BRAZOWELD TECHNICAL LITERATURE

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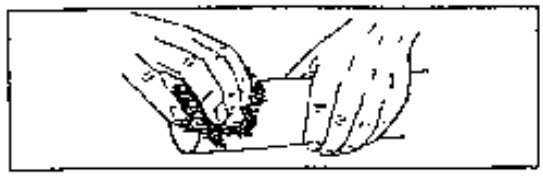
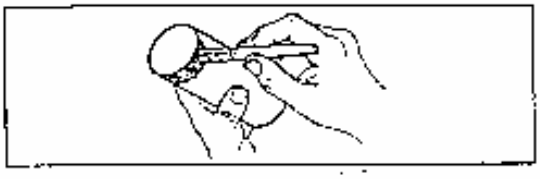
BRAZING COPPER TUBE TO BROWNALL BRAZOWELD FITTINGS



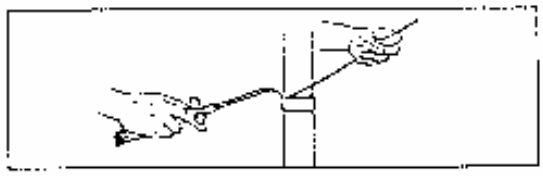
1) Preparation: Ensure that the tube is cut square and deburred.



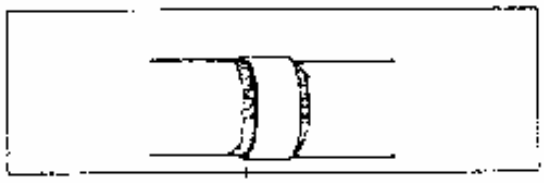
2) Cleaning: The surfaces to be joined on the fitting and tube must be clean and free from oil, grease and heavy oxide. Steel wool can be used for this, but all slivers of steel must be removed from the fitting and tube before assembly and fluxing.

3) Fluxing: The flux should be applied to the cleaned area of the tube and fitting evenly and sparingly, avoiding any excess.
Tenacity 4A or the Easyflow range of fluxes are recommended.

4) Assembly: Once fluxed, assemble by inserting the tube hard against the fitting abutment. Firmly support the assembly and braze as soon as possible.
Recommended rod is BS EN 1044 (CP102).



5) Brazing: Heat the cast fitting first ensuring the whole fitting is uniformly heated before attempting brazing (important: two torches are required on sizes above 76mm). Brazing temperature is approached as the flux takes on an appearance of glass, apply the flame to the joint area and introduce the filler metal. Ensure the flame is kept moving at all times, when the joint is filled, allow to cool in air (Do Not quench).



6) Cleaning: Remove residual flux from the joint using hot water and detergent.
Caution - Brazing alloy and flux manufacturers' recommendations should be adhered to.

7) Testing: All Brownall Brazoweld Fittings are hydraulically pressure tested during manufacture and therefore should only require pressure testing after installation.

Brownall Fittings are designed to withstand the working pressures of BS EN 12449 tubing, but Brownall recommend that installation test pressures do not exceed the values given in BS EN 12449, copper tubing in the fully annealed condition.

If higher test pressures are required please consult the Brownall Technical Department for guidance.

These notes are given as a guide only and Donald Brown (Brownall) Ltd. cannot accept any responsibility for installation work or system performance.

JOINTING TECHNIQUES BROWNALL FITTINGS (BRAZOWELD)

BRAZING (CAPILLARY JOINT) – DEFINITION
The process of BRAZING is carried out with the principal aim of using a filler metal to penetrate capillary gaps between the metals being joined, and thus create a strong joint by the bonding of the filler alloy with the with the parent surfaces over a comparatively large area. The formation of a fillet is secondary to this although possible.

LOW TEMPERATURE BRAZING is brazing taking place in the temperature range 600°C to 850°C. The filler metals used are normally based on silver and copper. This process is also commonly referred to as SILVER BRAZING or SILVER ALLOY BRAZING.

Two other process terms associated with Low Temperature Brazing are SILVER SOLDERING AND HARD SOLDERING. Capillary attraction, the basis upon which successful BRAZING depends, is ensured when a controlled gap is provided between the surfaces to be joined. This controlled gap is engineered by machining the sockets of BROWNALL fittings to close limits and the resultant assembly with copper tube to European Standard limits controls the desired gap.

RECOMMENDED RODS AND FLUXES FOR BRAZING

Rods recommended for this jointing technique are detailed in BS EN 1044: 1999 “Filler Metals for Brazing” and those widely used are CP101 and CP102 shown in table 4.

Table 3 Group AG: Silver Brazing Alloys.
Type AG2 is commonly used and has an approximate melting temperature of 610/620°C.

Table 4 Group CP: Copper Phosphorus Brazing Alloys.
Type CP101 and CP102 are widely used and have an approximate melting temperature of 645/825°C. Although having a wider melting temperature range and a higher melting temperature the alloys have no zinc or cadmium content and are therefore useful in most applications.

B.S. 1723: 1963 “Specification for Brazing” sets out general requirements for brazed joints:

1) CUTTING

The tube should be cut square, preferably with copper tube cutters designed for the purpose, and to exact length required, so that it will engage the socket of the fitting full depth to the stop. Remove all slivers and burrs left from cutting the tube by reaming and filing, both inside and outside.

2) CLEANING

The surfaces to be joined must be cleaned and free from oil, grease and heavy oxides.

FITTING

The socket of the fitting should be cleaned by similar methods to those used for the tube. Care should be observed in removing residues of the cleaning medium.

TUBE

The end of the tube needs to be cleaned for a distance only slightly more than is to enter the socket.
The cleaning can be done using steel wool but care must be taken to remove all slivers of steel wool before assembly of the joint.

3) FLUXING

The flux should be applied to the cleaned area of the tube and fitting evenly and sparingly, avoiding any excess.

4) ASSEMBLY

Immediately after fluxing, assemble the joint by inserting the tube into the socket hard against the stop. If fluxed parts are allowed to stand, the water in the flux will evaporate and dried flux could flake off, exposing the metal to oxidation from the applied heat. The assembly should be firmly supported so that it will remain in alignment during the jointing operation, which can now commence.

5) HEAT (BRAZING BRAZOWELD CAST FITTINGS)

Brazing is started by applying heat to the cast fitting to be joined. It is extremely important that the fitting is uniformly heated before any brazing is attempted. This preheating can be achieved either by a sweeping motion with the flame or a preheating stage in a furnace before assembly of the piping system.

An indication that the assembly has reached the correct preheating temperature is when the flux becomes completely clear and has the appearance of water (approximately 595°C). With fittings above 76mm it may be necessary to use two torches to obtain the heat input required.
When the preheating temperature is achieved redirect the flame to the areas directly around the tube abutment of the fitting. Keep the flame sweeping along the axis the joint and apply the filler metal. The filler should be drawn into the joint by natural capillary attraction. When the joint is filled, a continuous fillet of brazing alloys will be visible completely around the joint. Stop feeding as soon as the joint is filled.

HORIZONTAL JOINTS:

When making horizontal joints, it is preferable to start applying the brazing alloy at the top, then the two sides, and finally the bottom, making sure that the operations overlap.

VERTICAL JOINTS:

On vertical joints, it is immaterial where the start is made. If the opening of the socket is pointed down, care should be taken to avoid overheating the tube, as this may cause the alloy to run down the tube. If this condition is encountered take the heat away and allow the alloy to set. Then reheat the solder cup of the fitting to draw up the alloy.

6) REMOVAL OF RESIDUAL FLUX

After the brazing alloy has set, remove residual flux from the joint area as it is corrosive and presents an unclean appearance and condition. Hot water and detergent along with a soft cloth should be used.
Copper fittings may be chilled quickly. It is advisable to allow castings to cool naturally to some extent before applying a swab. All flux must be removed before inspection and pressure testing.

TROUBLE SPOTS

If the alloy fails to flow or has a tendency to “ball up”, it indicates oxidation of the metal surfaces, or insufficient heat on the parts to be joined.
If work starts to oxidise during heating, it indicates too little flux or too thin a consistency. If the brazing alloy refuses to enter the joint, it indicates that one part is overheated or the other is under heated or both.
In both cases operations should be stopped and the joints disassembled, re-cleaned and fluxed.

CAUTION

1) Brazing alloy and flux manufacturers’ recommendations should be adhered to.
2) These notes are given as a guide only and Donald Brown (Brownall) Ltd., cannot accept responsibility for installation work or system performance.

BRAZING AND WELDING RODS
FOR USE WITH BRAZOWELD FITTINGS

BRAZING RODS

To BS EN 1044: 1999 Table 4 (Copper Phosphorus)

TRADE NAME	SUPPLIER	TYPE	SILVER CONTENT	SOLIDUS °C	LIQUIDUS °C	FLUX
SILBRALLOY	Johnson, Matthey, 81 Hatton Garden, London	CP102	2%	644	740	Tenacity 4a Easyflow Range
PHOSPHALLY	The SSCO, Windsor Street, Sheffield	CP102	1.8-2.2%	645	740+	
CUPROTECTIC	B.O.C. Ltd. North Circular Rd, London	CP103		705	800	
SIL-FOS	Johnson, Matthey, 81 Hatton Garden, London	CP101	15%	644	700	Tenacity 4a Easyflow Range
EUTECTOID 1805	Eutectic Welding, North Feltham, Trading Estate, Feltham, Middlesex	CP102	2%	650	750	No. 18

WELDING RODS

To BS EN 1044: 1999 Table 5.2 (Copper-Zinc)

TRADE NAME	SUPPLIER	TYPE	SOLIDUS °C	LIQUIDUS °C	FLUX
BRAZOTECTIC	B.O.C. Ltd., North Circular Rd. London	CU 306	875	895	
EUTECTROD 146	Eutectic Welding, North Feltham, Trading Estate, Feltham, Middlesex	CZ 306	850	875	No. 18

BRAZOWELD PRESSURE RATINGS

RECOMMENDED MAXIMUM WORKING PRESSURE & TEMPERATURES

Service Temperature °C	**Working Pressure bar**			
	Size Range (mm)			
	10 - 28	**35 – 54**	**67 - 108**	**133 - 159**
-10 to +66	32	25	20	16
+66 to +100	32	25	20	16
+100 to +120	28.3	21.8	17.2	13.5
+120 to +150	22.8	16.5	13.0	9.5
+150 to +170	19.2	12.8	10.3	7.0
+170 to +180	17.4	11.3	9.0	N/A

Recommended test pressure is 1.5 times working pressure at ambient temperature (i.e. –10 to +66).

Ratings based on table ‘Y’ tube and in line with **former** copper alloy globe valve standard BS.5145 (tube in ‘0’ condition).

Suitable for use with tables X, Y, Z and table 5 tube.

NOTE: - The working pressure of the tube other than table Y is to be checked, as once brazed the tube will be in the ‘O’ condition around the joint.

Material: - BS EN 1982: 1999 CC760S (Formerly BS.1400 SCB6 - Dezincification resistant).

Fittings designed to be brazed or bronze welded.

For Brazing: - Filler rods to BS EN 1044: 1999 Table 4 CP102.

For Bronze Welding: - Filler rods to BS.1845 table 3 normally CZ6.