeded these values.

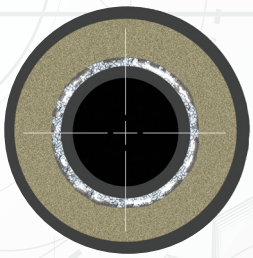
Common Buried Piping Profiles



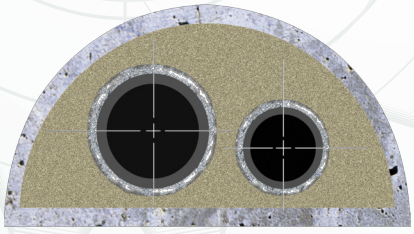
Box-Pour Concrete



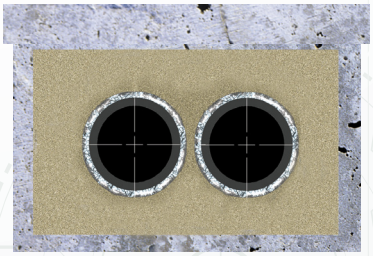
HT Hot Water



Drainable - Dryable (Class A)



Round Top Concrete



Trench

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Benefits & Energy Savings

Reduce Heat Losses	The minute ConduFil® is injected into a buried piping system, energy savings and reduced fuel costs begin. Restoration usually results in a 40-90% heat loss reduction and an ROI of 2-5 years depending upon on energy costs.
Prolong Service Life	ConduFill® will upgrade and repair the insulation thereby extending the life of the distribution system.
Prevent Water Intrusion	The formulation expands 30 times its own volume to effectively fill the target void and to seal off breaches, cracks and holes that have developed in the outer casing over time.
Avoid Pipe Replacement	The cost of excavating and replacing buried distribution piping ranges from $400 to $2000 per LF. ConduFill® is usually 20-40% of the cost of complete replacement.
Eliminate Vapor	Unsightly vapor is usually a sign of poorly insulated distribution piping. The vapor is eliminated as water can no longer get into the system due to the presence of ConduFill®.
Protect Nearby Utility Lines	Nearby utilities such as fiber optic, electrical and water lines can become damaged by the heat of nearby distribution lines. ConduFill® will eliminate this conflict and protect from further damage.

ECM Comparisons

ECM	Description	Project Cost	Annual Savings	Payback
Building Envelope Improvements	Replace single & double pane windows	$2,384,700	$158,980	15 years
Lighting System Improvement	Lighting Retrofits - Change Incandescent lights to Compact Fluorescent Lights (CLFs)	$1,207,008	$223,520	5.4 years
Insulation Improvements	**Thermally restore 3500 LF of 18" high-pressure steam piping with ConduFill®**	**$787,500**	**$187,000**	**4.2 years***
Mechanical System Improvement	Complete replacement of 3500 LF of 18" buried steam piping (Pre-insulated Class A)	$2,100,000	$175,000	12 years

TST is able to provide detailed energy savings analyses for underground and above-ground piping to determine existing thermal losses and annual energy savings after restoration takes place with ConduFill® or Removable Insulation Covers. Annual savings and projected payback estimates will vary due to many factors such as accessibility, pipe size, existing insulation conditions, steam production costs, steam pressure and steam flow rates.