



# Bending Copper Tubes - By Machine

**B**ending copper tubes using a bending machine should prove economical where numerous bends are required especially when bending the smaller sizes of tube. Rotary bending machines of various types and sizes, worked by direct hand power, can be obtained to bend copper tubes up to 42mm diameter. For larger diameters, ratchet action or geared machines are required. The most useful type of machine for 15 and 22mm tube is the portable type or Handy-bender which is light in weight and requires no adjustment in use.

The advantages of machine bending over spring bending can be summarised as follows: bends can be formed quickly; multiple bends can easily be formed on tubes if required; bends can be formed very close to the end of the tube; bend radius, quality and accuracy can be maintained over time.

The production of accurately positioned bends depends on the ability to determine the bending point and position of the tube in the machine.

To establish the bending mark position when making a 90° bend, measure the end to centre length

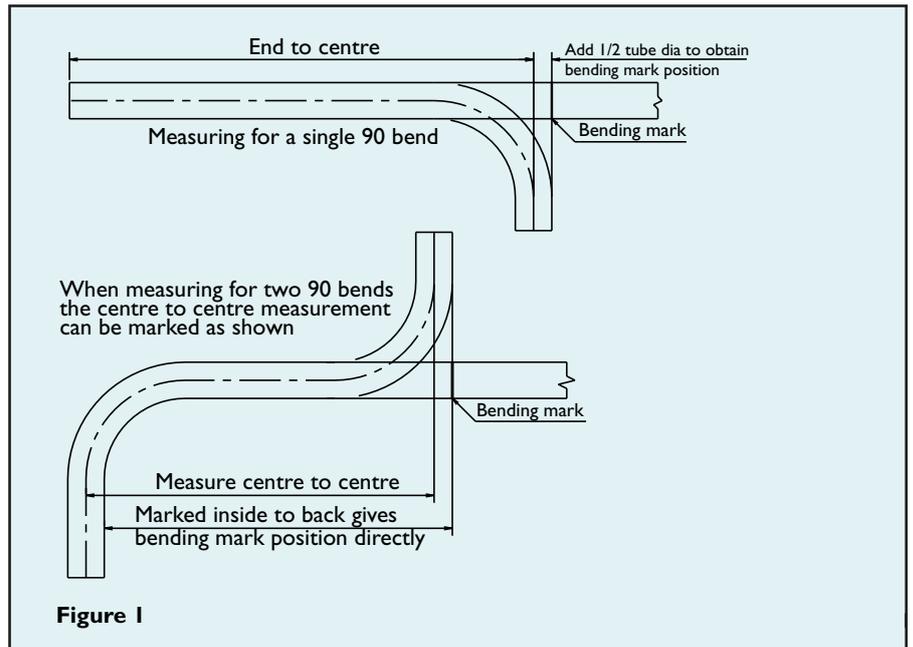


Figure 1

required and add 1/2 a tube diameter before placing the bending mark. Where a second 90° bend is required measure the centre to centre length required. Then mark the tube by measuring from inside to the back of the required bend. As shown in Figure 1.

Figure 2 illustrates how to accurately position the bending mark in the machine for 90° bends. When more than one bend is required on a length of tube remember to check whether the bends will align correctly in the same plane BEFORE pulling the second bend!

When bending single or double offsets you can use a 600mm folding rule to determine a suitable angle for the bends. Figure 3 shows how to stagger the ends of the rule to obtain the angle. Simply subtract

the offset size required from 600mm, in this case  $600 - 75 = 525\text{mm}$ . Next close the rule to this length. Then bend to the angle formed using the rule as a guide.

To determine the bending mark for the second bend of a double offset: first, align the first bend parallel to a straight edge with the inside edge of the tube the required distance from the straight edge; the position of the bending mark is in line with the straight edge. Next reposition the tube in the bender so that the bending mark forms a tangent (It just touches the edge) of the former and pull the second bend parallel to the first.

Where an offset has to be formed to pass an obstruction the distance from the fixed point to the centre of the first bend has to be found. This is achieved by placing a temporary mark on the tube equal to the actual distance from the fixed point to the obstruction. Next find the position of the bending mark by measuring BACK from the first mark a distance equal to the offset required PLUS two tube diameters. Now position the tube in the machine so that the

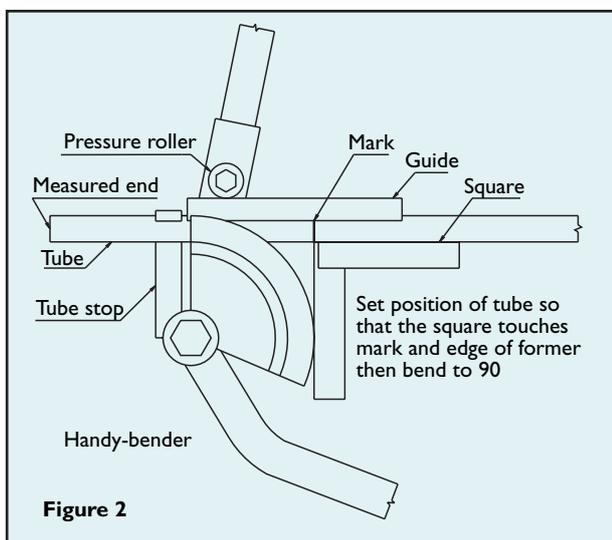


Figure 2

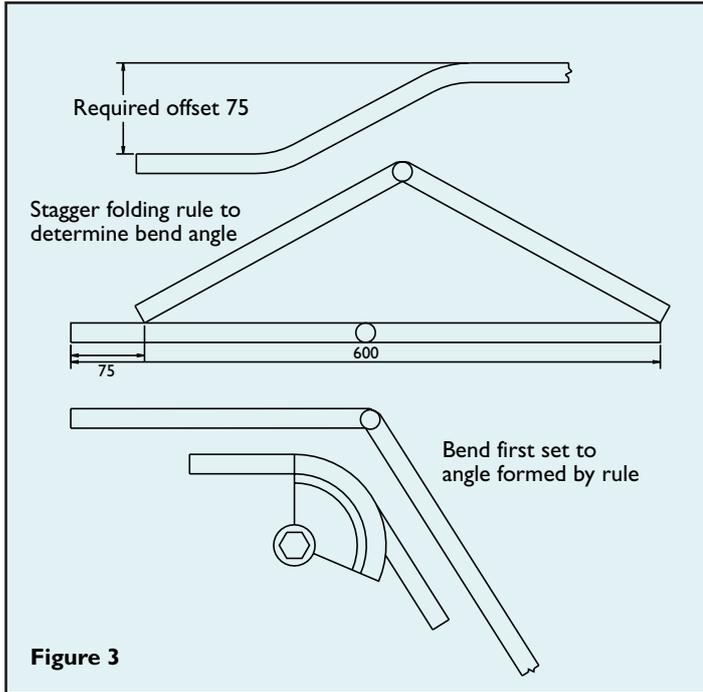


Figure 3

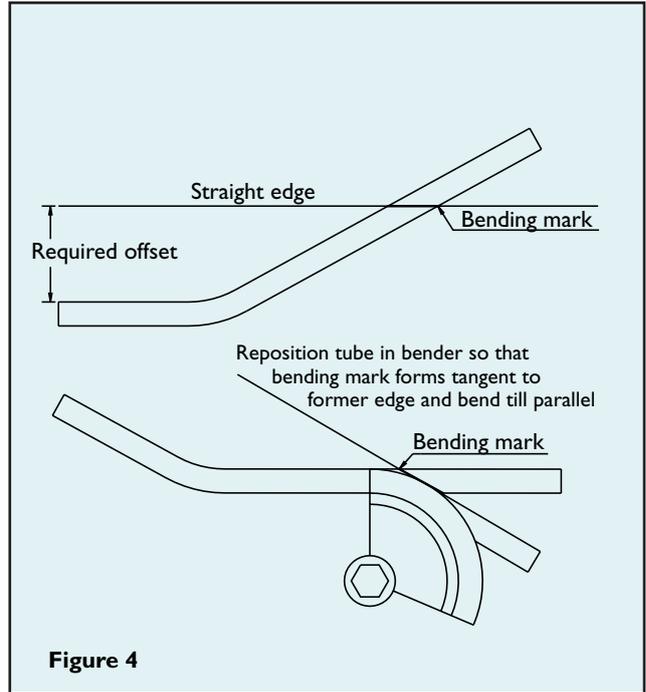


Figure 4

bending mark bisects the angle of the staggered rule when one leg is parallel to the tube and both legs of the rule are touching the edge of the former then bend until parallel. See Figure 4 and 5.

When using a press bending tool to form 90° bends on 6, 8 and 10mm soft coils (formerly Table W) tube mark the required length end to centre and then measure BACK 1 tube diameter to get the bending mark. Figure 6 shows how to align the mark with the small notch in the centre of the former.

**Rippling or throating of tube in machine made bends**

The design of the bending machine former and back guide supports the

throat and sides of the tube against collapse. Corrugations will occur in the throat of a bend if the pressure of the roller on the guide is exerted in the wrong place. The correct pressure point is slightly in front of the bending point, this is where the tube touches the former before bending takes place. As the bend is made these two points move forward maintaining the same distance apart. If the pressure point is too far in front of the bending point corrugations will occur. If the pressure roller is tightened too much the pressure point will be too far back and the tube will be excessively 'throated' or made oval in section.

If corrugations occur when using

non-adjustable 'handy-benders' the pressure point can be moved back by inserting a thin piece of strip steel about the thickness of a hack-saw blade between the guide and the pressure roller to remedy the problem.

Finally, if you use plastic coated copper tube why not get a set of formers to fit the increased outside diameter? You can make machine bends directly on plastic coated copper tube if the correct formers are used.

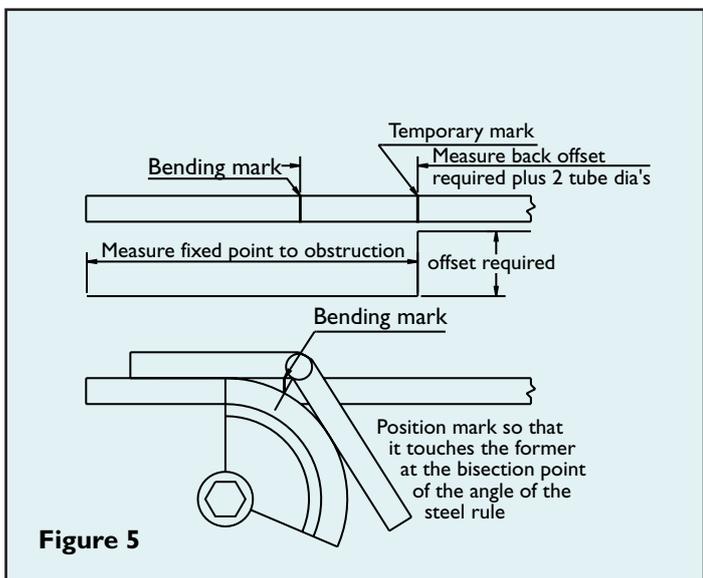


Figure 5

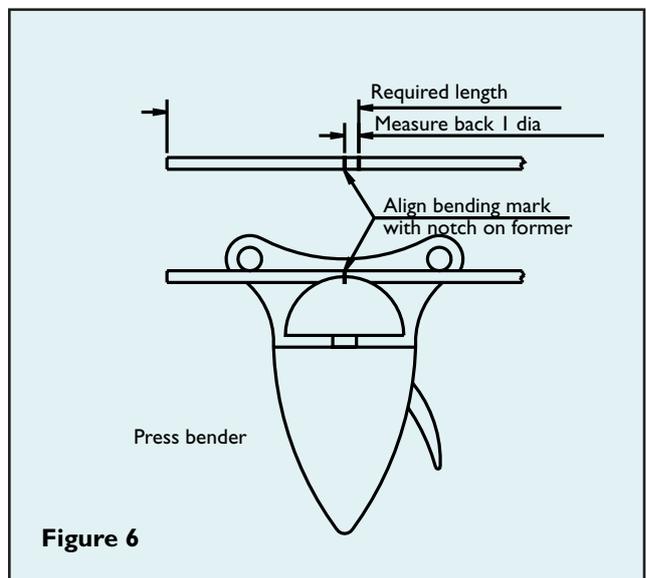


Figure 6