

Specifications for PVC pipe and fittings for water supply, drainage and sewerage under pressure

Background

The use of unplasticised polyvinyl chloride (PVC-U) pipes for the conveyance of water, drainage and sewerage under pressure has had a chequered history.

PVC-U pipes were first introduced to the UK in the late 1960's, manufactured to British Standard BS 3505: 1968. High levels of failure associated with poor fracture toughness and inexperience of handling PVC-U pipes on site led to product development and the introduction of blue metric PVC-U pipes. As new materials developed, the UK Water Industry introduced their own specifications to keep pace with innovation. These Water Industry Specifications (WIS) offered the opportunity for product testing and third party certification for blue metric PVC-U pipes and later for molecular oriented PVC and modified PVC.

With the development of European Standards (or EuroNorms, EN), the Water Industry Specifications for PVC-U pipes and fittings were used to formulate the UK's input into drafting. European Standards (EN) are adopted in the UK directly as British Standards (BS EN) and conflicting documents withdrawn. Therefore, PVC-U pipes and fittings traditionally purchased to a British Standard (BS) or Water Industry Specification (WIS) should now meet the requirements of European Standards where they exist.

In general, largely as a result of reputational damage earlier failures and the major developments in polyethylene pipe systems, PVC-U pipes are not widely used in the UK for water supply, drainage and sewerage under pressure. However, if they are considered for a project, it is important that current and suitable standards are selected.

The following guide has been prepared to provide information on specifications applicable to PVC pipes and fittings for water supply, drainage and sewerage under pressure.

Contact with drinking water

In the supply of drinking water to consumers, there are effectively three areas of application: public water supply system (water supplied by a water undertaker to a premises), private water supply system (water supplied from a private source to a premises), and the plumbing system in the premises. Each of these applications has different (but similar) requirements with respect to the suitability of the pipework for contact with drinking water.

Information on the relevant regulations, enforcement bodies and testing of products in contact with drinking water is provided in the complementary guide on specifications applicable to polyethylene

pressure systems (<http://www.plasticpipesgroup.com/media/16949/Specifications-relating-to-polyethylene-pipes-for-water-supply-and-for-drainage-and-sewerage-under-pressure.pdf>).

Product specifications

PVC-U pipes and fittings for water supply, drainage and sewerage under pressure should now be purchased to the relevant part of BS EN 1452.

BS EN ISO 1452: Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure. Unplasticized poly(vinyl chloride) (PVC-U)

BS EN 1452 was superseded in 2009 by BS EN ISO 1452 and the scope extended from the supply of water under pressure at approximately 20°C (cold water) to water mains and services buried in the ground, and buried / above ground drainage and sewerage under pressure up to and including 25°C (cold water).

BS EN ISO 1452 is a five-part publication which identifies the requirements for a piping system and its components when made from PVC-U.

Part 1: General specifies the overarching aspects of PVC-U pressure piping systems. It includes such items as definitions and characteristic of materials.

Part 2: Pipes specifies the characteristics of solid wall pipes made from PVC-U (pipes with a socket and pipes without socket). Part 2 includes a range of pipe sizes and pressure classes, and gives requirements on colours.

Part 3: Fittings specifies the characteristics of fittings made from PVC-U for solvent cementing and use with elastomeric ring seals. Fittings can be made by injection moulding or fabricated from pipe. It also covers PVC-U flange adapters (from PVC-U to other materials) and the corresponding flanges made from other materials. It sets out the mechanical properties of fittings including any non-plastic components, together with geometrical and marking requirements.

Part 4: Valves specifies the characteristics of valves or valve bodies made from PVC-U for solvent cementing, elastomeric ring seal joints and flanged joints. It sets out the mechanical properties of valves including any non PVC-U components, together with geometrical and marking requirements.

Part 5: Fitness for purpose of the system. Part 5 specifies the requirements for the assembled piping system (the pipes, fittings, valves and ancillaries in combination).

Where there are options, care should be taken to ensure that agreement is established between suppliers and purchasers, e.g. in terms of colour, size, physical characteristics, effect on water quality, quality assurance. In particular, the colour of pipes for use in water supply and marking on the pipe. In the UK, use of solvent cement joints in below ground applications is not recommended.

Pipes made from PVC modified by structure or composition:

BS ISO 16422: 2014 Pipes and joints made of oriented unplasticized poly(vinyl chloride) (PVC-O) for the conveyance of water under pressure - Specifications

This International Standard specifies the requirements of pipes and joints made of oriented unplasticized poly(vinyl chloride) (PVC-O), for piping systems intended to be used underground or above-ground where not exposed to direct sunlight, for water mains and services, pressurized sewer systems and irrigation systems. BS ISO 16422 is the direct adoption of International Standard ISO 16422.

WIS 4-31-08: 2001 Oriented Polyvinyl Chloride (PVC-O) pressure pipes for underground use

This Water Industry Specification specifies the properties and testing required for PVC-O pipes and integral joints (incorporating elastomeric sealing rings) for buried cold potable water systems, grey water systems, irrigation pipes and sewer pumping mains.

WIS 4-31-08 has not been updated since 2001 as there are no UK manufacturers of this product. Whilst it is still current according to the Water UK website, care should be taken when considering products to this specification.

PAS 27:1999 Unplasticized poly(vinyl chloride) alloy (PVC-A) pipes and bends for water under pressure

This Product Assessment Specification specifies the requirements for unplasticized poly (vinyl chloride) based plastics alloy (PVC-A) pipes, and PVC-A post-formed bends with integral joints, intended for the conveyance of drinking water under pressure.

PAS 27 has not been updated since 1999 as there are no UK manufacturers of this product. Whilst it is still current according to the BSI catalogue, care should be taken when considering products to this specification.

NOTES: BS EN ISO 1452 (all parts) and BS ISO 16422 can be purchased through BSI (<http://shop.bsigroup.com/>).

Pipeline performance

BS EN ISO 1452 sets out the performance requirements for a product and/or system as designed by the manufacturer. In addition to these, there are publications covering the installation and commissioning of PVC-U pipe systems which may be called up in contracts to ensure that pipelines are robust and reliable.

IGN 4-01-03: Pressure testing of pressure pipes and fittings for use by public water suppliers

This guidance document details the procedure for the *in situ* testing of PVC-U water and sewerage pressure pipelines laid in the UK. It is based on the requirements of BS EN 805 which offers advice on a range of test methods, the choice of which is left to the designer / water company.

NOTES: IGN 4-01-03 is available to download free of charge from Water UK's website (<http://www.water.org.uk/publications/WIS-IGN>).

Appendix A

THE BRITISH, WATER INDUSTRY AND EUROPEAN SPECIFICATIONS LISTED BELOW ARE NOW OBSOLETE AND SHOULD NOT BE USED FOR PURCHASING.

British Standards:

- BS 3505: Specification for polyvinyl chloride (PVC-U) pressure pipes for cold potable water.
- BS 4346: Joints and fittings for use with unplasticised PVC pressure pipes. (Parts 1 – 3).
- BS CP 312: Plastic pipework (thermoplastic pipes).
- BS EN 1456-1: Plastic piping systems for buried and above-ground drainage and sewerage under pressure. Unplasticized poly(vinyl chloride) (PVC-U). Specifications for piping components and the system.
- BS EN 1452: Plastics piping systems for water supply. Unplasticized poly (vinyl chloride) (PVC-U). (Parts 1 – 5).

Water Industry Specifications:

- WIS 04-31-04: Specification for unplasticised PVC pressure pipes for cold potable water
- WIS 04-31-06: Specification for blue unplasticised PVC pressure pipes, integral pipes and post-formed bends for cold potable water (underground use).
- WIS 04-31-07: Specification for unplasticised PVC pressure fittings and assemblies for cold potable water (underground use).

Other Standards:

- ISO 4422-1 Pipes and fittings made of unplasticized poly(vinyl chloride) (PVC-U) for water supply - Specifications