

INSTALLING COPPER PIPEWORK IN SUSPENDED FLOORING SYSTEMS

Copper pipework can be found in all types of buildings that use many different construction techniques. One very important aspect of pipework services installation is positioning in floors and ceilings. Joists span from wall to wall and support the floors/ceilings. They can be made from timber, metal or steel reinforced concrete. Copper pipework systems can easily be installed with the various joist options currently used by the building industry.

Traditional sawn timber joists

Copper pipework has been installed in homes fitted with timber joists for many years. Notching of joists to accommodate the tube is a simple exercise but a strict set of rules apply as to the width, depth and position of notches.

Traditional timber joists are installed using C16 or C24 strength graded timber (timber that has been visually selected so that it does not have large knots, shakes, splits or is warped). This means that the timbers' load bearing capacity can be predicted more accurately. Consequently floors and structures that are correctly specified and installed will be safe. Also there is sufficient safety margin that properly designed holes and notches can be cut into the joists without impairing the safety factor significantly (see Figure 1).

Holes must be drilled with their centres on the neutral axis (the horizontal centreline) of the joist. It is acceptable to drill holes in a zone that begins at 0.25 of the span, and extends to 0.4 of the span measured from the edge of the joist bearing surface. The maximum diameter of any hole is $\frac{1}{4}$ of the depth of the joist and, where more than one hole is to be drilled, the holes must be at least 3 diameters apart.

If the joist is to have notches cut into its top surface, then the maximum depth of any notch is $\frac{1}{8}$ of the depth of the joist. It is acceptable to cut notches into the joist in a zone that begins at 0.07 of the span, and extends to 0.25 of the span measured from the edge of the joist bearing surface.

Joist clips, which comprise a zinc-coated steel plate on top of a plastics moulded body (see Figure 2), can be used to secure tube in the notch and will help to prevent noises due to creaking floorboards, and punctures of the tube due to nails and screws.

Note: Notches or holes must NOT be cut or drilled in roof rafters or in joists that are 100mm deep or less, or in the bottom surface of any joist.



Figure 2: Typical joist clips

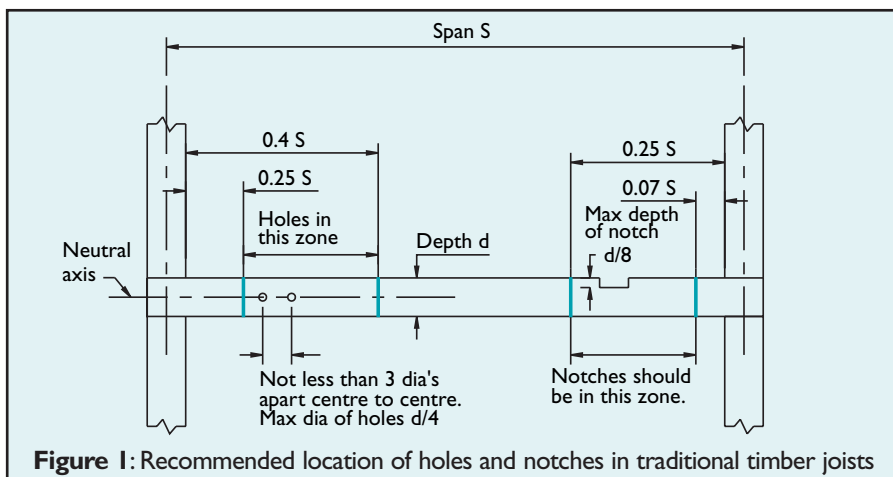


Figure 1: Recommended location of holes and notches in traditional timber joists

Timber-metal-web floor joist system

The open web design of timber-metal-web joist systems (see Figure 3) allows for easier and more flexible installation of services than is possible with traditional timber joists. However, it is essential that any copper services are installed without cutting, notching, drilling, or removing any timber or metal web components of the joists or any strongback beams, (which are fitted across the centre of spans of 4 metres or over to stiffen the floor structure). Piped services can be supported by fixing their supports to the timber components of the joist (see Figure 4).

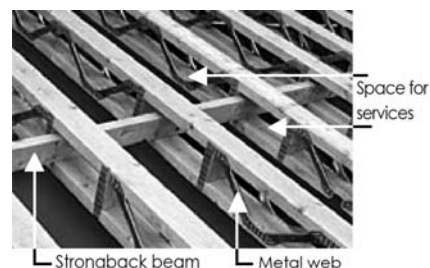


Figure 3: Timber-metal-web floor joist system

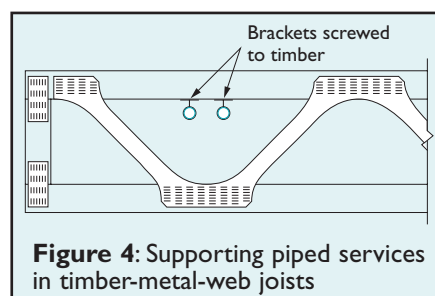


Figure 4: Supporting piped services in timber-metal-web joists

Engineered timber joist systems

Engineered timber joist systems are manufactured from glued wood fibres; the joists comprise a vertical web, which is the main weight carrying component, with rebated laminated timber reinforcing flanges glued along the top and bottom of the web to form an I-beam (see Figure 5).

Where beams or trimmer joists have to be incorporated into the floor, these are solid made from laminated-strand or stronger parallel-strand wood fibres. Joints between the floor components are made by metal joist connectors.

When installing copper pipework services into engineered timber joists, do not drill holes in or cut any cantilever reinforcement, or cut or notch the joist flanges. Where possible use the pre-stamped knockout holes to run services through the joists. These knockout holes are 38mm in diameter and located at 300mm centres along the length of the joists.

If the knockout holes are not suitable, then further holes can be cut in the joist web provided they fall within the areas as specified by the joist manufacturer, typically as shown in Figure 6.

It is also important to check the location of the joists before cutting through the floor covering, otherwise you may inadvertently cut the joist flanges, which could then impair the integrity of the floor!

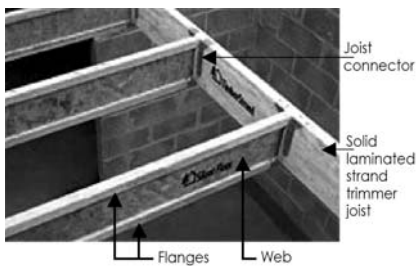


Figure 5: Engineered timber joist system

Steel joists

The open web design of lightweight fabricated steel joists (see Figure 7) allows for easier and more flexible installation of services than is possible with traditional timber joists. However, as with timber-metal-web joists, it is essential that any copper services are installed without cutting or removing any metal components.



Figure 7: Typical lightweight fabricated steel joists

Cellular steel joists (see Figure 8) are formed with circular holes in the web and copper pipework services can be run through these holes (see Figure 9) but again without cutting or removing any metal components.



Figure 8: Typical lightweight cellular steel joists

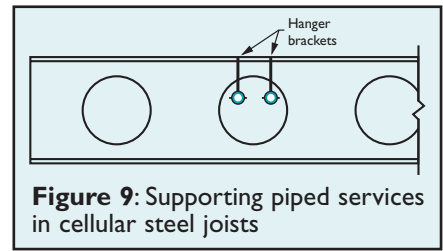


Figure 9: Supporting piped services in cellular steel joists

Pre-cast concrete beam and block floors

Pre-cast concrete beam and block floors (see Figure 10) can be used for both ground and upper floors. A typical beam is 150mm deep and is made from high strength concrete reinforced with 5mm diameter pre-stressed steel wires.

The space between the beams is infilled with solid or hollow concrete or polystyrene blocks and these are then covered with a screed which is typically 65mm deep.

Individual infill blocks can be omitted where vertical services have to pass through the floor and horizontal run-outs can be installed in accordance with regulations in ducts or in certain circumstances directly in the screed. However, the pre-cast beams must not be cut, otherwise the structural integrity of the floor will be damaged!



Figure 10: Typical concrete beam and block floor

Copper pipework services can be installed in buildings fabricated using modern building techniques and products. Providing the rules relating to each of the joist types are followed, copper pipework can be successfully installed.

B Curry, February 2009

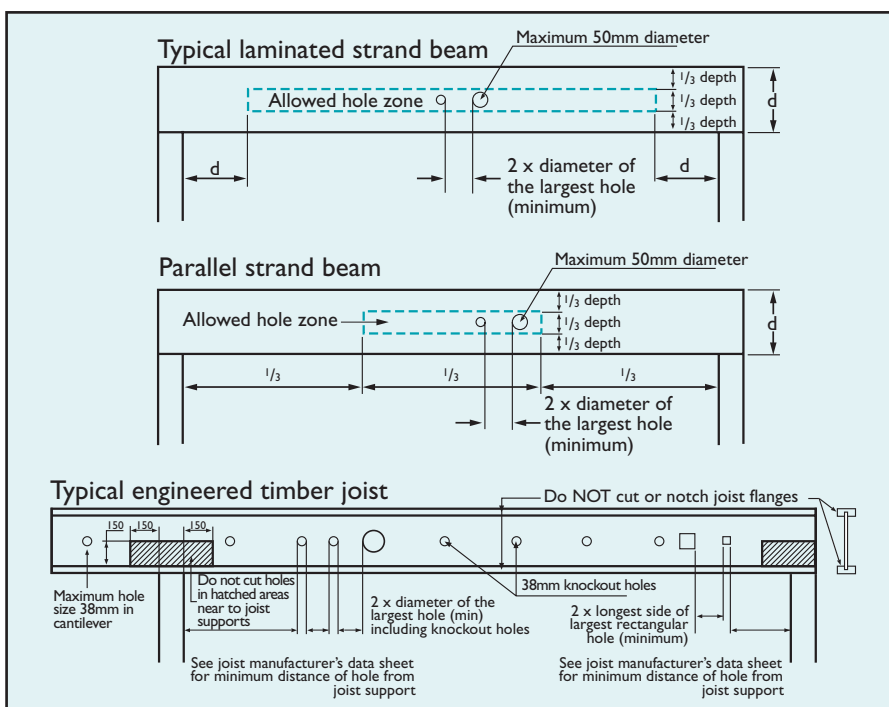


Figure 6: Typical allowable zones for further holes in engineered timber joists