

Copper Pipework Services in Modern Buildings

A Specifier's Guide

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Introduction

Specifying the right building material involves a highly complicated decision making process and is fundamental to the success of every construction project. You want the products you use to meet the highest standards of quality and, more importantly, you need materials that you can trust.

As a specifier, your responsibility does not end when the pipework services are installed – you want peace of mind and satisfied customers – copper systems offer you this.

Copper pipework services have been in widespread use for many years – proven performance that demonstrates copper has a pedigree unsurpassed by any other pipework material.

Copper gives you versatility, performance and confidence. In today's more environmentally-conscious world, it is a product that not only offers excellent health benefits but can also be recycled at the end of its useful life to help conserve the planet's natural resources.

You don't need to be told what you want in a product – cost-effectiveness, performance, reliability and peace of mind – that's copper.

Copper's performance

Versatility

Copper tube and fittings can be used in every part of domestic, commercial and industrial pipework services, including gas, hot water, cold water and central heating, with total confidence. It's strong, it can be easily formed into bends and systems can be assembled both on- and off-site. You can solve just about any problem with copper and rely on the result.

Copper is the ideal material for the following services:

- Domestic hot and cold water supplies
- Sanitary waste water drainage
- Chilled water systems
- Wet central heating systems
- Gas services
- Solar thermal systems
- Oil services
- Fire sprinkler systems

Range

Copper tube is available in a wide range of sizes, from 6 mm up to 219 mm, and is manufactured in accordance with the European Standard EN 1057.

Material temper	Condition	Minimum tensile strength, N/mm ²
R220	Annealed	220
R250	Half-hard	250
R290	Hard	290

Table 1 Mechanical properties and designations

Tube size, OD in mm	Marking
6	EN 1057 R250 6 x 0.6
8	EN 1057 R250 8 x 0.6
10	EN 1057 R250 10 x 0.6
12	EN 1057 R250 12 x 0.6
15	EN 1057 R250 15 x 0.7
22	EN 1057 R250 22 x 0.9
28	EN 1057 R250 28 x 0.9
35	EN 1057 R250 35 x 1.2
42	EN 1057 R250 42 x 1.2
54	EN 1057 R250 54 x 1.2
67	EN 1057 R290 67 x 1.2
76	EN 1057 R290 76 x 1.5
108	EN 1057 R290 108 x 1.5
133	EN 1057 R290 133 x 1.5
159	EN 1057 R290 159 x 2.0

Table 2 Popular copper tube sizes

Copper tube is produced in a number of tempers, including soft (annealed), half-hard and hard, and it is available in coils and straight lengths depending on size and temper. Copper tube is also available with a factory applied plastic covering and with a chrome plating for decorative applications.



Copper and copper alloy fittings are available in a similar size range and in a number of configurations. Fittings for use in pipework services are manufactured to the European Standard EN 1254 and include capillary, end feed and integral solder ring, braze fittings and compression fittings.





With changes in working practices and construction techniques, there is a demand for faster, cleaner, safer pipework installation practices. Advances in technology have led the copper industry to develop jointing techniques that complement the tried and trusted capillary soldering and compression fittings. The introduction of copper push-fit and press fittings has given installers more jointing options, providing a flame-free solution to meet modern construction techniques.

Copper and its alloys offer you the chance to use just one family of materials for your entire pipework services. Copper tube and fittings are available in a wide range of uniform sizes and configurations.

Uniformity

Wherever you source your tube and fittings you can be sure that individual components of a copper system will be interchangeable with those of other manufacturers. You can rest assured that the system components will be universally available throughout Europe for many years to come.

Quality

In the UK, most copper tube and fittings are manufactured to European Standards. EN 1057 is the standard for copper plumbing tube and EN 1254 is the standard that specifies copper and copper alloy fittings. Quality control systems are covered by European and International Standards. British product quality standards are arguably the highest in the world.

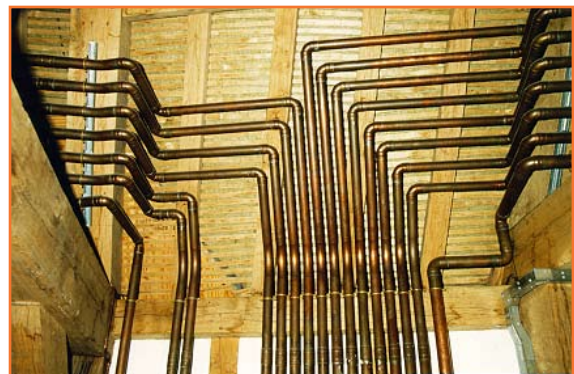
Products that carry the BSI Kitemark undergo regular audits by BSI's Quality Assurance Division.

Flow rates

Copper tube offers excellent flow rate benefits. The flow rate through pipework is dependent on the bore, fluid pressures and friction factors. The inherent strength of copper compared to other materials means that, for a given tube outside diameter, you can have thinner walls and a larger bore size. Hence the flow of water through the tube is greater than for comparable non-metallic systems.

Appearance

Copper's neat and attractive appearance cannot be surpassed by any other pipework material, an important factor as surface mounted pipework is common in many buildings, especially when retrofitting work is undertaken.



To achieve the same flow rate as copper, certain other materials will need to have a larger sized tube for the same bore size that compromises the aesthetic appearance of the pipework.

When hot water passes through copper, the low level of expansion that takes place is barely noticeable. With certain other materials expansion is so great that initially straight pipe runs quickly become wavy and unsightly.

Rigidity

The rigidity of copper means that it can be installed vertically or horizontally without sagging and with the minimum use of clips. Copper systems are self-supporting and are easily capable of supporting pumps, valves and central heating components.

Professional skills

Whenever quality counts, choose copper systems and trained professionals to design and install them. If reliability is your main consideration, the best solution is copper, with its proven track record, backed by the professional skills of a trained installer.

Post installation peace of mind

Since the 1940s copper has become the pre-eminent plumbing material in many countries around the world. A correctly designed and properly installed copper system will be virtually maintenance-free for the lifetime of the building, giving you peace of mind and confidence.

Post installation responsibility for the pipework services lies with the specifier. Copper systems have a number of benefits to ensure that post installation problems are minimised.

Proven performance

Copper pipework services have been in widespread use for years – the result: worry-free, trouble-free installations. With over four million miles of copper installed in the past one hundred years in the UK, copper has proven performance and a pedigree unsurpassed by any other pipework material.

Durability

Copper systems are strong and durable – the tensile strength of annealed copper tube is at least 220 N/mm² and more than 300 N/mm² for hard drawn tubes. Copper pipework services have successfully withstood these pressures and stresses for decades.

A unique range of properties

Copper offers a combination of properties that makes it unique. Copper handles extremes of heat with no problems, side effects or long-term degradation. In fact, copper and its alloys maintain acceptable physical, chemical and mechanical properties between –196°C and 205°C, which means that it is suitable for use in applications as diverse as cryogenics and steam lines.

Expansion

Copper has a low coefficient of linear expansion. For example, a 6 m length of copper tube, initially at 20°C, joined to a boiler with a working temperature of 82°C, will only increase in length

by about 7 mm. Certain plastics materials expand by 10 – 15 times more than copper and, under the same conditions, most plastics will expand between 70 – 100 mm. Hot water is known to make plastics pipework systems sag in between supports.

Fire resistance

Copper offers excellent resistance to fire and does not generate toxic fumes when subjected to fire. As a result, copper can be used for domestic, residential and certain commercial fire sprinkler systems.

Copper is ideal for fire sprinkler systems. Its inherent strength ensures that it has excellent flow rate benefits for a given outside diameter. As small diameter tube is used, installers benefit from copper's lightness, ease of handling and jointing.



Working pressures

Pipework systems constructed from copper offer high levels of safety and reassurance due to its ability to withstand high working pressures, such as those occurring in pressurised hot water and sealed central heating systems.

Copper tube 15 mm OD with a 0.7 mm wall thickness, half-hard temper to EN 1057, has a maximum working pressure in the region of 58 bar. This compares with a central heating system that operates at a maximum pressure of 6 bar.

Impermeability

Oxygen

Central heating systems are vulnerable to corrosion in steel radiators and iron boilers caused by oxygen ingress. Oxygen is known to pass through certain other materials and into the circulating water with highly corrosive results on ferrous components. Copper is the most commonly used pipework material that offers complete impermeability to oxygen.

Hydrocarbons

As a homogeneous metal, copper is the most extensively used pipework material which is completely impermeable to hydrocarbons, enabling it to play a vital role in maintaining the integrity of the water supply. Copper keeps out:

- Viruses and bacteria
- Harmful fluids
- Herbicides/insecticides
- Fats, oils and solvents.

You should remember that certain other materials are susceptible to permeation by many commonly found hydrocarbons, which may cause water to become contaminated and pipework to deteriorate.

Retrofitting

Certain other pipework materials are only available in limited sizes and from a limited number of stockists. Copper is available in a wide range of sizes, with all manufacturers' products offering compatibility and available from virtually all plumbers merchants. If you are doing retrofit work you need to be sure that you can obtain the tube and fittings in the right material and the right size easily – which can be done with copper.

Environment and health

Voluntary risk assessment

In 2000, the copper industry initiated a voluntary risk assessment for copper. The assessment process was agreed with the Italian Government's Istituto Superiore di Sanità, Italy acting as the review country on behalf of the European Commission and the EU Member States. The copper risk assessment has now been completed and extensively reviewed by the European Commission and EU Member States.

The 1,800–page dossier comprehensively assesses the health and environmental impact of copper during its production, use, recycling, and disposal. Information from the producers of anodes, cathodes, copper powders and copper chemicals, as well as from many semi-fabricators, cable companies and other downstream users, was collected from over 100 sites across the EU.

This comprehensive assessment, covering the production, use and end-of-life aspects of the copper value chain, shows that the existing legislative framework safeguards Europe's environment, the health of industry workers and the general public.

With this risk assessment, the copper industry is meeting its duty of care to all stakeholders by demonstrating the safe use of its products for the environment and for human health.

Life cycle assessment

The embodied energy of a material (in J/kg) is a measure of the total energy consumed during every phase of the life cycle of a product, from "cradle to grave", so for copper this includes energy used during mining and extraction, manufacture, disassembly and final recycling. The long life and recyclability of copper products have a positive impact on their embodied energy.

The copper industry has developed up-to-date life cycle data for its tube, sheet and wire products. The information has been prepared in co-operation with recognised life cycle practitioners, using international methodologies (ISO standards), leading software (GaBi), and proprietary production data collected from across the copper industry. For more information visit www.copper-life-cycle.org.

Conserving our resources

Sustainability of materials is something that impacts all parts of the construction sector and is an increasingly important concern in modern buildings. The copper industry has worked hard to produce information on the environmental performance of its products and the results are very positive.

The recycling of copper is well established and plumbers have always sold off-cuts and decommissioned pipework and cylinders that have reached the end of their lives into the recycling chain.

- Copper is 100% recyclable, with no loss in properties. Recycled copper can be used for exactly the same applications as newly mined copper.
- Recycling helps to meet the growing demand for copper, helping to preserve natural resources.
- In Europe 42% of the copper demand is satisfied by recycled material.
- Copper tube manufacturers use on average more than 50% recycled materials in their tubes.
- Recycling uses 15% of the energy that would be used to mine and produce the same copper, whilst helping to conserve fossil fuels and reduce CO₂ emissions.
- Copper has been recycled for at least 10,000 years and today is the most recycled plumbing material.



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Health

Copper is well known for its natural antimicrobial properties as well as being essential for human health.

- For centuries copper pipes and vessels have been used to convey clean drinking water.
- Copper has been shown to limit the growth of water-borne pathogens such as Legionella pneumophila.
- Copper and copper alloy surfaces can reduce contamination and help to reduce the risk of food poisoning (E.coli, Listeria, Salmonella) and healthcare-associated infections (e.g. MRSA, Clostridium difficile).
- We all need a daily intake of copper in our diets to maintain good health. Chocolate and nuts are two good sources of copper.
- Copper is a micro-nutrient, vital for all forms of plant and animal life, ensuring soil fertility and productivity.

Copper is important for delivering fresh, clean, wholesome drinking water, for generating and supplying electricity and for our health. Recyclability increases copper's value to society in that it helps to conserve natural resources. Use of recycled copper also reduces greenhouse gas emissions. Recycled copper is totally comparable to new copper, therefore no copper need ever go to waste.

With so many positive attributes, copper will play a key role in the development of sustainable buildings and one of its main applications will continue to be in plumbing and heating systems.

Appendix

Standards

- EN 1057 Copper and copper alloys – Seamless round copper tubes for water and gas in sanitary and heating applications.
- EN 1254 Copper and copper alloys – Plumbing fittings
Part 1 Fittings with ends for capillary soldering or capillary brazing to copper tubes.
Part 2 Fittings with compression ends for use with copper tubes.
- EN 12845 Fixed firefighting systems. Automatic sprinkler systems. Design, installation and maintenance.
- BS 6700 Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages.
- BS 6891 Installation of low pressure gas pipework of up to 35 mm (R1 1/4) in domestic premises (2nd family gas). Specification.
- BS 9251 Sprinkler systems for residential and domestic occupancies. Code of practice.

Bibliography

ICE Manual of Construction Materials, Edited by: M. C. Forde (University of Edinburgh), Institution of Civil Engineers.

Plumbing Engineering Services Design Guide, Chartered Institute of Plumbing & Heating Engineering.

Water Regulations Guide, Water Regulations Advisory Scheme (WRAS).

Installation Tips, UK Copper Board.

Copper, The Modern Solution, UK Copper Board.

Useful websites

Copper Development Association: www.copperinfo.co.uk

Antimicrobial copper: www.copperinfo.co.uk/antimicrobial/

Copper in Architecture: www.copperinfo.co.uk/arch

Copper life cycle data: www.copper-life-cycle.org

Copper risk assessment: www.eurocopper.org/copper/copper-ra.html

European Copper Institute: www.eurocopper.org

International Copper Association: www.copperinfo.com

UK Copper Board: www.ukcopperboard.co.uk

UK Copper Board

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Boundary Way

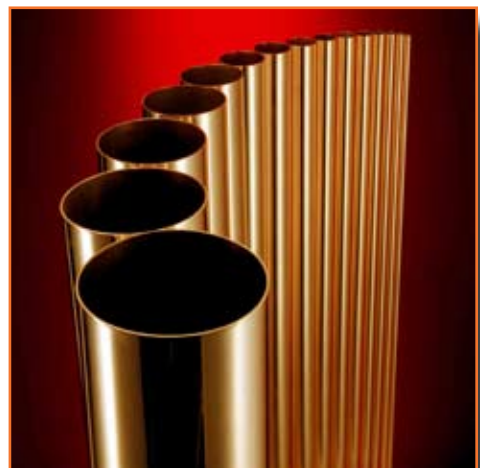
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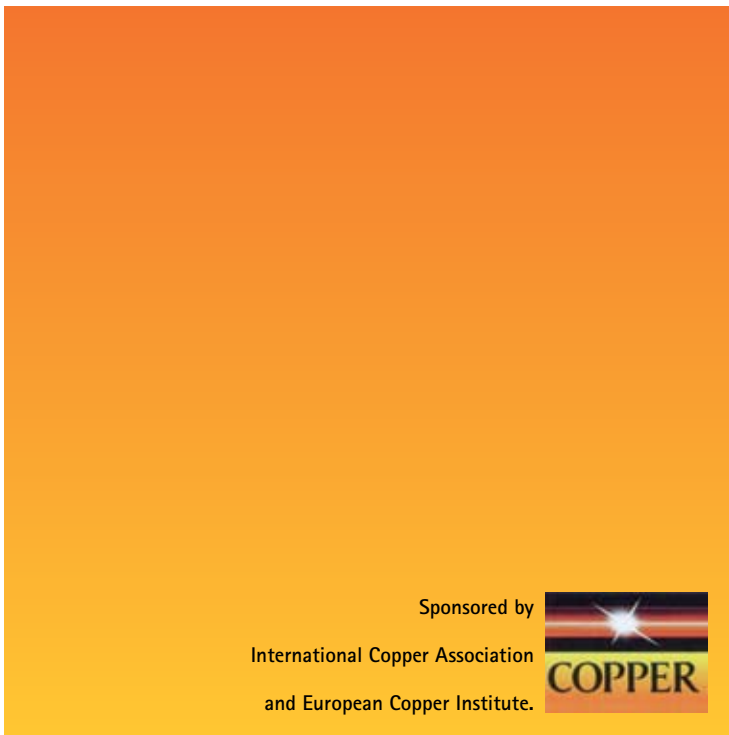
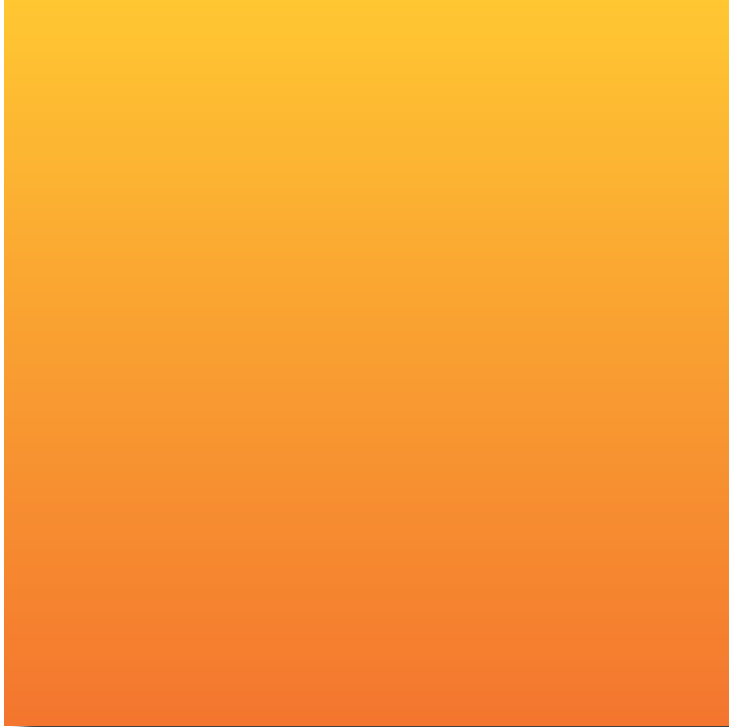
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