

## Soldering and brazing:

### Definitions:

**Soldering:** Soldering is a process of uniting two or more metal pieces under heat with the help of a solder and a flux. There are two types:

- Soft soldering
- Hard soldering.

**Flux:** it is cleaning agent used to prevent oxidation of metals at the soldering point. It helps the solder to melt quickly and allows it to flow freely to unite more firmly.

E.g. zinc chloride, ammonium chloride, hydrochloric acid, borax, rosin, turpentine oil etc.

**Solder:** generally it is an alloy of lead and tin. It melts at low temperature. For strong joints a mixture of copper and zinc is used which has high melting point.

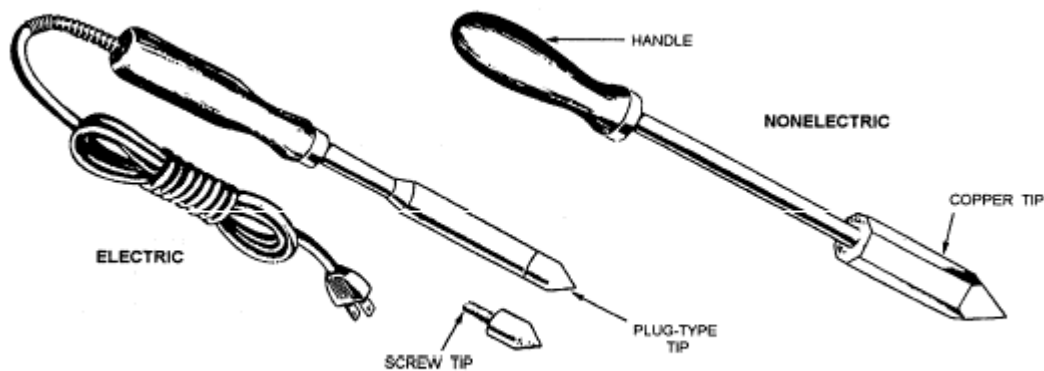


Figure 6-1. Soldering irons.

### Classification of solder:

**Soft solder:** for high joints using various proportions of lead and tin which has low melting point.

**Hard solder:** for strong joints using a mixture of copper, zinc etc. which has high melting point.

**Soft solder:** generally it is composed of lead and tin. They are mixed in various proportions to solder different metals at different temperatures. The range of melting point for such solder lies between 150 to 300°C. A suitable flux for the particular job is chosen. A small amount of bismuth and cadmium are frequently added to lower the melting point if necessary. Soft solders are used to join the wires and sheet metal works of light jobs which are subjected to light loads and slight shocks. A plain soldering iron is used to heat the metal pieces during the process. Soldering using soft solder is known as soft soldering.

**Hard solder:** generally it is composed of copper and zinc in 4:1 ratio. A small amount of silver or tin and antimony are frequently added to improve the quality. The range of melting point of such solder lies between 350 to 900°C. The fixtures for such solder will be in paste form. A propane

torch is used to heat the metal pieces during the process. Hard solders are used to make comparatively strong joints compare to soft solder.  
e.g.: plumbing, heavy sheet metal works etc.

### **Method of soldering:**

The step by step general procedure for soldering is as follows:

- The metal parts which are to be soldered must be thoroughly cleaned.
- The type of job whether light or heavy has to be decided.
- A good soldering iron has to be selected.
- In case of light jobs, the tip of the heating head of the soldering iron has to be heated sufficiently.
- It has to be then cleaned, dipped in flux and the rubbed on the solder to tin the tip.
- The molten solder has to be then deposited on the joint.
- In case of heavy jobs, the surface must be tinned first by cleaning, the heating using a blow torch.
- The job must be dipped in flux.
- Using a solder iron, the solder has to be applied over the parts.
- The parts may be then assembled and heated together until the solder melts.
- In case corrosive flux is used, the soldered job must be washed with water.

### **Advantages of soldering:**

- ❖ It is simple and economical.
- ❖ Base metals are safe against the metallurgical damages due to low operating temperature.

### **Brazing:**

It is the process of uniting two or more metals of similar or dissimilar type with the help of an alloy in the form of spelter and flux, like borax, ash etc. these are used in tanks, radiators, carbide tips on tool holder etc.

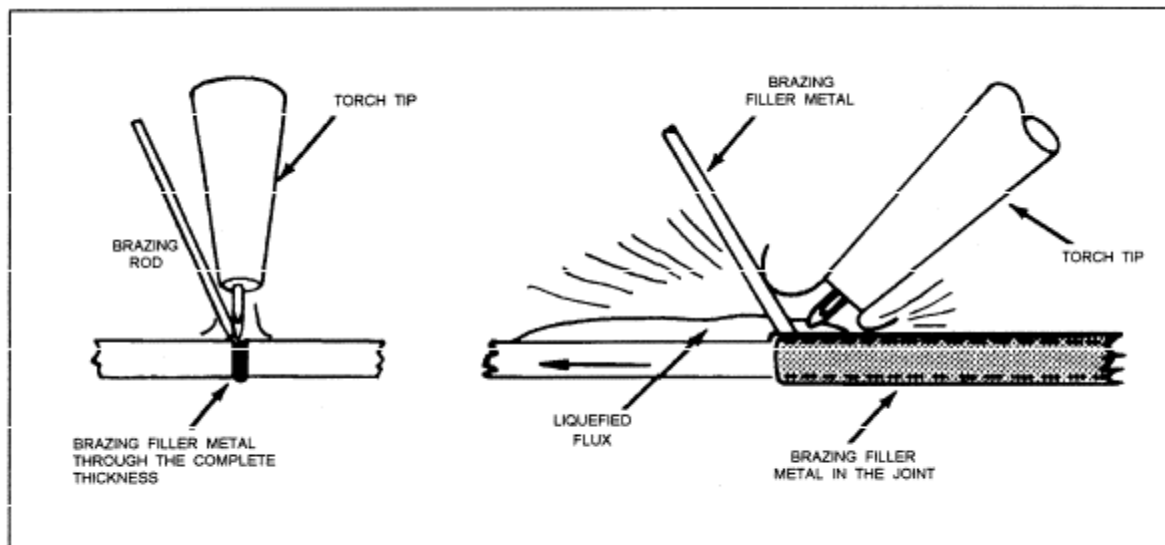
#### **Types of brazing:**

It is classified on the basis of actual heating as:-

- Torch brazing
- Electric brazing
- Immersion brazing.

### **Method of brazing:**

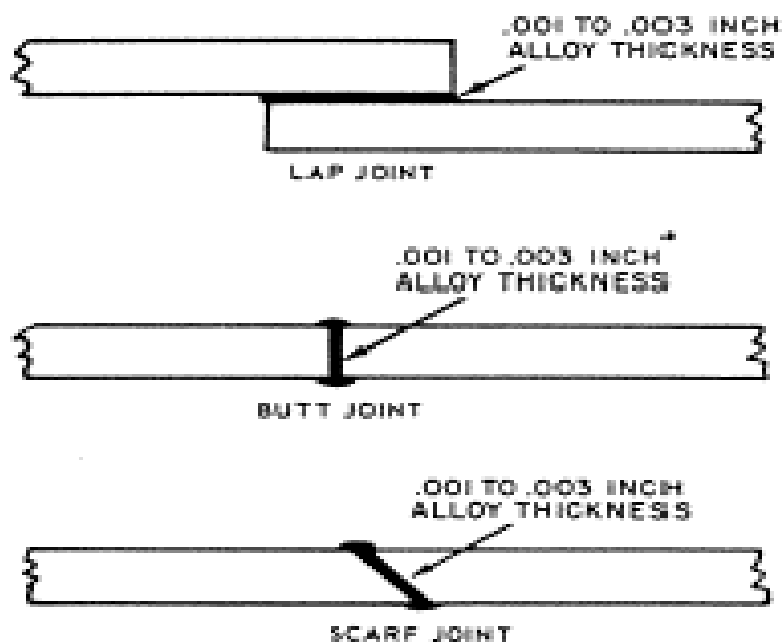
- The step by step procedure for brazing is as follows:
- The metal parts which are to be brazed must be thoroughly cleaned.
- The flux must be applied to the surface.
- The parts are to be clamped in the required position.
- The flux has to be applied on the surfaces.
- The job has to be heated using the blow torch or the furnace etc.
- The molten spelter has to be allowed to flow by capillary action into the joint.
- The job has to be allowed to cool slowly.



**Figure 6-16.**—Brazing a butt joint.

### Advantages:

- ❖ Even dissimilar metal pieces can be united.
- ❖ No metallurgical damage to base metals.
- ❖ Provides stronger joints than hard soldering.



**Figure 6-13.**—Three types of common joint designs for brazing.

### **Difference between soldering and brazing:**

<u>Soldering</u>	<b>Brazing</b>
Solder is used in this process.	Spelter is used in this process.
Joints are not very strong.	Joints are very strong.
Costs less.	Costs more.
Chlorides of zinc and rosin are used as flux.	Ash or borax is used as flux.
Low temperature is sufficient.	High temperature is necessary.
Suitable only for thin similar sheet metals.	Suitable even for thicker similar or dissimilar metal parts.
Soldered parts are to be cleaned with water.	Brazed parts are to be allowed to cool slowly.