INITIATIVE COPPER

Copper in Small Bore Heating Systems

Copper is the ideal material for use in small-bore, (Figure 1) mini-bore and micro-bore, (Figure 2) heating systems. Modern boilers use finned copper heat exchangers and copper tube for their internal pipework because of its proven long term advantages. It also makes sense for the installer to use half-hard and soft condition copper tube to EN 1057 for the installation, Table 1 indicates the wide selection of tube diameters available for use in this type of work.

Figure 1

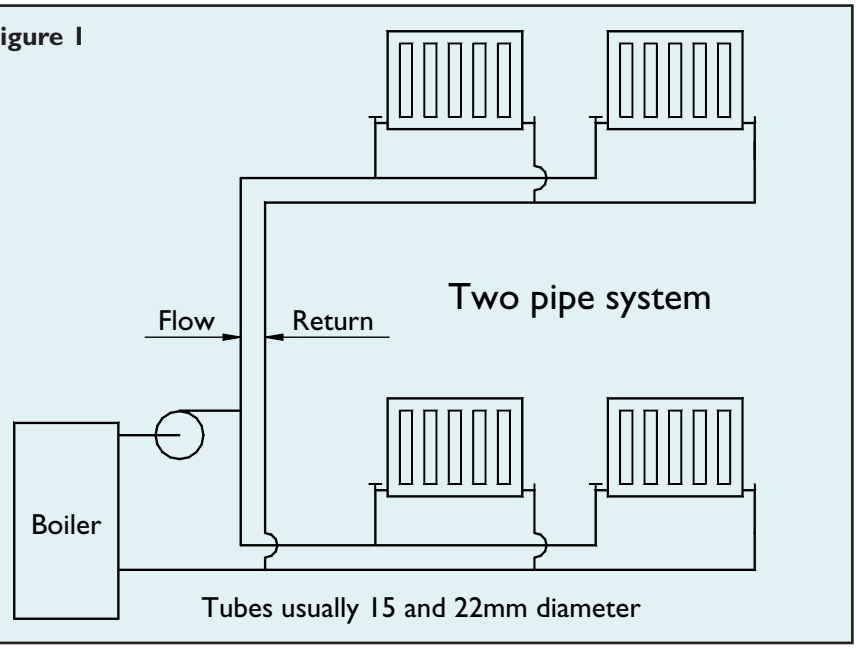
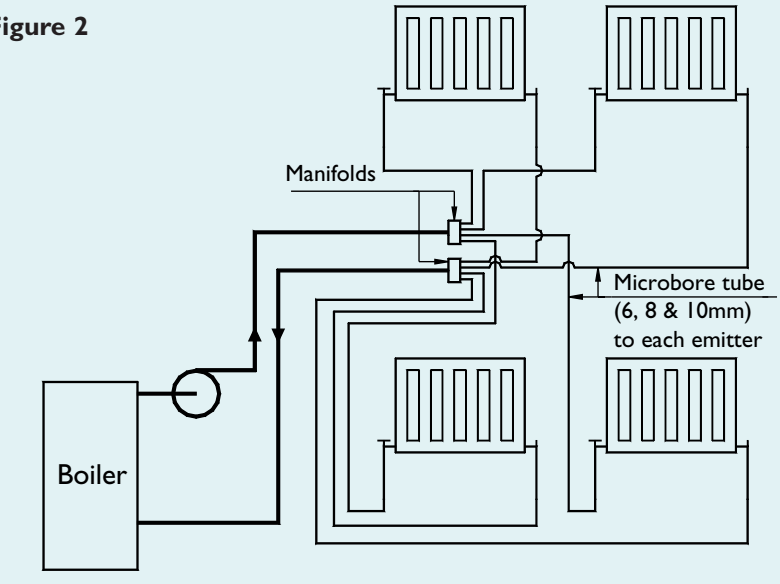


Figure 2



System design

Choose tube diameters from the wide selection available to give a water flow velocity of between 0.3 and 1.5m/s.

By selecting an appropriate tube diameter some of the long term problems associated with heating systems can be avoided. If the tube used in a circuit is too large in diameter, sluggish water flow can allow sludge (formed by slow corrosion of the steel heat emitters) to settle out into the pipework. If the tube used is too small in diameter, in addition to inadequate delivery, flow noises can be created. Bearing these factors in mind, Table 2 gives details of the minimum and maximum heating load that should be connected to any given circuit for a particular tube diameter. In open-vented systems the temperature drop is usually taken as 11°C. Sealed systems can be operated at a higher temperature, which allows smaller tubes and heat emitters to be fitted and a temperature drop of 20°C to be used. To use the table, select a suitable tube diameter based on emitter heat output and temperature drop. As further emitters are added to the circuit their heat outputs can be totalled to select the diameters of the tubes feeding them.

Installation

The installation of a copper system is a simple task for the competent operative; satisfying results are achieved in terms of appearance and ease of fixing. End-feed or integral solder ring fittings are normally used for tees, couplings and elbows. Compression fittings are used where disconnection will be required. For example: radiator valve tails, pump valve connections, tank connectors and the copper tails on the boiler.

For a quality installation, care and attention will pay dividends. Lengths

Table 1 Diameter and wall thickness of EN 1057 copper tube for domestic heating systems

Outside diameter	Wall thickness					
	0.6	0.7	0.8	0.9	1.0	1.2
6	R		R		R	
8	R		R		R	
10	R	R	R		R	
12	R		R		R	
15		R	R		R	
22				R	R	R
28				R	R	R

R = European recommended dimensions Indicates BS 2871 Part 1 tube

should be measured accurately so that the tube does not have to be sprung to make a connection.

Tube below 12mm in diameter should be cut square with a junior hacksaw, any burrs should be removed with a file. This is to avoid restricting or reducing the diameter of the bore at the tube end, which can be excessive when using a wheel-cutter, particularly on soft condition tube.

After cleaning capillary fittings, apply just sufficient amounts of flux on the tube end only, not inside the fitting. Twist the tube in the fitting after insertion, to spread the flux over the two surfaces and wipe off any excess flux. Apply heat, and in the case of end feed fittings, solder until a complete ring of solder appears around the mouth of the socket. Wipe the fitting with a damp rag to remove any flux residues, then examine the joint for a complete visible ring of solder for confirmation of a sound joint.

It is essential, for the long term reliability of any heating installation, to prevent contaminants such as: dirt, general debris, excess flux and metal filings, from entering the system during installation. This can be achieved by applying tape over tube ends or squeezing up-stands flat on carcass pipework. Once the system is in service, it is important to prevent air from entering the system. Over-pumping, micro-leaks on the suction side of the pump and certain types of plastics tube can all allow oxygen to enter the system. Copper tube, being totally impermeable, will not.

Plastics coated copper tube

Plastics coated copper tube has many uses in heating systems. Where solid floor construction is encountered plastics coated tube can be buried in the screed, but preferably with few or no joints. This is best achieved by using soft coiled copper tube, readily available in lengths up to 50m, installed in accordance with the water regulations. The plastics sheath is formed around the copper without a seam, providing a reliable continuous protective coating. As well as providing a tube suitable for buried services in corrosive environments, it can be colour coded: blue for water, yellow for gas and white for heating lines. Copper is also available with a castellated profile plastics sheath, see Figure 3. This gives a number of advantages, e.g. heat loss is reduced, noise transmission is reduced, some lateral expansion can be accommodated and a lower surface temperature is present on surface fixed tube. This could be particularly useful on jobs where low surface temperature heat emitters are specified. Formers are available to enable plastics coated tube to be machine bent easily. Where joints are to be formed, the plastics sheath can be slit and pulled back. This will prevent heat damage when using capillary joints. Once the joint is completed, the sheath can be pulled back into position and wrapped with adhesive tape to maintain the continuity of protection.

Figure 3

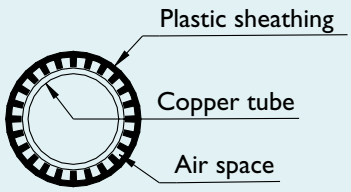


Table 2 Heat carrying capacity (kW) of BS EN 1057 copper tube

Diameter (mm)	Wall thickness (mm)	Heat capacity (kW)			
		Temperature drop 11°C		Temperature drop 20°C	
		0.3m/s (minimum)	1.5m/s (maximum)	0.3m/s (minimum)	1.5m/s (maximum)
6	0.6	0.24	1.24	0.45	2.25
8	0.6	0.49	2.48	0.90	4.51
10	0.7	0.80	4.00	1.45	7.27
12	0.8	1.17	5.86	2.13	10.60
15	0.7	2.00	10.00	3.63	18.10
22	0.9	4.42	22.14	8.05	40.20
28	0.9	7.43	37.17	13.50	67.50

Commissioning

It is important to thoroughly flush every heating system as soon as possible after installation. Fill and vent the system with cold water and check all connections for leaks before draining. Refill and commission the boiler and heat up the system. Occasionally leaks can be found at this stage, (sometimes due to heat melting grease based fluxes) so check again before draining the system whilst still hot. If corrosion inhibitor is necessary, it should be added during the final filling operation, before venting and balancing the system for a long and trouble free service life for specifiers, installers and customers.