

---

---

**Plastics piping systems for non-pressure  
underground drainage and sewerage —  
Unplasticized poly(vinyl chloride)  
(PVC-U)**

*Systèmes de canalisations en plastique pour les branchements et les  
collecteurs d'assainissement enterrés sans pression — Poly(chlorure  
de vinyle) non plastifié (PVC-U)*

**iTeh STANDARD PREVIEW  
(standards.iteh.ai)**

[ISO 4435:2003](https://standards.iteh.ai/catalog/standards/sist/9e2f54e2-81b5-4cbd-a4a7-96e2b57cd3bf/iso-4435-2003)

<https://standards.iteh.ai/catalog/standards/sist/9e2f54e2-81b5-4cbd-a4a7-96e2b57cd3bf/iso-4435-2003>



**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[ISO 4435:2003](https://standards.iteh.ai/catalog/standards/sist/9e2f54e2-81b5-4cbd-a4a7-96e2b57cd3bf/iso-4435-2003)

<https://standards.iteh.ai/catalog/standards/sist/9e2f54e2-81b5-4cbd-a4a7-96e2b57cd3bf/iso-4435-2003>

© ISO 2003

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

## Contents

Page

Foreword.....	iv
1 Scope.....	1
2 Normative references .....	1
3 Symbols and abbreviated terms.....	2
4 Material.....	3
5 General characteristics .....	5
6 Geometrical characteristics.....	5
7 Mechanical characteristics .....	16
8 Physical characteristics .....	18
9 Performance requirements .....	20
10 Sealing rings.....	20
11 Adhesives .....	20
12 Marking.....	20
Bibliography .....	22

<https://standards.iteh.ai/catalog/standards/sist/9e2f54e2-81b5-4cbd-a4a7-96e2b57cd3bf/iso-4435-2003>  
 iTeh STANDARD PREVIEW  
 (standards.iteh.ai)

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 4435 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 1, *Plastics pipes and fittings for soil, waste and drainage (including land drainage)*.

**iTeh STANDARD PREVIEW**

This second edition cancels and replaces the first edition (ISO 4435:1991), which has been technically revised.

[ISO 4435:2003](https://standards.iteh.ai/catalog/standards/sist/9e2f54e2-81b5-4cbd-a4a7-96e2b57cd3bf/iso-4435-2003)

<https://standards.iteh.ai/catalog/standards/sist/9e2f54e2-81b5-4cbd-a4a7-96e2b57cd3bf/iso-4435-2003>

# Plastics piping systems for non-pressure underground drainage and sewerage — Unplasticized poly(vinyl chloride) (PVC-U)

## 1 Scope

This International Standard specifies the requirements for unplasticized poly(vinyl chloride) (PVC-U) pipes, fittings and piping systems intended for use for non-pressure underground drainage and sewerage for the conveyance of soil and waste discharge of domestic and industrial origin, as well as surface water.

It covers buried pipework but does not apply to piping systems buried within the building structure.

In the case of industrial discharge, the chemical and temperature resistance have to be taken into account, but this will have to be done separately.

This International Standard is applicable to PVC-U pipes with or without an integral socket.

Fittings may be manufactured (i.e. produced on a large scale) by injection-moulding or be fabricated (i.e. produced on a small scale) from pipes and/or mouldings.

This International Standard also specifies the test parameters for the test methods referred to herein.

It does not cover requirements for the  $K$ -value of the raw material.

## 2 Normative references

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

ISO 265-1, *Pipes and fittings of plastics materials — Fittings for domestic and industrial waste pipes — Basic dimensions: Metric series — Part 1: Unplasticized poly(vinyl chloride) (PVC-U)*

ISO 3126:—<sup>1)</sup>, *Plastics piping systems — Plastics piping components — Measurement and determination of dimensions*

ISO 4633, *Rubber seals — Joint rings for water supply, drainage and sewerage pipelines — Specification for materials*

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

---

1) To be published. (Revision of ISO 3126:1974)

EN 743:1994, *Plastics piping and ducting systems — Thermoplastics pipes — Determination of the longitudinal reversion*

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

EN 763:1994, *Plastics piping and ducting systems — Injection-moulded thermoplastics fittings — Test method for visually assessing effects of heating*

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

EN 1053, *Plastics piping systems — Thermoplastics piping systems for non-pressure applications — Test method for watertightness*

EN 1277, *Plastics piping systems — Thermoplastics piping systems for buried non-pressure applications — Test methods for leaktightness of elastomeric sealing ring type joints*

EN 1411, *Plastics piping and ducting systems — Thermoplastics pipes — Determination of resistance to external blows by the staircase method*

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 12061, *Plastics piping systems — Thermoplastics fittings — Test method for impact resistance*

EN 12256, *Plastics piping systems — Thermoplastics fittings — Test method for mechanical strength or flexibility of fabricated fittings*

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)

[ISO 4435:2003](#)

### 3 Symbols and abbreviated terms

[http://standards.iteh.ai/catalog/standards/sist/9e2f54e2-81b5-4cbd-a4a7-96e2b57cd3bf/iso-4435-2003](#)

#### 3.1 Symbols

The following symbols are used in this International Standard. Their meanings are illustrated in the respective figures.

$A$	length of engagement
$a$	circumferential side cover of a saddle branch
$B$	length of lead-in
$C$	depth of sealing zone
$d_{em}$	mean outside diameter
$d_n$	nominal outside diameter
$d_{sm}$	mean inside diameter of a socket
DN	nominal size
DN/OD	nominal size, outside diameter related
$d_3$	internal diameter of groove
$e$	wall thickness

$e_m$	mean wall thickness
$e_2$	wall thickness of a socket
$e_3$	wall thickness in the groove area
$f$	groove width
$H$	length of chamfer
$L$	axial cover of a saddle branch
$L_1$	length of spigot
$L_2$	length of a solvent cement socket
$l$	effective length of a pipe
$M$	length of spigot of a plug
$R$	radius of a swept fitting
$z$	laying length ( $z$ -length)
$\alpha$	angle of a fitting

iTech STANDARD PREVIEW  
(standards.iteh.ai)

### 3.2 Abbreviated terms

PVC-U	unplasticized poly(vinyl chloride) <a href="https://standards.iteh.ai/catalog/standards/sist/9e2f54e2-81b5-4cbd-a4a7-96e2b57cd3bf/iso-4435-2003">ISO 4435:2003</a>
SDR	standard dimension ratio <a href="https://standards.iteh.ai/catalog/standards/sist/9e2f54e2-81b5-4cbd-a4a7-96e2b57cd3bf/iso-4435-2003">96e2b57cd3bf/iso-4435-2003</a>
SN	nominal stiffness
TIR	true impact rate

## 4 Material

### 4.1 Raw material

The raw material shall be PVC-U to which have been added those additives that are needed to facilitate the manufacture of components conforming to the requirements of this International Standard.

It is recommended that the requirements given in EN 1401-1 be followed for the use of non-virgin material.

NOTE Definitions relating to materials are given in EN 1401-1.

The PVC content shall be at least 80 % by mass for pipes and 85 % by mass for injection-moulded fittings when calculated on the basis of a known formulation or (in cases of dispute or when the formulation is not known) determined in accordance with EN 1905.

4.2 Pipe material

When tested in accordance with the method specified in Table 1, using the parameters indicated, the pipe material shall conform to the requirement given in Table 1.

The pipe material shall be tested in the form of a pipe.

Table 1 — Pipe material

Characteristic	Requirement	Test parameters		Test method
Resistance to internal pressure	No failure during test period	End caps	Type A or B <sup>a</sup>	EN 921
		Test temperature	60 °C	
		Orientation	Not specified	
		Number of test pieces	3	
		Circumferential (hoop) stress	10,0 MPa	
		Conditioning period	1 h	
		Type of test	Water-in-water	
		Test period	1 000 h	
		<sup>a</sup> In cases of dispute, the manufacturer shall declare the type of end cap to be used.		

4.3 Fitting material

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

When tested in accordance with the method specified in Table 2, using the parameters indicated, the fitting material shall conform to the requirement given in Table 2.

The fitting material shall be tested, without further modification, in the form of an extruded or injection-moulded pipe.

When fittings or parts of fittings are fabricated (i.e. produced on a small scale), they shall be made from pipes conforming to this International Standard, except for the requirements for the wall thickness, and/or from mouldings made from PVC-U which conforms to the material, mechanical and physical characteristics required by this International Standard.

Table 2 — Fitting material

Characteristic	Requirement	Test parameters		Test method
Resistance to internal pressure	No failure during test period	End caps	Type A or B <sup>a</sup>	EN 921
		Dimensions	50 mm ≤ d <sub>n</sub> ≤ 110 mm 3 mm ≤ e ≤ 5 mm	
		Free length of injection-moulded pipe	≥ 140 mm	
		Test temperature	60 °C	
		Orientation	Not specified	
		Number of test pieces	3	
		Circumferential (hoop) stress	6,3 MPa	
		Conditioning period	1 h	
		Type of test	Water-in-water	
		Test period	1 000 h	
<sup>a</sup> In cases of dispute, the manufacturer shall declare the type of end cap to be used.				



#### 4.4 Sealing ring retaining means

Sealing rings may be retained using components made from polymers other than PVC-U.

### 5 General characteristics

#### 5.1 Appearance

When viewed without magnification, pipes and fittings shall meet the following requirements:

- the internal and external surfaces shall be smooth, clean and free from grooving, blistering, impurities, pores and any other surface irregularity likely to prevent conformity with this International Standard;
- each end shall be cleanly cut, if applicable, and shall be square to its axis.

#### 5.2 Colour

Pipes and fittings shall be coloured through the whole wall.

NOTE The colour should preferably be orange-brown (approximately RAL 8023)<sup>2)</sup> or dusty grey (approximately RAL 7037)<sup>2)</sup>. Other colours may be used, however.

### 6 Geometrical characteristics

#### 6.1 General

All dimensions shall be measured in accordance with ISO 3126:—  
<https://standards.iteh.ai/catalog/standards/sist/9e2b54e2-81b5-4cbd-a4a7-96e2b57cd3bf/iso-4435-2003>

The figures given in this International Standard are schematic sketches only, to indicate the relevant dimensions. They do not necessarily represent manufactured components. The dimensions given shall be conformed to however.

---

2) As specified in RAL 840-HR, obtainable from Beuth Verlag GmbH, 1000 Berlin 30.

6.2 Dimension of pipes

6.2.1 Outside diameter

The mean outside diameter  $d_{em}$  shall be as specified in Table 3.

Table 3 — Mean outside diameters

Dimensions in millimetres

Nominal size <sup>a</sup> DN/OD	Nominal outside diameter $d_n$	Mean outside diameter $d_{em}$	
		min.	max.
110	110	110,0	110,3
125	125	125,0	125,3
160	160	160,0	160,4
200	200	200,0	200,5
250	250	250,0	250,5
315	315	315,0	315,6
(355)	355	355,0	355,7
400	400	400,0	400,7
(450)	450	450,0	450,8
500	500	500,0	500,9
630	630	630,0	631,1
(710)	710	710,0	711,2
800	800	800,0	801,3
(900)	900	900,0	901,5
1 000	1 000	1 000,0	1 001,6

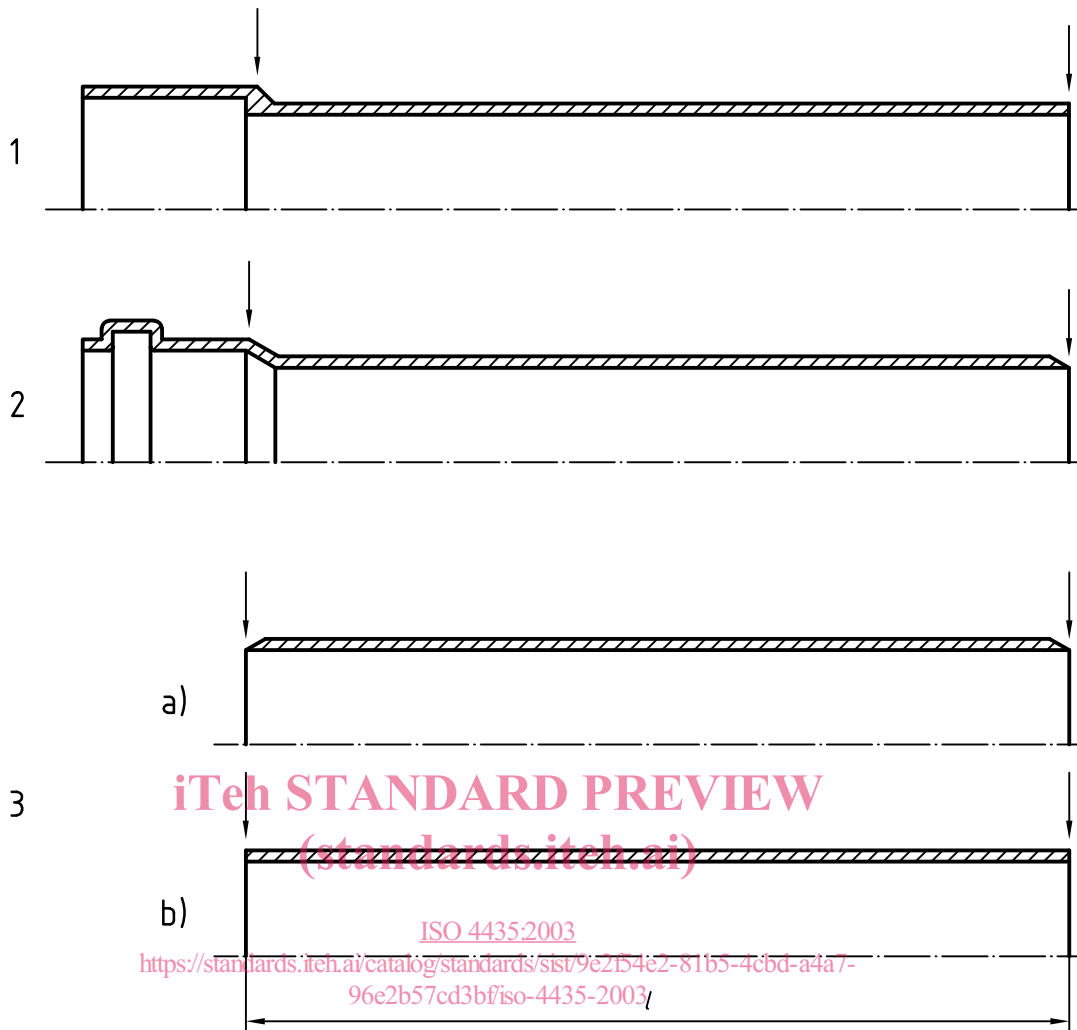
<sup>a</sup> Non-preferred sizes are indicated in parentheses.

6.2.2 Out-of-roundness

The out-of-roundness, measured directly after production, shall be less than or equal to  $0,024d_n$ .

6.2.3 Effective lengths of pipes

The effective length  $l$  of a pipe shall be not less than that specified by the manufacturer when measured as shown in Figure 1.

**Key**

- 1 single-socket pipe
- 2 ring-seal pipe
- 3 plain-ended pipe
  - a) with chamfer
  - b) without chamfer

**Figure 1 — Effective lengths of pipes****6.2.4 Chamfering**

If a chamfer is applied, the angle of chamfering shall be between 15° and 45° to the axis of the pipe (see Figure 2 and Table 5 or Figure 7 and Table 8, as applicable).

The wall thickness remaining at the end of the pipe shall be at least one-third of  $e_{\min}$ .