

Cryoflex Expansion / Contraction Joints

Contraction / Vapor Joints are addressed in section 3.10 of the Cryoflex Ammonia Refrigeration Specification. The recommended detail is based on the Tyson approved detail.

Nomaco Insulation has had ongoing discussions about the practicality of current expansion / contraction joint designs. It is our opinion that there are no effective designs currently in use. Our opinion is based on a review of the existing designs as well as field observation of older insulation installations. The reasoning behind our opinion for both single and multi-layer installations is listed below.

Single Insulation Layer Systems

1. In a single layer system, the insulation is subject to fairly even shrinkage for every 3 foot length.
2. By definition, a single layer system will be used on piping systems that require lesser insulation thickness due to higher operating temperatures and will therefore have less shrinkage than the inner layer of a multi-layer system.
3. In a single layer system, all of the butt joints are sealed with a flexible sealant such as Childers CP-70.
4. Existing expansion / contraction joint designs require the use of 2 *layers* at the joint. Most contractors will not have this material available on site.
5. In creating a 2 layer system at the joint, the joint will be subject to compression and limited movement when installed under a metal jacket.
6. Further, the design will require the use of fiberglass insulation in direct contact with the pipe. This practice is best avoided on below ambient systems.
7. Specific to Cryoflex, on single layer systems we recommend the practice of *compression fitting* the Cryoflex insulation, adding the equivalent of approximately ¼ inch for every 3 foot length of Cryoflex to allow for contraction.

From a performance standpoint, we would recommend a multi-layer insulation system, allowing the inner layer to float freely (see below). We are cognizant of the cost implications of a multi versus single layer system, so this would ideally be specified by the engineer or end user.

Multi- Layer Insulation Systems

1. In multi-layer insulation applications, the inner layer is subject to significantly lower temperatures and, therefore significantly more shrinkage than the outer layer(s).
2. The inner layer of insulation is typically “dry fit”, leaving the 3 ft lengths of insulation to shrink independently of the adjoining sections.
3. Most joint systems require installation of 1 or 2 inch width of fiberglass (see additional comments below) which is then compressed to approximately ½ its original thickness.
4. The major flaw in this system is the belief that as the insulation contracts, the fiberglass will expand to fill the voids created by this contraction. This concept defies logic. Assuming a joint spacing of every 30 feet, the fiberglass would have to *expand with enough force to push*

gaps occurring every 3 feet over a nominal 30 foot length (15 foot on either side of the contraction joint, or 5 sections of insulation) closed. The possibility of this happening is non-existent.

5. In addition, the introduction of fiberglass into a below ambient system creates potential failure points as the fiberglass will absorb and hold moisture at every joint in the event that a vapor seal or the vapor barrier is breached.
6. In a multi-layer system, it is highly unlikely that the inner layer will be able to move freely due to many constraints: friction between layers, compression at pipe supports, restraint at socket welds and raised fillets, compression due to tightening of the metal jacket and rigid / fixed points such as at fittings.

Based on all of the above, it is our opinion that the ideal system is a multi-layer system in which the inner layer is dry fit and allowed to “float”. This will create dead air spaces every 3 feet which will act as insulation and not adversely affect the overall performance of the system. In order for this system to be effective, it is important to pay close attention to all vapor stops and to fully seal the outer layer of Cryoflex insulation. The use of a vapor barrier provides a secondary layer of protection against moisture intrusion.