

PVC Q&A

Supporting evidence

August 2024



An introduction to PVC pipes

This document is designed to be used in conjunction with the BPF Pipes Group document *PVC Pipes Questions and Answers* and provides the evidence and further reading to support the various statements made.

PVC pipe safety

PVC is one of the most commonly produced plastics in the world. It was initially discovered while trying to find a cheaper synthetic alternative to natural rubber. Due to its transparency and its excellent anti-kinking properties, PVC eventually replaced rubber for the tubing used in hospitals.

Historically, different stabilisers have been used in PVC pipes, and as the science and understanding of these additives develops, some have been banned under European legislation for health reasons. Stabilisers which contained lead are one example of additives which are no longer used in the UK and Europe in virgin blends of PVC pipes; these were entirely phased out of virgin PVC pipe materials in Europe by 2015.

Source: https://vinylplus.eu/wp-content/uploads/2021/06/VinylPlus-Progress-Report-2021_WEB_sp-1.pdf

After a 3-year transition period (ending in May 2026), legislation in the EU will be “stipulating a maximum lead content of 0.1% in PVC products”

Note 1: products in this case refer specifically to pipes.

Source: <https://www.teppfa.eu/latest-news/european-commission-regulation-restricting-lead-in-pvc-supports-circular-aims-of-pvc-pipe-manufacturers/>

REACH and UK REACH are regulations applying in the EU and UK which aim to improve the safe use of chemicals and reduce the health, safety and environmental risks posed by them. Further guidance can be found here:

UK: <https://www.hse.gov.uk/reach/basics.htm>

EU: <https://echa.europa.eu/regulations/reach/understanding-reach>

Are PVC pipes long-lasting?

Research from the Netherlands Organisation for Applied Scientific Research (TNO) stated: “The investigations on the PVC sewage pipes studied here confirm the common knowledge that the lifetime of PVC pipe systems will exceed 100 years under most service conditions.”

Source: <https://www.teppfa.eu/wp-content/uploads/TNO-Report-Lifetime-of-PVC-pipes-4.pdf>

Further reading: <https://www.teppfa.eu/wp-content/uploads/TEPPFA-PVC4Pipes-Position-on-100years-lifetime-of-PVC-Pipes.pdf>

PVC pipes were first produced in Germany in 1935; many of these pipes are still in service today, and some have been dug up as part of a study into the lifetime of a PVC pipe. There have also

been several other studies into the lifetime of PVC pipes, see below:

Source: <https://www.teppfa.eu/wp-content/uploads/European-Vinyl-Corporation-Lifetime-of-PVC-pipes-3.pdf>

“Plastic pipes have an expected service life of >100 years and >50 years for below and above ground applications respectively. Meanwhile, research, extrapolation studies and reports on dig-up pipes in service confirm an expected service life of well over 100 years for below ground pressure and non-pressure applications. Plastic pipe systems have successfully been in service for over 70 years around the world.”

Source: <https://www.teppfa.eu/benefits-of-plastic-pipes-and-fittings/plastic-pipe-material-of-choice/#:~:text=Plastic%20pipes%20are%20strong%20and,resistance%20to%20most%20common%20chemicals>

What are the benefits of PVC pipes?

PVC is a relatively cost-effective material whilst still meeting regulations. Products may be certified to British and European Standards which define strict test regimes in order to ensure that products are fit for purpose through their lifetime. The British Plastics Federation (BPF) Pipes Group and its members strongly advise that compliance with the relevant product standards is verified by a third-party certification scheme (for example, the BSI Kitemark).

Further Reading:

<https://pvc4pipes.com/pvc-pipes/why-pvc-pipes/>

<https://pvc4pipes.com/pvc-pipes/>

<https://pvc4pipes.com/pvc-pipes/faq-pvc-pipes/>

https://www.teppfa.eu/wp-content/uploads/Benefits-of-plastic-pipes-brochure_digital.pdf

<https://www.teppfa.eu/benefits-of-plastic-pipes-and-fittings/plastic-pipe-material-of-choice/#:~:text=Plastic%20pipes%20are%20strong%20and,resistance%20to%20most%20common%20chemicals>

Are PVC pipes comparable to other materials?

Approved Documents³ as well as other regulatory/guidance documents in the UK recognise the importance of PVC pipes by quoting a variety of different PVC pipe system product standards. Some examples of these are:

- EN 1401 – *UPVC Underground Non pressure Solid Wall pipe and fittings.*
- EN 13476 – *UPVC Underground Non pressure Structured Wall pipe and fittings.*
- EN 1329 – *UPVC Soil Non pressure Solid Wall pipe and fittings.*
- EN 1453 – *UPVC Soil Non pressure Structured Wall pipe and fittings.*
- EN 1566 – *MUPVC Waste Non pressure Solid Wall pipe and fittings.*

Each of these product standards will specify a variety of tests (including routine batch release testing) for these products to ensure that they are fit for purpose.

EN 476 sets out requirements for gravity drainage products regardless of material. Each of the above standards sets out to validate these requirements whilst considering each specific application area and material (PVC).

Note 3: Approved Documents provide practical guidance with respect to the Building Regulations

Can PVC be recycled?

Yes – PVC is one of the most recycled polymers, and manufacturers in the UK are keen to increase the volume of recycled material they use vs virgin material.

“PVC can be recycled repeatedly up to 8 times depending on the application, because the recycling process does not measurably decrease the chain length of PVC molecules.”

Source: <https://www.vinylplus.eu/circular-economy/pvc-a-recyclable-material/sustainable-recyclable/>

PVC pipes utilise recycled material where allowed; the PVC piping industry is highly regulated and there are several product standards which define the maximum allowed recycled material content.

The table below shows the maximum amount of recycled content allowed in pipe products according to the relevant standards, however, systems manufacturers should refer to individual standards for the full requirements.

| Standard | Application | Recycled content (max allowed) | Reference in Standard |
|------------------------|--|--------------------------------|-----------------------|
| EN 1401-1:2019+A1:2023 | PVC-U Sewer Pipes | 20% ⁴ | Table 4 |
| EN 1329-1:2020 | PVC-U Soil and Waste | 20% ⁴ | Table 4 |
| EN 13476-2+A1:2020 | PVC-U Structured Wall Sewer Pipes (Type A) | 100% ^{4,5} | Table J.1 |
| EN 13476-3+A1:2020 | PVC-U Structured Wall Sewer Pipes (Type B) | 0% ⁴ | Table J.1 |
| | | 100% ⁶ | |
| EN 1566-1:2022 | PVC-C Soil and Waste | Not permitted | - |
| EN 1453-1:2017 | PVC-U Structured Wall Soil and Waste | 100% ^{4,5} | Annex B |
| | | 10% ^{7,10} | |
| | | 100% ^{8,9} | |
| | | 10% ^{8,10} | |
| | | 0% ¹¹ | |

Note 4: Recycled content refers to external reprocessed and recycled material with an agreed specification.

Note 5: If the material with an agreed specification comes from products which are not pipes and fittings, then 100% may be used in the intermediate layer only.

Note 6: Recycled content refers to external reprocessed and recycled material with an agreed specification from PVC-U pipes and fittings.

Note 7: Recycled content refers to external reprocessed and recycled material with an agreed specification not from PVC-U pipes and fittings.

Note 8: Recycled content refers to external reprocessed and recycled material without an agreed specification from PVC-U pipes and fittings.

Note 9: For material intended to be used in the intermediate layer of the pipe only.

Note 10: For material intended to be used in the external layer of the pipe only.

Note 11: Recycled content refers to external reprocessed and recycled material without an agreed specification not from PVC-U pipes and fittings.

Why don't we use more recycled materials?

One of the major barriers to the use of recycled PVC in the piping industry is the restriction on the amount of recycled content allowed by product system standards.

Another barrier is availability of recycled materials. As pipes manufacturers increase their usage of recycled material vs virgin material, it has become more difficult to find stable sources of material at the volumes they require.

What are we doing to improve this?

The BPF Pipes Group are actively involved in development and improvement of the relevant British and European Standards for our products. We contribute regularly at committee meetings with one of our agenda items being to increase the acceptable levels of recycled materials in the standards without lowering product quality.

We also work closely with TEPPFA (The European Plastic Pipes and Fittings Association) on issues such as availability of recycled materials.

Are recycled materials of as high quality as non-recycled materials?

PVC comes in many varieties, leading to numerous grades with different properties. Some PVC grades aren't suitable for our industry, as with certain recycled materials.

While some grades of recycled PVC may not meet our industry's standards, other grades exceed them. Choosing the right PVC or recycled PVC grade is crucial, with costs varying accordingly.

Proper selection and processing techniques can ensure availability of recycled grades which are just as good as virgin ones.

Are buried PVC pipes chemically compatible with the environment they are installed in?

"PVC pipes have excellent resistance to chemical attack which make them particularly suitable for a wide range of applications."

Source: <https://pvc4pipes.com/pvc-pipes/faq-pvc-pipes/>

A growing market in the UK construction industry is the utilisation of previously developed land (often industrial sites) for domestic housing, commonly known as brownfield sites.

With this comes requirements to complete chemical assessments of the ground to ensure that there are no chemical contaminations above levels which would be hazardous to human health.

However, many of these chemicals can adversely affect components which are installed in contaminated soils.

“PVC is resistant to most oils, fats, alcohols and petrol, but some petrol-based fuels containing benzene cause swelling.

“PVC is suitable for use in contact with aliphatic hydrocarbons, but aromatic hydrocarbons can cause unacceptable swelling, even by absorption from the vapour phase.”

Source: <https://pvc4pipes.com/pvc-pipes/faq-pvc-pipes/>

The BPF Pipes Group has produced guidance on how to review this chemical analysis in relation to the use of polymer piping systems (including PVC). Generally, PVC has high chemical resistance, and this guidance document gives advice on the maximum acceptable levels of contamination for the more aggressive chemicals which could be in the ground at brownfield sites.

Source: <https://www.bpfpipesgroup.com/media/62308/Designing-drains-and-sewers-for-brownfield-sites.pdf>

Disclaimer: These links are being provided in good faith as a convenience and for informational purposes only. The BPF Pipes Group bears no responsibility for the accuracy, legality or content of the external site or for that of subsequent links. Please contact the external site for answers to questions regarding its content. The links provided are primarily links not under the control of the BPF Pipes Group and as such may change without the prior knowledge of the BPF Pipes Group. All reasonable care for the accuracy of the information within this document has been taken to ensure that the information is correct at the time of writing, however all guidance, regulations, standards, science and understanding may change through time.