

Plastics piping systems for water supply — Unplasticized poly (vinyl chloride) (PVC-U) —

Part 2: Pipes

ICS 23.040.20; 91.140.60

National foreword

This British Standard is the UK implementation of EN 1452-2:1999. Collectively, Parts 1, 2, 3, 4 and 5 of BS EN 1452 supersede BS 3505:1986, BS 4346-1:1969 and BS 4346-2:1970. Since those British Standards are the basis of piping systems with a design life of at least 50 years, it is intended that they will be declared obsolescent, by 26 June 2001. With BS EN 14814:2007, collectively Parts 1 to 5 of BS EN 1452 also partially supersede BS 4346-3:1982, which is withdrawn to exclude requirements for joints for pressure pipes for water supply.

NOTE 1 The UK Water Industry has indicated that this British Standard is to be regarded as superseding the following Water Industry Specifications:
WIS 4-31-06, Issue 2: March 1994 *Blue unplasticised PVC pressure pipes, integral joints and post-formed bends for cold potable water (underground use)*
WIS 4-31-07, Issue 2: March 1994 *Unplasticised PVC pressure fittings and assemblies for cold potable water (underground use)*

The UK participation in its preparation was entrusted by Technical Committee PRI/61, Plastics piping systems and components, to Subcommittee PRI/61/2, Thermoplastics piping systems and components for pressure applications.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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Amd. No.	Date	Comments
10999 Corrigendum No. 1	July 2000	Indicated by a sideline
12005 Corrigendum No. 2	October 2000	Correction to National foreword supersession details
	31 August 2009	Correction to National foreword supersession details, and alignment of BSI and CEN publication dates
	30 November 2009	Replacement of core text with corrected version

The responsible UK committee gives the following advice concerning the selection and installation of piping systems and components conforming to this British Standard.

- a) Water supply companies and other entities are obliged to use Parts 1 to 5 of this suite of European Standards, produced under EC/U mandate, if they wish to purchase PVC-U pipe systems or components within its scope.

NOTE 2 Parts 6 and 7 have each been prepared as an ENV (pre-standard), to allow further development, and their use is voluntary unless invoked contractually.

- b) Sub-clause 5.2 enables the selection of pipe colours from grey, blue and cream. It has been the practice of UK water companies to use blue, metric PVC-U pipes (conforming to WIS 4-31-06), to facilitate identification of potable water pipelines. For buried applications in the United Kingdom, attention is drawn to the recommendations of the National Joint Utilities Group (NJUG) concerning the colour coding of pipelines and other services. For UK public water supply applications, the pipes should also be marked with the word "WATER".

Purchasers still requiring grey, Imperial (inch) -sized pipes should refer to normative annex B. The sizes equate to those of BS 3505:1986. Apart from the UK fracture toughness requirements, all other requirements are as in the main text of BS EN 1452-2:1999 (previously dated as BS EN 1452-2:2000).

- c) Table 2 covers a nominal outside diameter (d_n) of 12 to 1 000 and a nominal pressure PN range from 6 bar to 25 bar. In order not to use very thin wall PVC-U pipes and to benefit from rationalization, the UK water company range had been limited to PN 8 pipes in nominal outside diameters 90 mm to 630 mm, inclusive, and PN 12.5 pipes from 63 mm to 630 mm; the overall service (design) coefficient (C) was 2.0 for all sizes. In developing EN 1452-2, a compromise required the increase of C to 2.5 for nominal outside diameters up to and including d_n 90. For most PNs this has had the effect of increasing the maximum and minimum wall thickness values for d_n 90 pipe to 0.1 mm above those for d_n 110 pipe (in practice the wall thicknesses will probably be the same for these two diameters). Thus, if the same diameters and PNs are selected as previously, no pipe will have a wall thickness less than 3.5 mm.

- d) In 6.6.2, the requirements allow the wall thickness of the ring seal groove to be less than the minimum wall thickness of the pipe by up to 20 %. The UK Technical Committee recommends that the minimum wall thickness of the sealing ring groove is not less than the nominal (minimum) wall thickness for the pipe. This may be achieved by e.g. local thickening of the socket wall or by using an external sleeve.

- e) In Table 5, the depths of engagement given for sockets are minimum depths. It has been UK practice to use depths larger than the minimum (thus still permitted).

- f) For the purposes of 8.1, no purchaser selection decisions are required to be made with respect to the 0 °C impact test; PN 8 pipes are required to conform to level H requirements and PN 12.5 pipes to the level M requirements given in Table 6.

- g) In 8.2, for testing of pipes, the second paragraph allows either of two types of end caps to be used without identifying which of these alternatives is to be the reference condition in case of dispute. Since use of these two types of end caps is not expected to always give identical results, users of this standard should agree which type of end cap shall comprise the reference method in case of dispute. This comment also applies to the fourth paragraph, for the testing of integral sockets.

h) In Table 9, attention is drawn to the normative note 2) and hence to annex C and to note 2 to Table 11 of ENV 1452-7, which permits fracture toughness test requirements to be specified for UK applications as an alternative to the gelation test requirements specified in Table 9. It is strongly recommended that purchasers for UK applications adopt this option on a contractual basis.

i) In the case of pipes which also conform to other standards, attention is drawn to **14.3.1** concerning marking.

j) In Table B.4 *Dimensions of sockets for solvent cementing*, the committee considers that a typographical error has been carried over for nominal size 8 (in), in that the value for the minimum mean inside diameter of socket at midpoint of the socket length, $d_{im,min}$, should be 219,0 not 218,0. (The value of 219,4 for $d_{im,max}$ is correct.)

k) For the purposes of **B.5** and annex C to provide for UK needs for fracture toughness requirements, the UK has been made aware of a mismatch or error in the references to symbols for use of annex C in conjunction with the currently available (1999) ISO/DIS 11673. To avoid an erroneous double application of a correction factor and for consistency with the current and intended details of the test method, the values specified in Table C.1 of EN 1452-2 should be regarded as minimum values for K_C and not for K_{Ic} .

l) In annex C, the significance of “alternative test” is unclear. See UK comments on Table 9, note 2). Bearing in mind the status of ENV 1452-7, users of this standard should declare or agree which test method and requirements apply in case of dispute.

WARNING This British Standard, which is identical with EN 1452-2:1999, does not necessarily detail all the precautions necessary to meet the requirements of the Health and Safety at work etc. Act 1974. Attention should be paid to any appropriate safety precautions and the test methods should be performed only by trained personnel.

Regulation 25 of the Water Supply (Water Quality) Regulations 1989 specified the circumstances in which water undertakers may use products in contact with public water supplies in England and Wales. All pipes used to convey public water supplies must be approved under the provisions of regulation 25(1)(a) in order to ensure that use will not cause adverse effect on water quality or risk to health of consumers. Similar provisions apply in Scotland and Northern Ireland.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

English version

Plastics piping systems for water supply – Unplasticized poly(vinyl chloride) (PVC-U) – Part 2: Pipes

Systèmes de canalisations en plastique pour alimentation
en eau – Poly(chlorure de vinyle) non plastifié (PVC-U) –
Partie 2: Tubes

Kunststoff-Rohrleitungssysteme für die Wasserversorgung
– Weichmacherfreies Polyvinylchlorid (PVC-U) – Teil 2:
Rohre

This European Standard was approved by CEN on 2 July 1998.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 155, Plastics piping systems and ducting systems, the Secretariat of which is held by NNI. It has been prepared with the cooperation of Eureau and in liaison with CEN/TC 164, Water supply.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by december 1999, and conflicting national standards shall be withdrawn at the latest by June 2001.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This standard forms part of a System Standard for plastics piping systems of a particular material for a specified application. There are a number of such System Standards.

System Standards are based on the results of the work undertaken in ISO/TC 138, Plastics pipes, fittings and valves for the transport of fluids, which is a Technical Committee of the International Organization for Standardization (ISO).

They are supported by separate standards on test methods to which references are made throughout the System Standard.

The System Standards are consistent with general standards on functional requirements and on recommended practice for installation.

EN 1452 consists of the following Parts, under the general title, *Plastics piping systems for water supply — Unplasticized poly(vinyl chloride) (PVC-U)*:

- Part 1: General;
- Part 2: Pipes (this standard);
- Part 3: Fittings;
- Part 4: Valves and ancillary equipment;
- Part 5: Fitness for purpose of the system;
- Part 6: Guidance for installation (ENV);
- Part 7: Guidance for assessment of conformity (ENV).

This part of EN 1452 includes the following annexes:

- Annex A (normative): Allowable operating pressures;
- Annex B (normative): Imperial(inch)-sized pipes;
- Annex C (normative): Requirements for fracture toughness test;
- Annex D (informative): Bibliography.

At the date of publication of this standard, System Standards for piping systems of other plastics materials used for the same application are the following:

NOTE All listed System Standards are in preparation.

prEN 1796, *Plastics piping systems for water supply with or without pressure — Glass-reinforced thermosetting plastics (GRP) based on polyester resin (UP)*;

prEN 12201, *Plastics piping systems for water supply — Polyethylene (PE)*.

Introduction

The System Standard, of which this is Part 2, specifies the requirements for a piping system and its components made from unplasticized poly(vinyl chloride) (PVC-U). The piping system is intended to be used for water supply.

In respect of potential adverse effects on the quality of water intended for human consumption, caused by the products covered by this standard:

- 1) this standard provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;
- 2) it should be noted that, while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

For material and components, other than pipes, requirements and test methods are specified in Parts 1, 3 and 4 of EN 1452. Characteristics for fitness for purpose (mainly for joints) are covered in Part 5. Guidance for installation is given in ENV 1452-6. ENV 1452-7 is a guidance for the assessment of conformity.

This part of EN 1452 covers the characteristics of pipes.

1 Scope

This part of EN 1452 specifies the characteristics of pipes made from unplasticized poly(vinyl chloride) (PVC-U) for piping systems in the field of water supply.

It also specifies the test parameters for the test methods referred to in this standard.

In conjunction with Parts 1 to 5 of EN 1452 and ENV 1452-7, it is applicable to extruded PVC-U pipes without a socket and pipes with a socket (integral or not), intended to be used for the following:

- a) water mains and services buried in ground;
 - b) conveyance of water above ground for both outside and inside buildings;
- for the supply of water under pressure at approximately 20 °C (cold water) intended for human consumption and for general purposes.

This standard is also applicable to pipes for the conveyance of water up to and including 45 °C. For temperatures between 25 °C and 45 °C Figure A.1 in annex A applies.

This standard covers a range of pipe sizes and pressure classes and gives requirements concerning colours.

NOTE It is the responsibility of the purchaser or specifier to make the appropriate selections from these aspects, taking into account their particular requirements and any relevant national regulations and installation practices or codes.

2 Normative references

This standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

prEN 496, *Plastics piping and ducting systems — Plastics pipes and fittings — Measurement of dimensions and visual inspection of surfaces*

EN 578, *Plastics piping systems — Plastics pipes and fittings — Determination of the opacity*

EN 580, *Plastics piping systems — Unplasticized poly(vinyl chloride) (PVC-U) pipes — Test method for the resistance to dichloromethane at a specified temperature (DCMT)*

EN 681-1, *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber*

EN 727, *Plastics piping and ducting systems — Thermoplastics pipes and fittings — Determination of Vicat softening temperature (VST)*

EN 743, *Plastics piping and ducting systems — Thermoplastics pipes — Determination of the longitudinal reversion*

EN 744:1995, *Plastics piping and ducting systems — Thermoplastics pipes — Test method for resistance to external blows by the round-the-clock method*

EN 921:1995, *Plastics piping systems — Thermoplastics pipes — Determination of resistance to internal pressure at constant temperature*

EN 1452-1, *Plastics piping systems for water supply — Unplasticized poly(vinyl chloride) (PVC-U) — Part 1: General*

EN 1452-5, *Plastics piping systems for water supply — Unplasticized poly(vinyl chloride) (PVC-U) — Part 5: Fitness for purpose of the system*

ENV 1452-7:1999, *Plastics piping systems for water supply — Unplasticized poly(vinyl chloride) (PVC-U) — Part 7: Guidance for the assessment of conformity*

EN ISO 12162, *Thermoplastics materials for pipes and fittings for pressure applications — Classification and designation — Overall service (design) coefficient*

ISO 1183:1987, *Plastics — Methods for determining the density and relative density of non-cellular plastics*

ISO 6401:1985, *Plastics — Homopolymer and copolymer resins of vinyl chloride — Determination of residual vinyl chloride monomer — Gas chromatographic method*

ISO 7387-1:1983, *Adhesives with solvents for assembly of PVC-U pipe elements — Characterization — Part 1: Basic test methods*

ISO/TR 9080:1992, *Thermoplastics pipes for the transport of fluids — Methods of extrapolation of hydrostatic stress rupture data to determine the long-term hydrostatic strength of thermoplastics pipe materials*

3 Definitions, symbols and abbreviations

For the purposes of this standard, the definitions, symbols and abbreviations given in EN 1452-1 apply together with the following:

- L : length of socket
 m : depth of engagement

4 Material

4.1 Pipe material

The material to be used shall conform to EN 1452-1 and to the requirements given in 4.2 and 4.3.

4.2 Density

The density, ρ , at 23 °C of the pipe, when measured in accordance with ISO 1183, shall be between the following limits:

$$1350 \text{ kg/m}^3 \leq \rho \leq 1460 \text{ kg/m}^3$$

4.3 MRS-value

The pipe material shall have a minimum required strength, MRS, as defined in EN 1452-1, of at least 25 MPa.

The pipe material shall be evaluated according to ISO/TR 9080 method II ¹⁾, where an internal pressure test is performed in accordance with EN 921:1995, to find the LCL. This evaluation shall be made with an end cap type a) or b) in accordance with EN 921:1995 and using a pipe series $S \leq 12,5$. The MRS-value shall be derived from the LCL and the pipe material shall be classified by the compound manufacturer in accordance with EN ISO 12162.

Where there is available long-term experience with the effect of a change in material/compound, it is not necessary to re-evaluate the MRS. In this case the values determined with 5 test pieces at 20 °C and 60 °C during 1000 h to 5000 h shall be located on or above the 97,5 % LCL long-term characteristic curve established prior to the material/compound change.

¹⁾ In ISO/TC 138/SC5 a new extrapolation method is under development, which is intended to replace ISO/TR 9080.