Soldering New Composition Low Lead Valves

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Background

The Reduction of Lead in Drinking Water Act was enacted in 2011 to amend the current Safe Drinking Water Act. New requirements became effective 1/4/14 and included was a provision to further reduce the maximum lead content of wetted surfaces of plumbing products. To comply many valve manufacturers developed different low lead alloy compositions.

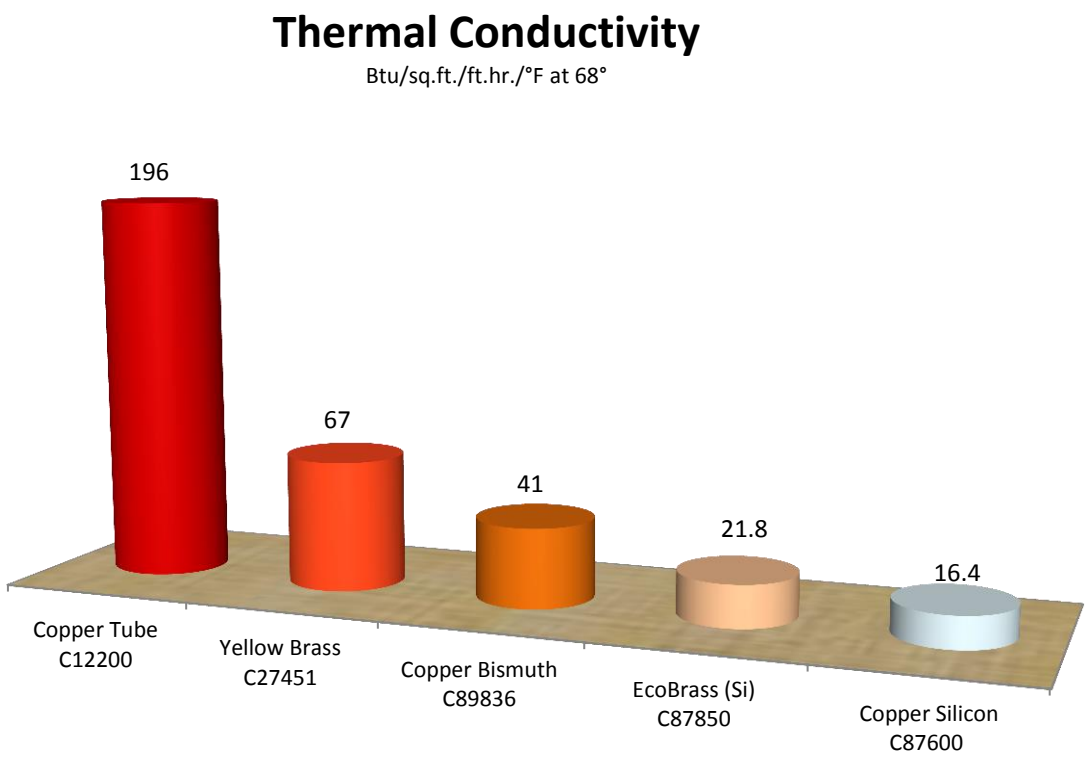
While there are several low lead alloys, popular new cast valve compositions are typically UNS copper alloy numbers C89836 or C87850.

- C89836 is a copper based alloy with approximately 89% copper, 5% tin, 3% zinc, and 2.5 % bismuth.
- C87850 ingot, (C69300 rod), is a copper based alloy containing approximately 76% copper, 21% zinc, and 3% silicon. This composition is sometimes referred to as “Eco Brass®”.

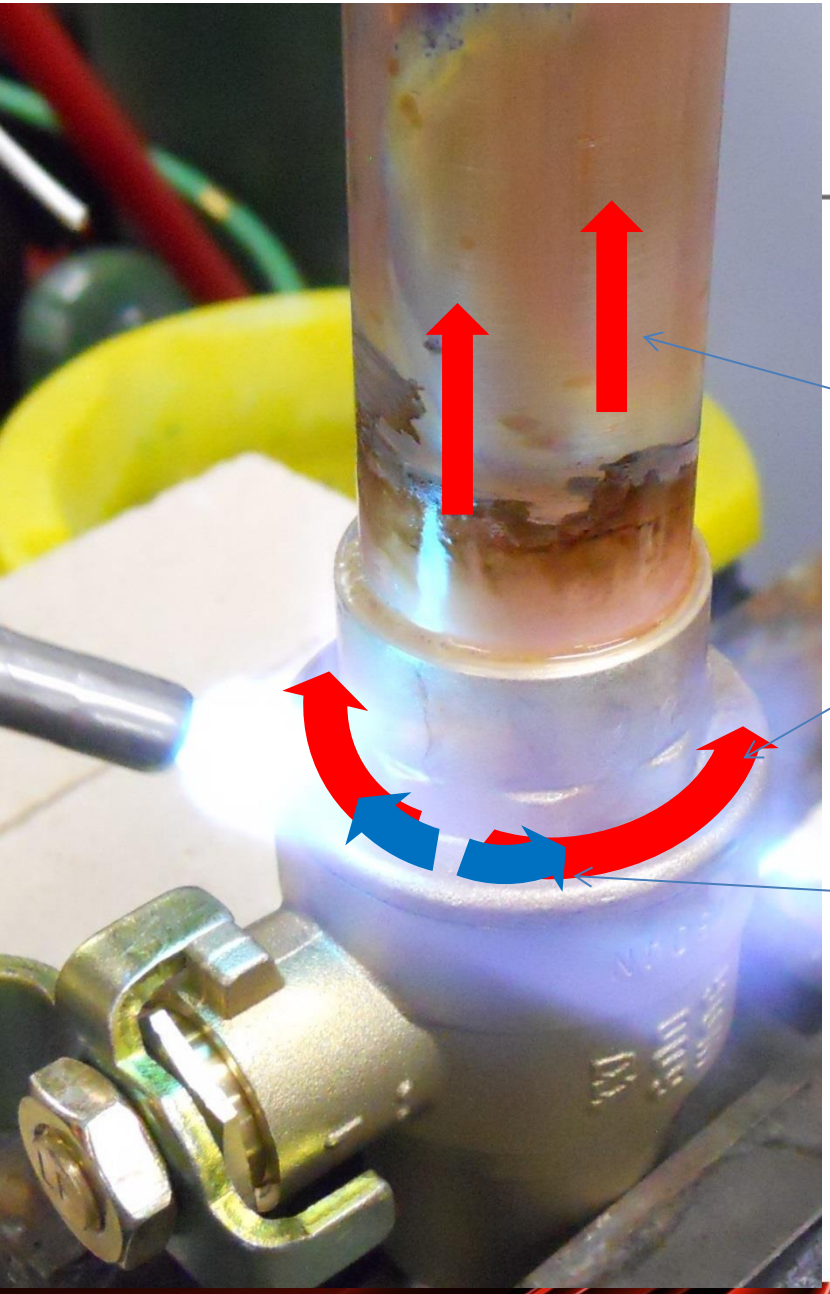
Lower thermal conductivity

- The new valve alloy compositions can be successfully soldered but require attention to several details.

The low lead compositions have reduced thermal conductivity. This means heat will not spread as rapidly through the metal. In the graph compare the heat conduction of several new compositions to each other, and to copper. Older valves conducted heat more like yellow brass. Notice the new EcoBrass® with silicon has only 1/3 this conductivity.



Conductivity affects heating



High conductivity copper tube always pulls heat away from the joint.

Heat flow pattern with previous brass valves.

Reduced heat flow pattern with new low lead brass valves.

Steps to take

- Clean thoroughly before soldering, (silicon containing valves have a more tenacious surface oxide that needs to be removed).
- Apply flux evenly to all surfaces to be soldered.
- Heat all the way around the tube to conduct heat inside and offset the heat being pulled away by the more conductive copper tube.
- Heat around the valve,(not just one area). This will ensure the entire valve body reaches sufficient temperature.
- Apply solder when parts are at soldering temperature. Solder should melt and flow. Avoid simply melting solder with the torch flame.
- Practice soldering in the shop and conduct a peel test to inspect.
- *The following slides illustrate this approach.*

Soldering recommendations

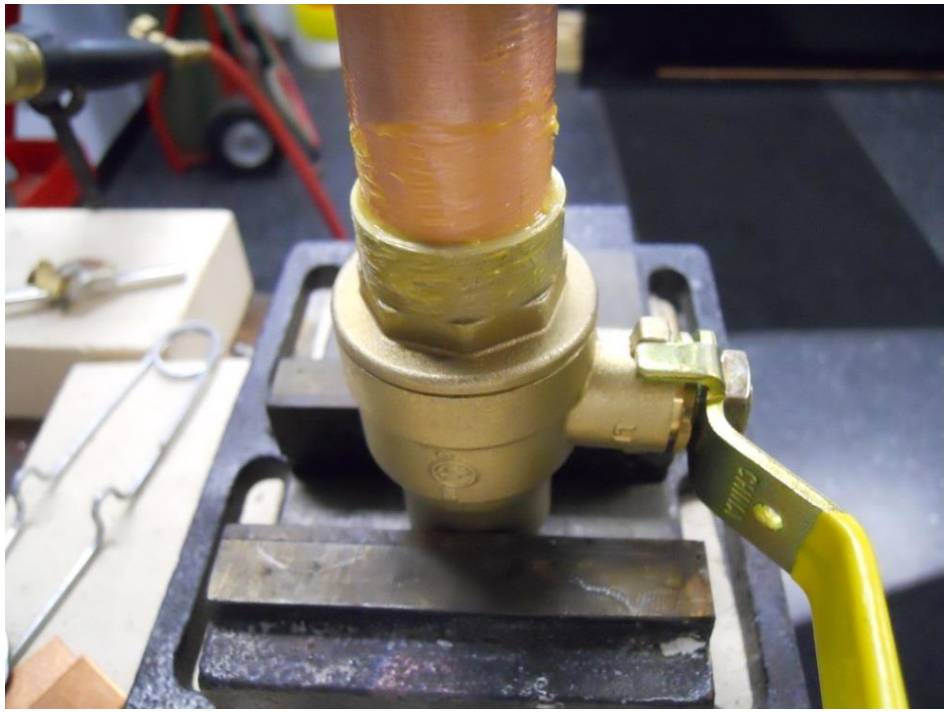
- Harris Inferno® air- acetylene torch.
- Harris Bridgit ® lead-free, (ASTM B32, NSF-ANSI 61/372), solder.
- Harris Bridgit ® “water soluble flux, (ASTM B813).

Clean parts

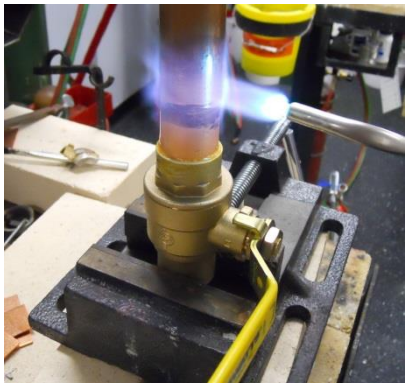
- Deburr tube. Thoroughly clean valve ID and OD and tube OD with Scotch Brite® or wire brush.

Flux parts

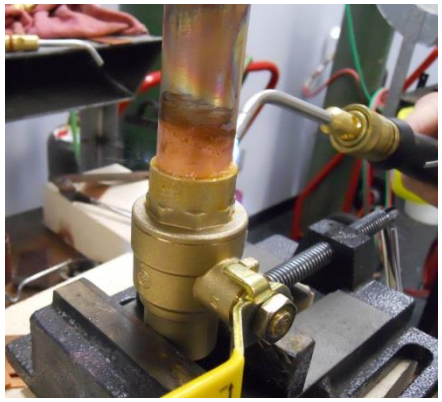
- Apply flux to valve ID and tube OD.
- Brush flux around outside to protect during heating.

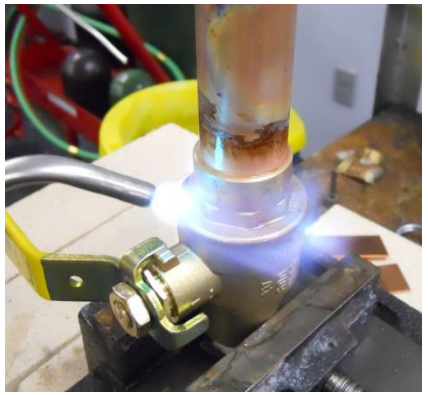


Heating technique

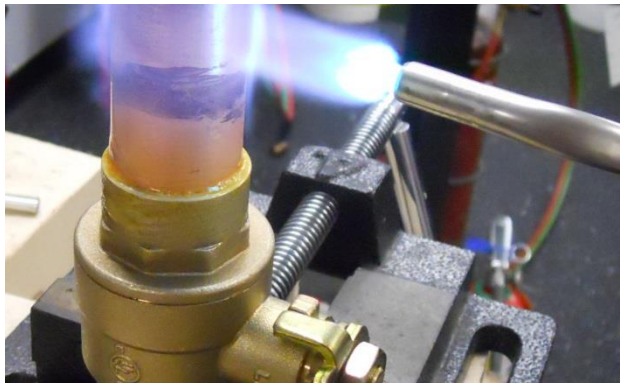


1 Heat around tube to conduct heat inside valve body.





2 Heat valve – *move torch to heat all sides of valve*. Begin heating away from the fluxed area to preheat the part. Then direct the flame to the to where you'll apply solder.



3 Remember to keep heat into the copper tube – this becomes more important as tube diameter increases.

4 To ensure good penetration : (a) Watch for solder to melt when applied . It should flow into the joint . If it just lays on top the parts aren't at the correct temperature. (b) Direct flame to valve base to pull solder into the joint.

Section & peel tests

- Full solder penetration and coverage.