Rubber Expansion Joints Provide Piping Flexibility

This component can compensate for misalignments up to 1/8 of an inch.

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Rubber expansion joints are used in piping installations to compensate for thermal growth, relieve piping stress during operation, and reduce vibration and noise caused by rotating equipment. While a rubber expansion joint can compensate for pipeline misalignment, this compliant product has installation and operational limitations. The best method for installing most piping products, including rubber expansion joints, is to follow standardized piping practices and use an installation tolerance of less than 1/8 inch (in.).

Using a rubber expansion joint when the piping misalignment will be more than 1/8 in., however, requires special considerations. One standard practice is to use a concurrent movement calculation to ensure that the installation of the product does not use too much of the joint's ability to compensate for movement.

The concurrent movement formula established by the Fluid Sealing Association's (FSA) Rubber Expansion Piping Division Edition 7.31 can help designers determine engineering needs and the allowable offset for piping installers. In addition, designers should write adequate construction notes for piping installers.

Concurrent movement is the combination of two or more expansion joint movements:

- Compression
- Elongation
- Lateral or transverse
- Angular
- Torsional

This value is expressed as the resultant movement. Equation 1 can be used to calculate concurrent movement.

$$1 \geq \frac{\Delta C}{RC} + \frac{\Delta E}{RE} + \frac{\Delta L}{RL} + \frac{\Delta T}{RT}$$

Equation 1

Where:
ΔC = change in compression
RC = rated compression
ΔE = change in elongation
RE = rated elongation
ΔL = change in lateral
RL = rated lateral
ΔT = change in torsional
RT = rated torsional

The concurrent movement formula is the sum of all the individual movements except for angular movement. When evaluating concurrent movements, angular movement is covered by compression and elongation.

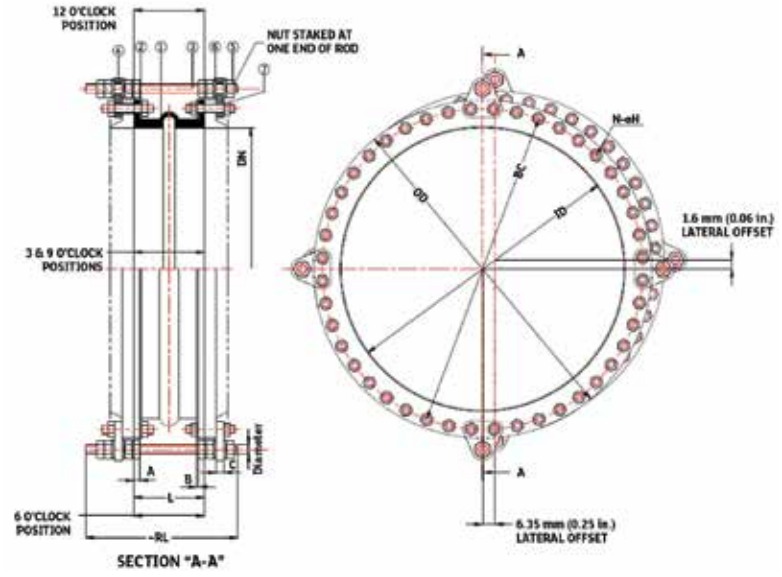

Figure 1. Expansion joint with built-in offset (*Courtesy of FSA*)

The sum of compression, elongation, lateral and torsional must be less than one. If not, the joint is operating outside the design intent and must be evaluated.

Sample calculation:
1 ≥ 2 in. / 4 in. + 0 in. / 2 in. + 0.75 in. / 1 in. + 0°/5°
1 ≥ .5 + 0 + 0.75 + 0
1 ≥ 1.25

In this example, the concurrent movement is above the allowable value.

For offset installations with piping misalignments that cannot be corrected because of limited space, cost or time, a rubber expansion joint can be fabricated to field dimensions to maintain 100 percent of the product's movement absorbing capability. While this is a viable option, it should be used as a last resort. Users are also advised to have a spare custom part on hand.

An expansion joint supplier will need correct dimensions of an offset from one side of pipe to the other, including parallel, angle and hole misalignment of mating flanges. Offset rubber expansion joints are often supplied with drilling on one flange so the other flange can be drilled in the field when precise measurements cannot be supplied.

When standard piping system installation tolerances using rubber expansion joints cannot be met, consider applying rubber expansion joints using a concurrent movement formula or having a built-in offset to stay within acceptable operating limits. ■

References:
1. Fluid Sealing Association - Technical Handbook – Piping Systems – Non-Metallic Expansion Joints 7.3 Edition

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