Phosphorus/Copper Brazing Alloys

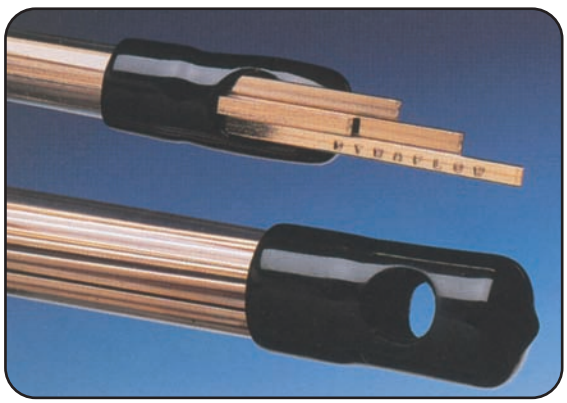
- Harris O
- Stay-Silv 5 and Stay-Silv 6
- Dynaflow
- Stay-Silv 15

J.W. Harris brazing alloys are the cleanest and brightest, free of oxide and surface impurities. Other brazing alloys just don't meet Harris standards. Compare our alloys with others -- you can see the difference. Harris alloys are pure and shiny, and the purity runs all the way through the rod. What a huge difference purity makes in the integrity of your brazed joint.

Leaks are caused by oxide and impurities -- CONTAMINATION -- that enter the joint in the molten metal of an impure brazing alloy and impede the brazing alloy flow. Wherever there is contamination, the alloy flows around it, leaving pinholes in the joint. These pinholes are tiny doors which allow refrigerant gas to leak out. Leaks are expensive -- the serviceman has to return to the job to rebraze the joint and must refill the expensive refrigerant that was lost from the leaks.

When properly brazed, the biggest difference between a Harris joint and a joint brazed with another brand is reliability. You won't find a more dependable brazing alloy, because you won't find a cleaner one.

J.W. Harris produces the highest quality phosphorus/copper brazing rod in the world. The proprietary production technology Harris developed to manufacture these alloys is still unique today. The alloys' phosphorus content is controlled to ±1/10 of one percent, a tolerance five times tighter than industry requires. This results in a guaranteed liquidus temperature of ±6°F/±3.3°C. Such tight control means absolute consistency in application and performance with every rod, every batch.



Phos/copper and silver/phos/copper alloys are used to braze copper to copper and copper to brass. The phosphorus content in these alloys makes them self-fluxing on copper. When brazing brass or copper to brass, use Stay-Silv white brazing flux. These alloys are not recommended for brazing steel or other ferrous metals.

Harris O: Low-cost alloy for many copper-to-copper applications where good fit-up can be maintained and brazing temperature is not critical.

Stay-Silv 5 and Stay-Silv 6: Medium-range alloys; Stay-Silv 5 is useful primarily where fit-up can not be tightly controlled. Stay-Silv 6 is slightly more fluid and can be used where closer tolerances are available. Both alloys are somewhat more ductile than Harris O.

Dynaflow: Premium, medium-range silver alloy, formulated to even tighter specifications than the Stay-Silv alloys to mirror the performance characteristics of the 15% silver brazing filler metals. Excellent for brazing both tight and poorly-fitted connections, Dynaflow's proven reliability and acceptance by field service engineers has made it the leading choice of brazing operators.

Stay-Silv 15: For many years, the industry standard for air conditioning/refrigeration applications. Still widely used but now often replaced by Dynaflow in many AC/R applications.

Alloy	Silver%	Phos% °F/°C	Melting Range		Fluidity Rating* A5.8	Specifications				
			Solidus °F/°C	Liquidus		AWS	FED QQB650C	DIN 8513	BS1845	Recommended Joint Clearance
Harris O	0	7.1	1310 / 710	1475 / 802	5	BCuP-2	BCuP-2	LCuP-7	--	.002 / .005"
Stay-Silv®2	2	7.0	1190 /643	1450 / 788	4	BCuP-6	--	--	CP2	.002 / .005"
Stay-Silv 5	5	6.0	1190 /643	1500 / 816	3	BCuP-3	BCuP-3	--	CP104	.002 / .006"
Stay-Silv 6	6	6.5	1190 /643	1425 / 774	5	--	--	--	--	.002 / .005"
Dynaflow®	6	6.1	1190 /643	1465 / 796	3	--	--	--	--	.002 / .006"
Stay-Silv 15	15	5.0	1190 /643	1480 / 804	3	BCuP-5	BCuP-5	--	CP1	.002 / .006"
L-CuP6	0	6.5	1310 / 710	1545 / 841	4	--	--	--	CP6	.002 / .006"
L-Ag2P	2	6.5	1190 /643	1515 / 824	3	--	--	L-Ag2P	CP2	.002 / .006"
L-Ag5P	5	6.3	1190 /643	1465 / 796	4	--	--	L-Ag5P	CP4	.002 / .005"
L-Ag15P	15	5.4	1190 /643	1435 / 779	4	--	--	L-Ag15P	CP1	.002 / .005"

*The higher the fluidity rating, the faster the alloy flows within the melting range.

Blockade Tubes

What is Silicon Brazing?

Blockade Product Information

Silicon brazing alloys offer significant advantages over phos/copper and silver/phos/copper (BCuP) brazing alloys and present important differences in the brazing of copper and its alloys. The addition of silicon effects such noticeable changes as:

- Outstanding ability to form a large shoulder, or cap, at the braze connection
- Distinct, favorable color changes in the finished braze alloy
- Improved ductility over non-silver-bearing BCuP-2 braze alloys
- Easily brazes brass and brass alloys without the addition of silver
- Significantly reduces brazing temperatures compared to BCuP braze alloys

Silicon Brazing Alloys

The majority of copper return bend brazing in air conditioning coils is performed with BCuP-2 phosphorus/copper brazing alloys. Most OEM's use very high-phosphorus-content alloys in the range of 7.3 to 7.6% to promote faster and lower melting temperatures which effect efficiency and prevent overheating of the copper. While these alloys flow and braze very readily, they also flow very thinly with a near water-like consistency when molten. The braze material flows quickly into the capillary area between the tube and fitting affording little or no shoulder or cap to form.

While penetration into the capillary is very good, it is extremely difficult to visually observe the finished braze and determine if the braze is complete and leak-proof. When brazing with rod by hand, the operator may observe that the braze alloy flows well into the joint area and, by experience, believe the connection to be sound, but he cannot be sure. To make his job more difficult, all of the BCuP braze alloys turn the area of both the braze and the adjacent copper tube a heavy black color caused by oxide formation. The multitude of brazes required to be made daily plus limited available lighting make visual inspection on the factory floor very difficult.

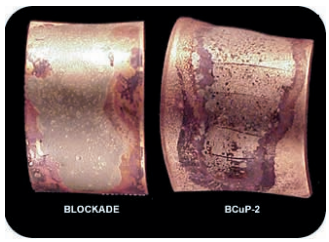
Necessary extensive testing of brazed coils and resulting leaks that must be reworked are of great concern to many OEM's. Some manufacturers use large quantities of BCuP alloys containing from 5 to 15% silver to counter leak problems. The silver alloys flow in a thicker consistency, and they are more ductile due to their lower phosphorus content. Their thickness causes a noticeable cap to form around the brazed connection - a "seal" that is visible to the operator.

Having brazing alloy flow into the capillary area offers no assurance of an absolute seal between the parts joined. At some point, either within the capillary area or at the junction of the two parts to be joined, there must be a continuous seal. Since we cannot see into the capillary area, it follows that a shoulder or cap can be of considerable assistance for leak-free brazing. This is where silicon brazing alloys make a huge difference - their outstanding ability to form a large shoulder at the braze connection is an instant visual confirmation to the operator that his braze will not leak.

Blockade Tubes

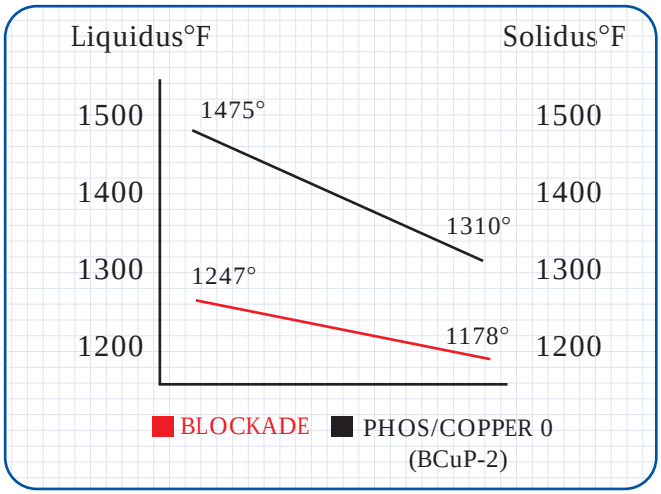
Brass
Flux-coated BLOCKADE brazes copper to brass and brass to brass. Brazes are very strong and ductile. Should extra flux be needed, use white or black silver brazing flux.

Ductility
BLOCKADE is ductile. The copper plates at the right were brazed, water-cooled and bent 90°. BLOCKADE remained smooth while the phos-copper braze (BCuP-2) shows severe cracking.



Low Temperature
228°F reduced heat makes brazes FAST.

Procedure
Heat and braze in a normal manner. Always use excellent ventillation, protect yourself from fumes and torch flame. Bring both parts up to brazing temperature (copper will just begin to show a change, turning to light red). Allow BLOCKADE to melt and flow by contact with the base metal. Avoid overheating. When the alloys begins to melt and flow, back your flame away enough to keep the metal very hot but avoid heating copper until it is cherry red. While BLOCKADE can take high temperatures, it is not necessary and it is harmful to the copper. On tubing, be sure to fully cap the connection by flowing BLOCKADE completely around the tube fitting. Once you have done this, you have formed a seal that can not leak. You can *SEE* your results.



High-Silver Brazing Alloys

- SAFETY-SILV ® 56
- SAFETY-SILV ® 40
- SAFETY-SILV ® 45
- SAFETY-SILV ® 25
- TECHNICAL DATA

SAFETY-SILV® 56 - This high silver (56%) content alloy makes first quality brazes.It is free-flowing with unequaled capillary attraction and deep penetration. Ductility is high, corrosion resistance suitable for all but strong chemical applications. Offers highest elongation of silver brazing alloys. Suitable for use in the food processing industry. The silver color is an excellent match for stainless steel and silverware applications. NSF Certified to NSF C2.

SAFETY-SILV® 40 - Ductile, free-flowing alloy offers economy, good penetration into tight connections, and medium temperature. Silver to light yellow color as in polished brass.

SAFETY-SILV® 45 - Excellent general purpose non-toxic brazing alloy. Often specified in governmental use. Good ductility and capillary flow. Color is silver to light yellow as in polished brass.

SAFETY-SILV® 25 - A low cost, brazing filler metal with good flow properties at relatively low brazing temperature.

Flux - Use Stay-Silv white brazing flux on applications requiring normal heat; Stay-Silv black flux on heavy parts, or parts heated over a prolonged period.

Forms - 1/32", 3/64", 1/16", 3/32" and 1/8" wire diameter, bare rod, flux coated rod; in straight lengths, coil, strip, rings, other types of preforms.

Packaging: Tubes/Tool box Jars/ Bulk Packs/Coils.

Safety-Silv Filler Metals

	Chemical Composition						Melting Range		Specifications				Wire Length (Inches per T.O.)			
Alloy	Ag	Cu	Zn	Cd	Ni	Sn	Solidus	Liquidus	AWS A5.8	Federal QQB 654A	Federal QQB 654	Military MIL-B 15395A	.031 1/32	.047 3/64	.062 1/16	.093 3/32
Safety-Silv56	56	22	17	-	-	5	1145	1200	BAg-7	BAg-7	-	-	260	116	65	29
Safety-Silv40	40	30.5	29.5	-	-	-	1150	1350	-	-	-	-	270	120	67	30
Safety-Silv45	45	30	25	-	-	-	1250	1370	BAg-5	BAg-5	1	1	265	118	66	30
Safety-Silv25	25	43	30	-	-	2	1265	1430	-	-	-	-	280	124	70	31

Cadmium Alloy Replacement Chart

Cadmium-Bearing Filler Metal	% Silver	Fluidity Rating*	Suggested Cadmium-Free Replacement	% Silver	Fluidity Rating*	Description-Comparison to Cadmium Alloy
30% 35%			Safety-Silv® 25			A moderate temperature, economical, filler metal of comparable cost. The melting point is higher than the cadmium-bearing alloys, but the plastic range is an advantage in filling loose connections.
30% 35%			Safety-Silv® 40			For brazing steel, brass, bronze and copper. This alloy offers a comparable temperature range to cadmium-bearing 30% and 35% with only a minor cost increase. Safety-Silv 40 produces sound joints with good ductility
45%			Safety-Silv® 45			These filler metals offer good joint strength and ductility at a somewhat higher temperature. The plastic range of 45 is an advantage when filling loose connections.
45% 50%			Safety-Silv® 56			A ductile, free-flowing alloy with flow characteristics similar to cadmium-bearing 45% and 50%. Safety-Silv 56 provides excellent penetration which ensures joint strength and elongation. The silver colored braze is a good match to stainless steel.