ANATOMY OF A BRAZED PIPE FITTING

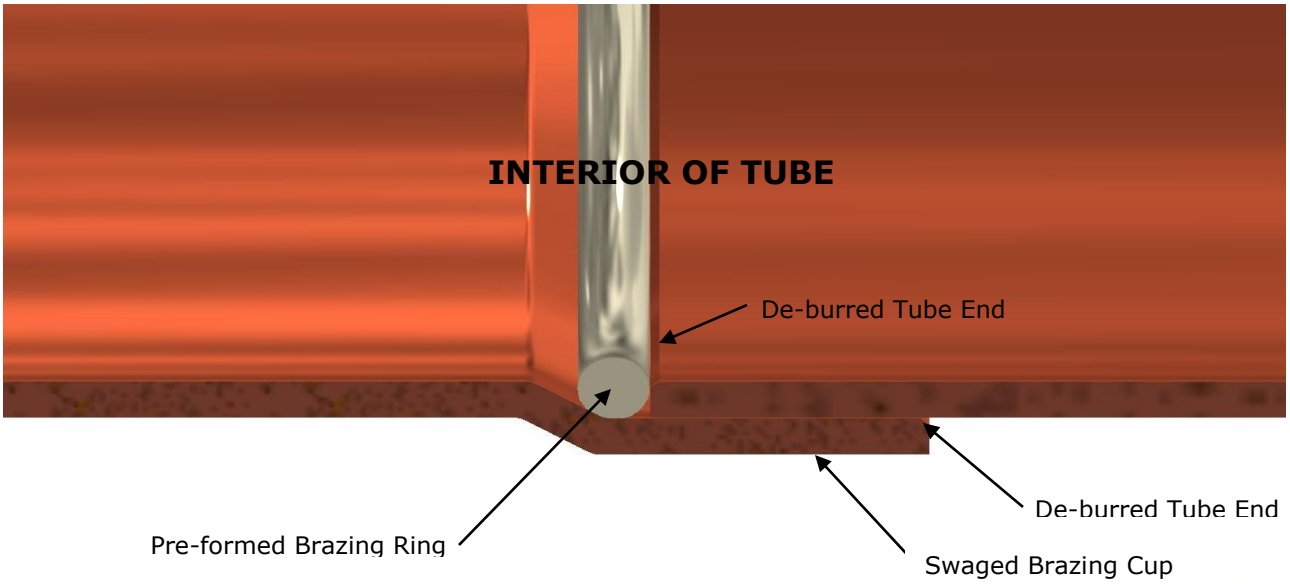
SUMMARY

A swaged socket with depth conforming to ASME B 16.50, combined with a pre-formed brazing ring will provide full penetration of the brazing filler combined with a fillet on both ends of the brazed joint. This quality of brazed joint greatly reduces the possibility of leaks and results in a joint that will remain leak free for the life of the system.

BRAZING TECHNIQUES

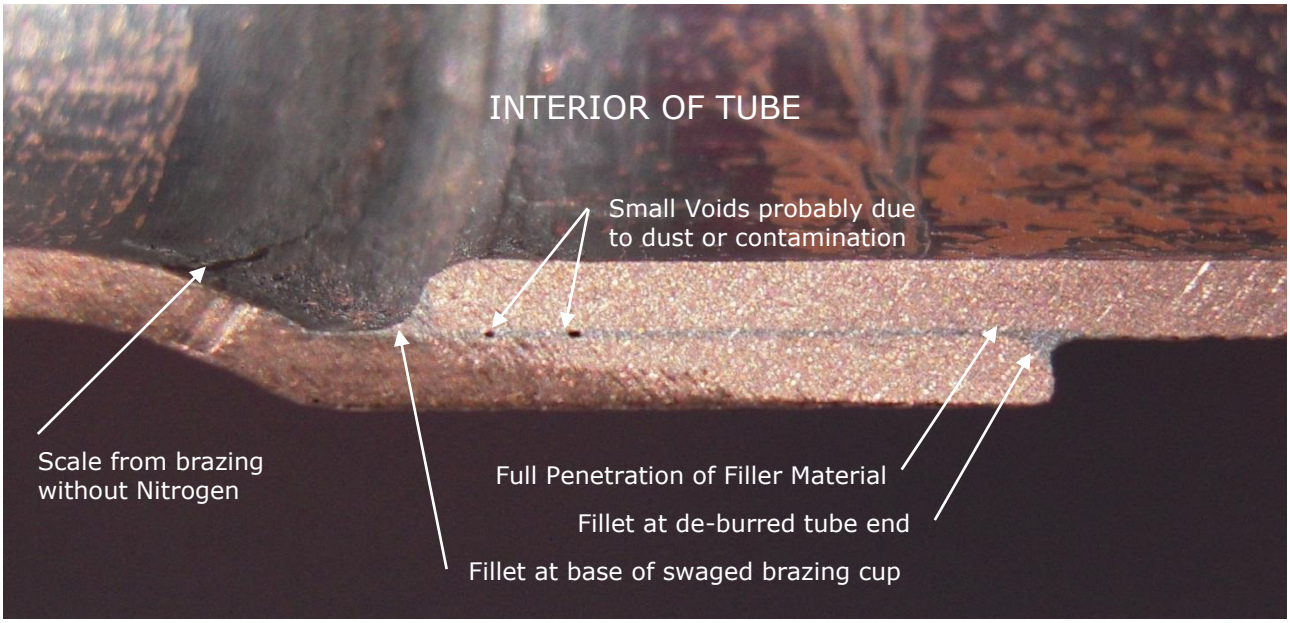
When brazing copper tubing for refrigeration piping, proper brazing procedures must be followed. This includes proper brazing equipment and tip sizes, personal protection equipment, tube cut squarely with sharp tubing cutter, deburring all cuts, cleaning of joints with "Scotch Brite" pads, properly supported tube, tube ends fully seated into the joint, and nitrogen purge during brazing.

JOINT PRIOR TO BRAZING



Assembled Joint Prior to Brazing

JOINT AFTER BRAZING



Assembled Joint After Brazing

DISCUSSION

Factory manufactured tube couplings are intended for solder joints. Even though approved for brazing, they are deeper than required for brazed joints. The depth of a brazed socket only needs to be two times the wall thickness of the tube to form a strong joint. A socket this shallow is impractical for field brazing, but there is no need for solder depth joints. ASME B 16.50 specifies the physical characteristics of brazed joints. This standard allows shallower socket depths than solder sockets. The shallower depth makes it easier to get full penetration of the socket brazing filler. Additional advantages are reduced filler material, and less time spent brazing and purging. By using half-hard (H55 Temper) ACR copper tubing, it is possible to swage sockets to the proper depth for brazing. This creates a coupling that requires a single braze, not the two required for factory couplings, and eliminates the need to purchase fittings. Obviously, the number of joints is reduced by half, with a corresponding reduction in leak potential. These joints can either be hand fed or can utilize pre-formed brazing rings. Pre-formed brazing rings allow the tube joint to be brazed from the inside out. When brazing filler is visible around the full perimeter of the brazing cup, the joint is complete. This visual indication ensures full penetration of the brazing filler and confirms that a brazing filler fillet has been created both at the base of the socket and at the outside edge of the tube socket.

All brazed joints will have some voids. Proper, clean joint preparation combined with the use of pre-formed brazing rings will minimize brazed joint voids and allow capillary action to fill the joint gap. Overheating the tube can also cause voids due to volatilization of the phosphorus in the brazing filler material.

When brazing filler is hand fed from the outside, there is no way to know for sure that the filler has penetrated the brazing socket full depth. Full penetration of brazing filler combined with fillets at both ends of the joint provide the best chance of a strong leak free joint. Pre-formed brazing rings make this possible.