

A. Brazing Copper Tubing Better and Faster

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The plumbing, heating and air conditioning industries have used copper tube for fluid distribution for decades. Although much joining of copper tube is done using solder, much is also brazed. Refrigerants, cooling and heating water and compressed gasses are also piped in copper tube using brazed connections. Medical gas piping is joined by brazing or mechanically.

Although the industry does a lot of brazing of copper tube, fittings specifically designed for brazing are not readily available, and when they are, they are expensive. The result is that brazers struggle with the unwarranted and costly challenge of brazing using solder joint fittings that have cups that are significantly deeper than necessary. This presentation will examine options when using solder-joint fittings for making joints faster and easier to braze, consistently sound and reliable and reduce filler metal consumption while maintaining full strength through the joint.

Testing performed by the industry over many years and recently by the author shows that an overlap (socket depth) of two times the thickness of the tube ($2t$) is more than adequate when joining copper using common BCuP and BAg type fillers. Data also shows that excessive overlap not only costs more in time and materials, but that leaks are more common as the socket depth increases.

Braze joint fittings are available, but these present some risk to the installer and the manufacturer if they are inadvertently joined by soldering rather than brazing. Other options include costly mechanical trimming of solder joint fittings and local deformation of the cup wall to reduce the depth of insertion and control alignment. Any method that is used to reduce the depth of insertion should be shown to be adequate by procedure qualification testing using the minimum depth of insertion to be used in production.