WHITE PAPER

Danger Overhead

Correctly sized and properly installed pipe support systems may be the unsung heroes of plumbing, HVAC and refrigeration piping systems.

www.armacell.us

armacell®

MAKING A DIFFERENCE AROUND THE WORLD

WHITE PAPER

SUPPORTING PIPE SYSTEMS

An often-overlooked, but critical consideration for all plumbing, HVAC and refrigeration applications.

When installing and maintaining pipe systems, the right combination of insulation, vapor retarder, and support system minimizes energy loss, maintains the pipe's structural integrity, and keeps the pipe system in place. However, get even one component wrong, and you risk substandard system operation and/or expensive repairs. Of interest for this paper are pipe support, suspension, and mounting systems including the characteristics that will ensure the pipe system's best operation and avoid costly damage.

Pipe suspension and mounting

Pipe suspension and mounting systems aim to support the weight of a pipe by transmitting the load or forces to the adjacent structure. At the same time, these systems need to avoid damaging the pipe insulation at the contact points, especially during the severe linear movements that pipes can undergo due to thermal expansion and contraction.

Typical thermal expansion rates of copper tubing for refrigeration (per 100 ft):[1]

1" (high temp) to 2.5" (ultra-low temp)

To most, the support of pipes is a detail that goes unnoticed. However, in some larger installations such as supermarkets, pipe runs can be at least a mile (1.6 km) long, simultaneously introducing more potential failure points but also presenting an opportunity for the building owner to protect their investment by ensuring the use of appropriate supports.

Common pitfalls

For any pipe length, damaged or crushed insulation and pipes compromise energy delivery, counteracting the energy and cost savings from the installation of new, energy-efficient heating, air conditioning, or refrigeration equipment.

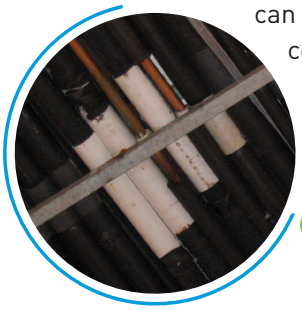
Potential issues include shifting/falling saddles, condensation and mold growth, freezing and thawing, refrigerant leaks, insulation tear-off, insulation that is crushed by the weight of the pipe at the contact points, and inefficient labor and material use.

With normal pipe movement and expansion, saddles can slip out of place, exposing the insulation to pressure and compression. Insulation compression is also possible with inappropriate saddle sizes.

1 Example of a shifted saddle as well as saddles that are too small

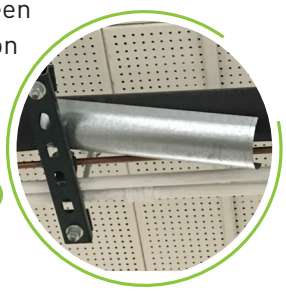
2 A pipe that has corroded due to excessive moisture exposure

(Image 1). For heating systems, BTUs are lost at the contact points. For all cold systems, condensation can cause moisture in the insulation, ice formation, and premature corrosion of the pipe inside the insulation (Image 2). Also, with some saddle systems, moisture can collect in the crevice between the support and pipe, increasing the likelihood of rust formation. When supports fail or fall, the insulated pipe run is no longer protected from friction at the support points (Image 3). This can tear the insulation leaving critical lines exposed. If these lines are inside a chase, the problem can go undetected causing condensation or water damage but also making mechanical systems underperform.



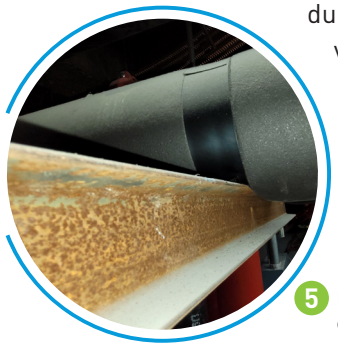
3 Insulation is damaged when pipe supports fail or slip

Unsecured saddles have even been known to fall from the suspension system, creating serious safety and liability concerns (Image 4).



Example of a saddle that has shifted from its location, with the potential to fall out 4

Insulation and/or vapor barrier damage also occurs from direct contact with a pipe support, particularly with the sharp edges of metal supports (Image 5), – crushing the insulation and creating friction during pipe expansion or vibration. When the pipe insulation is crushed or torn, thermal bridging can occur, negating the value of the insulation.



5 Pipe insulation that has been compromised by metal supports

Optimal characteristics

With some upfront planning and strategic equipment choices, these issues can be avoided. To be assured of the long-term efficiency, stability, and safety of pipe systems, look for the following pipe saddle and support characteristics:

// Saddles that offer extended support of the pipe system (minimum 12 in / 300 mm length)
// Integrated pipe supports that prevent the insulation from crushing or causing thermal bridging
// Ease of installation and maintenance
// Saddle attachment to any suspension or mounting system, regardless of size, including struts, steel angles, H-beams / I-beams, floor mounts, and Clevis hangers
// Saddles with curved design at both ends to prevent insulation damage due to pipe expansion
// Appropriate operating temperature ranges
// Compliance with building codes
// Datasheets and drawings from the manufacturer
// Tested according to ASTM E84/UL 723 standards for fire safety and ULC-S102.2

For aesthetic purposes, the following might also be important:

// Mechanical properties are not altered by painting
// Product maintains the appearance, cleanliness, and professionalism of standard pipe runs

Finally, proper installation is critical. Care should be taken to specify, size, install and support piping securely, but in a way that allows for natural pipe contraction and expansion. There are pipe saddle systems that achieve this and are faster to install.

Summary

A well-designed pipe suspension system protects the insulated pipe by spreading the load over a wider area, greatly reducing insulation compression from the combined pipe and fluid weight and prevents crushing or tearing of the insulation and/or vapor retarder caused by thermal linear expansion and vibration. Consider the product and installation characteristics during the planning phase of your pipe system to ensure a good design and avoid unwanted issues.

Armacell's ArmaFix® EcoLight pipe supports prevent the weight of the pipe from crushing the insulation at the contact points with a rigid PET core that also prevents thermal bridging. It easily marries up to ArmaFlex® elastomeric pipe insulation sizes. ArmaFix Insuguard and Insuguard Multi pipe saddles eliminate the need for tools, simply clicking in place to connect to any type of suspension system. Pipe movement is accommodated without compromising the insulation or displacing the saddle, with a design that includes rounded edges that curve away from the pipe at both ends.

Footnote 1: Copper Tube Handbook, www.copper.org

00166 | Insuguard | White Paper | 032024 | NA | EN-A | 857

ABOUT ARMACELL

As the inventor of flexible foam for equipment insulation and a leading provider of engineered foams, Armacell develops innovative and safe thermal and mechanical solutions that create sustainable value for its customers. Armacell's products significantly contribute to global energy efficiency making a difference around the world every day. With more than 3,300 employees and 25 production plants in 19 countries, the company operates two main businesses, Advanced Insulation and Engineered Foams. Armacell focuses on insulation materials for technical equipment, high-performance foams for acoustic and lightweight applications, recycled PET products, next-generation aerogel technology and passive fire protection systems.

armacell®

MAKING A DIFFERENCE AROUND THE WORLD

For more information, please visit:
www.armacell.us