



Joining Copper to Dissimilar Materials

The vast majority of plumbing and heating installations make use of copper tube and fittings for water and gas services. However, many other materials have been, and continue to be used to manufacture tube and fittings. This article describes and illustrates some methods of joining copper tube to other materials.

Connecting tubes made from dissimilar metals

Water Regulations require that tubes and fittings made from different types of metals shall not be connected directly together except where galvanic action is unlikely or where effective measures are taken to prevent it.

Galvanic Action

What can occur when different metals are connected together is that an electric cell or wet battery can be created with water as the electrolyte. Although minute, a current flow causes one metal to corrode and eventually perforate. A common misconception is to say that 'the copper causes the other metal to corrode'. This is not the case, the culprit being the presence of dissolved oxygen in the water.

Sequence of metals

As water flows along the tube, galvanic corrosion will not be a problem, provided that the metals follow this sequence of connection: from galvanised steel; to uncoated iron or steel; to lead; then finally to copper.

Whatever type of joint is to be made the following can all be regarded as good practice:

- use the minimum quantity of jointing material necessary to produce good quality joints;
- keep jointing materials clean and free from contamination;
- remove any cutting oil if used, as well as protective coatings and clean the surfaces to be jointed;
- prevent the entry of surplus materials into the tube bore;
- on completion of the joint, remove all excess materials and flush thoroughly.

Note: Don't forget that hemp must not be used for drinking water applications, as it supports the growth of microbes and can contaminate the water supply. Use only Water Research Council listed and approved jointing materials.

Connection to lead

The Water Regulations prohibit the use of lead for potable water fittings.

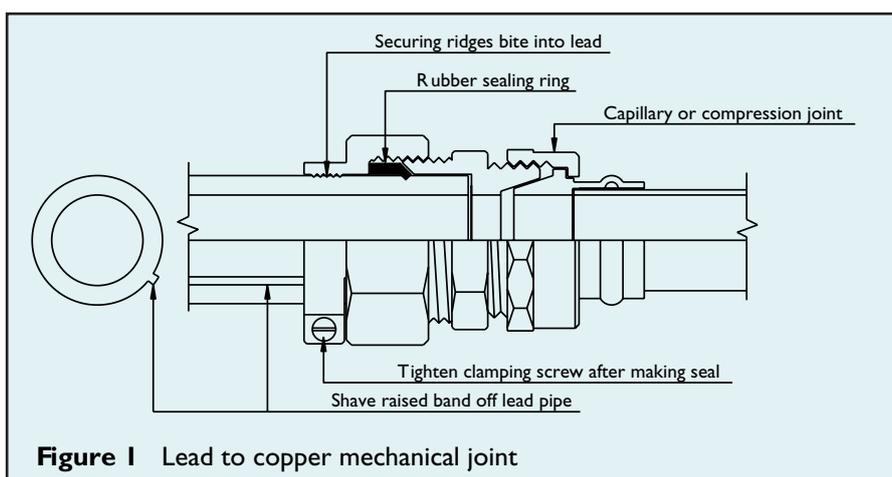
A lead pipe system requiring repair would be best removed and replaced completely with copper. If a joint has to be made to lead pipe then a "lead-lock" type compression joint can be used. This type of compression joint, shown in Figure 1, makes use of a relatively large rubber compression ring to overcome the problem of the variability of diameter and soft nature of the lead pipe. To make the joint choose a straight section of lead and cut square. If the lead pipe has a raised identification strip this needs to be shaved off before fitting and tightening the joint in accordance with the manufacturer's instructions.

If the copper replacement is to be installed underground it should be copper tube to EN 1057 thick wall half hard formerly Table Y - soft coiled copper; preferably plastic coated. EN 1254 Capillary joints or 'CR' marked Type 'B' manipulative compression joints can be used to joint it. If above ground then EN 1057 thin wall half hard formerly Table X tube and EN 1254 capillary or Type 'A' non-manipulative compression joints are usually used.

Connections to Threaded Galvanised and Plain Steel Tubes

Many patterns of capillary and compression fittings are available with both male and female BS pipe threaded ends, a few are shown in Figure 2. These can be used to connect to galvanised and uncoated steel tube. Only use approved sealing paste or the correct type of PTFE tape to make the threaded end of the joint. Only the thicker (0.2mm compared to 0.075mm standard PTFE), denser PTFE tape to EN 751-3 should be used on gas services. It must be wrapped around the thread with a 50% overlap.

If the joint is likely to require regular disconnection then a proper ground faced union joint is best, see Figure 2a. A compression joint, Figure 2b, will allow



occasional disconnection. But, if a capillary joint with a threaded end is used to connect directly to the steel tube, as in Figure 2c, it will be difficult to dismantle or remake the threaded joint in the future.

Stainless Steel

Light gauge stainless steel tube to EN 10312 can be jointed using EN 1254 capillary or compression fittings. Stainless steel can be a difficult material to solder and a phosphoric acid based flux is used. This MUST be used strictly in accordance with the manufacturers instructions and thoroughly flushed out of the tube bore and washed off the outside of the tube after jointing. Because of the care required when soldering stainless steel, compression fittings seem to be the preferred method of jointing.

Connecting copper to plastic tubes

Provided the correct type of joint is chosen, plastic tube can easily be connected to copper. Polythene, Polyethylene and Polybutylene can all be joined using non-manipulative type 'A' compression joints with metal liners to support the tube wall as in Figure 3.

It is very important to select the correct type and size of fitting and liner for the plastic pipe to be joined. Liners are often colour coded by paint marking on the flange. Blue Polyethylene tube (MDPE) to EN 12201 can be laid below ground, it can be joined with EN 1254 compression fittings.

Polyvinyl Chloride

When connecting to Unplasticised PVC or Chlorinated PVC it is necessary to solvent weld a fitting with a threaded end to the PVC tube so that an appropriate compression joint can then be used.

Oil based jointing compounds

Do not use oil based jointing compounds to make joints on plastics. Both the plastic and the jointing compound are made from oil. The oil can

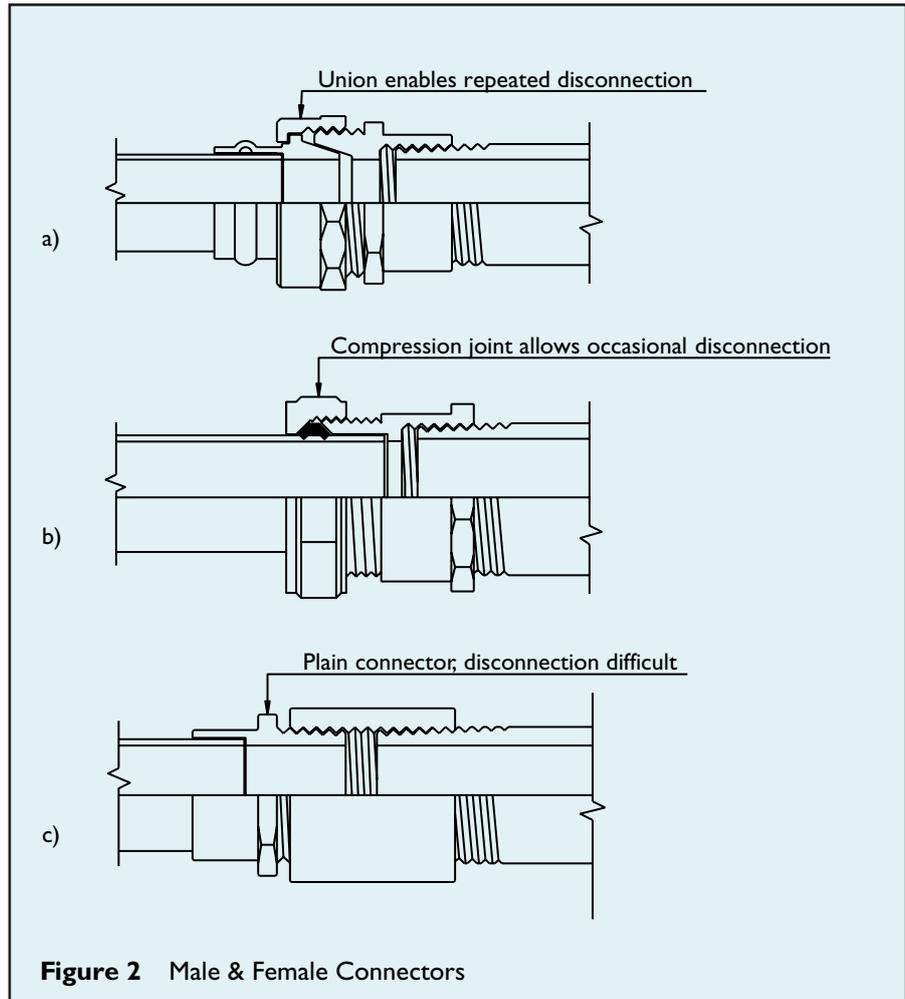


Figure 2 Male & Female Connectors

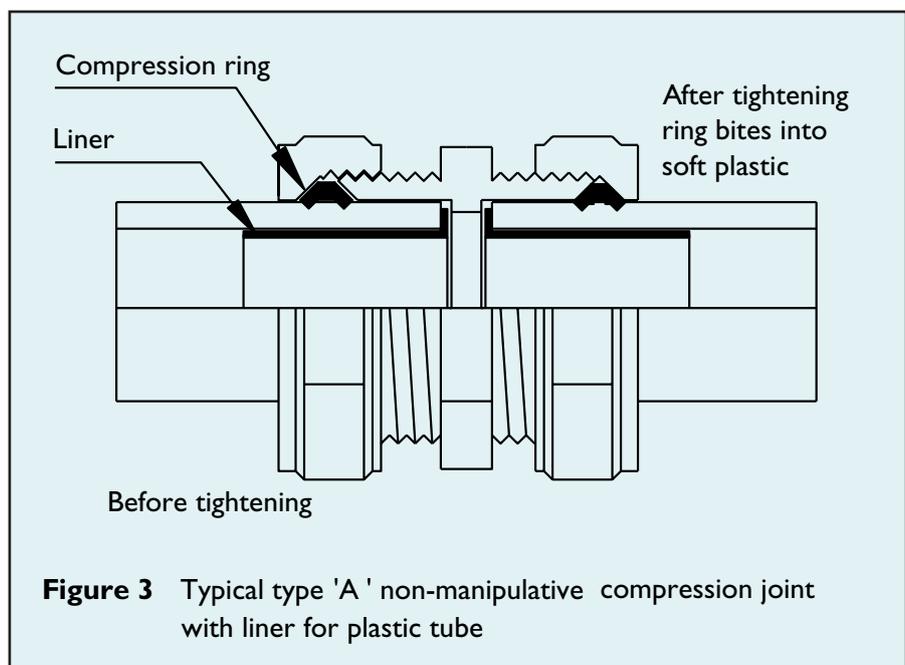


Figure 3 Typical type 'A' non-manipulative compression joint with liner for plastic tube

break down the plastic, in effect softening it so that the joint can fail after a short time. Use only PTFE tape, fibre washers or rubber rings to form a seal on plastic materials.