TPS THERMAL PIPE SHIELDS

Comparing Methods to Detail Commercial Pipe Insulation Through Structural Supports

TPS THERMAL PIPE SHIELDS

77 YEARS OF DEDICATION FORGED IN THE FIELD

THREE GENERATIONS OF INDUSTRY EXPERIENCE

Charles A. Heckman Sr.
SALES

Charlie worked for 35 years for the E.J. Bartells Co. Starting as a warehouseman in 1942 and retiring as the Chairman of the Board in 1977.

Charles A. Heckman Jr.
CONTRACTING

Chuck started with the E.J. Bartells Co. as a pipe insulator in 1962 before holding positions of estimator and project manager. Chuck went into mechanical insulation contracting business for himself, starting Industrial Insulators Inc. with a partner in 1987 before starting Heckman Inc. in 2001.

Jeffrey Charles Heckman
MANUFACTURING

Jeff started in 1984 as a pipe insulator with the EJ Bartells Co. before joining his father in the mechanical insulation contracting business he started in 1987. Jeff started TPS Inc. in 1995 and began manufacturing insulated pipe supports. TPS Inc. is now the largest manufacturer of insulated pipe supports on the West Coast.

Charles Heckman
4th Generation

Rule #1
Don’t Do This!

Electricians are great at bending pipe…

But not so good at insulating them! ☺

Failure Waiting to Happen

- Mineral fiber pipe insulation is the lowest cost and most common product for commercial buildings
- It lacks sufficient compressive resistance to support the weight of an empty 5/8” copper pipe through the clevis hanger
- Compressing the insulation and perforating the vapor retarder reduces thermal performance and can cause condensation

"ANSI / MSS SP-58" Pipe Hangers and Supports

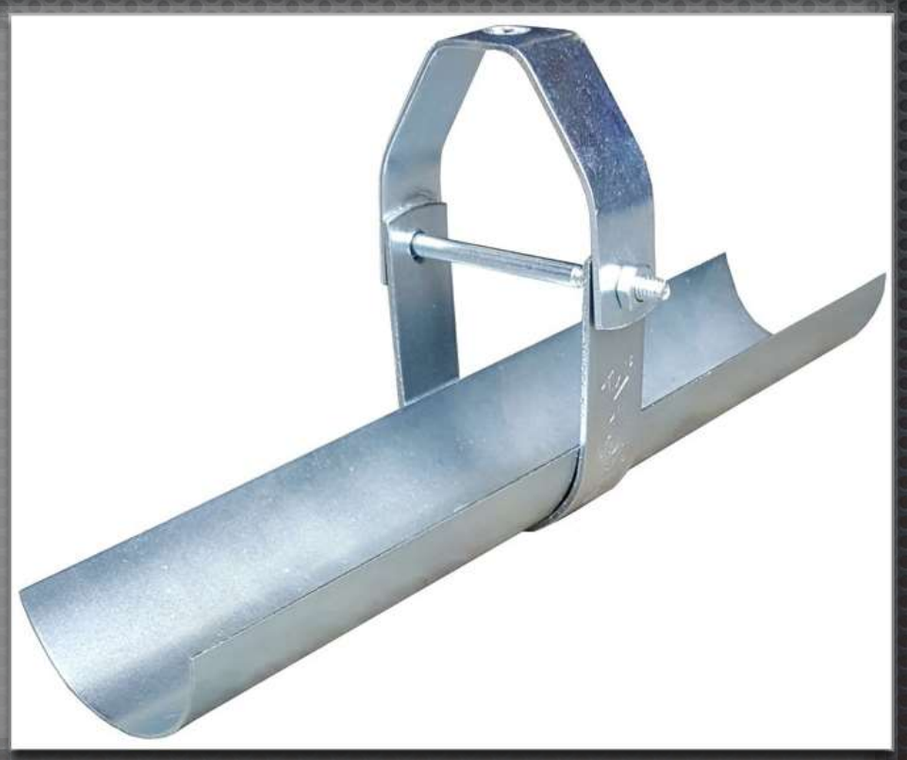
- Standard Practice 58 serves as "an industry accepted basis" for mechanical engineers and piping designers

- Establishes minimum guidelines for materials, allowable stresses, product design, testing and load rating for pipe hanger and support assemblies

- Section 7.6 covers "Protection Saddles and Shields"

Please purchase publication online via this link:
https://webstore.ansi.org/Standards/MSS/ANSIMSSSP582018?source=blog

- Section 7.6.2 - “Pipe covering protection shields are used to prevent crushing of insulation at the hanger point. They can be used with or without high compressive strength inserts.”
- Section 7.6.3 - “When used **WITHOUT** high compressive strength inserts, pipe covering protection shields shall be in accordance with Table A3 and shall span an arc of 180°.”



Pipe Size	Shield Length	Shield Gauge	Spacing
1/2 - 1 1/4”	12”	18	7’
1 1/2”	12”	18	9’
2 - 3 1/2”	12”	18	10'
4”	12”	16	10’
5 - 6”	18”	16	10’
8 - 14”	24”	14	10’
16 - 24”	24”	12	10’

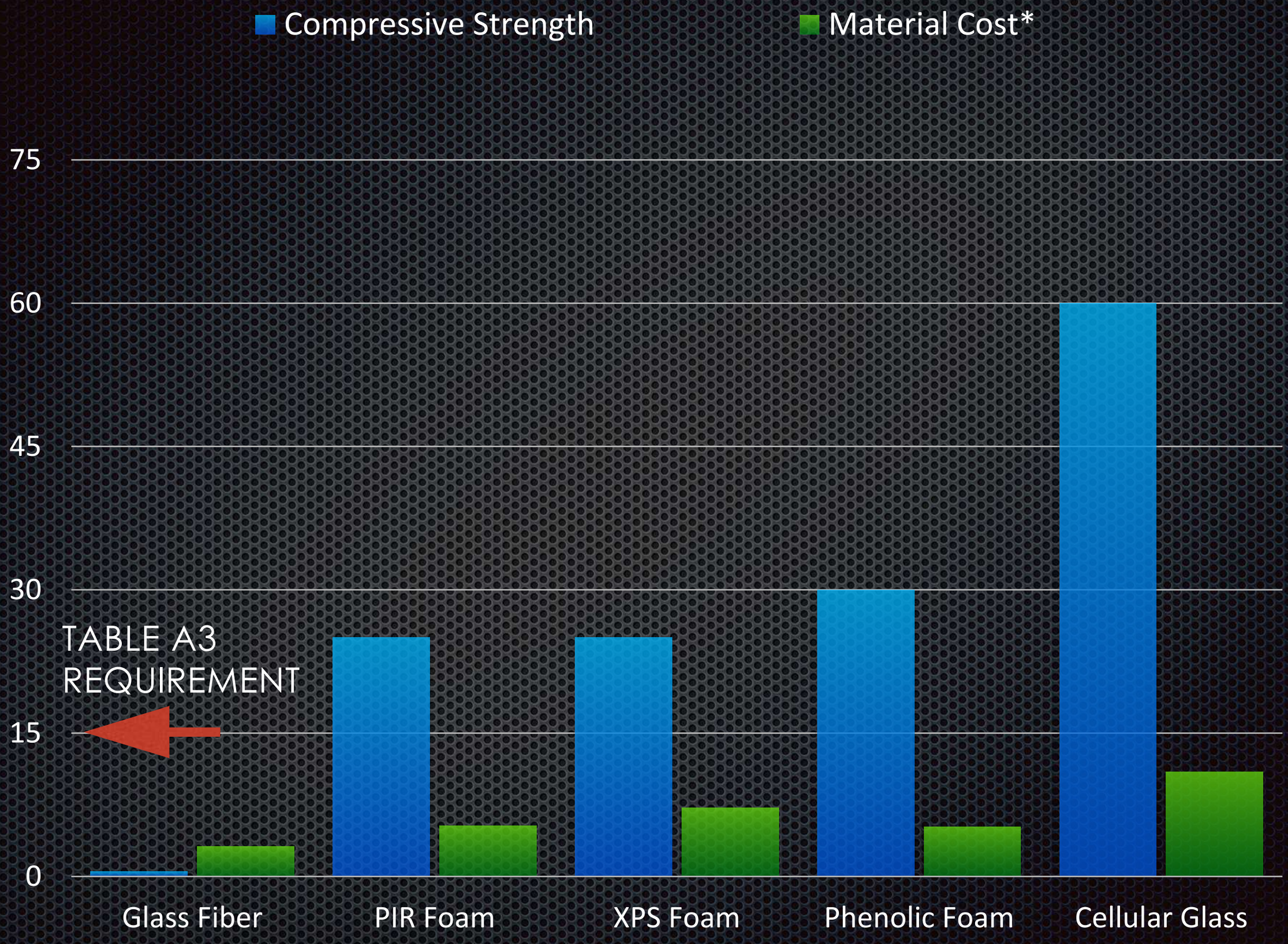
Table A3 - Shield Requirements
WITHOUT high strength inserts on band type hangers
“For point loading, increase shield thickness and length”

"The listed spacings and shield lengths are based on insulation with a compressive strength of 15 psi."

–MSS SP-58 Table A3: General Note 1

The Problem

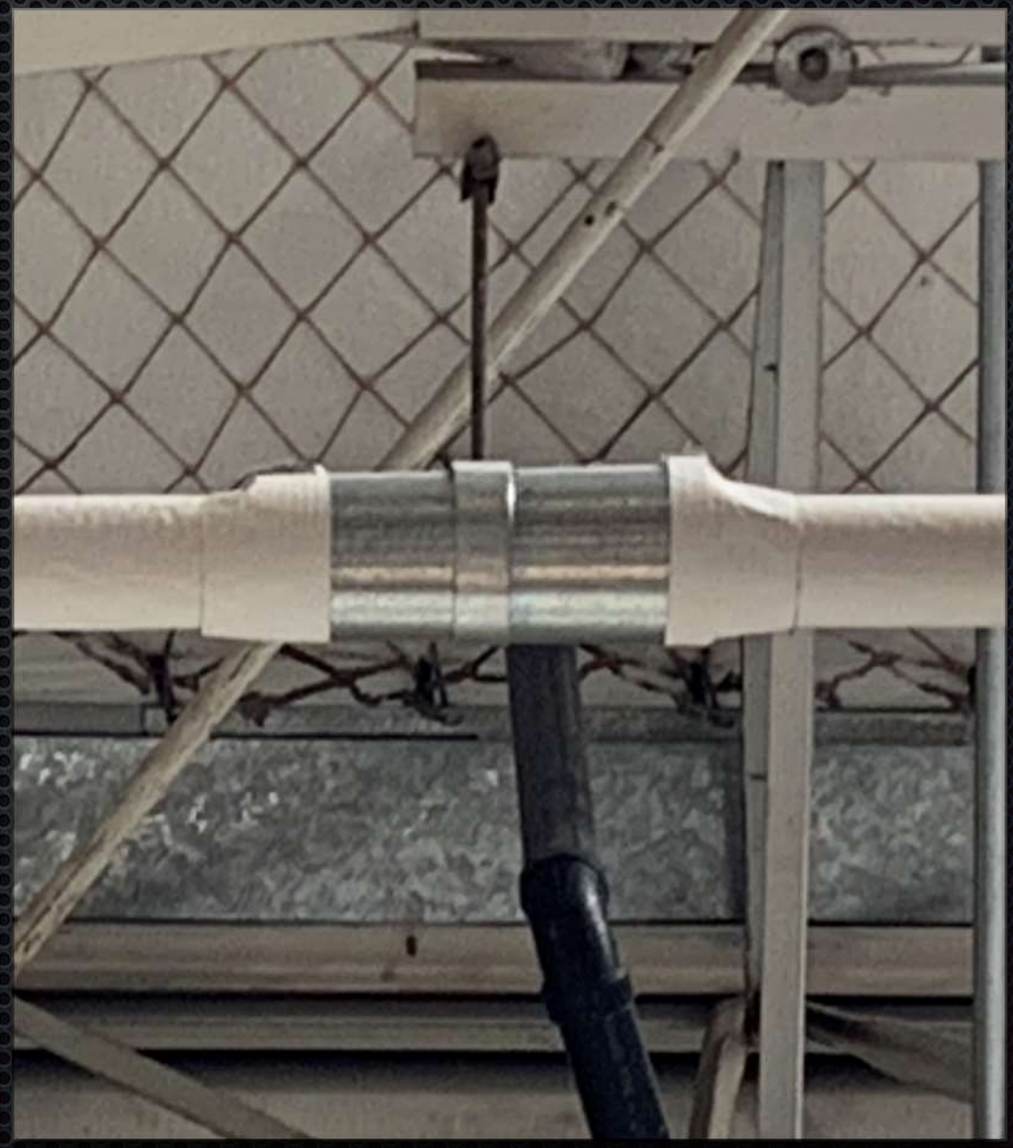
- The ASTM C547 standard specification for mineral fiber insulation does NOT measure or publish compressive strength
- It has been tested to provide **less than 0.5 psi** compressive strength



**Material only costs for 2.5 x 1.5 pipe insulations*

Logical Conclusion

- Mineral fiber insulation does not meet the minimum compressive strength requirement (>15 psi) to be used WITHOUT high strength inserts at the pipe hangers per MSS SP-58
- If mineral fiber is specified as the primary mechanical insulation,
- Then, specify high strength inserts and metal shields at ALL structural pipe supports.



Mechanical Insulation is a Skilled Trade

Wondering how to safely and effectively detail pipe insulation at the hangers?

Just ask a professional insulation contractor!

Mechanical Insulation Professional Organizations

Detail Diagrams Published in *"MICA Standards Manual" 8th Edition*

Please purchase publication online via this link:
https://www.micainsulation.org/standards-manual.html

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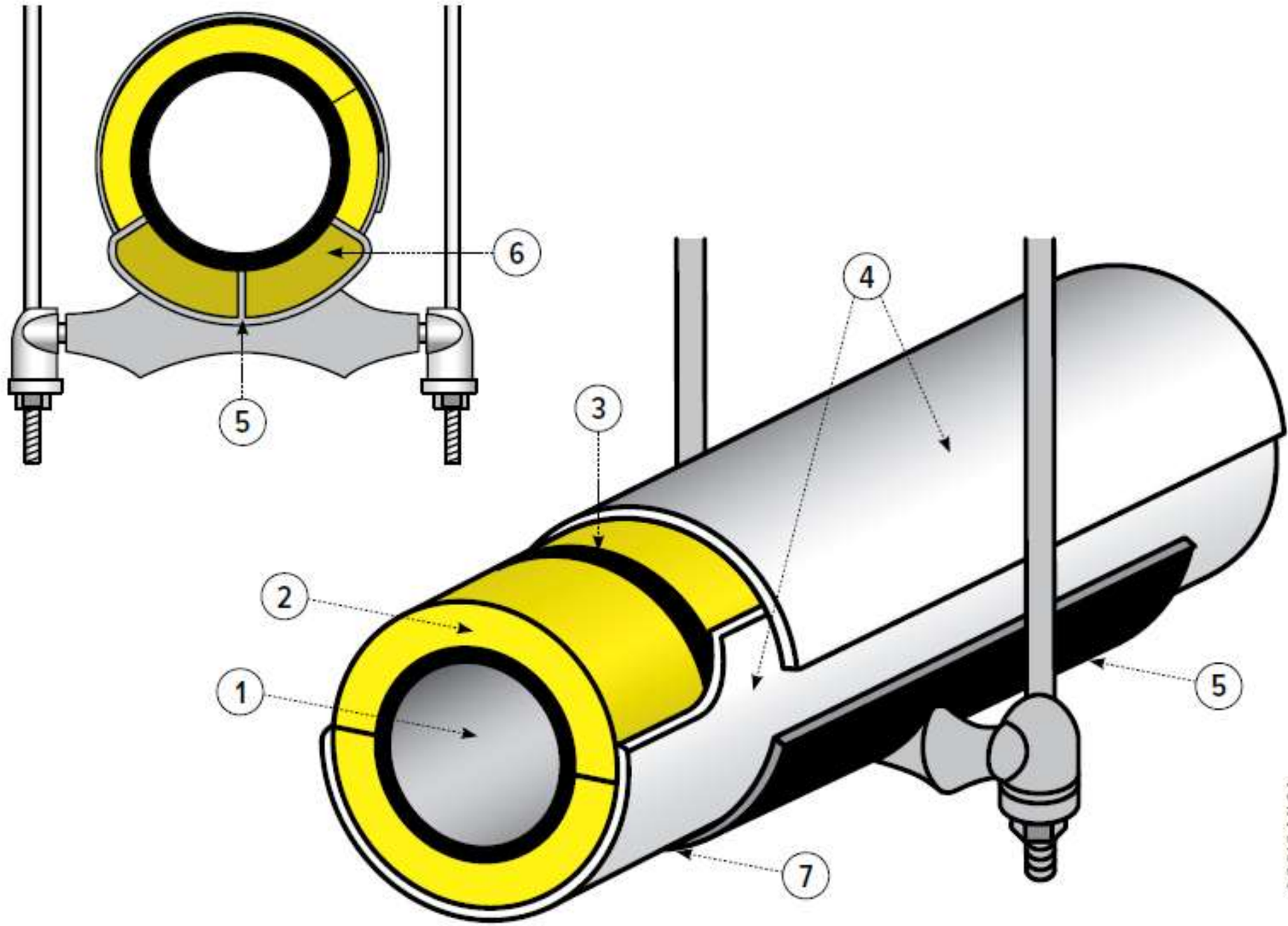
mica Plate 1-620

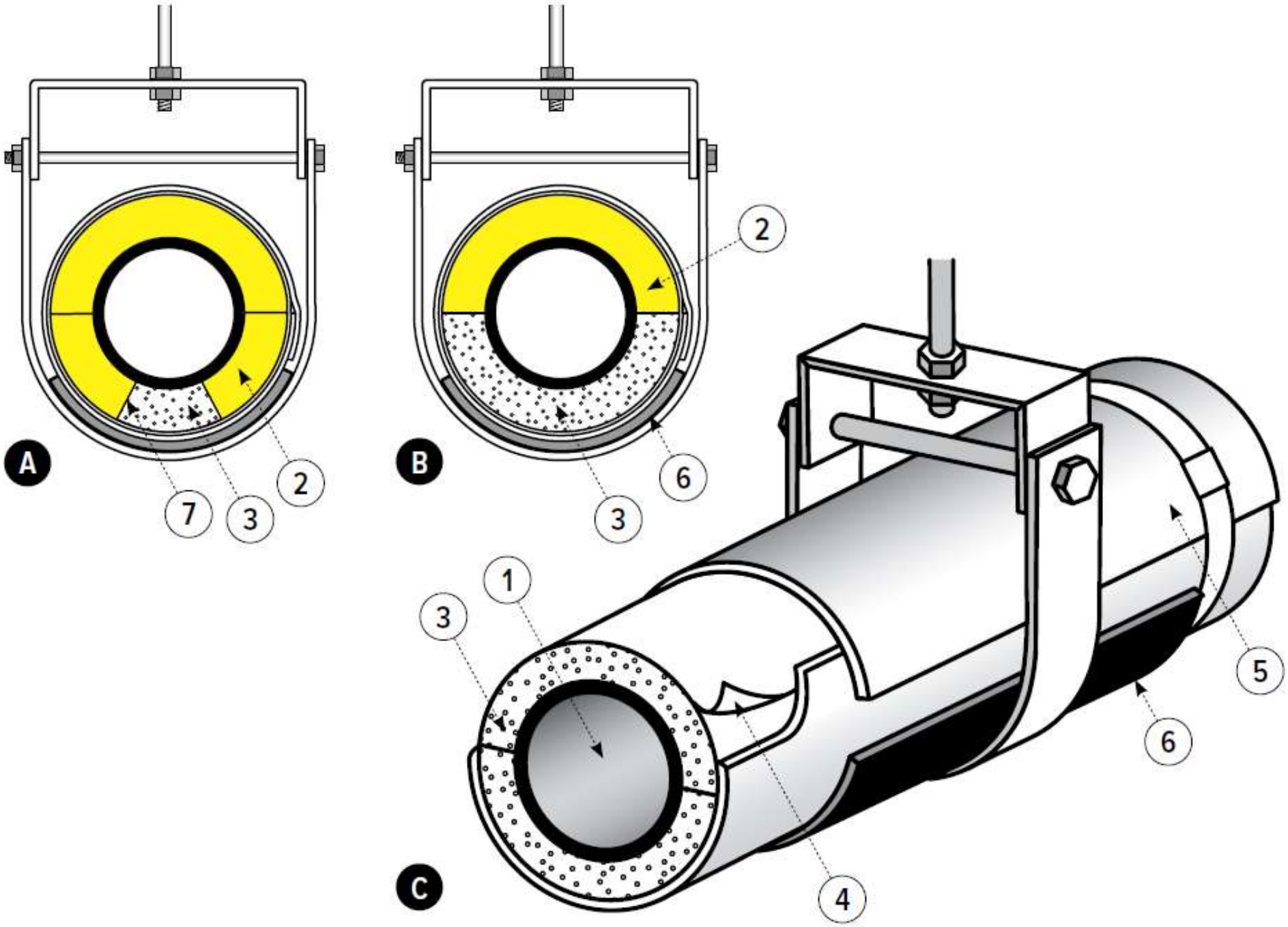
Pipe Shoe on Roller Support

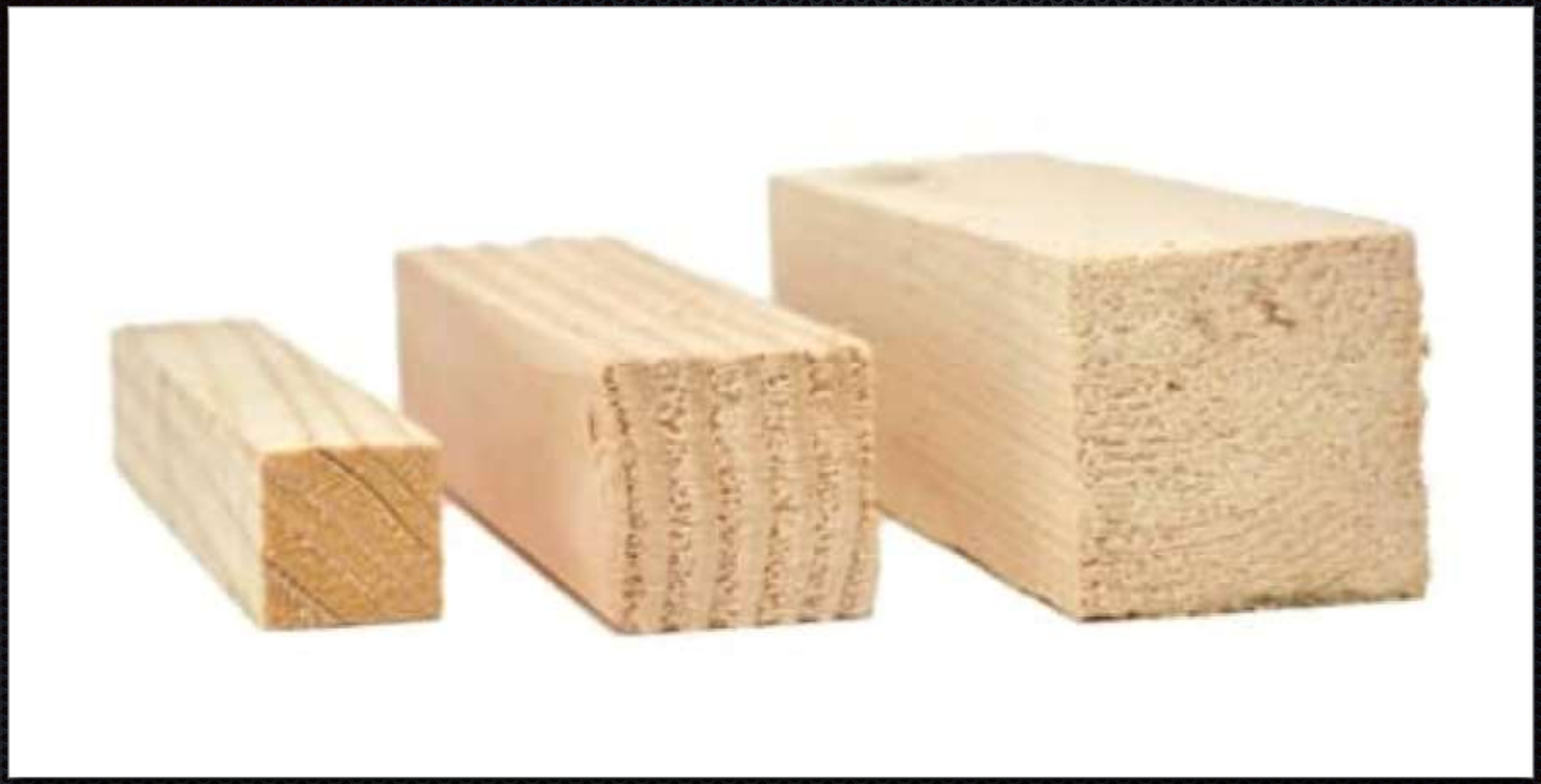


Metal Shoe Welded to Pipe on Roller

- Upper hemisphere insulated with fiberglass pipe cover
- Lower void between pipe and saddle filled by insulator with field fabricated fiberglass
- Thermal bridging from pipe to metal saddle overheated and warped PVC jacketing

Clevis Hanger – High Density Inserts





Wood Block Inserts

Installing Wood Block Inserts

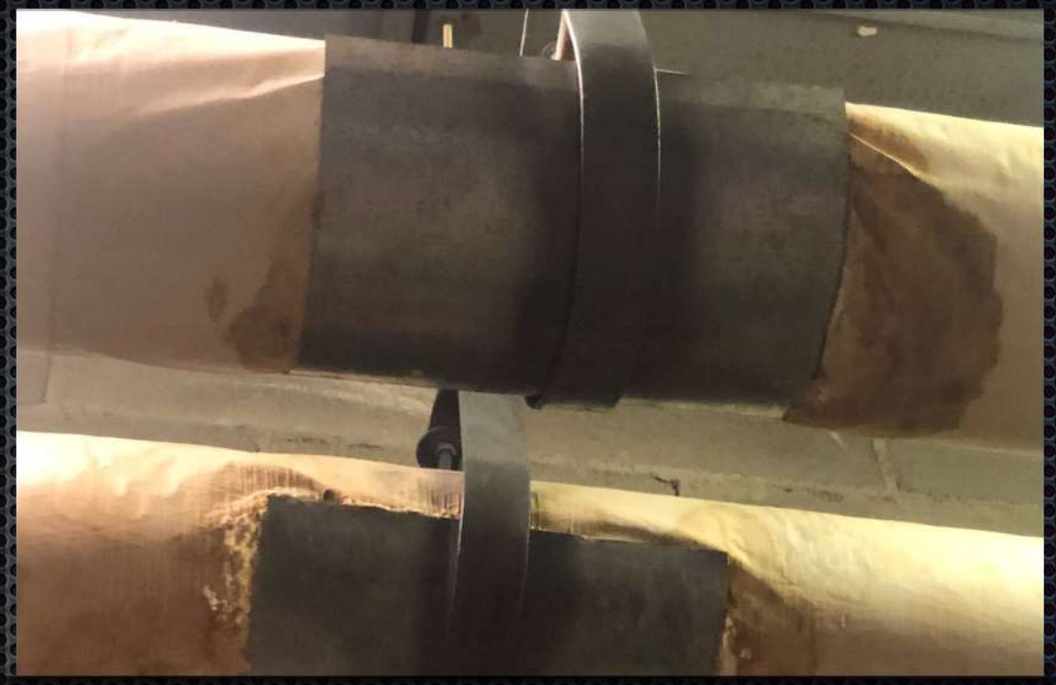
Fabricated by Insulation Contractor

Wood Block Inserts with Long Curved Metal Shields

- Common practice in many areas of North America
- High labor cost to notch fiberglass which risks perforating vapor retarder
- Increases time to insulate due to field adjusting of hangers which adversely effects pipe elevations

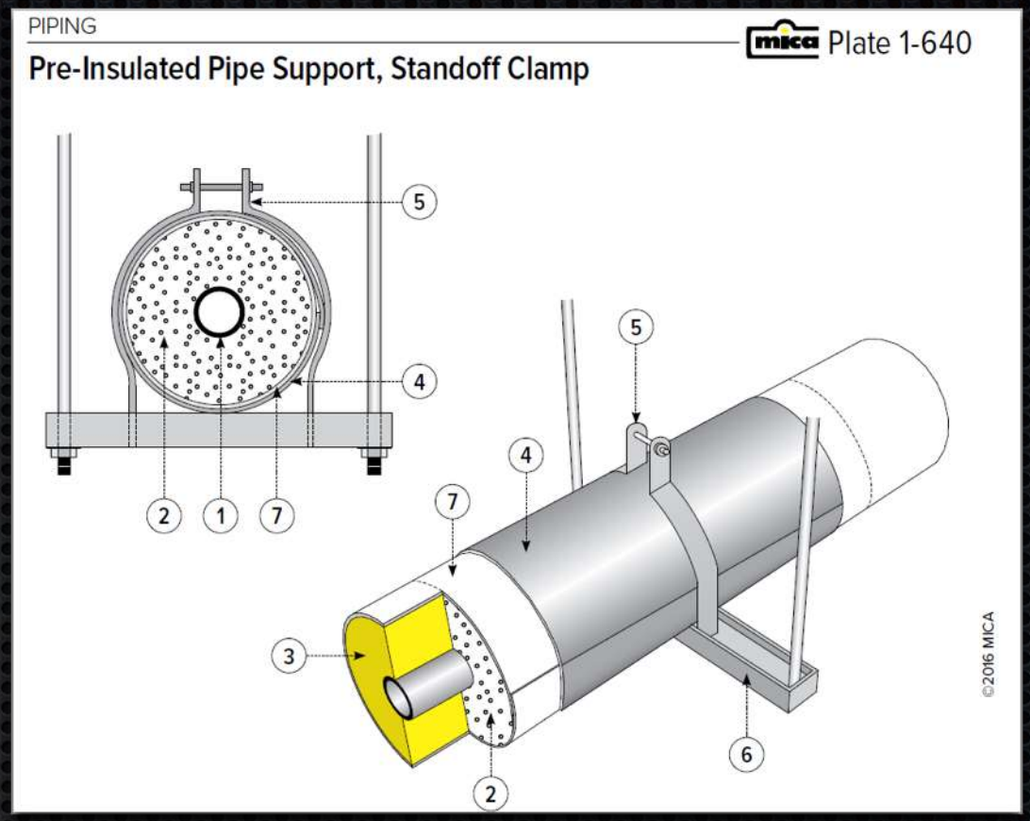
When Mechanical Contractor hangs perfect pipe elevations without insulated supports…

After Insulator has to loosen, lower and re-tighten nuts of every clevis hanger to notch fiberglass and install wood blocks… ;-)

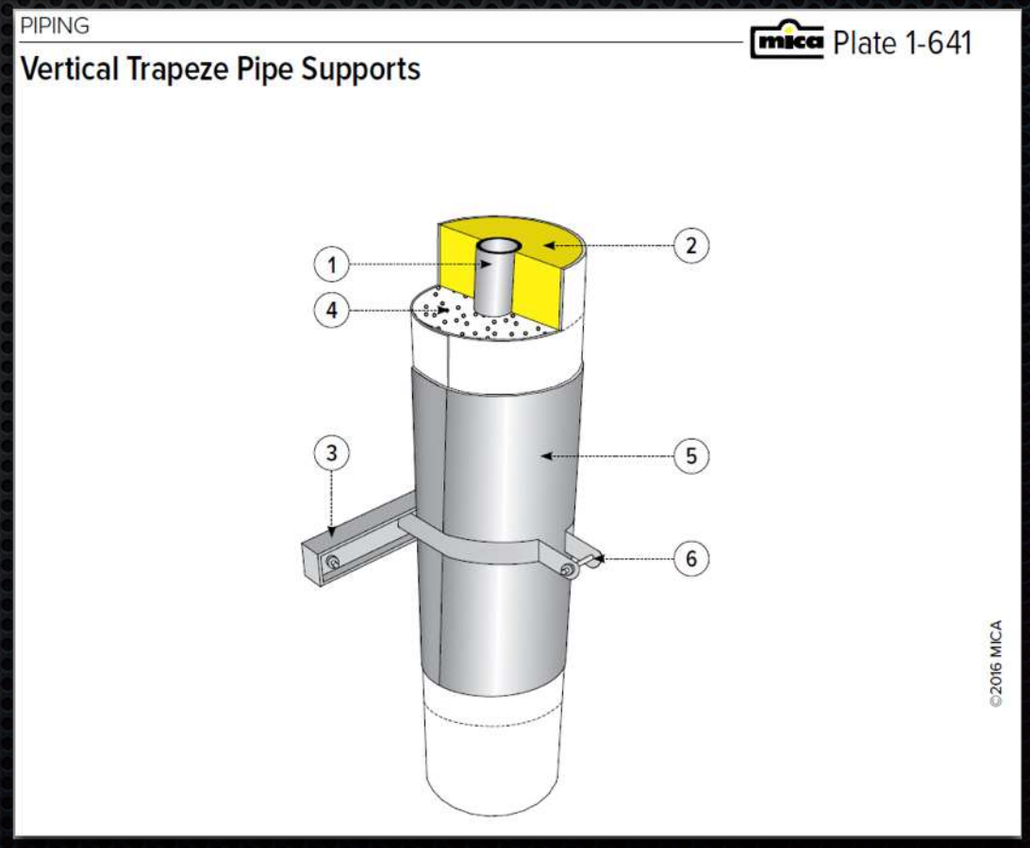


CHILLED WATER SYSTEM FAILURE

360° Inserts with Vapor Retarder: Universal Solution



- Use on all types of structural pipe clamps and clevis hangers
- Use on both above and below ambient piping systems



TPS Phenolic Foam Insert

- Thermoset: fire resistant
- 0°F - 210°F
- Low thermal conductivity
- 35 - 120 psi
- Factory laminated ASJ
- Typically 12-18” long

Advantages of Phenolic Foam Inserts

- Fabricated from block
- Lightweight (3-7 pcf)
- Moisture resistant
- Low cost
- Suitable for most commercial applications

Dual Density Phenolic Foam

Higher compressive strength bottom hemisphere
Lower density upper hemisphere to reduce cost

TPSX-12™ Calcium Silicate Insert

- Non-Combustible
- Highly water resistant
- 0°F - 1200°F
- 220+ psi
- Factory laminated ASJ
- Typically 12-18” long

“We stopped specifying calsil for commercial inserts a long time ago and would never consider calsil on chilled water lines due to high water absorption.”

– Anonymous Mechanical Engineer

Commercial Application for Calsil: Backup Generator Exhaust

Historical Reasons Cited to Stop Specifying Calcium Silicate

- Highly water absorbent
- Monopoly = High cost
- Damage in transit
- Maximum 6" iron pipe for 1" wall thickness (6 x 1)
- NO copper tubing size offerings over 1 5/8"

TPSX-12™
Calsil, only better…

- Much stronger
- More water resistant
- More size offerings
  - Copper tubing sizes
  - 1" wall for all sizes
- More cost effective

In a word - COMPETITION

- Incumbent
- Wet Molded
- Air bubbles/voids
- 100+ psi
- Limited water shedding ability

- TPSX-12™
- Filter Pressed
- Uniformly consistent
- 220+ psi
- Highly water resistant

MSS-SP 58 Allows for SHORTER

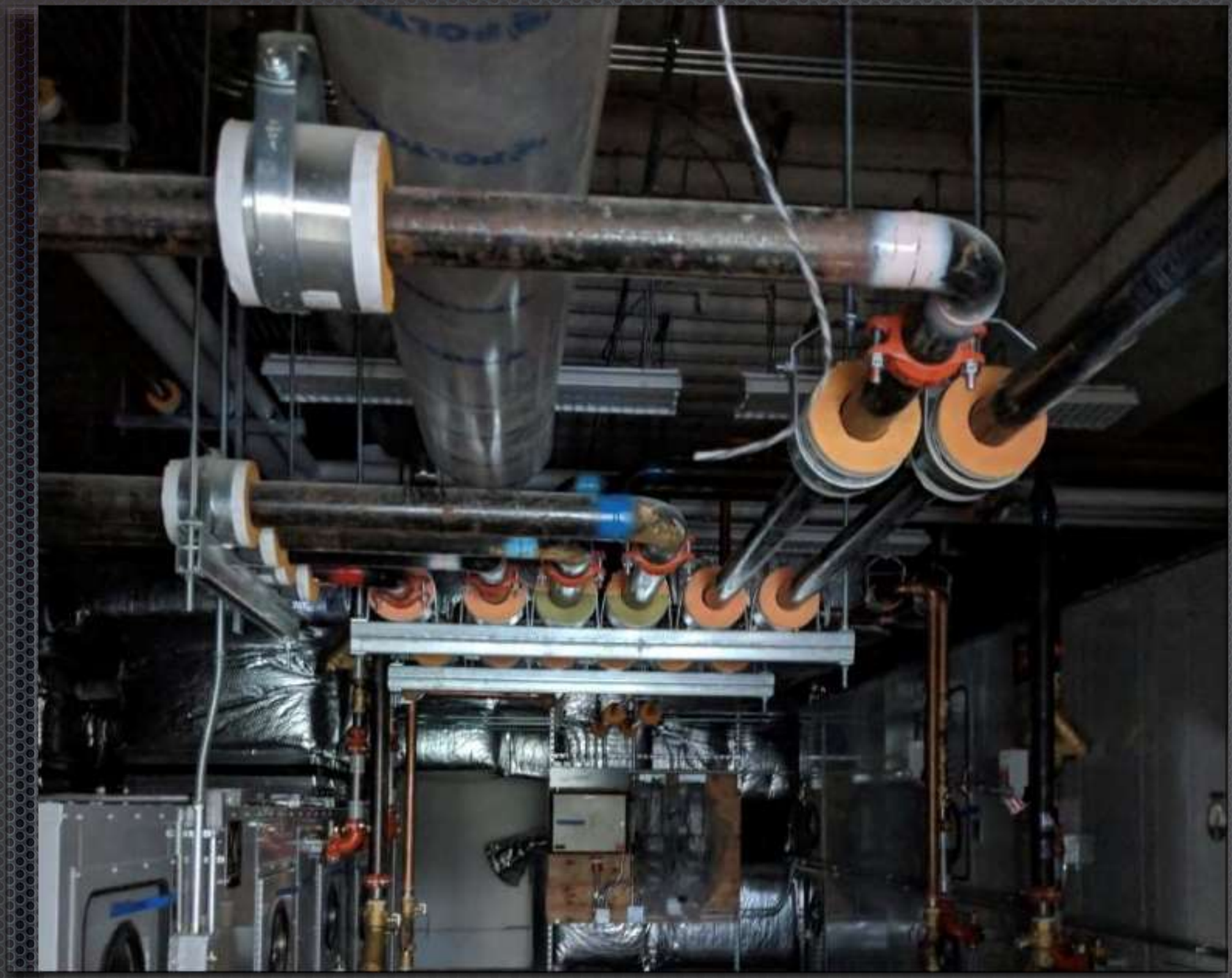
Inserts and thinner metal shields when using insulation with compressive strength > 15 psi

“Section 7.6.5 When pipe covering protection shields are used with high compressive strength inserts, the shield and thickness shall be appropriate for the compressive strength of the insert material.”

–MSS SP-58

25 PSI PIR Foam Failure

Compressive strength of insert must be engineered to support the pipe and fluid loads



INSTALLED BY MECHANICAL CONTRACTOR

F-1000

- Above ambient piping
- No vapor retarder
- Domestic hot water
- Hot water heating
- Rain water leaders
- Condensate drains

F-2000

- Above or below ambient
- ASJ vapor retarder
- Chilled water
- Domestic hot/cold
- Rain water leaders
- Condensate drains
- HVAC refrigeration piping

T-1000

- Above ambient piping
- No vapor retarder
- Hot water heating
- Condensate drains
- High pressure steam
- Generator exhaust

T-2000

- Above or below ambient
- ASJ vapor retarder
- Chilled water
- Domestic hot/cold
- Hot water heating
- Rain water leaders
- Condensate drains
- Low to high pressure steam

Nominal Pipe Diameter (Carbon Steel)	6.00	inches
Pipe Schedule	40	
Weight of Pipe per Linear Foot	18.990	lbs/LF
Pipe Outside Diameter	6.625	
Volume Capacity per Linear Foot	1.5008	gallon/LF
Type of Fluid in Pipe	Water	
Density of Fluid	8.34	lbs/gallon
Weight of Fluid per Linear Foot	12.5167	lbs/LF
Span Distance between Supports	10	feet
Insulation Thickness	3.0	inches
Insulation Density (nominal)	14.0	pcf (lbs/ft3)
Insulated Support Length	6	inches
Weight of Insulated Support	4.4157	lbs.
Compressive Strength of Insulation	220	psi
Design FOS	3	
Design Span Load	7.48	psi (lbs/in2)
Maximum Allowable Load per Insulated Support	17300.72	psi (lbs/in2)
Percentage Difference Safety Factor	199.83%	

The Math…
T-2000 Calsil Pipe Support
6" Pipe x 3" Thickness

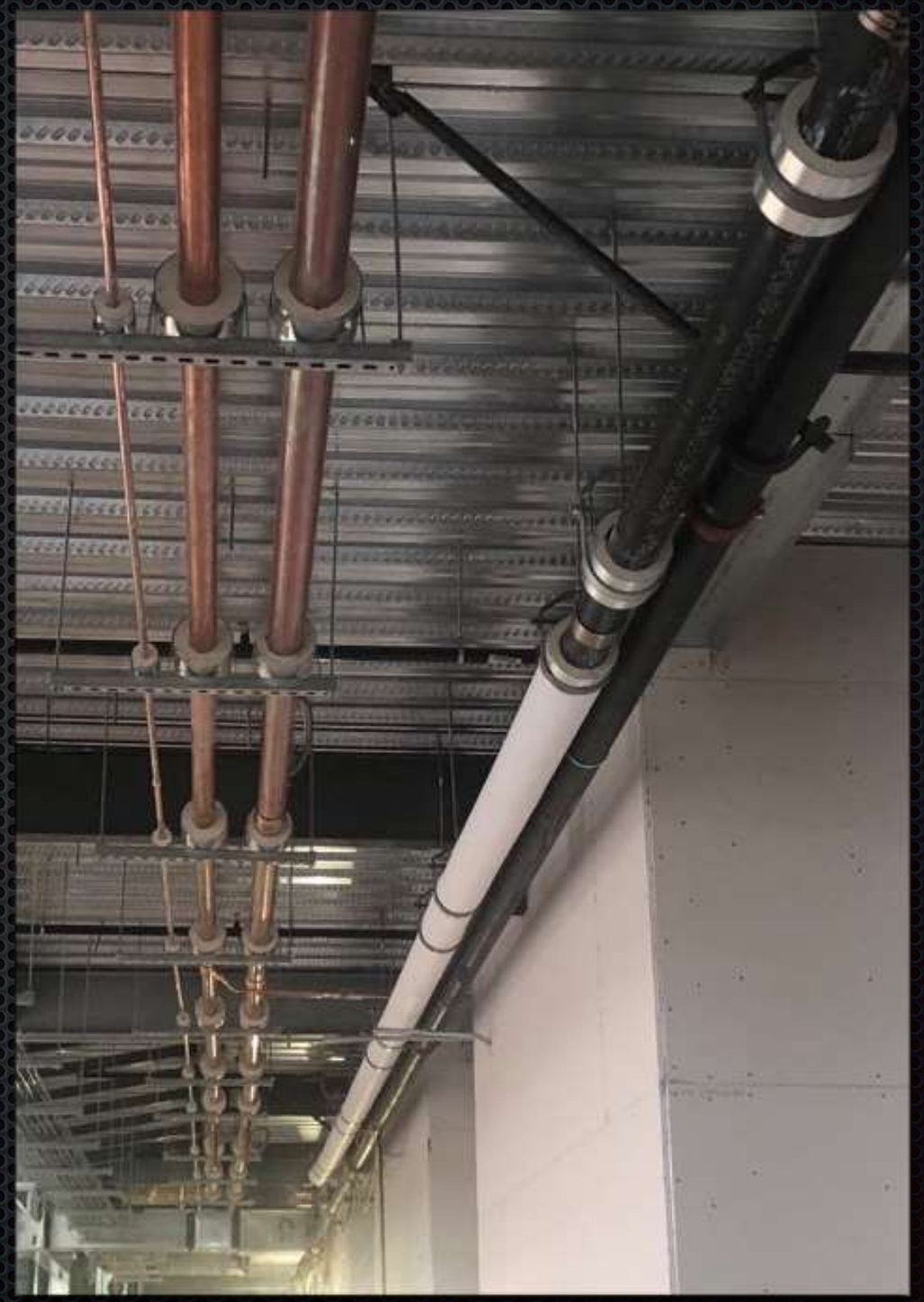
Actual COPPER Sizes!!

5/8" to 4 1/8"

1, 1 1/2 and 2" wall

Optimal Workflow

- Mechanical Engineer
  - Designs & specifies
- Mechanical Contractor
  - Installs during pipe installation scope
- Insulation Contractor
  - Insulates between supports without adjusting hanger elevations



Engineering Best Practices

- Understand MSS SP-58 does not allow the use of mineral fiber or any other insulation <15 psi WITHOUT a high strength insert passing through the structural pipe hanger.
- Specify high compressive strength inserts with factory laminated vapor retarder and 360 degree curved metal shields for both above and below ambient piping to be attached to any clevis hanger or Unistrut attachment.
- Water resistant Calcium Silicate or Phenolic Foam are appropriate inserts for most commercial building applications.
- Include installation of insulated pipe supports in the mechanical contractors scope of work to speed the insulation process.