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Thermoplastics piping systems for non-pressure underground drainage and sewerage — Thermoplastics shafts or risers for inspection chambers and manholes — Determination of ring stiffness

Systèmes de canalisations thermoplastiques pour assainissement enterré sans pression — Éléments de réhausse thermoplastiques pour chambres d'inspection et de branchement ou regards — Détermination de la rigidité annulaire

ICS 23.040.20; 23.040.45; 91.140.80; 93.030

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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.

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ISO 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)*.

This second/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

ISO XXXXX is based on EN 14982:2006 titled "Plastics piping systems — Thermoplastics shafts or risers for inspection chambers and manholes — Determination of ring stiffness". EN 14982 was prepared by Technical committee CEN/TC 155, *Plastics piping systems and ducting systems*.

Thermoplastics piping systems for non-pressure underground drainage and sewerage — Thermoplastics shafts or risers for inspection chambers and manholes — Determination of ring stiffness

1 Scope

This International Standard specifies a test method for assessing the initial (short-term) tangential ring stiffness of riser shafts for thermoplastics inspection chambers or manholes.

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 9969, *Thermoplastics pipes — Determination of ring stiffness*

ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
inspection chamber
drainage and sewerage fitting used for the connection of drainage or sewerage installations and/or for changing the direction of drainage/sewerage runs. An inspection chamber terminates at ground level, permitting the introduction of cleaning, inspection and test equipment and the removal of debris but it does not provide access for personnel. The riser shaft connected to these fittings has a minimum outside diameter of 200 mm and a maximum inside diameter of less than 800 mm

3.2
manhole
drainage and sewerage fitting used for the connection of drainage or sewerage installations and/or for changing the direction of drainage/sewerage runs. A manhole terminates at ground level, permitting the introduction of cleaning, inspection and test equipment and the removal of debris and also providing access for personnel. The minimum inside diameter of a manhole riser shaft is 800 mm

3.3
structured-wall ancillary fitting
fitting with an optimized structural design with regard to material usage, but which still achieves the relevant performance requirements. These fittings could be circular or rectangular in design

3.4
regular cross section shaft
riser shaft either fabricated from plain pipe or from structured wall pipe or fittings with a regular symmetrical design on their external surface. These products could be manufactured by extrusion, injection moulding, blow moulding or rotational moulding

3.5
irregular cross section shaft
riser shaft with an irregular asymmetrical design on its external surface such as those with additional reinforcing rings or structures intended to strengthen the riser in specific areas. These products could be manufactured by extrusion, injection moulding, blow moulding or rotational moulding

4 Principle

4.1 General

The ring stiffness of a shaft is determined using the ISO 9969 test method when the shaft has a circular and regular cross-section.

Where a shaft has a square or rectangular cross-section, or if the shape is irregular, then the ISO 9969 test is modified as described in this standard to determine the ring stiffness. See Table 1.

Table 1 – Relevant standards for determination of ring stiffness

External shaft design	Type of cross-section	Relevant standard for determination of ring stiffness
Plain surface	Regular cross-section and circular	ISO 9969
	Irregular cross-section, circular or square or rectangular	This standard
Structured wall surface	Regular cross-section and circular	ISO 9969
	Irregular cross-section, circular or square or rectangular	This standard

4.2 Principle for shafts with circular and regular cross-section

The ring stiffness is determined by measuring the force and the deflection while deflecting the shaft at a constant rate.

A length of shaft supported horizontally is compressed vertically between two parallel flat plates moved at a constant speed which is dependent upon the diameter of the shaft.

A plot of force versus deflection is generated. The ring stiffness is calculated as a function of the force necessary to produce a deflection of 0,03di diametrically across the shaft.

4.3 Principle for shafts with circular and irregular cross-section or, square or rectangular

The ring stiffness is determined by measuring the force and deflection whilst deflecting the shaft at a constant rate or constant load, until sufficient force is applied to obtain a resulting deflection in the range of 2 % to 6 %.

A riser shaft or segment of shaft is placed symmetrically between two rigid parallel plates or beams or alternatively between one rigid beam and a V-shaped support. A compressive force is applied to the shaft or segment using a bearer shaped to the external surface of the test piece.

The ring stiffness is calculated as a function of the force required to produce the deflection.

5 Apparatus

5.1 Shaft with circular and regular cross-section

The apparatus shall conform to that described in ISO 9969.

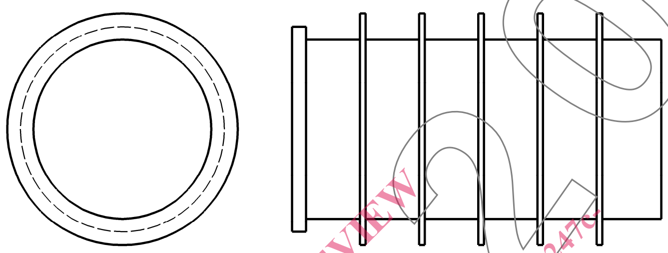


Figure 1 — Shaft with circular and regular cross section

5.2 Shaft with circular and irregular cross-section or, square or rectangular

NOTE Examples for representative test pieces are shown in Figures 2 to 3

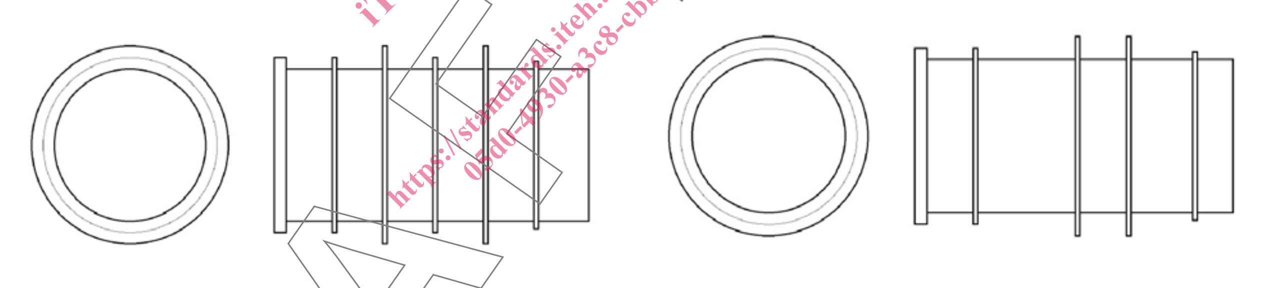


Figure 2 — Shafts with circular and irregular cross section

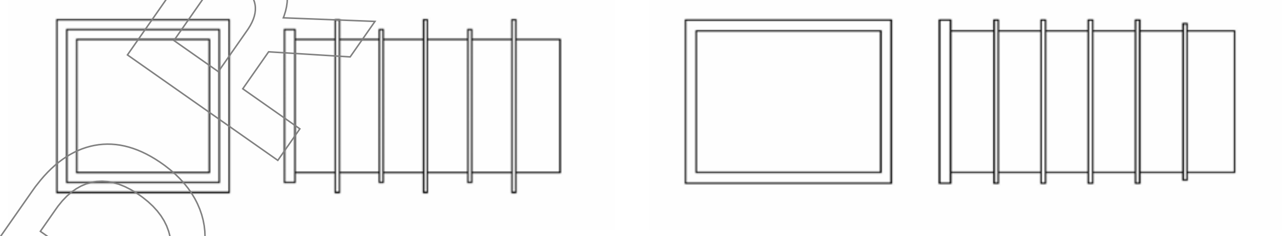


Figure 3 — Square and rectangular shaft

5.2.1 Loading frame, with two rigid parallel plates or beams between which a compressive force can be applied to the test piece so that the force and the resulting deflection of the test piece in the direction of the force can be measured with an accuracy of ± 1 %.

Where a V-shaped support is used, the included angle shall be 170° or more.

For shafts with square or rectangular cross sections the bearers shall have a width W not greater than 25 mm.

For circular shafts with irregular cross section the maximum width of bearers shall be for:

DN/ID ≤ 400:	50 mm;
400 < DN/ID ≤ 1 200:	0,12 × [DN/ID], expressed in mm;
DN/ID > 1 200:	150 mm.

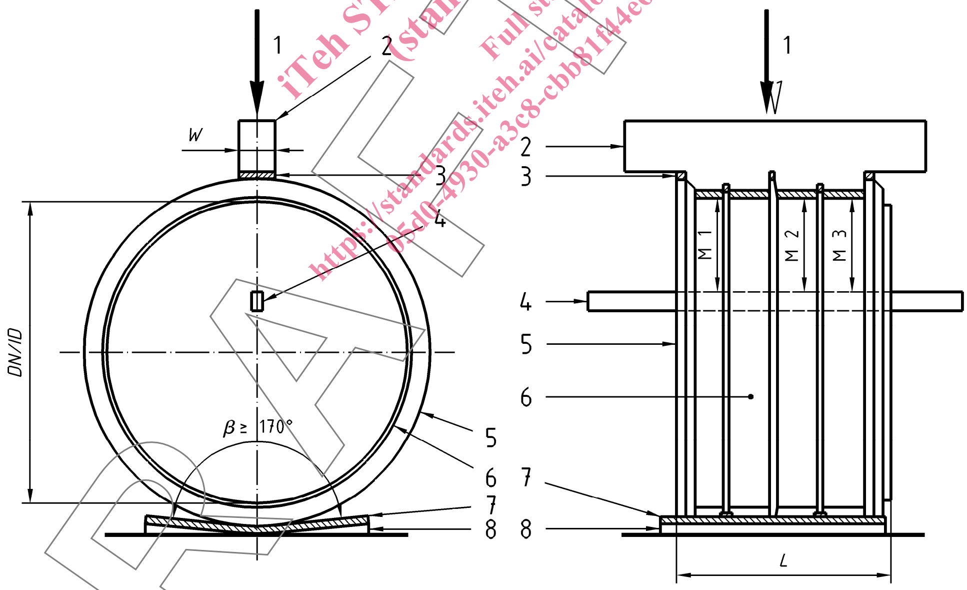
NOTE The above values have been taken from 9.2.1 of EN 476:1997 [1].

Where the outside of an irregular shaft has a change in cross-section incorporated within the test piece, the bearers shall be shaped to accommodate this (see Figure 4). Where square or rectangular shafts have a regular rib configuration this shall not be considered not to be a change in cross-section, and the load imposed shall be applied just to the crests of the ribs.

The centre of loading shall be so arranged that the vertical deflection of the two ends of the test piece differs by not more than 0,5 % of the nominal size of the shaft.

Where the surface of the outside of the shaft does not provide a smooth bearing contact, the bearers shall be surfaced with a strip, not less than 3 mm thick, of elastomeric material of (50 ± 5) IRHD hardness in accordance with ISO 48.

The length of each bearer shall be not less than the length of the test piece.



Key

1 load, applied to upper bearer
2 bearer, accommodated to shape of test piece
3 elastomeric strips
4 reference beam for measuring
5 joint element, assembled, comprising standard sealing system of the manufacturer
6 test piece
7 elastomeric material
8 support
L length of test piece
M1, M2, M3 measuring points
W width of bearer

Figure 4 — Loading arrangement

5.2.2 Measuring devices, capable of determining the length to an accuracy of ± 0,5 mm and the force and deflection along the length of the test piece to an accuracy of ± 1 % in the direction of the applied force.

6 Test pieces

6.1 Number of test pieces

Three test pieces shall be taken, each consisting of a riser or an appropriate length of riser segment incorporating a joint element, if required.

6.2 Age of test pieces

Test pieces shall be (21 ± 2) days old and conditioned in air at ambient temperature for at least 24 h prior to testing.

6.3 Specification of test pieces

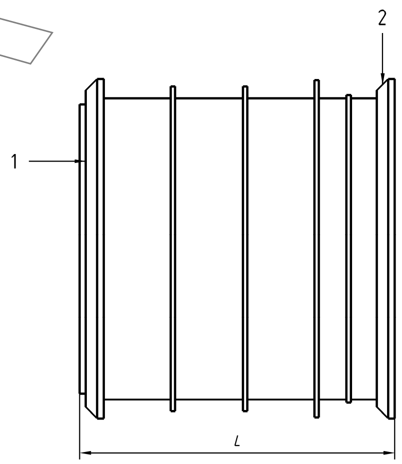
6.3.1 Shafts with circular and regular cross-section

When the shaft has a circular and regular cross-section the test piece shall be in accordance with ISO 9969 and have a minimum length of 300 mm. In the case of a one-piece chamber or manhole, the shaft shall be cut off at a minimum of 300 mm from the top of the main channel. It shall be cut smoothly and perpendicular to the main axis.

6.3.2 Shafts with a square or rectangular or irregular cross-section

When the chamber or manhole consists of a chamber base and a separate shaft, the whole shaft with an additional joint element shall be used as the test piece. The additional joint element shall be connected with the shaft by using the standard sealing or welding system of the manufacturer (see Figure 5).

In the case of a one-piece chamber or manhole, the test piece shall be cut off at a minimum of 300 mm from the top of the main channel. It shall be cut smoothly and perpendicular to the main axis of the chamber or manhole. The length of the piece shall be chosen to obtain maximum symmetry but shall not be less than 300 mm and not exceed 1 000 mm.



Key

1 joint element

2 joint element connected with the standard sealing system of the manufacturer

Figure 5 — Shaft with an irregular cross-section connected with a joint element

