Brazing Welding - General Principles

Braze Welding differs from conventional silver brazing in that the filler metal is distributed by deposition rather than by capillary action. Base metals are not melted, only the filler metal, and bonding between the deposited filler metal and the hot unmelted base metal occurs in the same manner as conventional brazing.

Braze welding alloys melt over a temperature range rather than a single temperature – the lower temperature, which is the temperature below which the alloy is fully solid, is called the solidus while the upper temperature, above which the alloy is fully molten, is called the liquidus.

Compared to conventional fusion welding, the advantages of braze welding are:

- Due to the lower fusion temperatures of braze welding filler metals, there is less distortion and reduced incidence of cracking.
- The deposits are soft and ductile and easily machineable.
- Base metals with low ductility such as cast irons can be braze welded with lower and less extensive pre-heats.
- Enables joining of dissimilar metals which could form unfavourable alloys if melted in contact.

Some limitations of the process are:

- Weld strength is limited to that of the deposited filler metal.
- Allowable service temperatures are lower than for fusion welds, usually restricted to a maximum of 260°C approx.
- Braze welded joints may be susceptible to galvanic corrosion.

Most welding processes can be utilized for braze welding: oxy-fuel gas welding (OFW), gas metal arc (GMAW), gas tungsten arc (GTAW), plasma arc (PAW) and shielded metal arc (SMAW).

BRAZE WELDING PROCEDURE

To obtain a strong bond between the filler metal and the unmelted base metal, the molten filler metal must wet the hot base metal. Clean metal surfaces, free of oxides are necessary for this to occur. Fluxes are therefore essential for oxy-fuel torch heating. Inert gases can be used for the other braze welding processes.

Fixturing: Required for precision assemblies but not as critical as for conventional brazing since filler metal feeding is not by capillarity.

Joint Preparation: Can be similar to fusion welding configurations. V-grooves or double V-grooves are common.

Pre-cleaning: Joint surfaces must be free of oxides, dirt, grease and other foreign material that might inhibit wetting. Grey cast iron surfaces must be free of graphites, this can be achieved by a pre-heat using a slightly oxidizing flame (450±50 °C) followed by a wire brush clean.

Braze Welding Temperature: The brazing temperature is usually 10 to 50°C above the liquidus of the filler metal.

Brazing Welding - General Principles - Continued

Technique

- **Align and fixture the joint members**
- **Apply brazing flux liberally (unless using flux-coated rods)**
- **Heat the base metal until the temperature is sufficient to allow flow of the filler metal and wetting of the base metals. The joint can then be filled with one or more passes.**

Mechanical Properties of Braze Welding Filler Metals

Designation	Description	Tensile Properties (Min) MPa
DIN L-CuZn40	Tobin Bronze	275
RCuZn-C	Mang Bronze	344
RCuZn-D	Nickel Bronze	413