SLOVENSKI STANDARD
SIST EN 1451-1:2018

01-januar-2018

Nadomešča:
SIST EN 1451-1:1999

Cevni sistemi iz polimernih materialov za nizko- in visokotemperaturne odvodne sisteme v zgradbah - Polipropilen (PP) - 1. del: Specifikacije za cevi, fitinge in sistem

Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Polypropylene (PP) - Part 1: Specifications for pipes, fittings and the system

Kunststoff-Rohrleitungssysteme zum Ableiten von Abwasser (niedriger und hoher Temperatur) innerhalb der Gebäudestruktur - Polypropylen (PP) - Teil 1: Anforderungen an Rohre, Formstücke und das Rohrleitungssystem

Systèmes de canalisations en plastiques pour l'évacuation des eaux-vannes et des eaux usées (à basse et à haute température) à l'intérieur de la structure des bâtiments — Polypropylène (PP) — Partie 1: Spécifications pour tubes, raccords et le système

Ta slovenski standard je istoveten z: **EN 1451-1:2017**

ICS:

23.040.20	Cevi iz polimernih materialov	Plastics pipes
91.140.80	Drenažni sistemi	Drainage systems

SIST EN 1451-1:2018 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1451-1

November 2017

ICS 23.040.01; 91.140.80

Supersedes EN 1451-1:1998

English Version

Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Polypropylene (PP) - Part 1: Specifications for pipes, fittings and the system

Systèmes de canalisations en plastiques pour l'évacuation des eaux-vannes et des eaux usées (à basse et à haute température) à l'intérieur de la structure des bâtiments - Polypropylène (PP) - Partie 1: Spécifications pour tubes, raccords et le système

Kunststoff-Rohrleitungssysteme zum Ableiten von Abwasser (niedriger und hoher Temperatur) innerhalb der Gebäudestruktur - Polypropylen (PP) - Teil 1: Anforderungen an Rohre, Formstücke und das Rohrleitungssystem

This European Standard was approved by CEN on 18 September 2017.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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 United Kingdom.

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

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

Ref. No. EN 1451-1:2017 E

Contents

Page

European foreword

This document (EN 1451-1:2017) has been prepared by Technical Committee CEN/TC 155 “Plastics piping systems and ducting systems”, the secretariat of which is held by NEN.

This 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 May 2018, and conflicting national standards shall be withdrawn at the latest by May 2018.

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 document supersedes EN 1451-1:1998.

EN 1451, *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Polypropylene (PP)* consists of the following parts:

— *Part 1: Specifications for pipes, fittings and the system*

— *Part 2: Guidance for the assessment of conformity* (CEN/TS)

The main changes with respect to the previous edition are:

— updating in accordance with the new template;

— updating of normative references;

— thermal stability (OIT) requirement is made valid in general;

— two new dimensions for nominal size and outside diameter have been added, 250 mm and 315 mm;

— alignment of the impact resistance requirements for BD applications with the UD applications in EN 1852-1;

— utilization of non-virgin PP materials are described in the new Annex A;

— Annex B has been deleted and the relevant text has been moved to the main standard;

— new Annex B “Product standards” has been added.

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.

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 Scope

This part of EN 1451 specifies the requirements for solid-wall polypropylene (PP) pipes, fittings and the system intended for:

— soil and waste discharge applications (low and high temperature) inside buildings (application area code “B”);

— soil and waste discharge applications (low and high temperature) for both inside buildings and buried in the ground within the building structure (application area code “BD”).

The intended use is reflected in the marking of products by “B” or “BD.

NOTE 1 For use buried in the ground within the building structure are intended only those components marked with “BD”, with dimensions equal to or greater than 75 mm and nominal ring stiffness of at least SN4.

This part of EN 1451 is also applicable to PP pipes and fittings and the system intended for the following purposes:

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

— rainwater pipework within the building structure.

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

This European Standard covers a range of nominal sizes, a range of pipes and fittings series and gives recommendations concerning colours.

NOTE 2 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, e.g. CEN/TR 13801 [1].

NOTE 3 Pipes, fittings and other components conforming to any of the plastics product standards listed in Annex B can be used with pipes and fittings conforming to this European Standard, provided they conform to the requirements for joint dimensions given in Clause 6 and to the requirements of Table 18.

This standard applies to pipes and fittings, marked with “B”, which are intended to be used inside buildings and outside buildings fixed onto the wall.

It applies to pipes and fittings, marked with “BD”, which are intended to be used for both inside buildings and buried in the ground within the building structure.

This standard is applicable to PP pipes and fittings of the following types:

— plain-ended,

— with integral elastomeric ring seal socket,

— for butt fusion joints,

whereby the fittings can be manufactured by injection-moulding or be fabricated from pipes and/or mouldings.

NOTE 4 EN 476 [2] specifies the general requirements for components used in discharge pipes, drains and sewers for gravity systems. Pipes and fittings conforming to this standard fully meet these requirements.

NOTE 5 For information about the chemical resistance of PP, guidance is given in ISO/TR 10358 [3] and for rubber materials in ISO/TR 7620[4].

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 12099, *Plastics piping systems - Polyethylene piping materials and components - Determination of volatile content*

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

EN ISO 580, *Plastics piping and ducting systems - Injection-moulded thermoplastics fittings - Methods for visually assessing the effects of heating (ISO 580)*

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

EN ISO 1133-1, *Plastics - Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics - Part 1: Standard method (ISO 1133-1)*

EN ISO 1167-1, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - Part 1: General method (ISO 1167-1)*

EN ISO 1167-2, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - Part 2: Preparation of pipe test pieces (ISO 1167-2)*

EN ISO 1183-2, *Plastics - Methods for determining the density of non-cellular plastics - Part 2: Density gradient column method (ISO 1183-2)*

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 3451-1, *Plastics - Determination of ash - Part 1: General methods (ISO 3451-1)*

EN ISO 11357-6, *Plastics - Differential scanning calorimetry (DSC) - Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT) (ISO 11357-6)*

EN ISO 9969, *Thermoplastics pipes - Determination of ring stiffness (ISO 9969)*

prEN ISO 13254, *Thermoplastics piping systems for non-pressure applications - Test method for watertightness (ISO 13254)*

prEN ISO 13255, *Thermoplastics piping systems for soil and waste discharge inside buildings - Test method for airtightness of joints (ISO 13255)*

prEN ISO 13257, *Thermoplastics piping systems for non-pressure applications - Test method for resistance to elevated temperature cycling (ISO 13257)*

prEN ISO 13259, *Thermoplastics piping systems for underground non-pressure applications - Test method for leaktightness of elastomeric sealing ring type joints (ISO 13259)*

prEN ISO 13263, *Thermoplastics piping systems for non-pressure underground drainage and sewerage - Thermoplastics fittings - Test method for impact strength (ISO 13263)*

prEN ISO 13264, *Thermoplastics piping systems for non-pressure underground drainage and sewerage - Thermoplastics fittings - Test method for mechanical strength or flexibility of fabricated fittings (ISO 13264)*

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

ISO 4065, *Thermoplastics pipes - Universal wall thickness table*

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

3 Terms and definitions

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

3.1
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, or for components outside buildings fixed onto the wall;

— D: application code for the area under and within 1 m from the building where the pipes and fittings are buried in ground and are connected to the underground drainage and sewerage system;

— BD: application area code for components intended for use for both code B and code D application areas

Note 1 to entry: In D application areas, the existence of external forces from the surroundings in addition to the hot water discharge is usual.

Note 2 to entry: Other application area codes U and UD not covered by this standard are defined elsewhere, e.g. in EN 1852-1.

3.2
nominal size
3.2.1
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

3.2.2
nominal size
DN/OD
nominal size, related to the outside diameter

3.3
nominal outside diameter
d_n
specified outside diameter, in millimetres, assigned to a nominal size DN/OD

3.4
outside diameter
d_e
value of the measurement of the outside diameter through its cross section at any point of a pipe or spigot of a fitting, rounded to the next greater 0,1 mm

3.5
mean outside diameter
d_{em}
value of the measurement of the outer circumference of a pipe or spigot of a fitting in any cross section, divided by π (≈ 3,142), rounded to the next greater 0,1 mm

3.6
inside diameter
d_s
value of the measurement of the inside diameter through its cross section at any point of a socket, rounded to the next greater 0,1 mm

3.7
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

3.8
wall thickness
e
value of measurement of the wall thickness at any point around the circumference of a component

3.9
mean wall thickness
e_m
arithmetical mean of a number of measurements of the wall thickness, regularly spaced around the circumference and in the same cross section of a component, including the measured minimum and the measured maximum values of the wall thickness in that cross section

3.10
pipe series
S
dimensionless number for pipe designation (see ISO 4065)

3.11
standard dimension ratio
SDR
nominal ratio of the outside diameter, d_n, to the minimum wall thickness, e_{min}

3.12
nominal ring stiffness
SN
numerical designation of the ring stiffness of a pipe or fitting which is a convenient round number relative to the determined stiffness in kilonewtons per square metre (kN/m^2), indicating the minimum ring stiffness of a pipe or fitting

3.13
fabricated fitting
fitting produced from pipe and/or from injection-moulded fittings by thermoforming or welding

3.14
solid wall pipe and fitting
pipe or fitting with smooth internal and external surface with the same compound/formulation through the wall

3.15
material definitions

3.15.1
copolymer
polymer derived from more than one species of monomer

3.15.2
homopolymer
polymer derived from one species of monomer

3.15.3
virgin material
material in the 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.

3.15.4
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

3.15.5
external reprocessed material
material prepared from unused thermoplastics products regardless of where those products were manufactured

3.15.6
recycled material
material from used thermoplastic products which have been cleaned and crushed or ground

3.15.7
reformulated material
recycled/reprocessed material that has been reformulated, by additives and processing techniques, to meet an agreed specification

3.15.8
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

4 Symbols and abbreviations

4.1 Symbols

A length of engagement

B length of lead-in

C depth of sealing zone

e_2 wall thickness of a socket

e_3 wall thickness in the groove area

l effective length of a pipe

L_1 length of spigot

R radius of swept fittings

Z design length of a fitting

α nominal angle of a fitting

4.2 Abbreviations

MFR melt mass-flow rate

OIT oxidation induction time

PP-B polypropylene copolymer

PP-H polypropylene homopolymer

TIR true impact rate

5 Material

5.1 PP-compound

The compound for pipes and fittings shall be PP-base material (homopolymer or copolymer) to which are added those additives that are needed to facilitate the manufacture of components conforming to the requirements of this standard.

5.2 Additional requirement for pipe and fitting material for application area BD

The material of pipes and fittings intended to be used in application area BD shall comply with the additional requirements given in Table 1, when tested in accordance with the methods and the parameters indicated in Table 1.

The pipe and fitting material shall be tested in form of a pipe.

Table 1 — Material characteristics of pipes and fittings intended for BD applications

Characteristic	Requirements	Material type and test designation	Test parameters		Test method
Resistance to internal pressure	No failure during the test period	PP-H: Test at 140 h at 80 °C	End caps Test temperature Orientation Number of test pieces Circumferential (hoop) stress Conditioning period Type of test Test period	Types A or B 80 °C Free 3 6,0 MPa 1 h Water-in-water 140 h	EN ISO 1167-1 and EN ISO 1167-2
		PP-H: Test at 1 000 h at 95 °C	End caps Test temperature Orientation Number of test pieces Circumferential (hoop) stress Conditioning period Type of test Test period	Types A or B 95 °C Free 3 3,5 MPa 1 h Water-in-water 1 000 h	
		PP- B: Test at 140 h at 80 °C	End caps Test temperature Orientation Number of test pieces Circumferential (hoop) stress Conditioning period Type of test Test period	Types A or B 80 °C Free 3 4,2 MPa 1 h Water-in-water 140 h	

Characteristic	Requirements	Material type and test designation	Test parameters		Test method
		PP- B: Test at 1 000 h at 95 °C	End caps Test temperature Orientation Number of test pieces Circumferential (hoop) stress Conditioning period Type of test Test period	Types A or B 95 °C Free 3 2,5 MPa 1 h Water-in-water 1 000 h	

5.3 Utilization of non-virgin material

For the utilization of non-virgin PP materials, conditions and requirements are given in Annex A.

5.4 Melt mass-flow rate

The MFR of the base material shall be tested in accordance with EN ISO 1133-1 using the test parameters: temperature 230 °C and loading mass 2,16 kg.

Pipes and fittings shall be made from materials with an MFR ≤ 3,0 g/10 min.

Materials for pipes and fittings for butt fusion joints shall be designated by the following classes with regard to the MFR:

Class A: MFR ≤ 0,3 g/10 min

Class B: 0,3 g/10 min < MFR ≤ 0,6 g/10 min

Class C: 0,6 g/10 min < MFR ≤ 0,9 g/10 min

Class D: 0,9 g/10 min < MFR ≤ 1,5 g/10 min

Only pipes and fittings made from materials of the same or adjacent MFR-classes may be fused together.

5.5 Thermal stability (OIT)

The test shall be carried out in accordance with EN ISO 11357-6 using a test temperature of 200 °C. The oxidation induction time of the material shall not be less than 8 min.

5.6 Sealing ring retaining means

Sealing rings may be retained using means made from polymers other than PP.

5.7 Fire behaviour

Pipes and fittings conforming to this standard shall conform to any relevant national requirements on fire regulations.

6 General characteristics

6.1 Appearance

When viewed without magnification the following requirements apply:

— the internal and external surfaces of pipes and fittings shall be smooth, clean and free from grooving, blistering, impurities, pores or other surface irregularity likely to prevent performance of pipes and fittings with this standard;

— each end of a pipe or a fitting shall be cleanly cut, if applicable, and shall be square to its axis.

6.2 Colour

The pipes and fittings shall be coloured through the wall. The colours of pipes and fittings should be preferably grey, black or white. Other colours may be used.

7 Geometrical characteristics

7.1 General

Dimensions shall be measured in accordance with EN ISO 3126.

NOTE The figures given in this standard are only schematic sketches intended to indicate the relevant dimensions. They do not necessarily represent the manufactured components.

7.2 Dimensions of pipes

7.2.1 Outside diameters

The mean outside diameter, d_{em}, shall conform to Table 2 or Table 3, as applicable.

Table 2 — Mean outside diameters (metric series)

Dimensions in millimetres

Nominal size DN/OD	Nominal outside diameter d_n	Mean outside diameter	
		$d_{em, min}$	$d_{em, max}$
32	32	32,0	32,3
40	40	40,0	40,3
50	50	50,0	50,3
63	63	63,0	63,3
75	75	75,0	75,3
80	80	80,0	80,4
90	90	90,0	90,4
100	100	100,0	100,4
110	110	110,0	110,4