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BSI Standards Publication

Plastics piping systems with structured-wall pipes for soil and waste discharge (low and high temperature) inside buildings - Unplasticized poly(vinyl chloride) (PVC-U)

Part 1: Specifications for pipes and the system

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National foreword

This British Standard is the UK implementation of EN 1453-1:2017, incorporating CEN corrigendum July 2017. It supersedes BS EN 1453-1:2000, which is withdrawn.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by CEN corrigendum July 2017 is indicated in the text by [AC1⟩ ⟨AC1].

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

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

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English Version

Plastics piping systems with structured-wall pipes for soil and waste discharge (low and high temperature) inside buildings - Unplasticized poly(vinyl chloride) (PVC-U) - Part 1: Specifications for pipes and the system

Systèmes de canalisations en plastique avec des tubes à paroi structurée pour l'évacuation des eaux-vannes et des eaux usées (à basse et à haute température) à l'intérieur des bâtiments - Poly(chlorure de vinyle) non plastifié (PVC-U) - Partie 1 : Spécifications pour tubes et le système

Kunststoff-Rohrleitungssysteme mit Rohren mit profilierter Wandung zum Ableiten von Abwasser (niedriger und hoher Temperatur) innerhalb von Gebäuden - Weichmacherfreies Polyvinylchlorid (PVC-U) - Teil 1: Anforderungen an Rohre und das Rohrleitungssystem

This European Standard was approved by CEN on 29 October 2016.

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This document consolidates EN 1453-1:2017 and the corrigendum EN 1453-1:2017/AC:2017.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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Full document details: BS EN 1453-1:2017

Contents

Page

European foreword ... 3
1 Scope ... 4
2 Normative references ... 4
3 Terms and definitions, symbols and abbreviations ... 6
3.1 Terms and definitions ... 6
3.2 Symbols ... 8
3.3 Abbreviations ... 9
4 Material ... 9
4.1 Raw material ... 9
4.2 Utilization of non-virgin material ... 9
4.3 Sealing ring retaining means ... 9
5 General characteristics ... 10
5.1 Appearance ... 10
5.2 Colour ... 10
6 Geometrical characteristics ... 10
6.1 General ... 10
6.2 Dimensions of pipes ... 10
6.3 Dimensions of sockets ... 13
7 Mechanical characteristics ... 19
7.1 General requirements ... 19
7.2 Additional requirements ... 20
8 Physical characteristics ... 21
9 Performance requirements ... 22
10 Sealing rings ... 22
11 Adhesives ... 22
12 Marking ... 22
12.1 General ... 22
12.2 Minimum required marking ... 23
12.3 Additional marking ... 23
Annex A (informative) Guidance for calcium carbonate additives ... 24
A.1 Composition of calcium carbonate additives ... 24
A.2 Physical properties of calcium carbonate additive ... 24
Annex B (normative) Utilization of non-virgin material ... 25
B.1 Own reprocessed material ... 25
B.2 External reprocessed and recycled materials with agreed specification ... 25
B.3 External reprocessed and recycled material not covered by an agreed specification ... 28
Annex C (informative) Product standards ... 29
Bibliography ... 30

Documents
Document Sharing Hub

Full document details: BS EN 1453-1:2017

European foreword

This document (EN 1453-1:2017) has been prepared by Technical Committee CEN/TC 155 "Plastics piping systems and ducting systems", the secretariat of which is held by NEN.

This document supersedes EN 1453-1:2000.

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 July 2017, and conflicting national standards shall be withdrawn at the latest by July 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This standard is a 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 1453 consists of the following parts, under the general title *Plastics piping systems with structured-wall pipes for soil and waste discharge (low and high temperature) inside buildings — Unplasticized poly(vinyl chloride) (PVC-U)* [1]:

— *Part 1: Requirements for pipes and the system* (the present standard)

— *Part 2: Guidance for the assessment of conformity* (under preparation)

This document includes the corrigendum EN 1453-1:2017/AC:2017 which corrects a reference in Clause 2 and Table B.1.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1) EN 1453 does not cover a recommended practice for installation. A recommended practice for installation is covered by the following European Technical Report: CEN/TR 13801, *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure — Thermoplastics — Recommended practice for installation*.

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Full document details: BS EN 1453-1:2017

1 Scope

This part of EN 1453 specifies the requirements for structured-wall unplasticized poly(vinyl chloride) (PVC-U) pipes and the system intended to be used for soil and waste discharge applications (low and high temperature) inside buildings (application area code "B")

NOTE 1 The intended use is reflected in the marking of products by "B".

This part of EN 1453 is also applicable to structured-wall unplasticized poly(vinyl chloride) (PVC-U) pipes, and the system intended for the following purposes:

— ventilating part of the pipework in association with discharge applications;

— rainwater pipework inside building.

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

NOTE 2 Single layer foamed PVC-U pipes and spirally-formed PVC-U pipes are not covered by this standard.

This standard covers a range of nominal sizes and gives recommendations concerning colours.

NOTE 3 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.

For external above ground application additional requirements depending on the climatic conditions should be agreed between the manufacturer and the user.

NOTE 4 Pipes conforming to this standard are normally associated with fittings conforming to EN 1329–1 [1]. Pipes, fittings and components conforming to any of the product standards listed in Annex C can also be used with pipes conforming to this standard, provided they conform to the requirements for joint dimensions given in Clause 6 and to the requirements in Table 11.

NOTE 5 Joints and adhesives are considered to be part of the system as covered in the scope.

NOTE 6 Products conforming to this standard may be submitted to national requirements on fire regulation.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

EN 681-2, *Elastomeric Seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 2: Thermoplastic elastomers*

EN 1905, *Plastics piping systems — Unplasticized poly(vinyl chloride) (PVC-U) pipes, fittings and material — Method for assessment of the PVC content based on total chlorine content*

EN 10204:2004, *Metallic products — Types of inspection documents*

EN 14680, *Adhesives for non-pressure thermoplastics piping systems — Specifications*

EN 15346:2014, *Plastics — Recycled plastics — Characterization of poly(vinyl chloride) (PVC) recyclates*

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Full document details: BS EN 1453-1:2017

EN ISO 306, *Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST) (AC ISO 306 AC)*

EN ISO 472, *Plastics — Vocabulary (ISO 472)*

EN ISO 1043-1, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics (ISO 1043-1)*

EN ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pyknometer method and titration method (ISO 1183-1)*

EN ISO 2505, *Thermoplastics pipes — Longitudinal reversion — Test method and parameters (ISO 2505)*

EN ISO 3126, *Plastics piping systems — Plastics components — Determination of dimensions (ISO 3126)*

EN ISO 3451-5, *Plastics — Determination of ash — Part 5: Poly(vinyl chloride) (ISO 3451-5)*

EN ISO 6259-1, *Thermoplastics pipes — Determination of tensile properties — Part 1: General test method (ISO 6259-1)*

EN ISO 13229, *Thermoplastics piping systems for non-pressure applications — Unplasticized poly(vinyl chloride) (PVC-U) pipes and fittings — Determination of the viscosity number and K-value (ISO 13229)*

ISO 2507-1, *Thermoplastics pipes and fittings — Vicat softening temperature — Part 1: General test method*

ISO 3127, *Thermoplastics pipes — Determination of resistance to external blows — Round-the-clock method*

ISO 6259-2, *Thermoplastics pipes — Determination of tensile properties — Part 2: Pipes made of unplasticized poly(vinyl chloride) (PVC-U), chlorinated poly (vinyl chloride) (PVC-C) and high-impact poly (vinyl chloride) (PVC-HI)*

ISO 9852, *Unplasticized poly(vinyl chloride) (PVC-U) pipes — Dichloromethane resistance at specified temperature (DCMT) — Test method*

ISO 11173:1994, *Thermoplastics pipes — Determination of resistance to external blows — Staircase method*

ISO 13254, *Thermoplastics piping systems for non-pressure applications — Test method for watertightness*

ISO 13255, *Thermoplastics piping systems for soil and waste discharge inside buildings — Test method for airtightness of joints*

ISO 13257:2010, *Thermoplastics piping systems for non-pressure applications — Test method for resistance to elevated temperature cycling*

ISO 18373-1, *Rigid PVC pipes — Differential scanning calorimetry (DSC) method — Part 1: Measurement of the processing temperature*

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3 Terms and definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 472 and EN ISO 1043-1 and the following apply.

3.1.1
application area code
code used in the marking of pipes and fittings to indicate the application area(s) for which they are intended, as follows:

B: application area code for components intended for use above ground inside the building

Note 1 to entry: Other application area codes D, BD, U and UD not covered by this standard are defined elsewhere, e.g. in EN 1329–1 [1] and EN 1401–1 [2].

3.1.2
structured-wall pipe
pipe with smooth internal and smooth external surfaces, with two solid PVC layers, or in which the inner and outer solid PVC layers are connected by foamed or non-foamed PVC intermediate layers

Note 1 to entry: Pipe in which the inner and outer solid PVC layers are connected by foamed PVC intermediate layers is also called foam core pipe.

3.1.3
solid layer
layer made of non-foamed PVC

3.1.4
foamed PVC
poly(vinyl chloride) which contains numerous small gas cells distributed throughout the mass

Note 1 to entry: Foam layers have a density less than 1,37 g/cm^3 when measured according to EN ISO 1183-1.

3.1.5
nominal size
DN
numerical designation of the size of a component, other than a component designated by thread size, which is approximately equal to the manufacturing dimension, in millimetres

3.1.6
nominal size
DN/OD
nominal size, related to the outside diameter

3.1.7
nominal outside diameter
d_n
specified outside diameter, in millimetres, assigned to a nominal size DN/OD

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3.1.8
outside diameter
d_e
value of the measurement of the outside diameter through its cross-section at any point of a pipe or spigot end of a fitting, rounded up to the next greater 0,1 mm

3.1.9
mean outside diameter
d_{em}
value of the measurement of the outer circumference of a pipe or spigot end of a fitting in any cross-section, divided by π (≈ 3,142), rounded up to the next greater 0,1 mm

3.1.10
inside diameter of a socket
d_s
value of measurement of the inside diameter through its cross-section at any point of a socket, rounded up to the next greater 0,1 mm

3.1.11
mean inside diameter of a socket
d_{sm}
arithmetical mean of a number of measurements of the inside diameter of a socket in the same cross-section

3.1.12
out-of-roundness
ovality
difference between the measured maximum and the measured minimum outside diameter in the same cross-section of a component

3.1.13
wall thickness
e
value of the measurement of the overall wall thickness at any point around the circumference of a component

3.1.14
mean wall thickness
e_m
arithmetical mean of a number of measurements of the overall wall thickness, regularly spaced around the circumference and in the same cross-section of a component, including the measured minimum and the measured maximum value of the overall wall thickness in that cross-section

3.1.15
wall thickness of inside layer
e_4
thickness at any point of the inside layer

3.1.16
Wall thickness of outside layer
e_5
thickness at any point of the outside layer

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Full document details: BS EN 1453-1:2017

3.1.17
virgin material
material in a form such as granules or powder that has not been subjected to use or processing other than that required for its manufacture and to which no reprocessed or recycled material has been added

Note 1 to entry: It is understood that the addition of additives such as stabilizers and pigments is still resulting into a virgin material.

3.1.18
own reprocessed material
material prepared from rejected unused pipes, gutters or fittings and ancillaries, including trimmings from the production of pipes or fittings, that has been reprocessed in a manufacturer's plant after having been previously processed by the same manufacturer by a process such as moulding or extrusion, and for which the complete formulation is known

3.1.19
external reprocessed material
material prepared from unused thermoplastics products regardless of where those products were manufactured

3.1.20
recycled material
material from used thermoplastics products which have been cleaned and crushed or ground

3.1.21
reformulated material
recycled/reprocessed material that has been reformulated, by additives and processing techniques, to meet an agreed specification

Note 1 to entry: Typically the additives used would be stabilizers, pigments, etc.; the reformulation material: homogeneous pellets, granules powder, etc., with the produced batch having consistent physical properties.

3.1.22
agreed specification
specification of the relevant material characteristics agreed between the supplier of the non-virgin material and the pipe, fitting and/or ancillary manufacturer

3.2 Symbols

A length of engagement

C depth of sealing zone

d_e outside diameter (at any point)

d_{em} mean outside diameter

d_n nominal outside diameter

d_s inside diameter of a socket

d_{sm} mean inside diameter of a socket

e wall thickness (at any point)

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Full document details: BS EN 1453-1:2017

e_m mean wall thickness

e_2 wall thickness of a socket

e_3 wall thickness at the groove

e_4 wall thickness of the inside layer

e_5 wall thickness of the outside layer

L_1 length of a spigot

L_2 length of a socket

l effective length of a pipe

3.3 Abbreviations

DN nominal size

DN/OD nominal size, outside diameter related

PVC-U unplasticized poly(vinyl chloride)

TIR true impact rate

4 Material

4.1 Raw material

The compound/formulation shall be PVC, to which are added additives intended to facilitate the manufacture of pipes conforming to the requirements of this standard.

When calculated on the basis of a known formulation or, in case of dispute/unknown formulation, when determined in accordance with EN 1905, the PVC content shall be at least 80 % by mass.

When PVC is substituted by $CaCO_3$, a further reduction of the PVC content is permitted for pipes to the following levels:

— Intermediate layer: ≥ 60 % by mass;

— External layers: ≥ 75 % by mass.

Guidance for calcium carbonate additives is given in Annex A.

4.2 Utilization of non-virgin material

Conditions and requirements for the utilization of non-virgin material are given in Annex B.

4.3 Sealing ring retaining means

Sealing rings may be retained using means made from polymers other than PVC-U, provided the joints conform to the requirements given in Table 11.

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