Tips on the Art of Soldering Architectural Metals

By James Agans, RRC

WHILE TRADITIONAL METALS SUCH AS COPPER, LEAD-COATED COPPER AND LEAD HAVE GENERALLY given way to contemporary metals such as painted aluminum and steel in metal roofing systems, there is no substitute for solderable materials where difficult transitions take place. Accessory metal for bituminous roofing systems must be corrosion-resistant, malleable, and solderable. These are necessary attributes of a metal used for scuppers, conductor heads, pipe sleeves, and gussets, where immersion in water is likely.

Unfortunately, the number of craftsman who know the proper techniques to join the traditional metals is dwindling. Prior to a recent Region I meeting, I was fortunate to sit down with Ed Wright of Citiroof Corporation. Ed is a real artisan, and he took his time to pass some family secrets on to me.

While some of the secrets passed down from generation to generation— such as the "Pfffffft!" sound made when an iron is plunged into flux—cannot be properly conveyed here, I have assembled (with incessant prompting from Rick Wagner, our new director and long-time friend), some information which I hope is helpful.

Solder

Most soldering of architectural metal is done with 50/50 lead/tin solder. One-pound bars are recommended, as they do not soften and bend when trying to hold the work in place.

Soldering Coppers

Soldering irons or "coppers" are used to join copper, lead-coated copper, stainless steel, galvanized steel and lead. Today, most artisans prefer 3-4 lb. coppers for ease of use. Heavier irons of five pounds or more were used in the past when heating was done with charcoal pots and turn-around time to heat the irons was longer. Their use today is limited to those times when thicker metals are specified. Propane-fired equipment allows quick heating of the coppers for production-oriented soldering, and charcoal pots have, for the most part, become a thing of the past. For most work, blunt coppers are used (these look like a pyramid when viewed on end, looking at the tip). The accompanying chart shows which irons should be used with a particular type and thickness of material.

Tinning of Coppers

Tinning of coppers is done with a block of Sal Ammoniac (ammonium chloride) and 50/50 solder. Before a soldering iron can be used, one or more faces of its tip must be filed smooth and coated with solder or "tinned." For most work, the iron should be tinned on all four faces. For work where the iron is held under the object to be soldered, only one face should be tinned—the face to be held against the object. If all four sides were tinned from the top of the iron, solder would flow down the sides and drip off the bottom. Untinned sides will prevent the flow of solder.

Ed Wright of Citiroof Corporation demonstrates techniques and provides insights for soldering various types of metal at a recent Region I meeting of RCI.

Tinning of Iron

Follow these steps:

1. File the tip faces bright while the iron is hot (faces can be prepared cold, but it is more difficult).
2. Heat copper over burner. As the iron heats, rub Sal Ammoniac block over the tip faces every 10 to 20 seconds, followed by solder. As soon as the iron is hot enough, the solder will spread smoothly and evenly over the faces. The purpose of this repeated fluxing is to continuously coat the copper, preventing oxidation from occurring on the face, which would prevent tinning.
3. As soon as the tinning is completed, wipe the tip with a soft cloth while the solder is still molten. This will expose a mirror-like layer of solder on the tip faces.

Cleaning

The key to successful soldering is absolute cleanliness. Surfaces to be soldered must be cleaned prior to fluxing. The degree of cleaning necessary depends on the condition of the metal to be joined. Bright new copper may only need to be

fluxed, whereas oxidized metal must be mechanically cleaned. Mechanical cleaning can be done with emory cloth, wire wheel or brush. Do not use sandpaper, as the resin used in its production can contaminate the surfaces to be joined, preventing proper tinning.

Two containers of flux are recommended: one container for dipping the coppers in to clean them during the soldering process, and one with the specific type of flux for the metal being soldered. A milder flux can and should be used to clean the irons. This reduces acidic breakdown of the coppers. Another benefit of this procedure is that it keeps the chance of contamination for the flux used to coat the joint to a minimum. For instance, when soldering stainless steel, M-A Flux is required to clean the surfaces to be joined, but the coppers can be cleaned in Rubyfluid. Since Rubyfluid is pink, and M-A Flux is clear, the chance for contamination is minimized.

Material Being Soldered	Weight of Material	Weight of Each Iron (Copper)	Flux
Copper and lead-coated copper	16 > 20 oz./sq. ft.	3-4 lb.	Rubyfluid or M-A flux
	24 > 32 oz./sq. ft.	5-6 lb.	M-A flux
Galvanized steel	26 > 24 gage	3-4 lb.	20% muriatic acid
	22 > gage	5-6 lb.	20% muriatic acid
Stainless steel	26 gage .018"> 22 gage .032"	3-4 lb.	M-A flux
Lead	3 > 4 lb./sq. ft.	3-4 lb.	M-A flux

Joining Specific Materials

COPPER

1. Flux with Rubyfluid™ or M-A Flux™.
2. Tin all surfaces to be joined on both sides at least 1-1/2 inches. (For gutter laps, tin 2-1/2 inches.) Tinning is not required on lead-coated copper up to 20 oz. per square foot, but it must be thoroughly cleaned and fluxed. Lead-coated copper over 20 oz. should be tinned.
3. Prior to riveting, tin all surfaces to be joined on both sides at least 2-1/2 inches. Install rivets in two rows, not more than 2 inches apart, staggered.
4. Rivets to join copper must be of copper, brass or bronze with copper or brass mandrel. Install rivets in two rows, not more than 2 inches apart, staggered. (Steel mandrels will not tin and will rust out.)
5. Solder from "wet" side (i.e., inside gutter), allowing solder to flow into joint and rivets.
6. Solder flat, or down-hand, whenever possible.
7. Rinse work copiously with water after it reaches ambient temperature.

GALVANIZED STEEL

1. Flux with 20% muriatic (hydrochloric) acid.
2. Wear NIOSH-approved acid gas respirator in confined areas.
3. Prior to riveting, tin all surfaces to be joined on both sides at least 2-1/2 inches. Install rivets in two rows, not more than 2 inches apart, staggered.
4. Rivets to join galvanized steel must be zinc-plated with steel mandrels. (Do not use stainless rivets with galvanized steel.)
5. Solder from "wet" side (i.e., inside gutter), allowing solder to flow into joint and rivets.
6. Solder flat, or down-hand, whenever possible.
7. Rinse work copiously with water after it reaches ambient temperature.

STAINLESS STEEL

1. Flux with M-A Flux™.
2. Prior to riveting, tin all surfaces to be joined on both sides at least 2-1/2 inches. Install rivets in two rows, not more than 2 inches apart, staggered.
3. Rivets to join stainless steel must be stainless with stainless mandrels.
4. Solder from "wet" side (i.e., inside gutter) allowing solder to flow into joint and rivets.
5. Solder flat, or down-hand, whenever possible.
6. Keep a container of water handy to cool the joint as you solder; stainless holds heat for a long time.
7. Rinse work copiously with water after it reaches ambient temperatures.

LEAD

1. Flux with M-A Flux ™.
2. Prior to soldering, wire wheel or brush surfaces to be joined on both sides at least 2-1/2 inches.
3. Solder from "wet" side whenever possible, allowing solder to flow into joint.
4. Solder flat, or downhand, whenever possible.
5. Rinse work copiously with water after it reaches ambient temperature.

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About The Author

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