

# **SLOVENSKI STANDARD**

## **SIST EN 13476-2:2018+A1:2020**

**01-september-2020**

**Nadomešča:**  
**SIST EN 13476-2:2018**

**Cevni sistemi iz polimernih materialov za odvodnjavanje in kanalizacijo, ki delujejo po težnostnem principu in so položeni v zemljo - Cevni sistemi s strukturirano steno iz nemehčane polivinilklorida (PVC-U), polipropilena (PP) in polietilena (PE) - 2. del: Specifikacije za cevi in fitege z gladko notranjo in zunanjo površino in sistem, tip A**

Plastics piping systems for non-pressure underground drainage and sewerage - Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) - Part 2: Specifications for pipes and fittings with smooth internal and external surface and the system, Type A

Kunststoff-Rohrleitungssysteme für erdverlegte drucklose Abwasserkanäle und -leitungen - Rohrleitungssysteme mit profilierter Wandung aus weichmacherfreiem Polyvinylchlorid (PVC-U), Polypropylen (PP) und Polyethylen (PE) - Teil 2: Anforderungen an Rohre und Formstücke mit glatter Innen- und Außenfläche und an das Rohrleitungssystem, Typ A

**Ta slovenski standard je istoveten z: EN 13476-2:2018+A1:2020**

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93.030	Zunanji sistemi za odpadno vodo	External sewage systems

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Plastics piping systems for non-pressure underground drainage and sewerage - Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) - Part 2: Specifications for pipes and fittings with smooth internal and external surface and the system, Type A

Systèmes de canalisations en plastique pour les branchements et les collecteurs d'assainissements sans pression enterrés - Systèmes de canalisations à parois structurées en poly(chlorure de vinyle) non plastifié (PVC-U), polypropylène (PP) et polyéthylène (PE) - Partie 2 : Spécifications pour les tubes et raccords avec une surface interne et externe lisses et le système, de Type A

Kunststoff-Rohrleitungssysteme für erdverlegte drucklose Abwasserkanäle und -leitungen - Rohrleitungssysteme mit profilierter Wandung aus weichmacherfreiem Polyvinylchlorid (PVC-U), Polypropylen (PP) und Polyethylen (PE) - Teil 2: Anforderungen an Rohre und Formstücke mit glatter Innen- und Außenfläche und an das Rohrleitungssystem, Typ A

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## EN 13476-2:2018+A1:2020 (E)

## European foreword

This document (EN 13476-2:2018+A1:2020) 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 December 2020, and conflicting national standards shall be withdrawn at the latest by December 2020.

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

This document supersedes A1 EN 13476-2:2018 A1.

This document includes Amendment 1 approved by CEN on 12 February 2020.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

A1 The main changes in EN 13476-2:2018 with respect to the previous edition EN 13476-2:2007 are listed below: A1

- a) updating of references in Clause 2, Tables 2, 8, 9, 10, 12, 14, 16 and 17;
- b) deletion of Note 2 in scope;
- c) changed denomination ‘material’ to ‘compound / formulation’ (entire document);
- d) clarification requirement ‘sealing rings’ (4.5);
- e) correction position  $e_3$  dimension (Figure 3);
- f) range nominal sizes extended (Table 5, Table 6);
- g) references to socket dimensions added (7.2.4);
- h) deletion of Table 7;
- i) short sockets added (7.2.4, 11.2.1, 11.2.2);
- j) alternative test method for DCM test added in Table 8;
- k) changed  $d_{em}$  to  $d_{im}$  (Table 14);
- l) changed  $d_{em\ min}$  to  $d_{im\ max}$  (Table G.1; Table H.1);
- m) impact strength at 0 °C added (Table 14, Table G.1);
- n) deletion of long term performance of TPE seals (Table 17);
- o) redrafted Annexes A and B, Table B.1, Table B.2, Annex F, Table F.1, Table F.2, Annex J;
- p) impact test for large diameter added (Annex K);

- q) deleted application of recycle without agreed specification (Annexes B, D, E, F and J);
- r) updated with new CEN template (entire document).

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

System Standards are based on the results of the work being 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 13476 consists of the following parts under the general title “Plastics piping systems for non-pressure underground drainage and sewerage — Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE)”:

- Part 1: General requirements and performance characteristics;
- *Part 2: Specifications for pipes and fittings with smooth internal and external surface and the system, Type A* (this standard);
- Part 3: Specifications for pipes and fittings with a smooth internal surface and profiled external surface and the system, Type B;
- *Part 4: Assessment of conformity (CEN/TS).* (CEN/TS 13476-4:2013; valid for pipes up to and incl. to DN 1200).

For guidance for installation, see CEN/TR 1046.

National standards specifically for pipes and fittings for the transport of surface water are not considered to be conflicting with this standard and may thus be allowed to coexist.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

**EN 13476-2:2018+A1:2020 (E)****Introduction**

This standard provides optional choices for impact resistance (see Annex G, Annex H and Annex K) and ring flexibility, see Annex I.

As appropriate, the individual countries may select between those options in their national forewords.

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## 1 Scope

This part of EN 13476, together with EN 13476-1, specifies the definitions and requirements for pipes, fittings and the system based on unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) structured-wall piping systems that are intended to be used for non-pressure underground drainage and sewerage systems.

This part is applicable to pipes and fittings with smooth internal and external surfaces, designated as Type A.

It specifies test methods and test parameters as well as requirements.

This part is applicable to:

- a) structured-wall pipes and fittings, which are intended to be used buried underground outside the building structure; reflected in the marking of products by “U”;
- b) structured-wall pipes and fittings, which are intended to be used buried underground both outside (application area code “U”) and within the building structure (application area code “D”); reflected in the marking of products by “UD”.

This part is applicable to structured-wall pipes and fittings with or without an integral socket with elastomeric ring seal joints as well as welded and fused joints.

This part covers a range of pipe and fitting sizes, materials, pipe constructions, stiffness classes, application classes, and tolerance classes and gives recommendations 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.

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## 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 476, *General requirements for components used in drains and sewers*

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 681-4, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 4: Cast polyurethane sealing elements*

EN 1401-1, *Plastics piping systems for non-pressure underground drainage and sewerage — Unplasticized poly(vinyl chloride) (PVC-U) — Part 1: Specifications for pipes, fittings and the system*

EN 1852-1, *Plastics piping systems for non-pressure underground drainage and sewerage — Polypropylene (PP) — Part 1: Specifications for pipes, fittings and the system*

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

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EN 12666-1, *Plastics piping systems for non-pressure underground drainage and sewerage — Polyethylene (PE) — Part 1: Specifications for pipes, fittings and the system*

EN 13476-1:2018, *Plastics piping systems for non-pressure underground drainage and sewerage — Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) — Part 1: General requirements and performance characteristics*

EN 13476-3, *Plastics piping systems for non-pressure underground drainage and sewerage — Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) — Part 3: Specifications for pipes and fittings with smooth internal and profiled external surface and the system, Type B*

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

EN 14758-1, *Plastics piping systems for non-pressure underground drainage and sewerage — Polypropylene with mineral modifiers (PP-MD) — Part 1: Specifications for pipes, fittings and the system*

CEN/TS 15223:2017, *Plastics piping systems — Validated design parameters of buried thermoplastics piping systems*

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

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

EN ISO 1133-1:2011, *Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 1: Standard method (ISO 1133-1:2011)*

EN ISO 1158, *Plastics — Vinyl chloride homopolymers and copolymers — Determination of chlorine content (ISO 1158)*

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

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

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

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

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

EN ISO 3451-1:2008, *Plastics — Determination of ash — Part 1: General methods (ISO 3451-1:2008)*

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

EN ISO 9967, *Thermoplastics pipes — Determination of creep ratio (ISO 9967)*

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

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

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 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)*

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

EN ISO 13257:2017, *Thermoplastics piping systems for non-pressure applications — Test method for resistance to elevated temperature cycling (ISO 13257:2010)*

EN ISO 13260, *Thermoplastics piping systems for non-pressure underground drainage and sewerage — Test method for resistance to combined temperature cycling and external loading (ISO 13260)*

EN ISO 13262, *Thermoplastics piping systems for non-pressure underground drainage and sewerage — Thermoplastics spirally-formed structured-wall pipes — Determination of the tensile strength of a seam (ISO 13262)*

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

EN 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 13967, *Thermoplastics fittings — Determination of ring stiffness (ISO 13967)*

EN ISO 13968, *Plastics piping and ducting systems — Thermoplastics pipes — Determination of ring flexibility (ISO 13968)*

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

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

## EN 13476-2:2018+A1:2020 (E)

### 3 Terms, definitions, symbols and abbreviations

#### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13476-1:2018 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

#### 3.2 Symbols

$A$	length of engagement, or maximum pull-out whilst maintaining tightness
$C$	length of the sealing zone
$d_e$	outside diameter
$d_{em}$	mean outside diameter
$d_{im}$	mean inside diameter
$d_n$	nominal diameter
$d_{sm,min}$	minimum mean inside diameter of socket
$e$	wall thickness (at any point)
$e_c$	construction height
$e_{min}$	minimum wall thickness of pipe or spigot
$e_2$	wall thickness at any point of the cylindrical part of a socket
$e_3$	wall thickness at any point of a sealing ring groove of a socket
$e_4$	wall thickness of the inside layer (waterway wall thickness)
$e_5$	wall thickness of the inside layer under a hollow section
$l$	effective length of a pipe
$L_{1,min}$	minimum length of a spigot
$IMP\ 23C$	impact resistance determined at +23 °C
$*$	impact resistance determined at -10 °C

#### 3.3 Abbreviations

$CaCO_3$	calcium carbonate
CT	close tolerance
DN	nominal size
DN/ID	nominal size related to inside diameter
DN/OD	nominal size related to outside diameter
H50	value for impact resistance of a pipe
$MgCO_3$	magnesium carbonate
$Mg_3Si_4O_{10}(OH)_2$	magnesium silicate, talcum

MFR	melt mass-flow rate
OIT	oxidation induction time
PE	polyethylene
PP	polypropylene
PP-MD	mineral modified PP
PVC-U	unplasticized poly(vinyl chloride)
RF	ring flexibility performance
S	pipe series S
SDR	standard dimension ratio
SN	ring stiffness class
TIR	true impact rate
TPE	thermo plastic elastomer
VST	vicat softening temperature

## 4 Material

### 4.1 General

The material shall be one of the following: unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) or polyethylene (PE), to which are added additives needed to facilitate the manufacture of components conforming to this document, including the relevant annexes.

### 4.2 Unplasticized poly(vinyl chloride) (PVC-U)

#### 4.2.1 General

The compound / formulation shall be PVC-U to which are added additives needed to facilitate the manufacture of components conforming to the requirements of this document (see also Annex A).

NOTE Additional information on the characteristics of PVC-U compound and components is given in EN 13476-1:2018, Annex A.

#### 4.2.2 Pipe and fitting compound / formulation characteristics

When tested in accordance with the test method as specified in Table 1 using the indicated parameters, the compound / formulation shall have characteristics conforming to the requirements given in Table 1.

**Table 1 — Compound / formulation of PVC-U pipes and injection-moulded fittings**

Characteristic	Requirements	Test parameters		Test method
Resistance to internal pressure <sup>a b c</sup>	No failure during the test period	End caps	Type A or Type B	EN ISO 1167-1 and EN ISO 1167-2
		Orientation	Free	
		Number of test pieces	3	
		Test temperature	60 °C	
		Circumferential stress for pipe compound / formulation	10 MPa	
		Circumferential stress for fitting compound / formulation	6,3 MPa	
		Conditioning period	Shall conform to EN ISO 1167-1	
		Type of test	Water-in-water	
		Test period	1 000 h	
<sup>a</sup> This requirement does not apply to the specified intermediate layer of a Type A1 pipe. <sup>b</sup> For the extrusion compounds for the internal and external layers of a multilayer pipe, this test shall be carried out in the form of a solid wall pipe made from the relevant compound / formulation. <sup>c</sup> For injection-moulding compounds, this test shall be carried out in the form of an injection-moulded or extruded sample in solid wall pipe form made from the relevant compound / formulation.				

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#### 4.2.3 Utilization of non-virgin materials

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For the utilization of non-virgin PVC-U materials, conditions and requirements are given in Annex B.

NOTE Annex J offers a survey of the possible use of reprocessed and recycled materials.

### 4.3 Polypropylene (PP)

#### 4.3.1 General

The compound for pipes and fittings shall be PP based material to which are added additives needed to facilitate the manufacture of components conforming to the requirements of this document. See also Annex C.

NOTE Additional information of the characteristics of PP material or components made thereof is given in EN 13476-1:2018, Annex A.

#### 4.3.2 Pipe and fitting compound / formulation characteristics

When tested in accordance with the test methods as specified in Table 2 using the indicated parameters, the compound shall have characteristics conforming to the requirements given in Table 2.

**Table 2 — Compound / formulation characteristics of PP pipes and injection-moulded fittings**

Characteristic	Requirements	Test parameters		Test method
Resistance to internal pressure, 140 h <sup>a b c</sup>	No failure during the test period	End caps Test temperature Orientation Number of test pieces Circumferential stress Conditioning period Type of test Test period	Type A or Type B 80 °C Free 3 4,2 MPa Shall conform to EN ISO 1167-1 Water-in-water 140 h	EN ISO 1167-1 and EN ISO 1167-2
Resistance to internal pressure 1 000 h <sup>a b c</sup>	No failure during the test period	End caps Test temperature Orientation Number of test pieces Circumferential stress Conditioning period Type of test Test period	Type A or Type B 95 °C Free 3 2,5 MPa Shall conform to EN ISO 1167-1 Water-in-water 1 000 h	EN ISO 1167-1 and EN ISO 1167-2
Melt mass-flow rate	≤ 1,5 g/10 min	Temperature Loading mass	230 °C 2,16 kg	EN ISO 1133-1:2011
Thermal stability, OIT	≥ 8 min	Temperature	200 °C	EN ISO 11357-6
<p><sup>a</sup> This requirement does not apply to the specified intermediate layer of a Type A1 pipe.</p> <p><sup>b</sup> For the extrusion compounds for the internal and external layers of a multilayer pipe, this test shall be carried out in the form of a solid wall pipe made from the relevant material(s).</p> <p><sup>c</sup> For injection-moulding compounds this test shall be carried out in the form of an injection-moulded, or extruded sample in solid wall pipe form made from the relevant material.</p>				

#### 4.3.3 Melt mass-flow rate classification

Materials for pipes and fittings intended for in field jointing by fusion or welding, shall be designated by the following MFR classes:

- 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.

In the case where a raw material, because of its MFR tolerance arbitrarily falls in one of two adjacent classes, the manufacturer of the components may mark the MFR class on the product as follows: