INITIATIVE COPPER

Flame-Free Jointing

Copper push-fit and press fitting jointing systems offer a high-quality modern solution that meets the challenge of changing working practices, evolving construction techniques and the more stringent health and safety regulations present in today's workplace. They offer flame-free jointing, quick installation, shortened project times, and are ideal for the installation of copper building services with fast-track building systems.

Push-fit jointing

Copper and copper alloy push-fit joints are ideal for making final connections to terminal fittings and heat emitters; they are available to suit tube sizes from 10 to 54 mm and can be used on hot and cold water services including direct, indirect and pressurised systems. They can also be used on heating systems and chilled water applications within permitted temperature and pressure parameters. Neither spanners nor naked flames are needed to install copper and copper-alloy push-fit joints. Furthermore, the ability to rotate the fitting once it has been pushed on to the tube means that installation in confined spaces is facilitated; this versatility is also useful when carrying out alterations to pipework, repairs and maintenance.

Push-fit joints rely on a mechanical mechanism to join tube and fittings. There are a number of designs that use similar principles. Some create a permanent joint and once pushed on to the tube they cannot be removed; others are demountable by using a release tool.

Generally, when a length of tube is pushed into the demountable joint it passes through a release collar and then through a stainless steel grip ring. This has a series of teeth that open out and grip on to the tube, securing it so that it can only be released using some form of disconnecting tool. Pushing the tube further into the joint ensures that it passes through a support sleeve, which helps to align the tube and compresses a pre-lubricated EPDM 'O' ring between the wall of the fitting and the tube. Only when the tube has passed through the 'O' ring and reached the tube stop is a secure joint created.

Push-fit jointing method

1. Ensure the fitting is the right size for the tube.

2. Cut tube using a tube cutter, ensuring the tube end is round and free from damage.

3. Use a deburring tool to ensure that the end of the tube is free from any burrs or sharp edges. It is essential that all burrs are removed and the outside of the tube is chamfered around the full circumference to remove any sharp edges.

4. Mark the socket insertion depth to provide visual evidence that the tube has been fully inserted.

5. Keeping the fitting and tube in line, insert the tube through the release collar to rest against the grip ring.

6. Push the tube firmly with a slight twisting action until it reaches the tube stop with a positive 'click'. Note that excessive force should not be necessary to assemble tube and fitting and, if required may indicate damage to the tube end.

7. Pull on the tube to check that the fitting is secure and the grip ring is engaged.

Other points to note

- Copper and copper-alloy push-fit joints do not need flux or heat to achieve a joint
- Do not use push-fit joints directly with capillary fittings as the heating may damage the non-metallic components.
- Correct tube support should be used to secure finished pipework and prevent movement and vibration.
- Avoid contact with mineral oils as these may affect the 'O' rings.
- Copper and copper-alloy push-fit joints are pre-lubricated with silicone; it is not necessary to add further lubricant.
- Where parallel threaded connectors are used, a good quality fibre jointing-washer should be used to form the seal.

Disconnecting demountable push-fit joints

Place the disconnecting tool on the fitting assembly. Squeeze the tool with one hand to compress the release collar and twist out the tube with the other.

Press fittings

Press fittings are available to suit tube sizes from 12 to 108 mm diameter, and can be used for systems operating from -20°C up to 200°C and up to 16 bar pressure. Pressfit jointing is a fast, efficient, flame-free, and very cost effective method of connecting copper tubes.

Mechanical and electronic tools are used to compress the fitting on to the tube to provide a secure, positive interlocking and frictional restraint without the need for any solder, adhesives, or additional jointing materials.

For potable water an EPDM 'O' ring seal is used, and there are various other seals available for various applications, including gas, solar, compressed air and chemicals, to name a few.

Press fitting method

Select the correct size of tube and fitting for the job, and ensure that both are clean and in good condition and free from damage and imperfections.

1. Cut the tube square using a tube cutter whenever possible.

2. Use a deburring tool to ensure that the end of the tube is free from any burrs or sharp edges. If a hacksaw has to be used, take care to cut the tube square and properly deburr.

3. Mark the tube insertion depth with a marker pen so that full insertion depth is ensured on assembly.

4. Check that the 'O' ring is seated correctly in the fitting socket and assemble the joint ensuring that the tube end meets the tube stop; this can be confirmed by checking the mark made on the tube earlier.

5. With the correct size jaws inserted into the press-tool, place them over the bead of the fitting maintaining a 90° angle between the tube and the tool. Depress the trigger to commence the compression cycle, the jaws will fully enclose the mouth of the fitting, compress the assembly and the tool will stop automatically when complete.

Press fitting tools

The making of a press fitting joint relies on the use of a press-tool together with the appropriate size and profile of clamping jaws, (and slings for larger fittings of 42 mm and above). Mains powered or cordless electric press tools are available, with jaws from 12 to 108 mm. press fitting tools can complete a joint in as little as 6 seconds, although 108 mm fittings require a double press to complete the joint. An automatic mechanism ensures that the correct amount of force is always used to create a sound joint and a safety clutch switches the machine off as soon as maximum pressing force is attained. The tool is easy to use. Some tools also have additional features, such as an automatic monitoring function to ensure consistent jointing quality.

Design considerations

When designing the pipework layout, allowances should be made for the clamping jaw and press fitting tool access so that there is sufficient room around the tube for the jaws of the tool to operate without hindrance. This requirement will usually be achieved if allowance for the correct insulation thickness for the tube size as specified by BS 6700 is made. Also, when pressing fittings on complex pipework or when working in difficult locations it may be important to plan the sequence to ensure tool access.

Fitting spacing and projection – A minimum gap between fittings is necessary. This is generally 10 mm for 15 to 35 mm fittings and 20 mm for 42 mm fittings and above. Where a pipe stub projects through a wall, allowance must be made for the size of the press-tool, *see Figure 6*.

Thermal movement - Another consideration when designing piping systems is thermal movement. Regardless of the materials they are made from, all piping systems will expand and contract with changes in temperature and so will be subjected to stress if their movement is restricted. Therefore, particularly with central heating and hot water

Press fitting jointing procedure

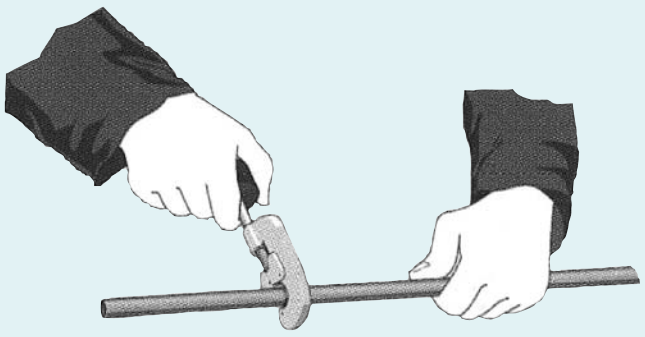

Figure 1 – use tube cutter

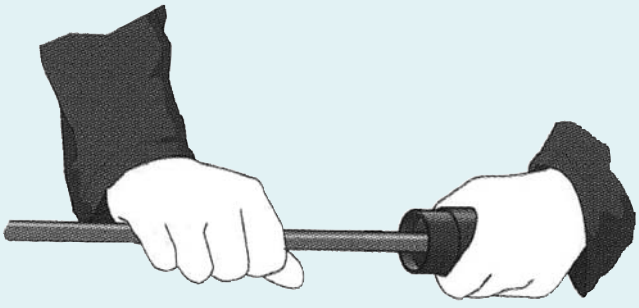

Figure 2 – deburr

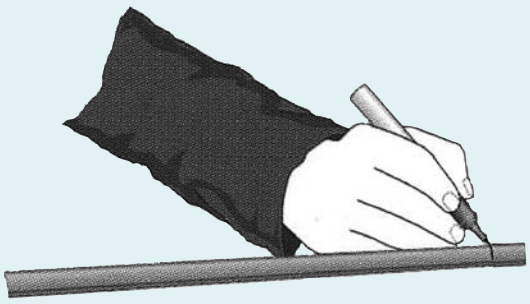

Figure 3 – mark insertion depth

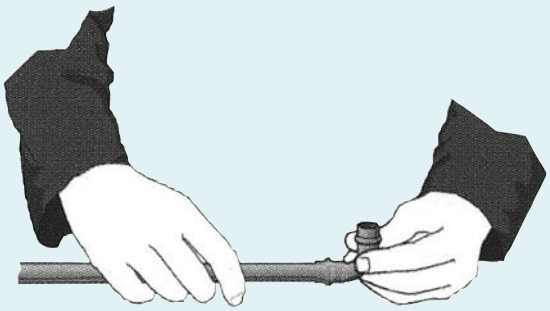

Figure 4 – assemble ensuring full insertion

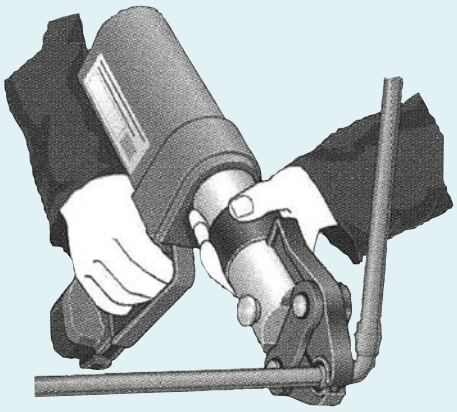

Figure 5 – press to complete joint

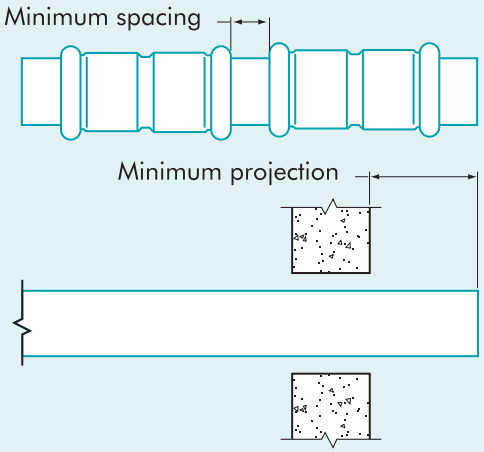

Figure 6 – minimum spacing & projection

distribution systems in large buildings, it is always good practice to allow for the effects of thermal movement. But note that press fittings and push-fit fittings should not be subjected to "cold-pull" on flanges when connecting to expansion couplings and anchor points. The stresses imposed by thermal movement can be considerable if no allowance is made. So in large buildings expansion loops, cross-over tees or bellows devices should be incorporated at appropriate points within the system to accommodate thermal movement. Also, wherever pipework is to be installed under screed or plaster, it is very important to make adequate allowance for thermal movement. The preferred practice is to lay tubing in ducts surrounded by loose, non-rigid material such as vermiculite or glass wool.

Large contracts

By specifying press fittings for the first-fix piping in risers and run-outs in ducts and ceiling voids and making final connections to terminal fittings, heat emitters and cooling coils using copper push-fit, a completely heat-free piping installation can be achieved. This is done without the use of any potential contaminants such as flux and steel wool. Furthermore, the use of heat-free jointing removes the necessity of applying for hot-work permits and the danger of flame damage during refurbishment projects. The ease of the jointing process significantly reduces the amount of time spent on site because installation is significantly speeded up! The only jointing tool required is the press fitting clamp, so there is no need to purchase and store fuel gases, adhesives, fluxes, solders or any other jointing materials.

Often, prefabrication of pipework can be an advantage, especially if the installation is in a confined or restricted space. Bending, jointing and assembly of complicated piping can be done more efficiently in the workshop – press-jointed systems are ideally suited to this method of working.

In conclusion

The correct specification and installation of press and push-fit jointing methods will enable professional installers to offer their customers all the peace-of-mind and proven benefits of copper in a fit-and-forget, resilient, maintenance free piping system that gives excellent protection against contaminants that threaten the water supply.

Brian Curry, January 2007.