GEBERIT

IS IT TIME TO **GIVE COPPER THE ELBOW?**

EXPLORING THE BENEFITS OF SELECTING MULTI-LAYER PIPING OVER COPPER AND OTHER MATERIALS

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Plastics are everywhere, whether you love them or hate them. The built environment that we inhabit contains plastic products in every shape and form; both visible and hidden. Technology has developed to utilise different plastics, polymers, elastomers and man-made rubbers in nearly every walk of life. We live with, wear, carry, drive in, fly in, eat with and drink from, shop with, and play sports with plastics.

Some of the most advanced materials in the world are Engineering Plastics which are sometimes used to replace components made from metal or wood. They often have superior properties and can also be formed into complicated shapes. 3D printing has also revolutionised manufacturing techniques and uses plastics to construct complex geometries which would not be able to be formed or cast. However, some commercially driven plastics are deemed unnecessary for modern living, and measures are being taken to develop products which have less of an environmental impact or recycle and reuse as much as is reasonably possible.

Buildings, and the materials used to complete them, have many components which are made from or contain plastics. With every procurement decision comes considerations as to what are the best or most appropriate materials to use. Some plastic based materials are essential when looking at cost effectiveness compared to physical properties and suitability. An example of this would be the necessity of having electrical wires covered in plastic or polymer shroud.

Thoughts around the environment and the use of plastics are at the forefront of everybody's minds and play a role in procurement and decision-making processes of overall construction products. When it comes to material selection for Building Services; drinking water, or heating and air conditioning, for example, the reason for using plastic systems must be correct and considerations must be made compared to their more traditional counterparts. Expansion, corrosion resistance, chemical resistance, surface roughness, and hygiene are all considered. Modern heating systems are evolving to use different product types, moving into lower temperature bands, and becoming more efficient, meaning that plastic and multi-layer systems become an attractive prospect.

Choosing to use multilayer piping systems when considering the variables of corrosion resistance, temperature resistance, pressure loss, expansion, recyclability and responsible sourcing is a great opportunity to use products which cover many, if not all, the modern environmental requirements.

This paper covers the benefits of using multi-layer systems, how the switch to these materials has and is happening; and why companies such as Geberit are embracing the technology to benefit projects, installers and the built environment. It is important now, more than ever, to recognise those technologies created to help with making building projects and the built environment the best it can be.

Antony Corbett MEng (Hons)
Geberit Product Applications Engineer

THE CHALLENGE OF **MATERIALS SELECTION**

It will come as no surprise to any consultant, building designer, specifier or contractor that appropriate materials selection is critical when designing a supply piping system.

Ensuring a safe, compliant and efficient water supply system, for example, starts with selecting the right products for the right project. It can support building efficiency, help meet applicable regulations, minimise running costs and deliver a better environment for the end user.

On top of this, the value of appropriate materials selection becomes even greater when you understand the risks and potential costs of inappropriate selection; from faulty fittings and pipe bursts, to corrosion and hygiene issues such as limescale build-up or Legionella risk.

Against the wider backdrop of budgetary squeezes and increased client demands, the two biggest costs on any development project are labour costs and remedial costs. Make the wrong choice up front, and it can add significant pressure to project costs.

With development costs still rising (the ONS's construction output price index for all work has increased by around 11% since 2015), and copper prices reaching an all-time high in January 2026, it has never been more important to keep costs down where possible.

"THE DURABILITY OF A PLUMBING SYSTEM IS DEPENDENT ON THE QUALITY OF ITS COMPONENT PARTS AND THE ASSEMBLY SKILLS OF THOSE WHO INSTALL IT. NO PLUMBING SYSTEM, HOWEVER WELL DESIGNED, CAN BE EXPECTED TO OPERATE SAFELY OR HYGIENICALLY IF THE PRODUCTS OR MATERIALS USED ARE UNSATISFACTORY."

World Health Organisation, 'Health Aspects of Plumbing' - 2006

↑
FLEXIBLE PLASTIC PIPING INTRODUCED IN THE 1980s

With these challenges in mind, it is vital for anyone working in the design, supply and installation of piping systems to keep an open mind to new materials, products and ways of working. Supported by continued product development, many in the industry have done that to their advantage over many years.

Since the 1940s (and particularly since the 1969 ban on lead piping in UK properties), copper has been widely used due to its inherent stability and strength, together with its resistance to the effects of heat and pressure. In the 1980s and 1990s, flexible plastic piping came to the fore; an inexpensive alternative to metal pipework systems, offering advantages such as flexibility, ease of installation and resistance to freezing.

Both remain popular. **In 2007, 90% of new domestic properties were built using plastic piping for the hot and cold plumbing system**, although copper remains the most commonly specified material for all pipework, particularly in high-rise projects.

→ **However, project teams are feeling the impact of copper price increases and mindsets are changing as a result.**

Global demand for copper continues to outstrip supply due to a number of factors including tariff fears, supply disruptions and unprecedented demand from electrification, AI data centres, and renewable energy. This led to record high prices in early 2026, when copper reached an all-time high of USD 13,842.50 per tonne.

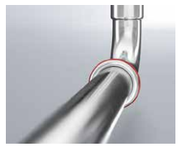
In 2023, a d22 copper pipe cost £4.98 – by March 2026 it had reached £6.16 for the same product. At current projections, it could reach nearly £18 by 2028/29.

British Plastics Federation Pipes Group

A BRIEF HISTORY OF PIPING MATERIALS

Lead piping

Copper piping



Carbon Steel systems

Multi-layer composite pipes

HDPE pressure pipes

"THESE DAYS WE DON'T JUST HAVE A STRAIGHTFORWARD DOMESTIC WATER SUPPLY, WE HAVE RECLAIMED SYSTEMS, GREYWATER, BLACKWATER, RAINWATER HARVESTING AND SOLAR. THERE ARE MORE AND MORE HIGH-RISE BUILDINGS... WE NEED TO BREATHE SOME SANITY INTO IT SO THAT PEOPLE UNDERSTAND WHAT THE ISSUES ARE AND WHAT THE PITFALLS ARE, TO MAKE SURE THE RIGHT SYSTEMS ARE BEING USED."

Jonathan Gaunt
Jonathan Gaunt, Associate Director at Cundall and Chair of the Society of Public Health Engineers - speaking at a CIBSE Journal Round Table Event, September 2019.

A BRIEF HISTORY OF PIPING MATERIALS

1930 1940 1950 1960 1970 1980 1990 2000 2010 2020

Copper is the most used material for plumbing in the developed world

Lead piping banned in the UK

Carbon steel systems introduced by Mannesmann

First multi-layer composite pipes introduced to UK market

First blue HDPE pressure pipes for potable water introduced into UK

The Water Supply (Water Fittings) Regulations 1999 introduced, setting requirements for the design, installation and maintenance of plumbing systems, water fittings and water-using appliances

Plastics replace copper as the most commonly used pipe for plumbing, although copper piping remains commonplace

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WHAT IS A **MULTI-LAYER PIPE?**

FLEXIBLE YET DURABLE, MULTI-LAYER PIPING SYSTEMS CONSIST OF THREE LAYERS:

An **outer plastic layer** usually made of polyethylene (PE-RT II) which protects against corrosion and mechanical damage. Non-reactive, fire retardant and flexible. Cross-linked polyethylene (PE-X) and high-density polyethylene (HDPE) can also be used.

A **central aluminium layer** which makes the pipe stable but also bendable. Typically up to 1.25mm thick depending on diameter.

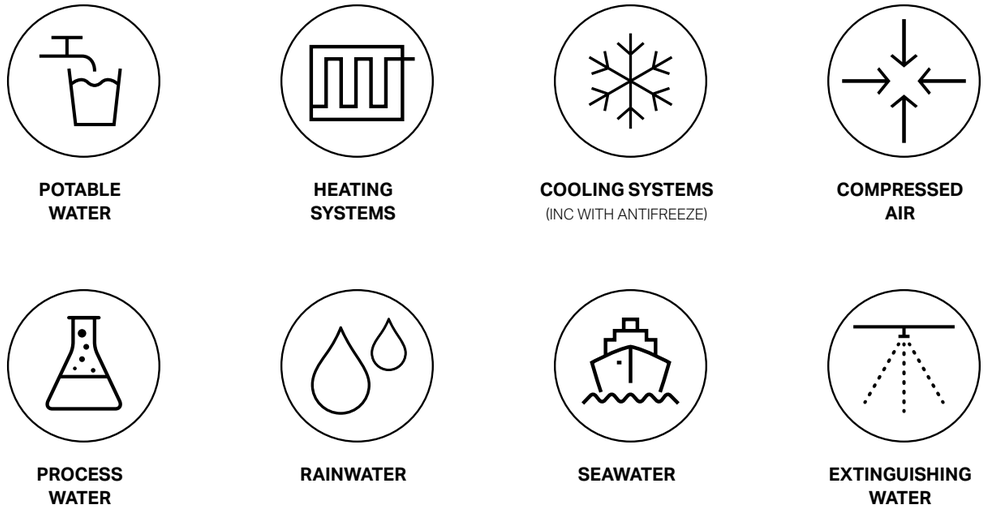
An **inner plastic layer**, which is usually made from the same or similar material to the outside layer.

Since it was first introduced to the UK in the 1970s, this technology has often been reserved for industrial applications, including compressed air and process water. However, it is also proving increasingly popular as a single solution for all potable water and heating supplies on both domestic and light commercial projects.

THIS ALL-ROUND SUITABILITY IS JUST ONE OF THE THINGS THAT SETS MULTI-LAYER PIPING APART FROM OTHER MATERIALS.

WHAT IS A MULTI-LAYER PIPE?

MULTI-LAYER PIPE IS SUITABLE FOR THE FOLLOWING APPLICATIONS:



→ GEBERIT FLOWFIT

OVERCOMING SPECIFICATION CHALLENGES

The unique construction of multi-layer composite piping offers a single solution to help consultants, designers and contractors to overcome many of the challenges commonly associated with materials selection, particularly for water supply systems.

CORROSION RESISTANT

Suitable for cold water systems with no need for additional measures to prevent corrosion. The polyethylene inner layer is resistant to cracking, aging and general wear and tear, as well as being non-reactive and corrosion resistant.

HYGIENICALLY PERFECT

The low internal surface roughness (7 µm) means it is difficult for limescale and biofilm to adhere to the smooth surface, enhancing hygiene for potable water applications.

ACOUSTICS

A smoother bore (including fittings) can ensure water passing through the pipework produces less noise than in metal piping.

NO OXYGEN DIFFUSION

The thin aluminium layer prevents the diffusion of oxygen through the pipe wall, which can be the case with plastic pipes over a period of time. This prevents unnecessary damage and corrosion elsewhere in the system.

LOWER PROJECT COSTS

Multi-layer piping systems are typically quicker (and therefore cheaper) to install than metal systems because pipes up to 20mm can be bent to shape by hand, instead of installing elbows and additional fastening points.

REDUCED THERMAL EXPANSION

The aluminium layer helps to maintain thermal expansion rate to about 10% of that of a solid PE-RT pipe, with five times less expansion than PE-X and eight times less than polybutylene pipes. Thermal expansion coefficient = 0.026 mm/(m·K) (0.026 millimetres per metre for every degree increase in temperature), compared with 0.0165 per metre (steel) and 0.016 per metre (copper).

POOR HEAT CONDUCTOR

Multi-layer piping is a poor heat conductor, with thermal conductivity of 0.43 W/mK. This means it loses around 800 times less heat than copper piping.

SUSTAINABLE

Multi-layer pipe supports sustainable construction because it is 100% recyclable (excluding systems comprising PE-X) and requires significantly less energy to fabricate, transport and install than comparative systems, according to calculations by the European Plastic Pipe and Fittings Association.

LOW INTRINSIC SCRAP VALUE

Reduces the risk of theft from site, which remains a key challenge throughout the supply chain.

BENEFITS OF **MULTI-LAYER**

There are direct benefits too. In addition to overcoming project and specification challenges, multi-layer piping offers a number of advantages for those throughout the supply chain. Here we highlight some of the most significant.

SIMPLICITY OF INSTALLATION

Multi-layer piping uses press-fitting, which means no need for hot works on site. The only tools needed to form a reliable, tight and durable connection are a cutter, deburrer and press tool, so joints can be easily made by any installer. In some newer systems, all that is needed is a cutter and press tool.

Press-fitting has been proven to take less time to install than traditional jointing methods, with no need to bring welding or soldering equipment on site too.

With Geberit FlowFit, the entire system can be pressed with just two jaws. Only one jaw is required for all sizes up to 40mm, with a second larger jaw to take care of sizes 50mm - 75mm.

"PLASTIC MIGHT BE CHEAPER, BUT BY THE TIME ALL THE EXTRAS, LIKE THE INCORPORATION OF ADDITIONAL INSULATION, FIRE STOPPING AND ACOUSTIC PROPERTIES ARE ADDED, IT WOULD BE INTERESTING TO SEE THE PRICE DIFFERENCE."

Jonathan Gaunt
Associate Director at Cundall and Chair of the Society of Public Health Engineers.
Speaking at a CIBSE Journal Round Table Event, September 2019.

FLEXIBILITY

Thanks to its ability to be easily shaped, multi-layer piping can be adjusted flexibly to the on-site conditions, even manipulated to follow the line of curved architectural features in modern buildings

Installers can bend 16mm and 20mm pipes effortlessly by hand, whilst larger diameters up to 50mm can also be bent without risk of de-lamination or kinking using an appropriate tool.

This can significantly reduce the number of fittings required and thus increase speed of installation, which, in many cases, results in a significantly lower overall project installation cost when compared with copper pipes.

LEAK-PROOF

Multi-layer pipes are typically manufactured to ensure that pressing tools can only be used in the correct way.

With Geberit FlowFit, unpressed fittings are immediately visible thanks to pressing indicators which detach after pressing. What's more, inspection windows on each fitting allow the installer to check the pipe is fully inserted before pressing, ensuring leak-proof connections every time.

ENHANCED STRENGTH

Ultimately, multi-layer systems are about improving the strength and durability of the system when compared with plastic piping, without compromising on weight or portability as can be the case with copper.

The central-welded aluminium layer offers mechanical stability to ensure that the pipe remains in its required position yet remains flexible enough to bend. The aluminium layer also provides an oxygen barrier, making it suitable for use in central-heating systems and makes the pipe detectable by electronic devices after installation.

FLOW CHARACTERISTICS

Multi-layer systems will generally have a higher friction factor loss through the system than metals if sized incorrectly. Modern multi-layer systems are being designed to reduce this deficit. Geberit FlowFit is the only multi-layer system to have internally-swept fittings which reduces friction losses, meaning it performs more like a metal system.

SPACE SAVING

As multi-layer pipes can be manipulated to follow contours around the building, the number of fittings can be significantly reduced. Additionally, more modern systems can be connected even closer to the wall, resulting in saved space. As Geberit FlowFit is pressed laterally rather than radially, pressing in tight spaces is not an issue.

COST SAVING & PRICE STABILITY

Multi-layer pipes and fittings are typically more expensive than their copper counterparts, but the cost saving is apparent when considering labour costs and the price volatility of copper. Based on projected copper prices, an installation with Geberit FlowFit could be 26.6%* cheaper than copper by December 2026 due to labour efficiencies and rising copper prices.

*see case study on page 14

COST AND TIME SAVINGS FOR WATER SUPPLY SYSTEM INSTALLATION AT COLWALL CARE HOME

→ Project information

Location: Colwall Care Home

Project Completion: January 2025

→ Geberit Know-How

Challenge: Hargen UK wanted Geberit to undertake a cost saving analysis to understand the benefits of using Geberit Flowfit compared to a press-fit copper system.

Solution: Geberit FlowFit highlighted significant cost savings, particularly around labour costs, so it was an easy decision to switch.

PROJECT OVERVIEW

A purpose-built new-build facility for residential and nursing care, Colwall Care Home from Rotherwood is nestled in the idyllic village of Colwall in Herefordshire, with breathtaking views of the famous Malvern Hills.

The modern care home, includes 60 bedrooms set over three floors with a spa suite, on-site restaurants, a library, craft room and salon. And beyond these benefits for residents, the Colwall Care Home project also offers an exemplary demonstration of the value of optimum pipework specification for the developer, contractor and building owner too.

Geberit's own calculations show that using Geberit FlowFit multi-layer press-fit pipes and fittings enabled a 19.3% saving on the total project cost compared with a press-fit copper system due to labour efficiencies on site and a significant reduction in pipe-diameters.

All whilst offering trusted, reliable performance and a host of other benefits, including a significant reduction in pipe diameters.

WHY GEBERIT?

In most cases, multi-layer piping offers total project cost savings compared with copper systems and the gap is widening as copper price volatility continues. The real benefits at Colwall Care Home became evident following a comprehensive cost analysis undertaken by Geberit's project specialists on behalf of HVAC and building services contractor Hargan UK Ltd.

In total, 2,000m of Geberit FlowFit pipework was installed for hot and cold water supply at Colwall Care Home.

Although generally multi-layer pipes and fittings are more expensive to purchase than copper, the difference is more than made up in labour cost savings. This is largely because 16mm and 20mm pipes (which represented 89% of the total system) can be bent to shape by hand, instead of installing elbows and additional fastening points – which means a cost saving for the customer and leaving the contractor free to move onto their next job quicker.

The cost analysis also showed additional savings due to tooling advancements when compared with other multi-layer piping systems, and a significant reduction in pipe diameters across the flow-optimised system which reduced the total material demand.

Geberit FlowFit fittings come in eight dimensions (of which six were used at Colwall Care Home) and only two pressing jaws are required for the entire range, rather than having to change for each pipe dimension. This saves significant time for installers, as well as needing to undertake less process work when preparing the product.

In addition, the flow-optimised design of Geberit FlowFit – which is the only plastic multi-layer system to include swept geometry in bends - results in minimised pressure losses, closer to that of metal pipework. This means that the water flows through the piping system and to the point of use with less pressure loss, meaning that piping systems can be planned and installed with much smaller diameters.

With all of these benefits combined, calculations show that using Geberit FlowFit multi-layer press-fit pipes and fittings enabled a 19.3% saving on the total project cost (installation and materials), when compared with a press-fit copper system, in February 2025.

Taking into account copper price increases, the same project would be 23.2% cheaper in March 2026, and 26.6% cheaper in December 2026, using projected copper prices.

DELIVERING THE SOLUTION

Mark Firmstone from contractor Hargan UK Ltd, said: "We've used Geberit's Mepla multi-layer system before and we know the benefits of press-fit multi-layer piping systems as a result, but when we saw the potential savings with Geberit FlowFit, it was an easy decision to switch.

"WE KNEW THAT WE'D BE GETTING A QUALITY PRODUCT, BUT THE TEAM ON SITE HAVE ALSO SAID HOW MUCH EASIER IT IS TO INSTALL, EVEN COMPARED TO MEPLA. BEING ABLE TO USE ONE SET OF JAWS MAKES A BIG DIFFERENCE WHEN WE'RE FITTING IN TIGHT SPACES."

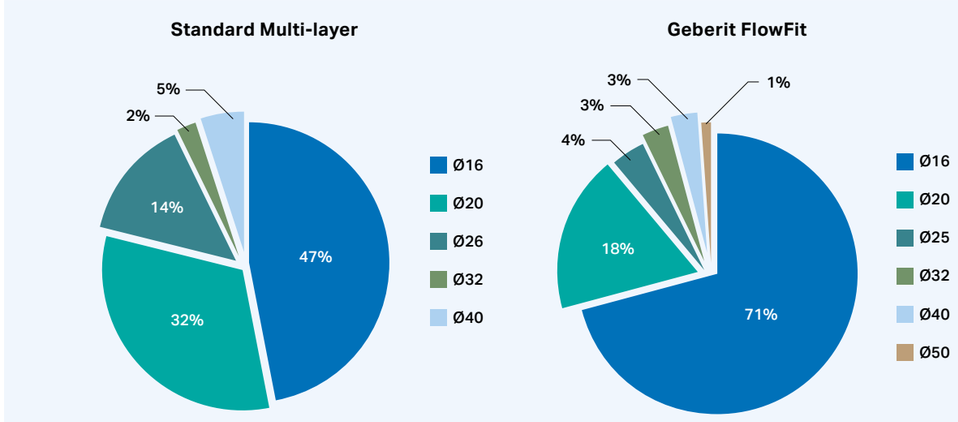
INSTALLED COST BREAKDOWN

	Mapress Copper	Standard Multi-layer	Geberit FlowFit
Material cost	£10,457.84	£12,252.52	£10,997.58
Labour cost	£9,895.56	7,323.69	£4,627.14
Number of hours	329.85	292.95	154.24
Total Cost	£20.353.40	£19,576.21	**£15,624.71**

UPDATED FIGURES TO BE SUPPLIED

Although the cost of materials is higher for Geberit FlowFit compared to Mapress Copper, the total installed cost is up to 23% lower thanks to Geberit FlowFit's speed of installation. The cost saving compared to standard multi-layer systems can be seen in the material cost as well as the significant reduction in labour time.

CALCULATED PRODUCT MIX



USING GEBERIT FLOWFIT OVER A STANDARD MULTI-LAYER SYSTEM ON THIS PROJECT OFFERED NUMEROUS BENEFITS:

- There was a significant reduction in pipe diameters used across the system, which not only reduces piping material costs but may also create further savings across the system
- 71% of the system was able to be completed in 16mm, vs only 47% in standard multi-layer
- It maximised the opportunity to bend pipe rather than use fittings, which helped to reduce cost, time and flow restrictions
- 99% of the system was able to be pressed with one jaw

KEY TAKEAWAYS

- Multi-layer composite piping systems offer a viable alternative to copper and plastic piping for water supply systems
- They can help the supply chain to address the typical challenges of material selection, protecting against price volatility whilst offering tangible benefits for project teams and contractors
- Multi-layer piping is strong, flexible, easy to install and suitable for a wide range of applications
- It can help to increase the speed and reduce the cost of installation whilst reducing the risk of pipe failure or corrosion
- With Geberit FlowFit's unique connection technology as well as its multitude of features designed to speed up installation, overall project costs can be significantly reduced thanks to a reduction in labour time

WANT TO KNOW MORE?

To speak to a Geberit expert, enquire about our CIBSE-approved CPD 'Water Transportation Systems within Buildings' or arrange product training, please contact **marketing.gb@geberit.com**

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