

EPIC FAILS



FINGERS CROSSED (I HOPE IT HOLDS)

Pipe Supports are an often overlooked part of our ammonia refrigeration systems. Often, they are installed as an afterthought, often as cheaply as possible. Many times, they are made of materials that look like they are from someone's garage, or a quick run to the local home improvement store.

The International Institute for Ammonia Refrigeration (IAR) develops standards that are considered to be Recognized and Generally Accepted Good Engineering Practices (RAGAGEP) for the ammonia refrigeration industry. IAR2, the Standard for Safe Design of Closed Circuit Ammonia Refrigeration Systems, does, in fact, give us requirements for proper piping support. The requirements are found across three separate sections. Section 5.11 provides general requirements for equipment AND piping supports.

5.11 Foundations, Piping, Tubing, and Equipment Supports

5.11.1 General. Supports and anchorage for refrigeration equipment shall be designed in accordance with the Building Code.

5.11.2 Combustibility. Structural supports shall be noncombustible. Pressure-treated lumber and synthetic materials shall be permitted under structural supports to protect the roof.

5.11.3 Seismic Joints and Restraints. Seismic joints and restraints shall be provided as required by the Building Code.

5.11.4 Manufacturers' Recommendations and Expected Loads. Supports and foundations shall



IS THAT ROCK OR THAT PIECE OF LUMBER HOLDING UP THE PIPE SUITABLE TO HANDLE ALL ANTICIPATED LOADS?

meet or exceed the manufacturers' recommendations and shall be designed to carry expected loads.

5.11.5 **Vibration and Movement Resistance.**

Supports and foundations shall be designed to prevent excessive vibration or movement of piping, tubing, and equipment.

Section 6.2.2 details the pipe support requirements in the machinery room.

6.2.2 **Piping Supports.**

Where piping is supported by the floor, roof, or ceiling structure, the structure or foundation supporting the piping shall be designed to support the expected static and dynamic loads, including seismic loads. Foundations and supports shall be in accordance with the Building Code.

Both Section 5.11 and Section 6.2.2 speak of complying with the building code. While this varies location to location, in general, the building codes, including the International Mechanical Code and the Uniform Mechanical Code, set requirements for materials of construction, minimum spacing distances, and protection against impact.

Finally, in the piping chapter, support is addressed further.

13.4 ***Piping, Hangers, Supports, and Isolation**

13.4.1 *Piping hangers and supports shall carry the weight of the piping and any additional expected loads.

13.4.2 *Refrigerant piping shall be isolated and supported to prevent damage from vibration, stress, corrosion, and physical impact.

13.4.3 Threaded hot-rolled steel hanger rods shall be permitted. 13.4.4 Anchors, their attachment points, and attachment methods shall be designed to support applied loads.

13.4.5 Mechanically expanded concrete anchor bodies shall not be adjusted or axially spun after being set.

13.4.6 For insulated piping, supports shall be designed or the insulation shall be selected to avoid damage to the insulation from compression.

All three sections of IAR2 that deal with pipe supports, and the mechanical codes, require that the supports be designed to carry the weight of the piping AND any additional expected loads. These loads could be static loads from equipment, a person, ice, or

snow. They could also be dynamic loads due to wind or seismic activity. The key is that these design calculations need to be documented.

Section 13.4.6 in IAR2 stated that the supports must protect against compression of insulation. Most people think of insulation with PVC jacketing as being most susceptible to such compression damage, but the weight of carbon steel pipe pressing down on a pipe support will also cause insulation with aluminum jacketing to compressor without some means of additional protection, such as pipe saddles, which spread the load.

IAR6, the Standard for Inspection, Testing, and Maintenance (ITM) of Closed Circuit Ammonia Refrigeration Systems addressed pipe supports from the ITM standpoint. In the chapter on



pipng, the standard calls for the following annual inspections.

d) Visually inspect supports for cracks and degradation

e) Visually inspect mounting bolts are in place

f) Visually inspect piping for indications of movement

g) Visually inspect seismic joints and restraints

h) Visually inspect materials used under roof pipe stands for indications of degradation (e.g., bases or sleepers)

i) Visually inspect piping supports are in place and for indications of degradation that could impede their ability to provide continued support of the piping as designed

It goes on to call for the following annual pipe support maintenance.

Replace missing or broken hangers, hanger rods, and pipe support saddles

It should be noted that the EPA's document "Ammonia Refrigeration List of Key Safety Measures" that was developed in conjunction with IIAR includes, as one of its measures:

A preventative maintenance program is in place to, among other things, detect and control corrosion, deteriorated vapor barriers, ice buildup, and pipe hammering, and **to inspect integrity of equipment/pipe supports.**

This list was developed as a guide for facilities that are not subject to the Risk Management Program (RMP) requirements found in 40 CFR Part 68, but rather fall under the General Duty Clause of the Clean Air Act. However, this list serves as a good starting point for facilities with over 10,000

pounds of anhydrous ammonia in their refrigeration system to quickly evaluate their safety and compliance programs. It can be found at:

<https://www.epa.gov/sites/production/files/2018-05/documents/listofkeymeasurements.pdf>

If you have photos of an Epic Fail please pass them on to nh3isB2L@gmail.com.

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