INTERNATIONAL STANDARD

ISO 3633

First edition
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Unplasticized poly(vinyl chloride) (PVC-U) pipes and fittings for soil and waste discharge (low and high temperature) systems inside buildings — Specifications

Tubes et raccords en poly(chlorure de vinyle) non plastifié (PVC-U) pour les systèmes d'évacuation d'eaux usées et d'eaux-vannes (à basse et à haute température) à l'intérieur des bâtiments — Spécifications

Reference number
ISO 3633:1991(E)

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.

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.

International Standard ISO 3633 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids.*

Annexes A, B, C, D, E, F and G form an integral part of this International Standard. Annex H is for information only.

This International Standard lays down the specifications for unplasticized poly(vinyl chloride) (PVC-U) pipes and fittings, with nominal outside diameters of 16 mm to 400 mm, intended for domestic installations inside buildings for

a) soil and waste discharge pipe lines (including the ventilation of these pipes), and

b) internal rainwater pipes

for the transportation of domestic waste waters[1] (low and high temperature).

NOTE 1 For other uses of these pipes and fittings, reference should be made to the relevant section of ISO/TR 7024, to the manufacturer's instructions and to national regulations.

There are two types of pipes and fittings (type A and type B) for such discharge systems:

— type A, which shall be used only for primary and secondary ventilation pipework and internal rainwater applications;

— type B, which shall be used for soil and waste discharge systems and may also be used for any type A application.

This International Standard may also be applied to pipes, fittings and joints for discharges of industrial

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 161-1:1978, *Thermoplastics pipes for the transport of fluids — Nominal outside diameters and nominal pressures — Part 1: Metric series.*

ISO 265-1:1988, *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 580:1990, *Injection-moulded unplasticized poly(vinyl chloride) (PVC-U) fittings — Oven test — Test method and basic specifications.*

ISO 1043-1:1987, *Plastics — Symbols — Part 1: Basic polymers and their special characteristics.*

ISO 2505:1981, *Unplasticized polyvinyl chloride (PVC) pipes — Longitudinal reversion — Test methods and specification.*

1) For the definition of the term "domestic waste waters" refer to annex A or, alternatively, to national regulations.

ISO 2507:1982, *Unplasticized polyvinyl chloride (PVC) pipes and fittings — Vicat softening temperature — Test method and specification.*

ISO 3127:1980, *Unplasticized polyvinyl chloride (PVC) pipes for the transport of fluids — Determination and specification of resistance to external blows.*

ISO 3606:1976, *Unplasticized polyvinyl chloride (PVC) pipes — Tolerances on outside diameters and wall thicknesses.*

ISO 4435:1991, *Unplasticized poly(vinyl chloride) (PVC-U) pipes and fittings for buried drainage and sewerage systems — Specifications.*

ISO/TR 7024:1985, *Above-ground drainage — Recommended practice and techniques for the installation of unplasticized polyvinyl chloride (PVC-U) sanitary pipework for above-ground systems inside buildings.*

ISO 8283-1:1991, *Plastics pipes and fittings — Dimensions of sockets and spigots for discharge systems inside buildings — Part 1: Unplasticized poly(vinyl chloride) (PVC-U) and chlorinated poly(vinyl chloride) (PVC-C).*

3 Material

3.1 The material shall consist substantially of poly(vinyl chloride) (PVC) to which may be added only those additives that are needed to facilitate the manufacture of pipes and fittings having good mechanical strength and opacity.

3.2 The use of the manufacturer's own clean rework material from pipes and fittings made to this International Standard is permissible. No other rework material shall be used.

3.3 Pipes and fittings shall be sufficiently stabilized against thermal ageing and ultraviolet (UV) light.

NOTE 2 Resistance to UV light is under study within ISO/TC 138.

4 Geometrical characteristics

4.1 Pipe dimensions

Pipe dimensions shall be in accordance with ISO 161-1 and ISO 3606.

4.1.1 Nominal outside diameter and wall thickness

Nominal outside diameters and wall thicknesses are classified into two size ranges: a primary size range (see table 1 and table 2) and a secondary size range (see table 3 and table 4). If dimensions other than those given for the primary size range are necessary, they shall be selected from the secondary size range.

4.1.1.1 Primary size range

Table 1 — Nominal outside diameter — Primary size range

Dimensions in millimetres

40	50	75	90	110	125	160

Table 2 — Wall thickness — Primary size range

Dimensions in millimetres

Nominal outside diameter D	Minimum wall thickness e_{min}	
	Type A	Type B
40	1,8	3,2
50	1,8	3,2
75	1,8	3,2
90	1,9	3,2
110	2,2	3,2
125	2,5	3,2
160[1)]	3,2[1)]	4

1) May also be suitable for type B applications, provided that the functional test requirements are fulfilled.

4.1.1.2 Secondary size range

Table 3 — Nominal outside diameter — Secondary size range

Dimensions in millimetres

16	20	25	32	63	200	250	315	400

Table 4 — Wall thickness — Secondary size range

Dimensions in millimetres

Nominal outside diameter D	Minimum wall thickness e_{min}	
	Type A	Type B
16	—	1,8
20	—	2,3
25	—	3,2
32	1,8	3,2
63	1,8	3,2
200	3,9	4,9
250	4,9	6,2
315	6,2	7,7
400	7,8	9,8

4.1.2 Length of pipe

The nominal length of a pipe shall be measured as shown in figure 1. For pipes with sockets, the nominal length is considered to be the distance between the ends minus the socket depth. For practical reasons, this length is measured to the outside of the socket.

4.2 Dimensions of fittings

4.2.1 Basic dimensions

Basic dimensions of fittings shall be given by the manufacturer, and the dimensions shall be defined as in ISO 265-1.

4.2.2 Wall thickness

The wall thickness shall be at least equal to the minimum wall thickness of the pipe of the same size unless otherwise specified in 4.3.2.

4.3 Socket and spigot dimensions of pipes and fittings

4.3.1 Basic dimensions

Basic dimensions of sockets and spigots shall be as given in ISO 8283-1 for nominal diameters up to 200 mm and as given in ISO 4435 for nominal diameters greater than 200 mm.

4.3.2 Wall thickness of sockets on pipes and fittings

The minimum wall thickness of sockets for joints of the primary size range shall meet the requirements of table 5 (see figure 2 for an example).

Table 5 — Minimum wall thickness of sockets on pipes and fittings — Primary size range

Dimensions in millimetres

Nominal outside diameter D	e_2 min.		e_3 min.	
	Type A	Type B	Type A	Type B
40	1,6	2,9	1	2,4
50	1,6	2,9	1	2,4
75	1,6	2,9	1	2,4
90	1,7	2,9	1,1	2,4
110	2	2,9	1,2	2,4
125	2,3	2,9	1,4	2,4
160	2,9	3,6	1,8	3

When a seal ring is firmly retained by means of a seal ring retaining component (see figure 3 for an example), the wall thickness of the socket in this area and that of the seal ring retaining component may be added together to achieve the required e_3 dimension provided that they are not separated by the seal ring.

The minimum values of e_3 given in table 5 apply only to those parts of the ring seal zone where the liquid in the pipe comes into contact with the fitting. For those parts of the fitting that do not come into contact with the liquid, i.e. beyond the designated seal point, thinner walls are permitted.

Seal ring retaining components may be manufactured in plastics other than PVC-U.

In all cases, the components shall meet the functional test requirements specified in clause 7.

5 Mechanical test requirements

5.1 Pipes

Either the impact test or the tensile test as specified in 5.1.1 or 5.1.2 may be selected to satisfy the test requirements.

5.1.1 Impact strength (alternative to 5.1.2)

The true impact rate (TIR) shall not exceed 10 % at 20 °C when tested in accordance with ISO 3127.

5.1.2 Tensile strength (alternative to 5.1.1)

When determined in accordance with a method agreed on between the interested parties, the maximum tensile strength plotted during the test shall not be less than 45 MPa and the elongation at break shall not be less than 80 %.

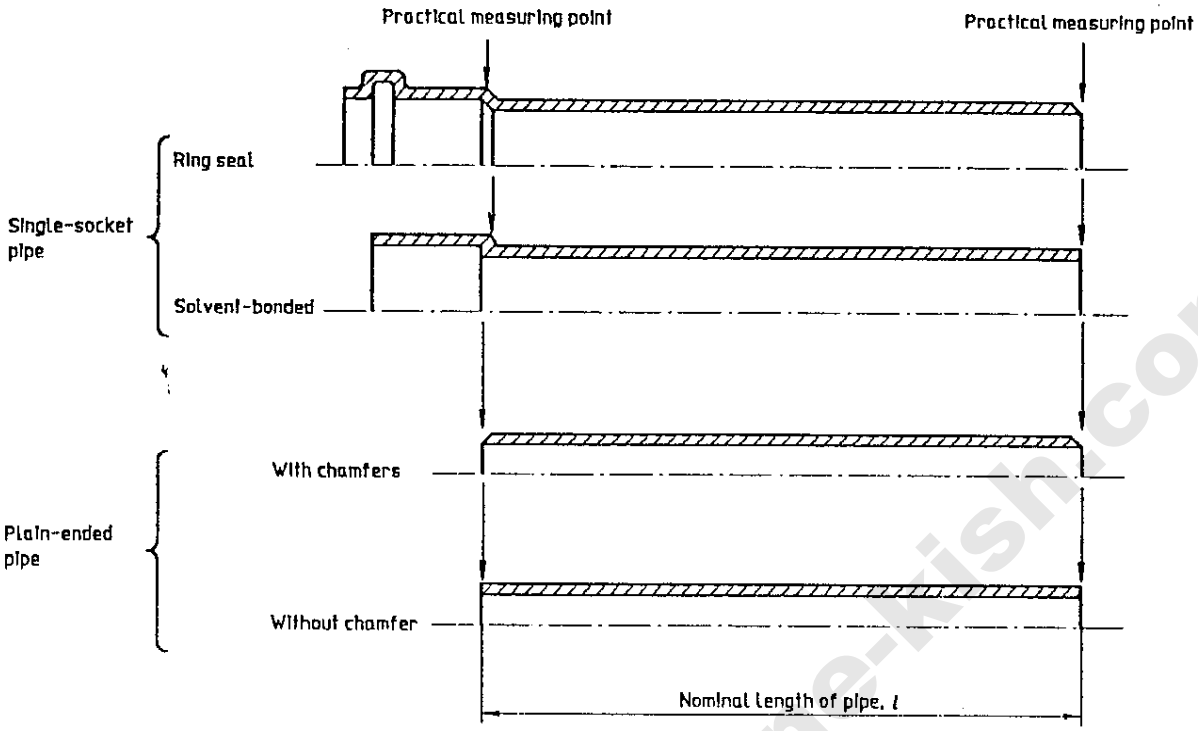


Figure 1 — Nominal pipe length and definitions

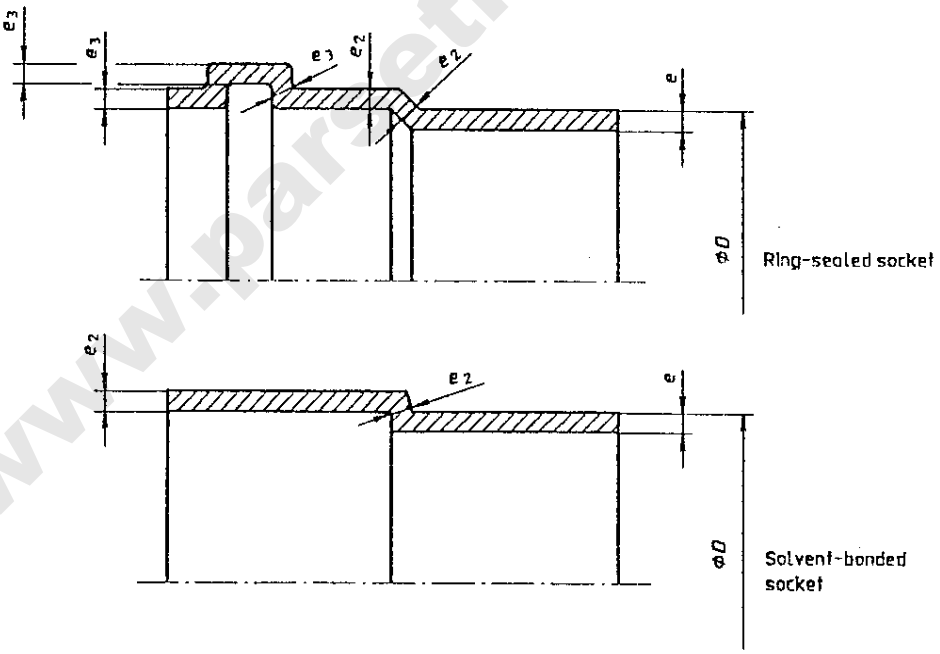


Figure 2 — Socket details

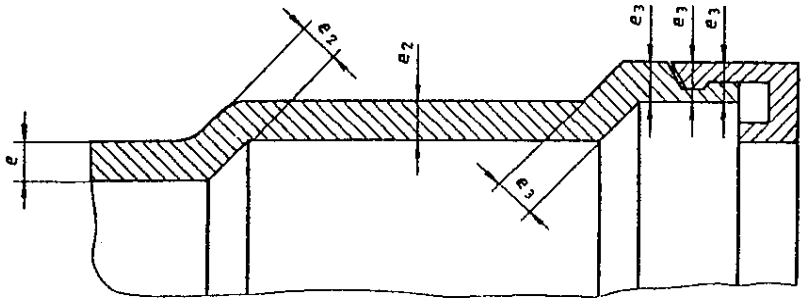


Figure 3 — Example of a seal retaining cap

5.2 Fittings — Impact strength

Five fittings of each diameter and type shall be conditioned for at least 30 min at a temperature of 0 °C ± 1 °C. Within 10 s after the conditioning treatment, each fitting shall be dropped freely in various positions on to a flat concrete floor from the heights specified below:

— for $D \leqslant 75$ mm, drop from $(2\ ^{+0,1}_{0})$ m;

— for $D > 75$ mm, drop from $(1\ ^{+0,1}_{0})$ m.

If none of the specimens is damaged in the test, the fittings shall be accepted. If one fitting is damaged, the test shall be repeated with five further fittings. None of these last five fittings shall be damaged.

NOTES

3 This is an optional test, to be carried out only if required in a national standard, but is mandatory for fittings with sealing caps or rings and for fittings fabricated from pipes.

4 In the context of this test, "damage" means any visible split or any complete breakage in the body of the fitting. Surface scratches, scuffing, or chipping of edges which may occur in the test does not constitute damage.

6 Physical test requirements

6.1 Pipes

6.1.1 Vicat softening temperature

The Vicat softening temperature shall be not less than 79 °C when determined in accordance with ISO 2507.

6.1.2 Longitudinal reversion

The longitudinal reversion shall not exceed 5 % when determined in accordance with ISO 2505.

6.2 Fittings

6.2.1 Vicat softening temperature

The Vicat softening temperature shall be not less than 77 °C when determined in accordance with ISO 2507.

6.2.2 Oven test

Moulded fittings shall meet the requirements of ISO 580.

7 Functional test requirements (type tests)

7.1 Watertightness

Joints between pipes and fittings, pipes and pipes, and fittings and fittings shall not leak when tested in accordance with annex B.

7.2 Airtightness

Joints between pipes and fittings, pipes and pipes, and fittings and fittings shall remain airtight when tested in accordance with annex C.

7.3 Elevated-temperature cycling test

The test assembly used shall meet the requirements given in either annex D or annex E. Where national standards specify which of these two tests is to be used, they shall be complied with.

Only type B pipes and fittings are required to satisfy these requirements.

Annex F specifies the information to be provided and the symbols to be used in the test report.

7.4 Axial shrinkage

The axial shrinkage shall not exceed 2 % when determined in accordance with annex G.

NOTE 5 This is an optional test to carried out only if required by a national standard.

8 Elastomeric sealing elements and adhesives

All elastomeric sealing elements and adhesives shall be as specified by the manufacturer of the fittings.

The sealing elements and adhesives shall not have a detrimental effect on the pipes or fittings, i.e. they shall not cause the test assembly to fail the functional tests.

9 Delivery conditions

The internal and external surfaces of pipes and fittings shall be smooth and free from grooving, blistering and any other surface defect. The materials shall not contain visible impurities or pores. Pipe ends shall be cleanly cut, and the ends of pipes and fittings shall be square with the axis of the pipe.

10 Marking

Pipes, fittings and sealing rings shall be marked clearly and indelibly so that legibility is maintained for the life of the products under normal conditions of storage, weather and use.

The markings may be integral with the product or on a label. The markings shall not damage the product.

10.1 Pipes

Pipes shall be marked with at least the following information:

— manufacturer's name or trade mark;

— pipe material;

— nominal diameter of pipe;

— nominal wall thickness of pipe;

— manufacturing information, in plain text or in code, providing traceability of the production period to within the year and month and the production site if the manufacturer is producing at several national or international sites;

— the number of this International Standard.

Pipes with a nominal laying length up to and including z_2 metres shall be marked at least once. Pipes with a nominal laying length greater than z_2 shall be marked at intervals of z_3 metres at the most. The values of z_2 and z_3 shall be as specified by the authorities in each country.

10.2 Fittings

Fittings shall be marked with at least the following information:

— manufacturer's name or trade mark;

— fitting material (may be given on packing only in the case of PVC, provided this information is not required on each article by national authorities);

— nominal diameter of fitting;

— classification (where applicable);

— values of angles, if any;

— manufacturing information, in plain text or in code, providing traceability of the production period to within the year and month and the production site if the manufacturer is producing at several national or international sites (may be given on packing only, provided this information is not required on each article by national authorities);

— the number of this International Standard (may be given on packing only, provided this information is not required on each article by national authorities).

10.3 Sealing rings

Sealing rings shall be marked with at least the following information:

— manufacturer's name or trade mark;

— nominal dimension of ring;

— manufacturing information, in plain text or in code, providing traceability of the production period to within the year and the production site if manufacturer is producing at several national or international sites.

No markings are required on sealing rings which are moulded to pipes or fittings or any other marked component.

10.4 Designation of the material (in accordance with ISO 1043-1)

PVC-U

Annex A
(normative)

Definition of domestic waste waters

domestic waste waters: Waters discharged and diverted into the sewage system, in particular

a) waters that have become altered in composition and have become fouled (or impure) by being used domestically (including waters from flushing systems containing human excrement and, if necessary or authorized, animal excrement, and waters from normal households, offices, old people's homes, hotels, schools, etc.), and

b) rainwater, if a separate discharge channel is not available.

Such waters never have a temperature exceeding 100 °C continuously for more than 2 min and have a pH value normally in the range pH 2 to pH 12.

Annex B
(normative)

Watertightness test

B.1 Apparatus

B.1.1 Apparatus, to which the test assembly can be connected, allowing a controlled water pressure to be applied.

P ? **Precision pressure gauge.**

B.2 Test assembly

Pipes, fittings and joints in accordance with this International Standard in all other respects shall be used.

The connection (joint) shall be made in accordance with the manufacturer's instructions.

B.3 Procedure

If the joint to be tested permits deflection, perform the test with the test assembly under the maximum possible deflection of the axis without forcing.

Connect the test assembly (see clause B.2) to the precision pressure gauge (B.1.2). By allowing water to enter the test assembly, gradually increase the internal pressure from 0 MPa to 0,05 MPa (0 bar to 0,5 bar) over a period of not greater than 15 min and maintain the pressure of 0,05 MPa (0,5 bar) for at least 15 min.

B.4 Test requirements

The test requirement (see 7.1) shall be fulfilled for all types of test assembly, including those combining minimum spigot ends and maximum sockets.

Annex C
(normative)

Airtightness test

C.1 Apparatus

C.1.1 Apparatus, to which the test assembly can be connected, allowing a controlled air pressure to be applied.

A suitable apparatus is shown in figure C.1.

C.1.2 Precision pressure gauge or **manometer.**

C.2 Test assembly

Pipes, fittings and joints in accordance with this International Standard in all other respects shall be used.

The connection (joint) shall be made in accordance with the manufacturer's instructions.

The test assembly shall consist of a specimen of pipe mounted in two clamped blocks. Seal one end of the pipe with a plug that has a combined water and air inlet. Insert any fitting or joint into the open end of the pipe. The joint or fitting shall then be sealed at all open ends with plugs, one of which has a water outlet and shut-off valve mounted centrally in the sealing plug.

C.3 Procedure

C.3.1 Apply a strong solution of soapy water or detergent around the annular space between the mouth of the fitting and the pipe.

C.3.2 Open the water outlet valve and close the air inlet valve on the pipe shut-off.

C.3.3 Open the water inlet valve. When the assembly is half full, that is say when water flows from the outlet, close the water inlet and outlet valves.

C.3.4 Open the air inlet valve and increase the internal air pressure to 0,01 MPa $\pm$ 0,001 MPa (0,1 bar $\pm$ 0,01 bar) at ambient temperature. Maintain this pressure for 5 min.

C.3.5 Note, during this 5 min period, any leaks which occur between the mouth of the fitting and the pipe, and which are evident by the formation of bubbles.

C.3.6 Deflect the pipe manually in the socket of the fitting until it reaches the maximum permissible deflection for the particular joint under test. Carry out this deflection at 0°, 90°, 180° and 270° (see figure C.1), maintaining it for 1 min in each of these directions.

C.4 Test requirements

No water leaks shall occur, but if bubbles appear at any time during the test, a new application of soapy water or detergent shall be made. If there is still a continuous emission of bubbles during the test, the joint shall be deemed not to meet the requirements of the test.

The test requirements shall be fulfilled for all types of test assembly, including those combining minimum spigot ends and maximum sockets.

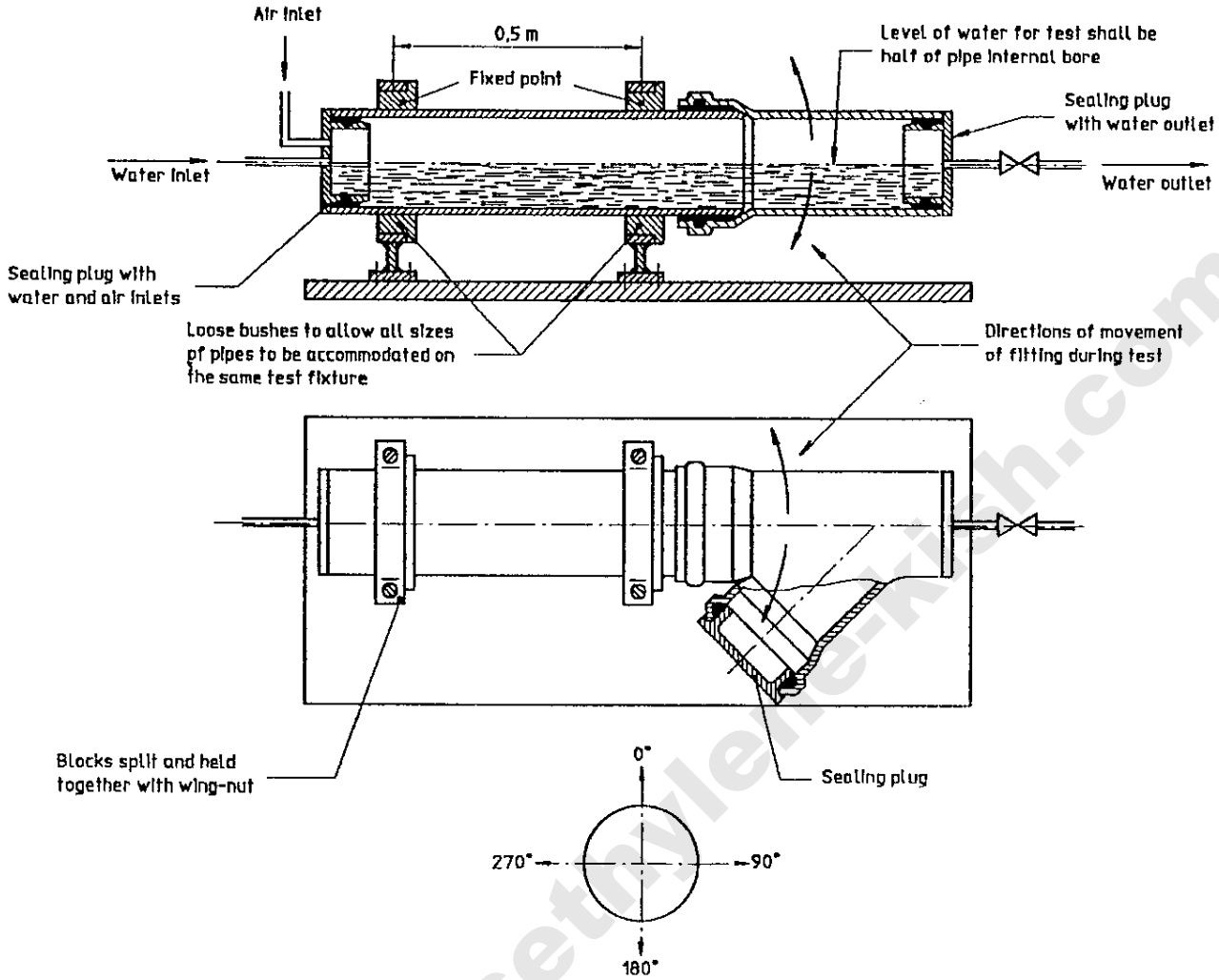


Figure C.1 — Test assembly for airtightness test

Annex D
(normative)

Elevated-temperature cycling test — 1 500-cycle test (type B pipes and fittings — Primary size range)

D.1 Test assembly

The test assembly shall consist of a vertical stack of pipes with fittings and two near-horizontal pipe assemblies with fittings in accordance with figure D.1. Installation shall be carried out on a firm wall or frame with guide and anchor brackets, with no other support of the test assembly.

Anchor brackets shall be located directly below or behind the sockets of each pipe length. Guide brackets shall be placed not less than 10*D* apart for near-horizontal assemblies. (An exception to this is the first pipe in the near-horizontal line from the inlet, where possible sagging is to be measured.)

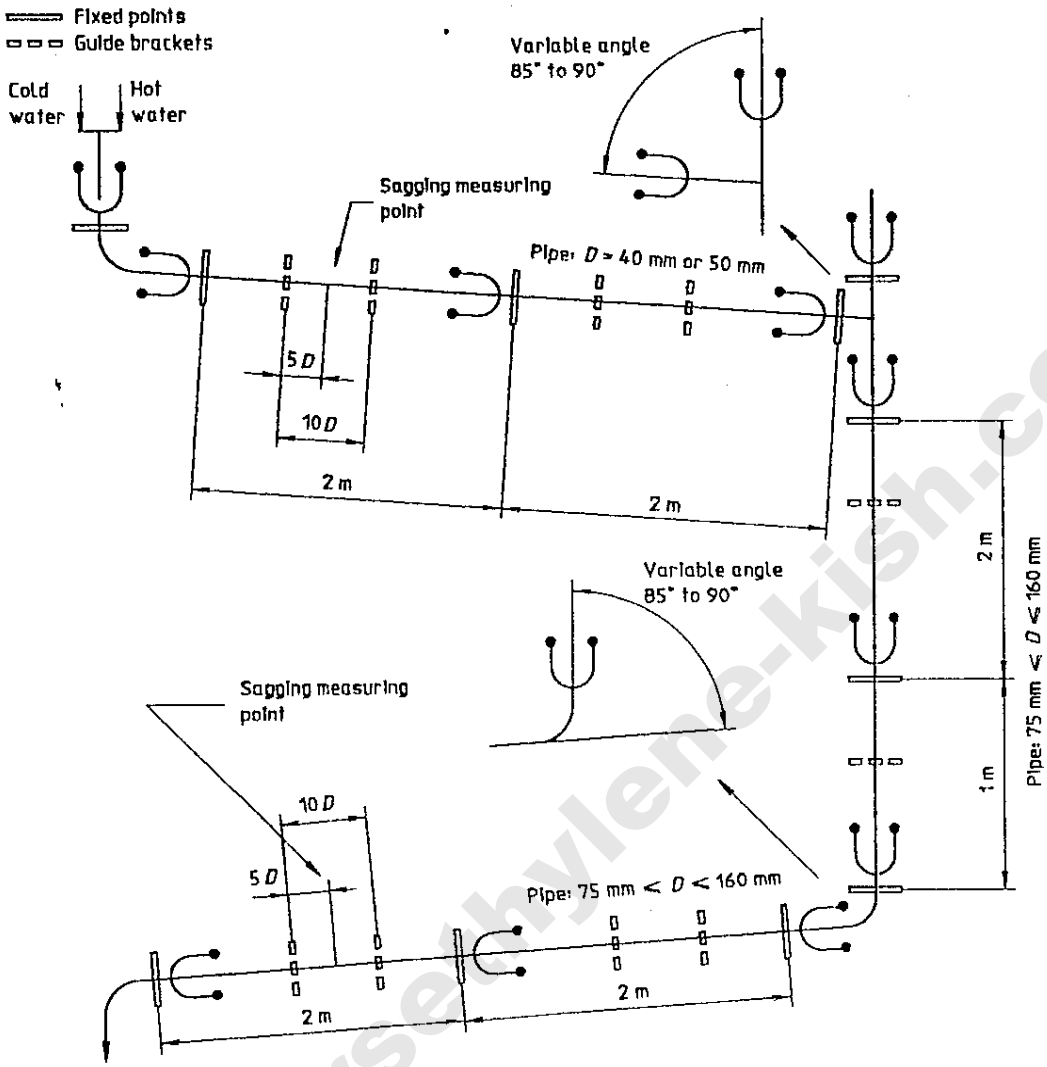
a) 30 l of water at a temperature of 93 °C ± 2 °C (measured at the point of entry) over a period of 1 min (30 l/min);

b) rest and drain period of 1 min;

c) 30 l of water at a temperature of 15 °C ± 5 °C (measured at the point of entry) over a period of 1 min (30 l/min);

d) rest and drain period of 1 min.

D.3 Test requirements



NOTE – The fittings shall be assembled without undue stresses. The test assembly illustrated is only representative and the positions of the joints are not mandatory but should follow appropriate installation techniques (see ISO/TR 7024) and the manufacturer's instructions.

Figure D.1 — Test assembly for elevated-temperature cycling test (1 500 cycles)

Annex E
(normative)

Elevated-temperature cycling test — 5-cycle test

E.1 Test assembly

The test assembly shall consist of a vertical stack of pipes with fittings and two near-horizontal pipe assemblies with fittings in accordance with figure E.1. Installation shall be carried out on a firm wall or frame with guide and anchor brackets, with no other support of the test assembly.

Anchor brackets shall be located directly below or behind the sockets of each pipe length. Guide brackets for near-horizontal assemblies shall be positioned as shown in figure E.1.

It shall be checked that the test assembly exhibits no sagging greater than $0{,}1D$ at the mid-point between two guide brackets (see figure E.1).

Devices shall be provided, and positioned as indicated in figure E.1, to measure any sagging f_1 and f_2 of the test assembly.

Room for expansion of pipes shall be provided for all spigot ends of pipes, but not for the spigot ends of fittings. The entry of hot water into the test assembly shall be direct; there shall be no heat-absorbing intermediate pieces.

E.2 Procedure

E.2.1 Test the assembly for watertightness and airtightness in accordance with E.3.1 and E.3.2.

E.2.2 Subject the assembly to the passage of hot and cold water according to the following schedule for 5 cycles:

a) circulation of water at 93 °C ± 2 °C for 15 min, at a flow-rate of 0,3 l/s (18 l/min);

b) circulation of water at 15 °C ± 5 °C for 10 min, at a flow-rate of 0,3 l/s (18 l/min).

During the cycling test

a) check that the temperature of the water remains constant within the specified limits;

b) note any leaks from the test assembly and any "incidents" which may have an influence on the results;

c) record the sagging f_1 and f_2 between guide brackets.

E.2.3 After completion of the cycling test, carry out the watertightness test again, as described in E.3.1.

E.3 Tightness test procedures

E.3.1 Watertightness

Carry out the following procedure.

a) Seal off the lower end of the test assembly.

b) Apply a pressure of at least 0,01 MPa (0,1 bar) to each joint by filling the installation with water.

c) Maintain the pressure for a period of 1 min.

d) Take note of any leaks at each joint.

E.3.2 Airtightness

Carry out the following procedure.

a) Seal off the ends of the test assembly.

b) Coat the annular space between spigot and socket ends of joints with soapy water.

c) Apply an air pressure of 0,01 MPa (0,1 bar) at ambient temperature.

d) Maintain the pressure for a period of 1 min.

e) Take note of any leaks, evident through the formation of bubbles.

E.4 Test requirements

E.4.1 The joints shall remain watertight and airtight before and after the 5-cycle test.

E.4.2 The sagging at the mid-point between two guide brackets shall not exceed $0{,}1D$.

E.5 General information

See annex F.

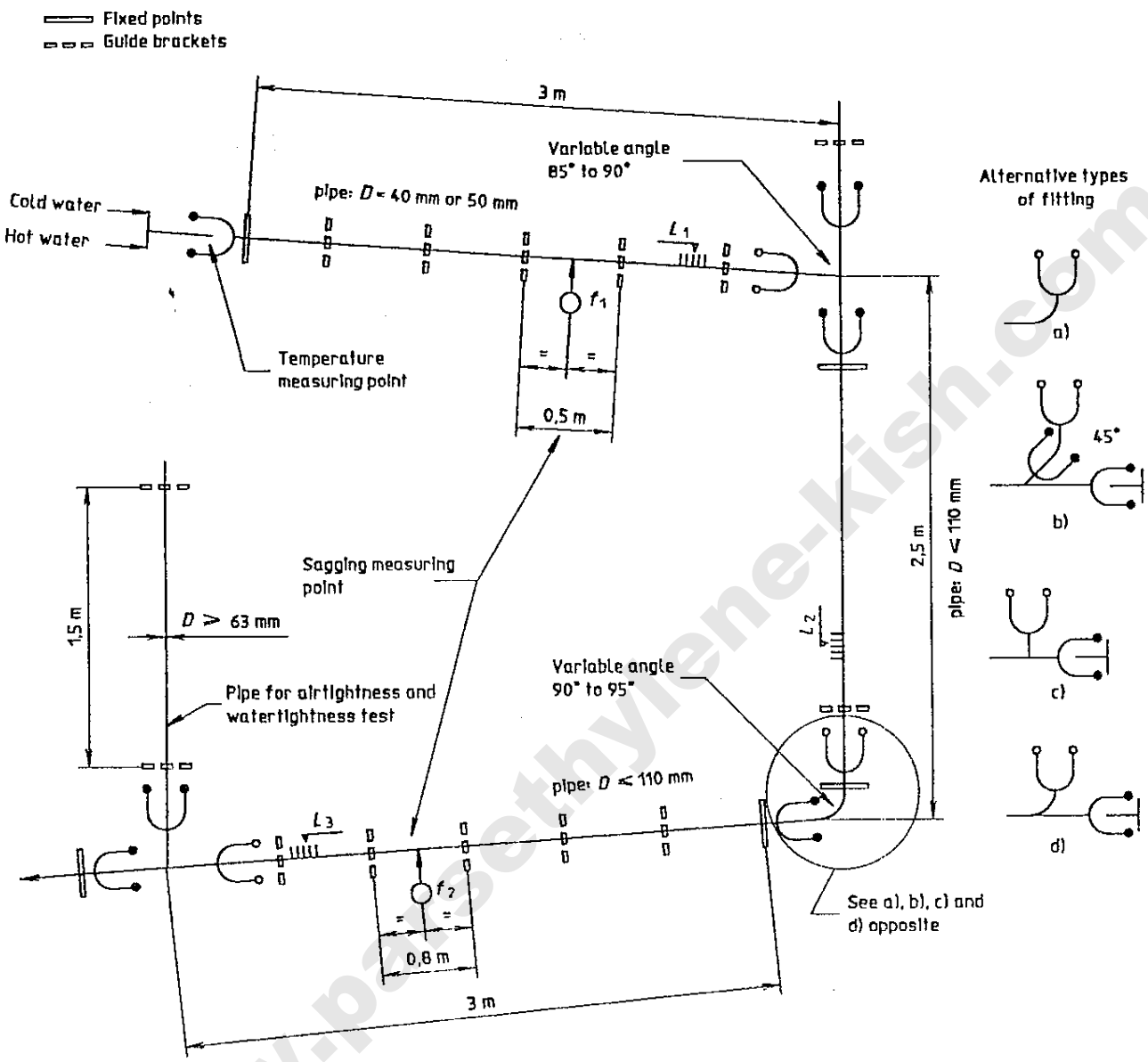


Figure E.1 — Test assembly for elevated-temperature cycling test (5 cycles)

Annex F
(normative)

Cycling tests — General information for both 1 500-cycle and 5-cycle tests

F.1 Test report

The test report shall include the following information:

a) a statement indicating the cycling test carried out (i.e. 1 500-cycle or 5-cycle test);

b) the types and dimensions of the components used in the test assembly;

c) all test parameters;

d) results of leakproofness tests before the cycling test;

e) observations during the cycling test;

f) results of leakproofness tests after the cycling test;

g) any sagging noted;

h) results of final inspection of the test assembly;

i) all details not provided for in this International Standard, as well as any incidents which might have had an influence on the results.

F.2 Key to symbols

The symbols used to specify or report on a test assembly shall comply with ISO/TR 7024.

Annex G
(normative)

Determination of axial shrinkage of pipes

G.1 Scope

Determination of the permanent axial shrinkage at 90 °C of PVC-U pipes to be used for waste and soil discharge systems inside buildings.

G.2 Apparatus

G.2.1 Thermostatically controlled water-bath, capable of being maintained at 90 °C ± 2 °C.

The volume and performance of the bath shall be such that there is virtually no variation in temperature when the test pieces are immersed.

The water in the bath shall not contain substances which can alter the product investigated.

Adequate stirring shall be provided so that the temperature limits are complied with at all points in the bath water.

G.2.2 Mounting device for the test pieces.

G.2.3 Thermometer, graduated in divisions of 0,5 °C.

G.3 Test pieces

Select three pipes 300 mm ± 20 mm in length. Mark each pipe, for example by means of a scriber, around the circumference with two circular marks, 200 mm apart, such that one of them is approximately 10 mm from one of the ends.

G.4 Conditioning

Condition the test pieces for at least 2 h at 23 °C ± 2 °C.

G.5 Procedure

With the test pieces at a temperature of 23 °C ± 2 °C, measure the distance between the marks to the nearest 0,25 mm. Regulate the temperature of the heating water to 90 °C ± 2 °C. Suspend the test pieces vertically in the heating water by the ends furthest from the marks, such that the whole test piece is immersed in the water and the upper end is at least 50 mm below the surface of the water.

The test pieces shall be placed in such a position that they touch neither the walls nor the bottom of the bath.

Leave the test pieces immersed for 1 h.

Remove the test pieces from the bath and, after complete cooling to 23 °C ± 2 °C, measure, under the same conditions as above, the distance between the marks along two lines running parallel to the longitudinal axis of the pipe and diametrically opposite each other on the pipe.

G.6 Expression of results

Calculate the percentage change in distance between the marks on the test piece using the equation

$$T = \frac{|\Delta L|}{L_0} \times 100$$

where

T is the percentage change in length, or shrinkage;

$\Delta L = L_0 - L$;

L_0 is the distance, in millimetres, between the marks before the test;

L is the distance, in millimetres, between the marks after the test.

Select the value of L which gives the greatest value of ΔL.

For the value of axial shrinkage of the pipe, take the arithmetic mean of the values obtained for each of the three test pieces.

Annex H
(informative)

Equivalent International Standards

The following International Standards, which concern materials other than PVC-U, are considered to specify performance characteristics equivalent to those specified in this International Standard:

[1] ISO 7671:1991, *Polypropylene (PP) pipes and fittings (jointed by means of elastomeric sealing rings) for soil and waste discharge (low and high temperature) systems inside buildings — Specifications.*

[2] ISO 7675:1991, *Chlorinated poly(vinyl chloride) (PVC-C) pipes and fittings for soil and waste discharge (low and high temperature) systems inside buildings — Specifications.*

[3] ISO 7682:1991, *Acrylonitrile/butadiene/styrene (ABS) pipes and fittings for soil and waste discharge (low and high temperature) systems inside buildings — Specifications.*

[4] ISO 8770:1991, *High-density polyethylene (PE-HD) pipes and fittings for soil and waste discharge (low and high temperature) systems inside buildings — Specifications.*