

# SOLDERING

## MATERIALS:

- Silver, gold, brass or copper
- solder

## TOOLS

- Flame proof boards
- Torch
- Flux
- Small brush
- Tweezers
- Heat proof bowl of water
- Pickle
- Plastic tweezers

Soldering is relatively simple and not as scary as it seems. It's a strong and reliable method of permanently joining metals – brass, copper, silver or gold. It follows six basic steps to create a solid and permanent connection.

1. Making a good fit – the pieces must be touching with no gaps
2. Cleaning and preparation
3. Assembling the parts
4. Fluxing
5. Heating with an open flame torch
6. Pickling and cleaning up

## HEALTH & SAFETY

Wear proper protective equipment. Apron and safety glasses. Make sure your sleeves are rolled back and that you aren't wearing loose scarves or jewellery. Obviously the open flame is hot but so can be a lot of the tools such as tweezers, wire mesh supports and fire proof blocks. Especially in a group class, be aware that things can be hot even if they don't look it as someone could have used them before you. Be aware.

## PROCESS

### 1. Make a good fit

Soldering relies on the pieces of metal fitting closely together so the solder can flow properly and complete the join. It can't fill or bridge a gap so make sure all your parts are filed and cut to fit precisely. If you can see daylight through the join then it needs adjusting, re-cutting or filing to make it fit properly.

### 2. Clean the metal

If you are working in fresh metal then they may be clean enough to skip this step. If you are using recycled metals or have done a lot of shaping or working on the metals then any dirt or grease needs to be removed.

The work can be cleaned in a number of ways

- wash in hot soapy water to remove any grease
- remove the surface layer with sandpaper or wet and dry abrasive paper
- pickle to final traces of dirt or grease

If you want to be really thorough you can go for a triple and do them all.

### 3. Assemble the parts

This can be really fiddly and time consuming – often the longest stage of soldering the join. Make sure your piece is positioned on the heat proof block in the centre of the station. You can use steel or iron items – washers, nails, tweezers etc to prop and support work. If necessary use iron binding wire to hold the pieces securely. Make sure all the areas that need to be joined are touching and meeting well.

### 4. Fluxing

Flux is used to stop the metal oxidising which would prevent the solder bonding to the metal. It comes in liquid, powder and solid forms. In the class we use borax. Wet the dish and grind the cone in the dish to make a thin paste. Use a small brush to paint the flux only onto the areas of the piece you want to solder to flow onto to create the join.

### 5. Solder

Solder comes in five grades of 'hardness'. This refers to the melting temperature not the strength of the join. They go from the lowest temperature to highest

extra easy – easy – medium – hard – enamelling

enamelling

730C – 800C

hard

745C – 778C

medium

720C – 765C

easy

705C – 723C

extra easy

667C – 709C

If you need to solder in stages to add extra components start with a high temperature solder and work your way down, this helps make sure you won't melt any previous joins when you reheat the piece.

Apply tiny pieces of solder, known as pallions, to the join with tweezers or a damp brush. Only a small amount is needed. Dip the solder pallions in the flux to help them stick in place.

Light the torch. Make sure the two air holes on the top are lined up and turn the dial to fully open. Click the switch to light the flame and then adjust the flame to the size you need. The aim is to heat the metal and let the heat from the metal melt the solder. This ensure the solder fully bonds with the metal and will make the join strong. Move the flame over the whole piece continuously, heating it evenly until the solder flows. If you melt the solder without bringing the hole piece up to temperature it won't bond and will snap apart – this is known as a dry solder.

When the metal becomes hot enough the solder will melt and become shiny and liquid. It should be drawn along the joint by capillary action. Remove the flame as soon as this happens.

### 6. Clean and finish

Allow the piece to cool a little and then quench in fresh water. Use plastic tweezers to move the piece into the safety pickle solution. It should only take a few minutes for the acid to remove the oxides created during soldering and make the piece clean and white. Remove from the pickle using plastic tweezers and rinse thoroughly in fresh water.

The piece can now be polished and finished however you like. The heat used in soldering can soften the metal so be careful with small pieces such a stud wires as they can be vulnerable. You can toughen the metal by hammering or by polishing in the barrel polisher.

**NOTTINGHAM  
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