

Specifications for pipes and fittings for hot and cold water applications and heating inside buildings v4 November 2023



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Background

Plastic pipes and fittings for hot and cold water systems and heating inside buildings are now the preferred solution for most domestic installations. Systems are available in crosslinked polyethylene (PE-X), polyethylene with raised temperature performance (PE-RT), polybutylene (PB), polypropylene (PP), chlorinated polyvinylchloride (PVC-C) as well as multilayer pipes and their matching fittings.

British Standards, such as BS 4991 (first published 1974) and BS 7291 (first published in 1990) led the way in setting performance and installation principles. These early British Standards were used to formulate the UK's input into the development of European Standards. European Standards (EN) are now adopted in the UK directly as British Standards (BS EN).

To purchase products suitable for the application and service conditions for which they have been designed, it is important to refer to the correct standard.

The purpose of this short guide is to provide information on the specifications for plastic pipes and fittings for domestic hot and cold water supply and domestic heating systems inside a building.

This information is applicable to residential properties such as private dwelling houses or multi-occupancy buildings and non-residential properties such as shops, halls etc. but does not cover systems in hospitals or similar accommodation for which guidance is available from the Department of Health and Social Care.

Readers of this guidance are reminded that when designing and installing new and replacement hot and cold water services, national legislation applies.

For technical information on system design, jointing, installation, and connection to other pipework systems inside a building, the BPF Pipes Group has produced guidance note '*Domestic hot and cold water supply and central heating systems*' (<https://www.bfppipesgroup.com/technical-information/technical-guidance/>).

For information on specifications for plastic pipes and fittings used for water supply to a building, the BPF Pipes Group has produced guidance note '*Specifications for polyethylene pipe and fittings for water supply, drainage and sewerage under pressure*' (the latest version can be found here (<https://www.bfppipesgroup.com/technical-information/specification-guidance/>)).

Product specifications for hot and cold water and heating

BS 7291 Thermoplastics pipe and fitting systems for hot and cold water for domestic purposes and heating installations in buildings.

BS 7291 is a three-part publication which identifies the requirements for a piping system and its components, in either crosslinked polyethylene (PE-X) or polybutylene (PB) materials. The scope covers piping systems specifically for UK Class S applications. This standard is applicable up to 110 mm nominal outside diameter.

Amendments to all three parts have been published by BSI as:

- BS 7291-1: 2010 including A1: 2023
- BS 7291-2: 2010 including A1: 2023
- BS 7291-3: 2010 including A1: 2023

Part 1 General requirements – this part specifies general requirements and methods of test for solid wall ('plain') pipes, barrier pipes to inhibit gas permeability and multilayer pipes including definitions, service conditions, performance and marking.

UK service conditions for domestic hot water services are defined in Table 1 of BS 7291-1 for:

- Indirect cold water systems;
- Direct mains-fed cold water systems;
- Subsurface heating systems;
- Vented domestic hot water supply systems;
- Unvented domestic hot water supply systems including instantaneous heaters and/or incorporating storage;
- Vented central heating systems and indirect hot water primary circuits; and
- Sealed central heating systems and indirect hot water primary circuits.

Part 2 Specification for polybutylene (PB) pipes and associated fittings – this part specifies additional requirements to those given in Part 1 for polybutylene systems including materials, dimensions, and requirements for fittings.

Part 3 Specification for cross-linked polyethylene (PE-X) pipes and associated fittings – this part specifies additional requirements to those given in Part 1 for cross-linked polyethylene systems including materials, dimensions, and requirements for fittings.

NOTE:

Pipework for continuously operated recirculating domestic hot water systems and pipework for waste discharge from unvented hot water systems are excluded from the scope of BS 7291-1: 2010 + A1: 2023.

BS EN ISO standards for plastics piping systems for hot and cold water installations

There are six British Standards for water for human consumption in domestic systems and for heating systems which have been developed collaboratively in CEN and ISO.

- BS EN ISO 15874 Plastics piping systems for hot and cold water installations – Polypropylene (PP)
- BS EN ISO 15875 Plastics piping systems for hot and cold water installations – Cross linked polyethylene (PE-X)
- BS EN ISO 15876 Plastics piping systems for hot and cold water installations – Polybutylene (PB)
- BS EN ISO 15877 Plastics piping systems for hot and cold water installations – Chlorinated Polyvinylchloride (PVC-C)
- BS EN ISO 21003 Multilayer piping systems for hot and cold water installations inside buildings
- BS EN ISO 22391 Plastics piping systems for hot and cold water installations – Raised temperature performance polyethylene (PE-RT)

The standards have been developed through cooperation between ISO and CEN and designated as EN ISO. The standards are therefore internationally recognised. Under its membership of CEN, BSI automatically adopts all European Standards as British Standards.

Where additional information or clarification is required for UK applications, the BSI committee may add a National Foreword or National Annex which forms an important part of the standard. For this reason, the British Standard (BS EN ISO) together with any published amendments should always be consulted.

Each standard has the same structure, with the Part 1 (General), Part 2 (Pipes), Part 3 (Fittings) and Part 5 (Fitness for purpose). Note: There is no Part 4 as this is reserved for valves where applicable to the plastic piping system.

Products included in these standards necessarily cater for a wide range of operating systems. The BS EN ISO standards do not cover the service conditions in Table 1 of BS 7291-1 for sealed central heating systems and indirect hot water primary circuits. The BS EN ISO standards cover products for the transportation of cold water at a design pressure (system maximum working pressure) of 10 bar. This is lower than the service condition in Table 1 of BS 7291-1 for direct mains-fed cold-water systems.

Products conforming to one of these BS EN ISO standards, but not to BS 7291,

- intended for use in sealed central heating systems and indirect hot water primary circuits should be additionally subjected to temperatures covered by Table 1 of BS 7291-1: 2010 including A1: 2023;
- intended for direct mains-fed cold-water systems should have a minimum design pressure of 12.5 bar as shown in Table 1 of BS 7291-1: 2010 including A1: 2023;
- intended for unvented hot water supply systems should have a minimum design pressure of 6 bar as shown in Table 1 of BS 7291-1: 2010 including A1: 2023.

- This applies to PB and PE-X piping systems if the BS EN ISO is used to demonstrate performance in preference to BS 7291.
- This applies to PP, PVC-C, PE-RT and MLC piping systems where there is no materials-specific part to BS 7291.
- Note: The National Forewords to some, but not all, parts of the six BS EN ISOs currently signpost readers to BS 7291 for Class S conditions. This is being addressed by BSI.

NOTES:

The latest version of these BS EN ISO standards together with any published amendments are listed on the BSI website: <https://shop.bsigroup.com/>. Please read the section below on fittings for further advice.

Specifying fittings

Part 3 of each of the six BS EN ISO standards specifies the characteristics for fittings for plastic piping systems intended for use for hot and cold water installations.

Each Part 3 was amended in 2021 to replace reference to BS EN 1254-3 with definitions, materials, dimensional and performance requirements. These amendments have been published by BSI as:

- BS EN ISO 15874-3: 2013 including A1: 2018 + A2: 2021
- BS EN ISO 15875-3: 2003 including A1: 2020 + A2: 2021
- BS EN ISO 15876-3: 2017 including A1: 2020 + A2: 2021
- BS EN ISO 15877-3: 2009 including A1: 2010 + A2: 2021
- BS EN 21003-3: 2008 + A1: 2021
- BS EN 22391-3: 2009 including A1: 2020 + A2: 2021

BS 7291-1, BS 7291-2 and BS 7291-3 were amended in 2023 to replace reference to BS EN 1254-3 with reference to BS EN ISO 15875-3, BS EN ISO 15876-3 and BS EN 21003-3.

NOTES:

The reason for these amendments is that BS EN 1254-2: 1998 and BS EN 1254-3: 1998 did not include a requirement for resistance to dezincification, a form of corrosion that happens when zinc is leached out of the alloy leaving a weakened porous copper fitting. Dezincification typically reduces the wall thickness of a fitting over time and therefore minimum wall thickness has traditionally been included in EN 1254 in place of testing and a requirement.

During the revision of BS EN 1254-2: 1998 and BS EN 1254-3: 1998, the minimum wall thickness requirement has been removed but a requirement for resistance to dezincification has not been added. This presents a risk that a metallic fitting might not satisfy the service set out in the standards for plastic piping systems for hot and cold water installations. C

Compression fittings conforming to BS EN 1254-2: 1998 and BS EN 1254-3: 1998 which include the minimum wall thickness may continue to be specified for use with plastic piping systems.