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SUBJECT: Use of Long-Radius Elbows in HVAC/R Applications

Mueller Streamline Co. always recommends the use of long-radius elbows in HVAC/R applications. The long-radius elbow is most equipped to handle to dynamics of refrigerant-bearing applications in three critical ways.

1. Long sweeps reduced pressure drop and less turbulence, which supports maximum flow rates of refrigerants in both the liquid and gaseous phases as well as oil return, where applicable.
2. Long sweeps effectively redirect flow as opposed to diverting it. Rapid directional changes, even in 45-degree elbows, result in residual stresses as fluids collide with the back wall of the fitting and put strain on the inside of the bend.
3. Long sweeps are able to absorb expansion and contraction forces as the radius can flex – however minutely – and minimize stress on the inside of the bend.

Intermediate-radius 90-degree elbows (available in select diameters only) provide some of these benefits while in a more compact footprint. Designers should consider the intensity of use and the criticality of the system when determining whether these elbows are sufficient for the application.

Short-radius 90-degree elbows are intended for plumbing and mechanical applications where the compact designs have proven reliable and effective with potable and non-potable water and gases at modest temperatures. These fittings should not be utilized in refrigerant-bearing systems due to the severity of temperature swings and are an especially poor choice for offsets to deal with expansion and contraction. There is no sweep to absorb those stresses, which can lead to fatigue failure when the inside radius is subjected thousands of cycles that act to subtly open and close the bend from less than 90 to more than 90 degrees.

For the same reason, Mueller recommends limited use of 45-degree elbows in HVAC/R applications. All 45-degree elbows are produced with a short-radius. While the degree of bend is less severe, there is no sweep to this design. Experience confirms that these fittings can be slightly more susceptible to fatigue failure in refrigerant-bearing applications. Where a 45-degree elbow is needed, the use is generally fine as long as expansion-contraction is appropriately addressed. However, use of two 45-degree elbows to mimic a long-radius 90 is strongly discouraged.