NIA's 62nd Annual Convention
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Embracing the Change to Pre-Insulated Pipe Supports

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Rilco Manufacturing Company, Inc.

NIA | National Insulation Association

THE VOICE OF THE INSULATION INDUSTRY™

Pre-Insulated Pipe Supports for Various Applications

- Above-ground piping for distribution
- Above-ground piping in plants
- Piping in buildings
- Piping in tunnels
- Piping in trenches

Pre-Insulated Pipe Supports Basic Knowledge

THREE MAIN ENVIRONMENTS FOR SUPPORT DESIGN AND STRESSES PRESENT

SLIDING (UN-RESTRAINED)	VERTICAL LOADS
GUIDED SUPPORTS (SLIDING AND GUIDED)	VERTICAL AND LATERAL LOADS
ANCHOR AND STOP SUPPORTS (RESTRAINED)	VERTICAL, LATERAL, AXIAL LOADS

THERMAL ENVIRONMENT OF SUPPORTS

- HOT SERVICE
- COLD SERVICE
- DUAL-TEMPERATURE RANGE SERVICE

APPLICATIONS OF SUPPORTS

- SITS ON STRUCTURE
- HANGING APPLICATIONS

Pipe Support Loading Basics

Hot supports utilize structural inserts within the support for load carrying and clamping capabilities. Some cold supports use material densities to carry loads.

All designs are calculated with a

5:1 Safety Factor

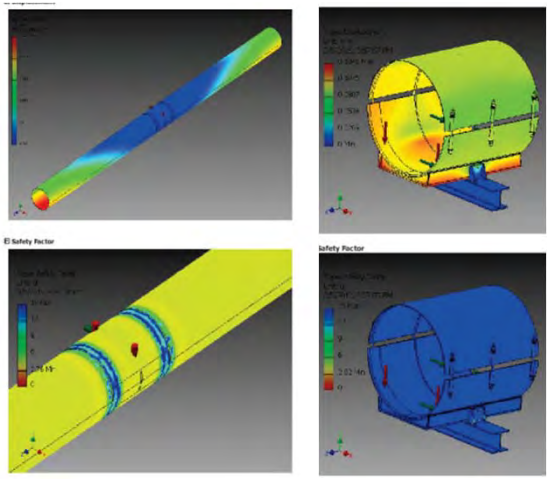
in regard to support loading.

This is backed up by:

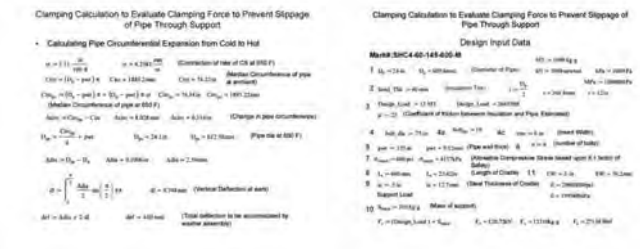
- Calculations
- Physical Testing
- FEA Analysis Modeling

Pipe Support Loading Assurance

Computer Modeling



Calculations

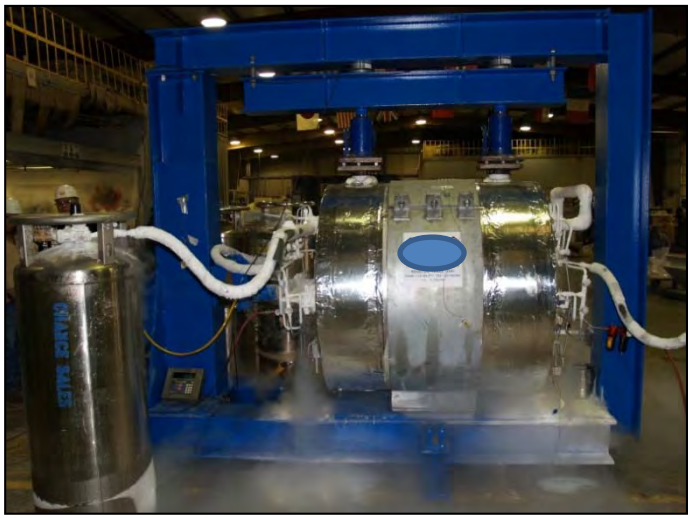


Clamping Calculation to Evaluate Clamping Force to Prevent Slippage of Pipe Through Support

Clamping Calculation to Evaluate Clamping Force to Prevent Slippage of Pipe Through Support

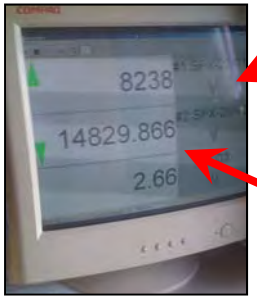
Design Input Data

Physical Testing



Clamping to the Pipe

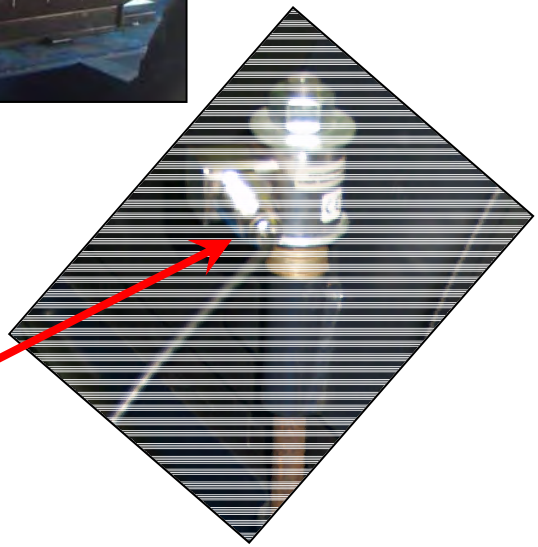
CLAMPING FORCE ASSURANCE
Pipe Supports MUST not slip or rotate on the pipe



36.6 Kn
(8,238 Lbf)
Vertical Load

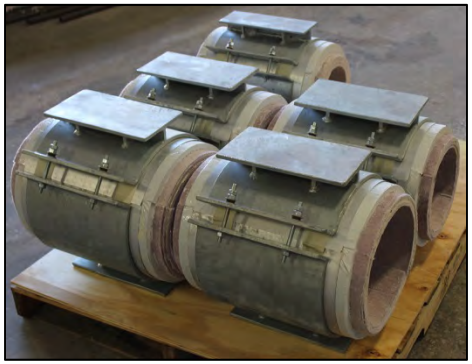
66 Kn
(14,829 Lbf)
Axial Forces

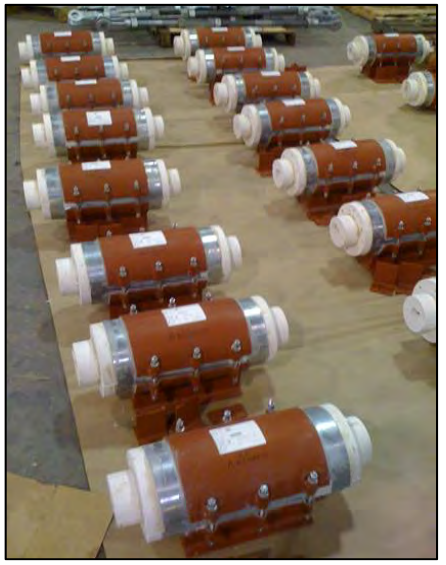
LOAD
CELL

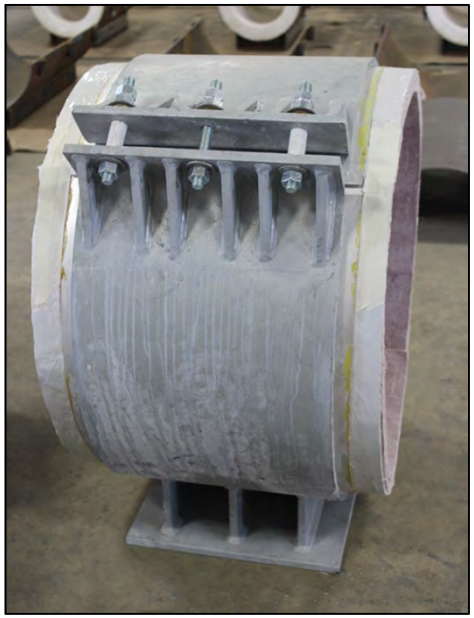


BELLEVILLE WASHERS ARE UTILIZED TO MAINTAIN CLAMPING FORCES DURING THERMAL PIPE EXPANSION OR CONTRACTION IN EXTREME ENVIRONMENTS

Pipe Support Insulation Material Options







Aerogel Blanket
Calcium Silicate
Cellular Glass
Closed-Cell Foam Insulation
High Density Polyurethane (PUF)
Others

Composites of different insulations may be utilized for special applications for cold service, hot service, or dual-temperature range service applications

Pre-Insulated Pipe Supports Hot Environment Applications

Qualified Service Temperature: -10°F (-23°C) to 1200°F (650°C), and to 1800°F (983°C for some special applications)

Hot Service Product Lines:

- ✓ Pre-Insulated Pipe Shoes
- ✓ Guides
- ✓ Anchors
- ✓ Isolation Blocks
- ✓ Phenolic Resin Blocks, Sleeves, and Washers

Insulation Types:

- ✓ Calcium Silicate
- ✓ Aerogel Blanket
- ✓ Closed-Cell Foam Insulation
- ✓ Cellular Glass Insulation

Pre-Insulated Pipe Supports Cold Environment Applications

Qualified Service Temperature: -425°F (-253°C) to 275°F (135°C)

- Cryogenic Product Lines:
  - ✓ Pre-Insulated Pipe Shoes
  - ✓ Guides
  - ✓ Anchors
  - ✓ Isolation Blocks
  - ✓ Phenolic Resin Blocks, Sleeves, and Washers

- Insulation Types:
  - ✓ Polyurethane Foam
  - ✓ Aerogel Blanket
  - ✓ Closed-Cell Foam Insulation
  - ✓ Cellular Glass Insulation

Efficiency—A Core Objective

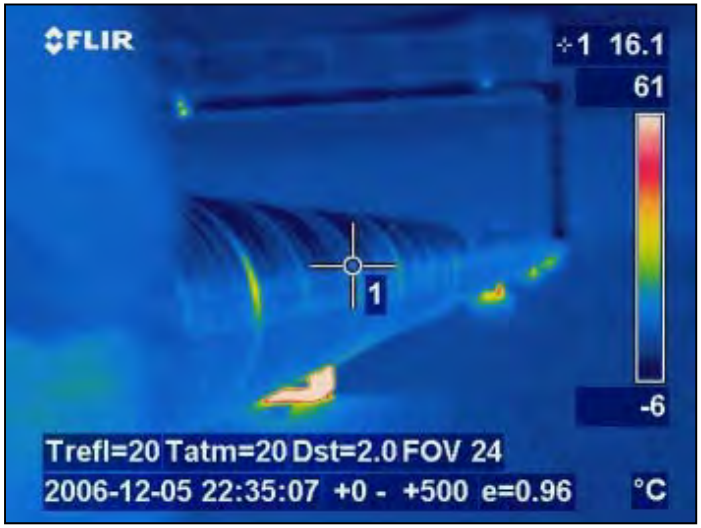
Supports that WELD directly to the pipe

OR

CLAMP directly to the pipe

Have documented inefficiencies

Welded Supports on an Insulated Line



Thermal Analysis of a Pipeline without Pre-Insulated Pipe Supports Installed on the Line

Solution for Maximum Efficiency

Pre-Insulated Pipe Supports Isolate the Pipe from the Outside Structure for MAXIMUM EFFICIENCY

- Pre-insulated supports offer an immediate thermal break
- Eliminates “radiator fin” heat loss through the base
- Keeps BTUs in or out of the pipe depending on temperature of service

Case #1—Comparative Heat Loss

"ASTM C680-10 Standard Practice for Estimate of the Heat Gain or Loss and the Surface Temperatures of Insulated Flat, Cylindrical, and Spherical Systems by Use of Computer Programs"

This is the basis utilized to predict the surface temperature and heat loss of the insulation system.

We compared:

36" pipe with 100mm of Mineral Wool, 296 °C with a **welded support** and insulated over

36" pipe with 50mm of Aerogel blanket, 296 °C using a **pre-insulated pipe support**

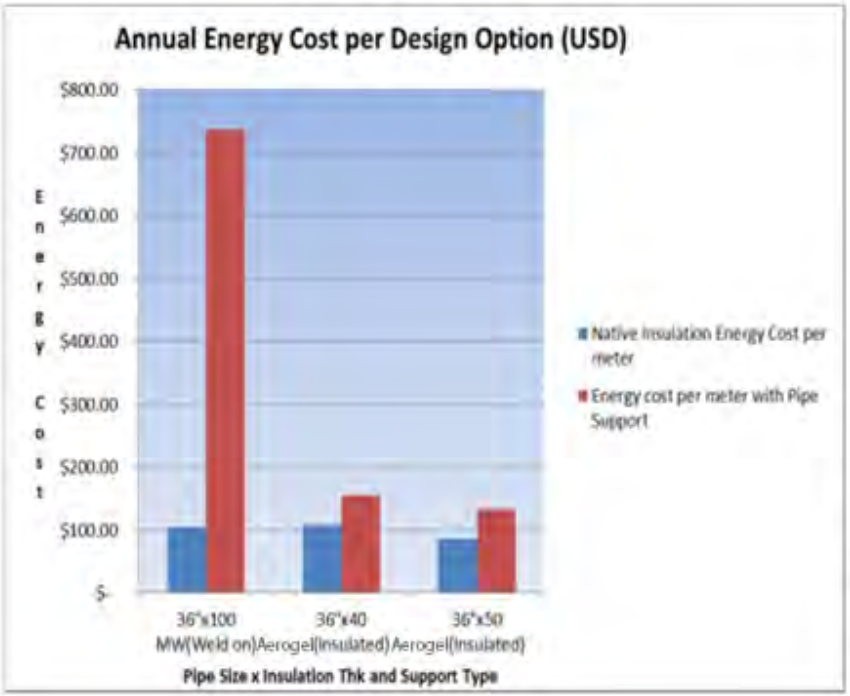
- All pipe lengths 1 meter
- **Native insulation of each was calculated for a baseline without supports**

Results of the Comparison

PIPE SIZE	INSULATION TYPE THICKNESS	SUPPORT TYPE	NATIVE INSULATION HEAT LOSS CFD (W/m)	SUPPORT LOCATIONS HEAT LOSS PER TYPE OF SUPPORT CFD (W/m)	HEAT LOSS % DIFFERENCE PER TYPE OF SUPPORT ARRANGEMENT
36"	MINERAL WOOL 100mm	**WELDED SUPPORT** / INSULATED OVER SUPPORT	-589.8	-4107	**596.3%**
36"	AEROGEL BLANKET 50mm	**PRE-INSULATED SUPPORT**	-478	-745.25	**55.9%**

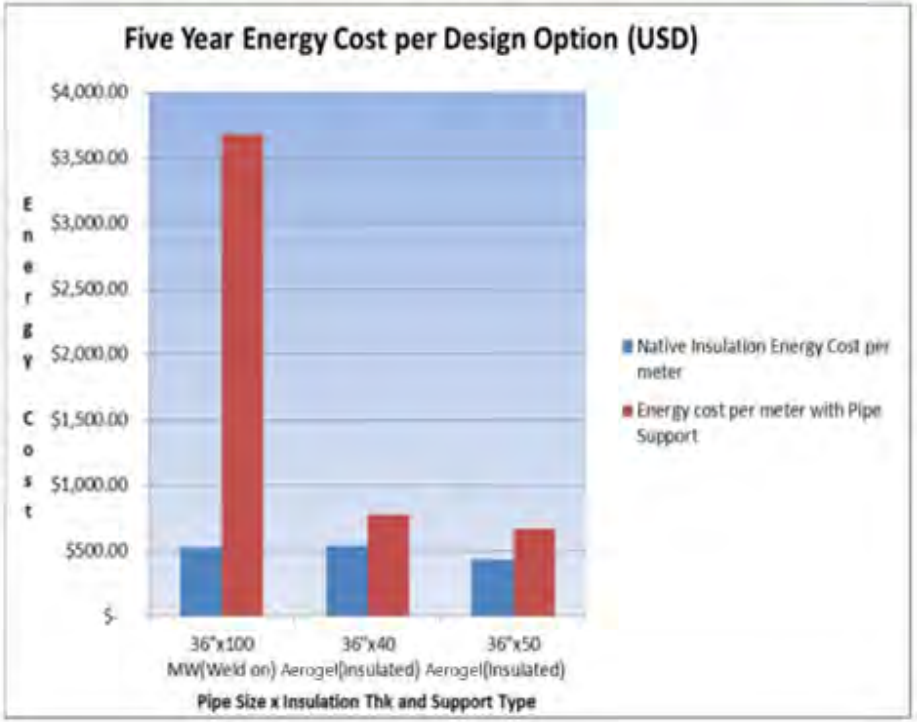
Note the Welded Support System Inefficiency

Visual Representation of Cost Comparison



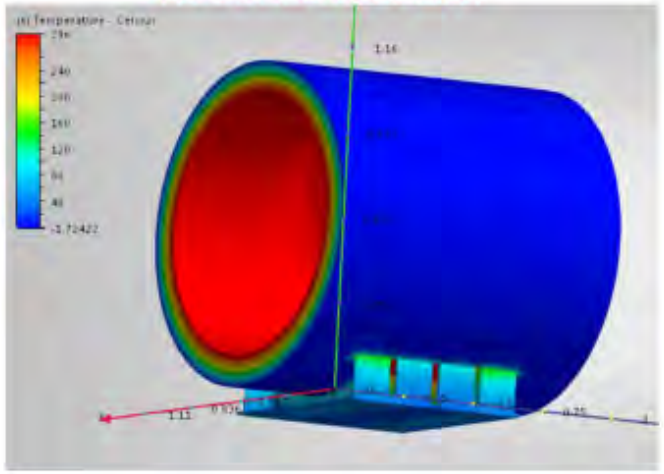
GRAPHS SHOW ONE SUPPORT ON ONE METER OF PIPE.

EXTRAPOLATE TO YOUR PROJECT SIZE

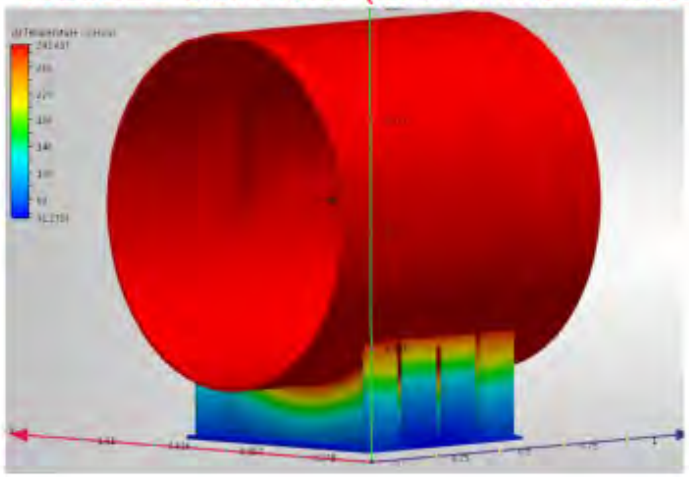


Computer Modeling of Heat Loss

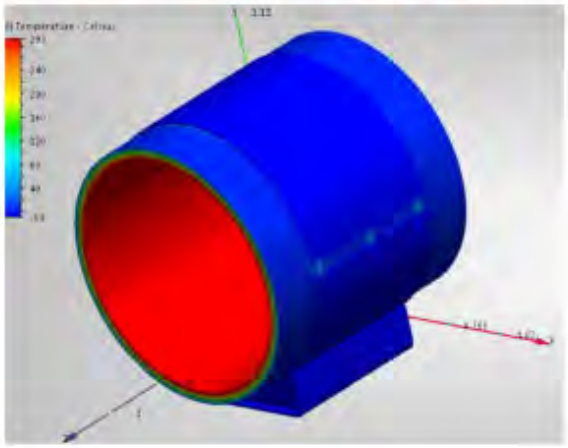
WELDED SUPPORT



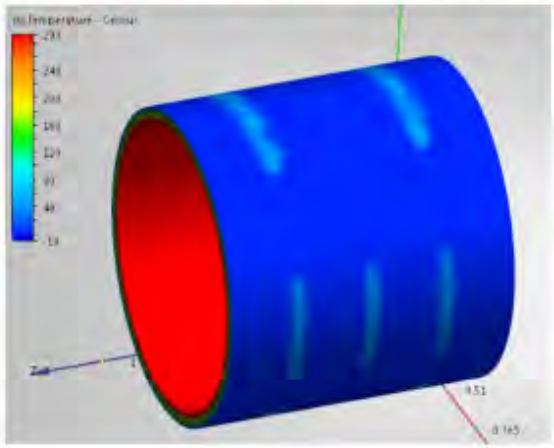
WELDED SUPPORT (INSULATION HIDDEN)



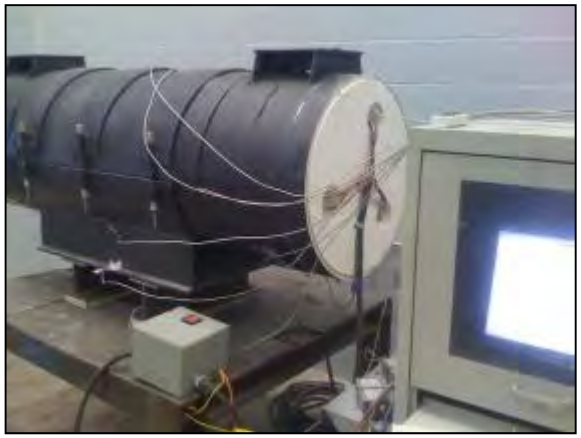
PRE-INSULATED SUPPORT



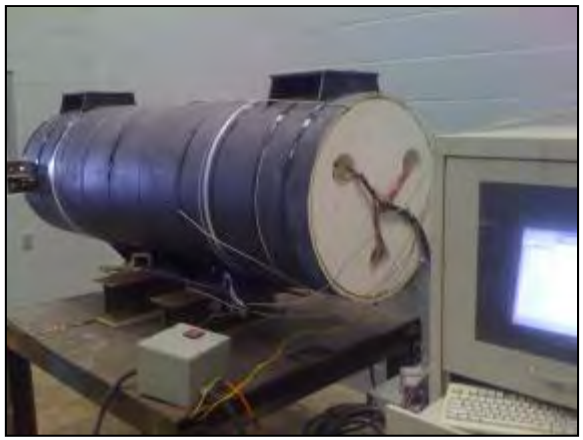
PRE-INSULATED SUPPORT (STEEL HIDDEN)



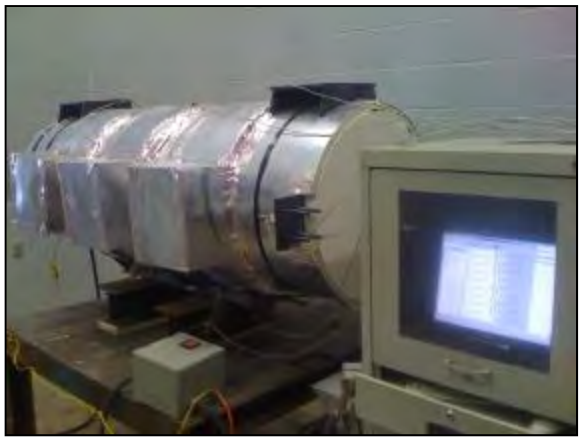
Case #2—Thermal Loss Test Comparison of 3 Types



Pre-Insulated Support



Weld-On Shoe



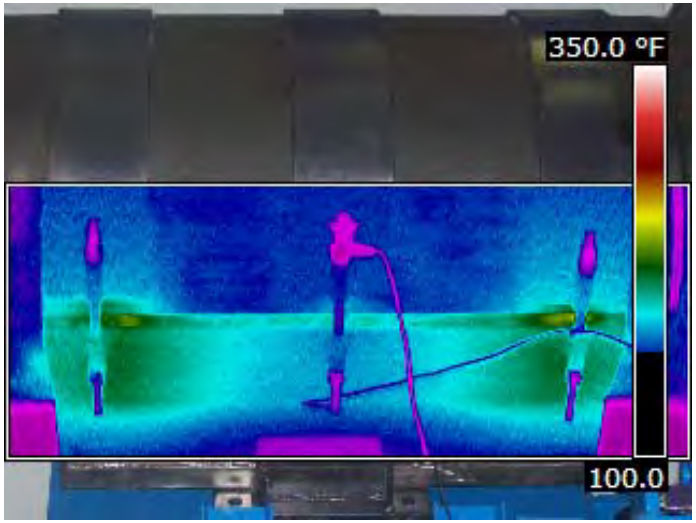
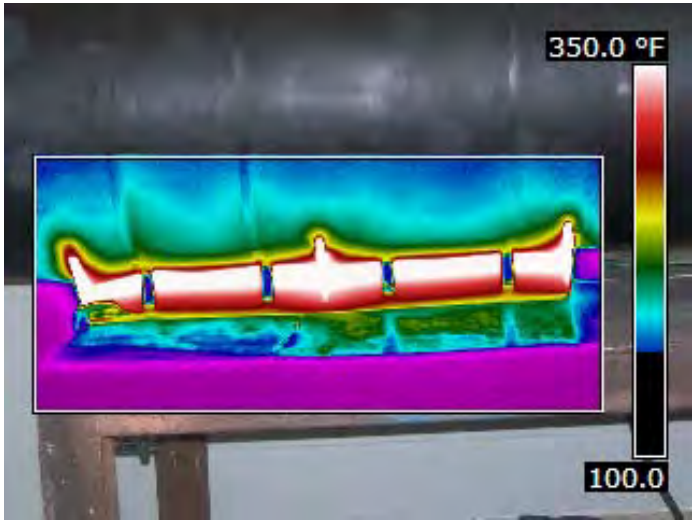
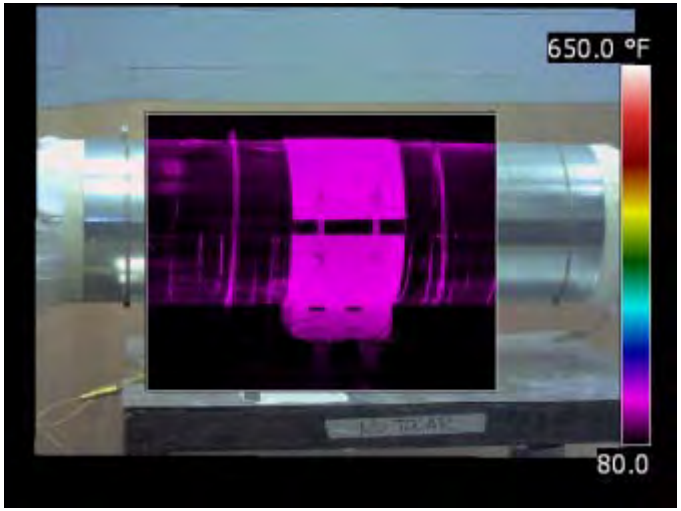
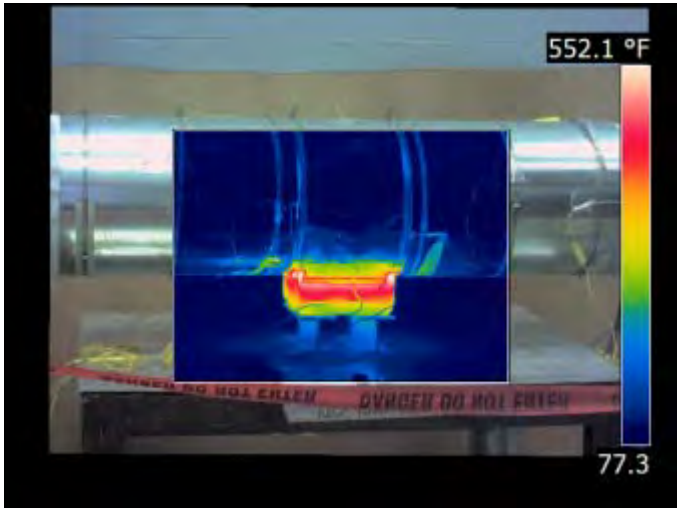
Clamp-On Shoe

NOTE: Testing was performed in a shop environment at approximately 75-80°F (24°C). The test was performed in a calm environment with NO WIND. WIND across the system, and especially the WELDED support will significantly affect the heat loss and energy usage.

Watt Meter

Thermal Logging

Case #2—Thermal Loss Test Comparison of 3 Types

	PRE-INSULATED SUPPORT	WELD-ON SUPPORT
 24” STEAM LINE SUPPORTS **343°C (650°F)**		
 12” PROCESS SUPPORTS **621°C (1150°F)**		

Support Comparison

HOT SERVICE AEROGEL BLANKET
GUIDED
PRE-INSULATED PIPE SUPPORT

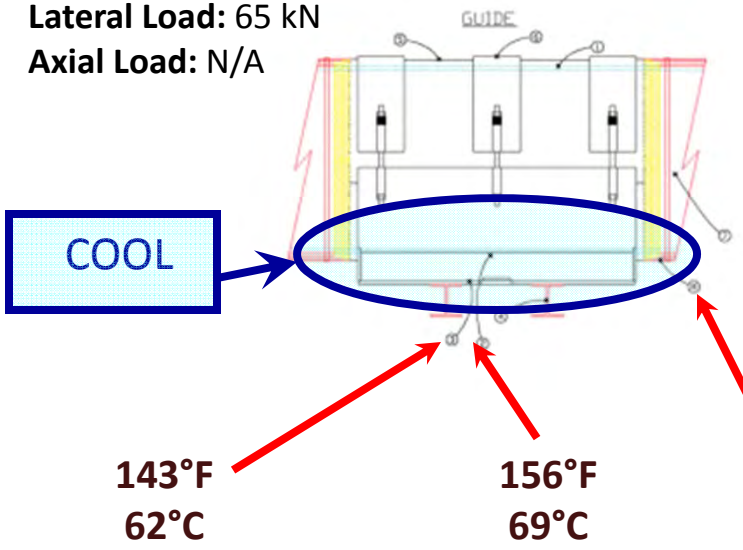
Pipe Size: 24”
Insulation Thickness: 20 mm
Length: 900 mm

Design Temperature: 343˚C (650˚F)

Vertical Load: 65 kN
Lateral Load: 65 kN
Axial Load: N/A

3.4
Kwatt/Hour to Retain Heat Saturation

651°F
344°C
PIPE



GUIDE SUPPORT

LS1-3-A-24”

WELDED PIPE SUPPORT

Pipe Size: 24”
Insulation Thickness: 0 mm

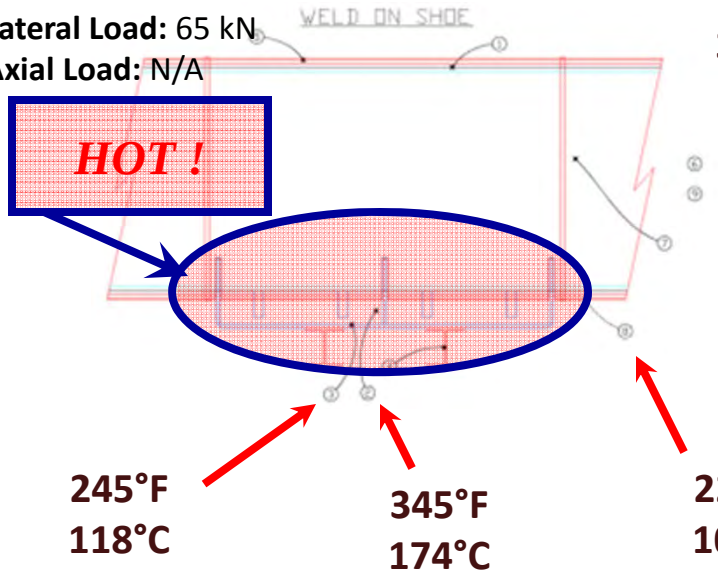
Length: 900 mm

Design Temperature: 343˚C (650˚F)

Vertical Load: 65 kN
Lateral Load: 65 kN
Axial Load: N/A

4.6
Kwatt/Hour to Retain Heat Saturation

656°F
347°C
PIPE



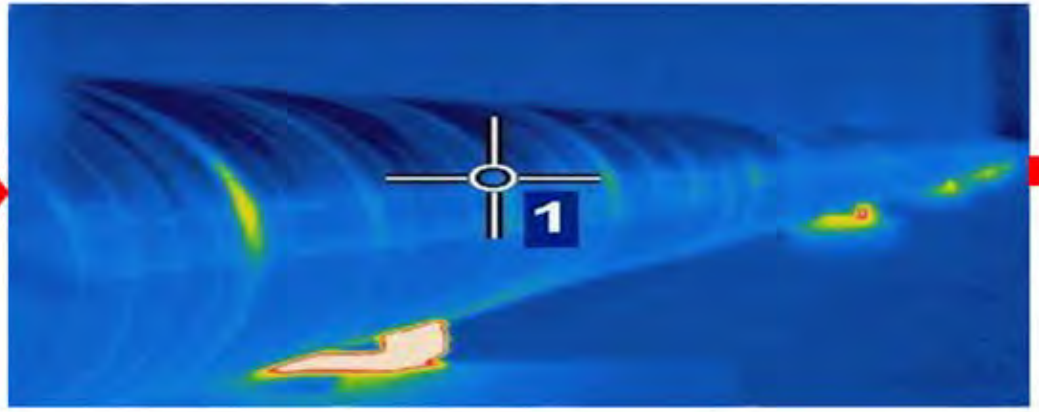
WELD-ON SUPPORT

Energy Usage Comparison

ENERGY USAGE COMPARISON-PER *EACH* SUPPORT		
Weld-on vs Guide	**1.2**	Kw att/Hour More Energy Reqired For Weld-on
Clamp-on vs Guide	1.5	Kw att/Hour More Energy Reqired For Clamp-on

EVERY HOUR	833	Cubic Feet of Natural Gas Energy is
EVERY DAY	19,993	WASTED at pipe support points due to
EVERY YEAR	7,297,674	IN-Efficient supports

1.2 Kwatt/Hour Saved from EACH Support = 1.2 Kwatts saved PER HOUR
100 Supports = 120 Kwatts PER HOUR
24 Hours in One Day = 2,880 Kwatts PER DAY
365 Days in One Year = 1,051,200 Kwatts PER YEAR
30 Year Plant Life Estimate = 31,536,000 Kwatts LIFE PLANT



EVERY HOUR	.85
EVERY DAY	20.55
EVERY YEAR	7,502,01

M Btu's are LOST at pipe support points due to IN-Efficient Supports

PARTICIPATION SHAPES OUR FUTURE
NIA'S 62ND ANNUAL CONVENTION

Case #3—Pre-Assembly of Pipelines: Modular Approach







Benefits of Pre-Assembled Pipe Lines

- Ability to pre-install offsite—minimizing laydown space issues. Or, can be installed onsite on the ground at facility location prior to lifting into place.
- Install piping as buildings are being built—eliminates threading pipe through structure then installing supports, insulation, and jacketing at final location, which may have accessibility issues.
- Pipe system can be pre-assembled prior to project start-up.
- Efficient pre-installation reduces labor time, improving project schedule, reducing costs, and working safe at waist-high conditions.
- Very efficient on straight piping runs using up to 80-foot long sections of pipe. Proven cost savings.

Other Benefits of Pre-Insulated Pipe Supports

INSTALLATION:

Pre-Insulated Pipe Supports

versus

Supports that Weld or Clamp Directly to Pipe

Installation Comparisons: Various Types of Supports

Installation Problems with Non-Insulated Supports

Weld-On Supports

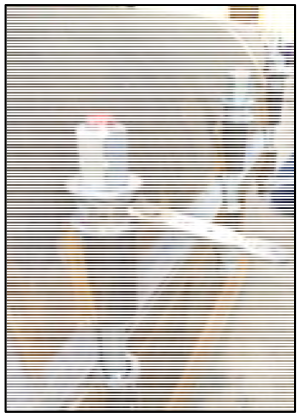
1) Expensive labor rates to weld and time-consuming welding and for QC

2) Time consuming labor to trim insulation and jacket around steel ribs

Easy Installation Using Pre-Insulated Supports

Pre-Insulated Supports

1) Bolt-on to pipe for fast, secure installation



2) After bolting you are Finished, as the insulation and jacket are part of the support and are installed as well

Corrosion Under Insulation

Pre-Insulated Pipe Supports
versus
Supports that Weld or Clamp Directly to the Pipe






Corrosion Under Insulation

Pre-Insulated Pipe Supports Totally Isolate the Pipe from the Outside Structure

Pre-Insulated Supports

Welded Support

Condensation

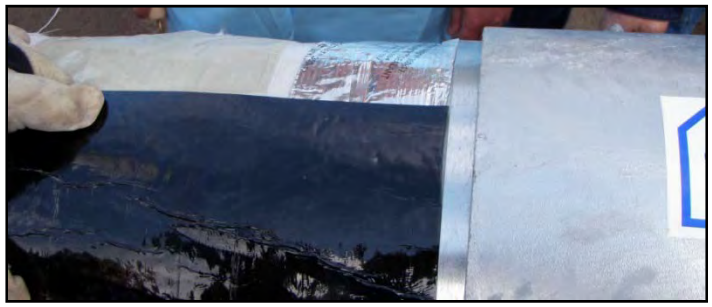
Pre-Insulated Pipe Supports

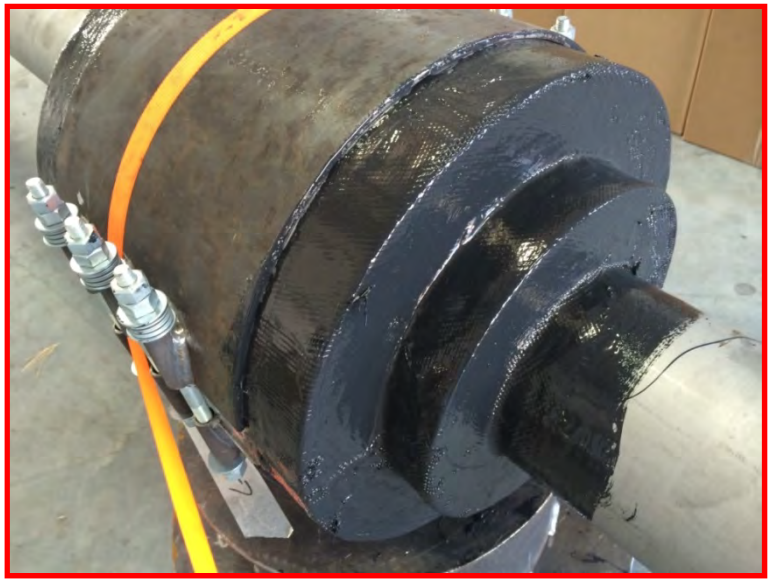
versus

Supports that Weld or Clamp Directly to the Pipe

Pre-Insulated Supports Totally Isolate the Pipe from the Outside Structure

Pre-Insulated Supports Can Include a Sealed Vapor Barrier and Line Stop System to Eliminate Condensation





Why use pre-insulated supports?

Efficient

- Saves energy
- Saves operating costs

Easy to Install

- Saves construction time
- Saves construction cost

Benefits

- Can be built using various types of insulation to work with your system
- Carry the loads of your pipe
- Protect against corrosion (CUI)
- Protect against condensation

Considerations

- Engineering time to select the applicable support
- Consideration of a higher initial cost with a lower installed cost and efficiencies
- Material selection for application type and environment

Thank You from Rilco

Any questions?

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