

# SOLDERING INSTRUCTIONS

Soldering is a method of uniting two metallic surfaces by means of a fusible alloy, solder. The solder has a lower melting point than the metals that are joined. A solder joint when completed will be as strong or stronger than the metals it connects.

The process of soldering consists in . There are 5 sequences to accurate soldering. Each is important. The steps in sequence are:

1. Fitting- making a tight even joint between surfaces to be soldered.
2. Cleaning- removal of all surface films (grease, oil or oxides).
3. Fluxing- applying flux to all areas in sufficient amounts to prevent oxidation during heating.
4. Solder placement- placing the solder in the right places and in the right amounts.
5. Heating- in a manner which quickly and safely causes solder to melt and flow.

Soldering alloys are applied to the joining surfaces with a flux. Flux is a substance which helps the fusing of the metals by keeping the surfaces clean and preventing any kind of oxide from forming during the heating process. One cannot solder without flux. It is important that it be well applied to the surfaces to be joined as well as to the solder itself. A liquid flux is the easiest form of flux to work with.

**Clean and brightly polished surfaces will permit better soldering results.** The first rule in soldering is to clean the surfaces to be soldered. One cannot say this too often because when a soldering operation fails, the reason will most often be that the surfaces had a residue of grease from the fingers or oxidation tarnish was not totally removed. A clean surface is bright and allows the flux to spread evenly without forming drops and pools. Never try to solder without first rubbing the surface with a fine steel wool. If oxidation is evident (from dipping or brushing on an oxidizing bath) it must be cleaned off too. It is always worth spending an extra few moments doing this no matter how clean the surfaces appear to be.

The same is true of the solder itself. Never cut pieces of solder from a strip without first cleaning the surfaces with emery paper or steel wool. To cut small pieces of solder, flatten the end of the strip with a hammer on a steel block. With a gate cutter cut into the end of the solder strip. Then cut at right angles and small pieces will fall away. The solder is cut into pieces in order to control the amount of solder applied. One can change the size of the pieces by varying the distances between the cuts.

These pieces should be applied to the fluxed joints by means of a small paint brush which has been dipped into the flux. The flux from the brush will now transfer itself to the piece of solder. Always, use the brush for all fluxing operations. It is important that all surfaces to be soldered and solder are completely covered with flux. Flux is applied to the metal parts to keep the metal clean and prevent oxides from forming. The melting point of the solder must be below that of the material which is being soldered. The flowing properties of the solder are in the solder and not in the flux.

The question of how much solder is needed for a specific joint is not an easy one to answer. There must be sufficient solder present for it to flow through the joint so that it can just be seen at the edges. Solder should not be used as a filler and should not form large blobs at the joints.

Areas to be soldered are to be closely fitted by filing. Solder will not fill an irregular joint satisfactorily. The solder joint, if fitted properly, **will be strongest where the least amount of solder flows through an area of contact** between the two metals. Solder will flow freely into the smallest carefully fitted joint, alloy with the metal and freeze smooth.

Small parts can be soldered together without clamps but practice doing this is required. Make sure both surfaces to be joined are clean and well-fluxed. Have your soldering iron tip well tinned (it should be shiny all over with no black blobs of oxides on it) with enough solder on it that it is just about to drip off. While holding the pieces together touch the corner of the chisel tip of the soldering iron to the joint. Excess solder can be trimmed off. You will find the use of the Helping Hands tool with the magnifier quite useful. The technique of soldering is like any art form, practice and more practice is the best teacher.

### **Additional Soldering tips:**

Allow several minutes for the iron to heat up. We definitely suggest using the temperature controlled soldering iron or one controlled by a rheostat. If not, you will have no control of the temperature and may damage your castings. Adjust the temperature so the tip will melt the solder quickly but not the cast figure. You can test this on scrap or un-poured metal.

Parts to be soldered must be clean and dry. Never use soap on anything you intend to solder.

Do not use too much flux. A little flux brushed on will go a long way. Use an artist brush to apply flux.

The soldering iron tip should be kept clean during use by wiping it across a damp sponge (you can even wet the sponge with flux).

Cut off small snippets of solder wire and hold with a tweezers or hemostat. Always angle the soldering iron handle away from the work area so you will have a clear view of the tip head and proposed joint.

For placement of parts use alligator clips to hold parts, or position them lying down and supported with damp wadded up paper towel pieces. Adhesive backed copper foil used in stained glass work may be useful in adding thin parts to models or holding broken parts together just long enough to "tack". The initial joint can be partial, just long enough to hold the pieces together, and then the rest filled in. Again, this takes a lot of practice.

If you find it necessary to abandon all of the above suggestions for soldering you can file flats on parts to be joined and drill a small hole in each part with a pin vise and small drill bit. Trim a small section from a paper clip to make a pin. Insert it in one of the parts and place it in the other to check if the length is correct. If it is remove the pin and place a drop of Zap-A-Gap in the hole, replace pin and position parts, then clean off any excess glue when dry. At this point you have a secure mating of parts. You may choose to flux the seam and fill the seam with solder or use MS105, FastSteel Putty to skip soldering all together.