



# SLOVENSKI STANDARD

## SIST EN 1411:1997

01-februar-1997

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### Cevni sistemi iz polimernih materialov - Plastomerne cevi - Določanje odpornosti proti zunanjim udarcem z metodo stopnjevanja

Plastics piping and ducting systems - Thermoplastics pipes - Determination of resistance to external blows by the staircase method

Kunststoff-Rohrleitungs- und Schutzrohrsysteme - Rohre aus Thermoplasten - Bestimmung der Widerstandsfähigkeit gegen äußere Schlagbeanspruchung im Stufenverfahren

Systemes de canalisations et de gaines en plastiques - Tubes thermoplastiques - Détermination de la résistance aux chocs externes par la méthode en escalier

Ta slovenski standard je istoveten z: EN 1411:1996

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#### ICS:

23.040.20 Cevi iz polimernih materialov Plastics pipes

**SIST EN 1411:1997**

**en**

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EUROPEAN STANDARD

EN 1411

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 1996

ICS 23.040.20

Descriptors: pipelines, sheathing, plastic tubes, thermoplastic resins, tests, determination, shock resistance

English version

**Plastics piping and ducting systems -  
Thermoplastics pipes - Determination of resistance  
to external blows by the staircase method**

Systèmes de canalisations et de gaines en  
plastiques - Tubes thermoplastiques -  
Détermination de la résistance aux chocs  
externes par la méthode en escalier

Kunststoff-Rohrleitungs- und Schutzrohrsysteme  
- Rohre aus Thermoplasten - Bestimmung der  
Widerstandsfähigkeit gegen äußere  
Schlagbeanspruchung im Stufenverfahren

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This European Standard was approved by CEN on 1996-01-04. 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 Central Secretariat or to any CEN member.

The European Standards exist 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

## CEN

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

## Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 155 "Plastics piping systems and ducting systems" of which the secretariat is held by NNI.

This standard is based on ISO/CD 11173:1991 "Thermoplastics pipes - Determination of resistance to external blows - Staircase method", prepared by the International Organization for Standardization (ISO). It is a modification of ISO/CD 11173 for reasons of applicability to other test conditions and alignment with texts of other standards on test methods.

The modifications are:

- the procedure has been extended to enable use without prior knowledge of a relevant drop height, striker mass or  $H_{50}$  value;
- editorial changes have been introduced.

The material-dependent parameters and/or performance requirements are incorporated in the System Standard(s) concerned.

Annex A, which is informative, gives a bibliography.

This standard is one of a series of standards on test methods which support System Standards for plastics piping systems and ducting systems.

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 July 1996, and conflicting national standards shall be withdrawn at the latest by July 1996 .

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

## 1 Scope

This standard specifies a method for determining the resistance to external blows of thermoplastics pipes by using the staircase method. This method is not applicable to perforated pipes.

The method is intended to be applied for pipe testing at 0 °C. When necessary the method can be applied at -20 °C or +23 °C.

## 2 Definitions

For the purposes of this standard, the following definitions apply.

**2.1  $H_{50}$  value:** The height of fall (drop height) of a striker of specified mass which provokes failure of 50 % of test pieces from samples of pipe taken to represent a batch.

*NOTE: In practice, test pieces are drawn at random from a batch and the result is only an estimate of the  $H_{50}$  for that batch.*

**2.2 production batch:** a clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound conforming to the same specification.

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## 3 Principle

Test pieces, comprising cut lengths of pipe, are subjected to a single blow by a falling striker of specified mass and shape dropped from one of a sequence of different heights onto either a random position around the circumference of the pipe or on to a specified generatrix of the pipe.

If a test piece fails (see d) of 7.1), the drop height for the next blow is decreased by a predetermined amount. If a test piece does not fail, the drop height for the blow on the subsequent test piece is increased accordingly. If sufficient test pieces are used, the  $H_{50}$  value of a batch, or a production run from an extruder, can be calculated.

A preliminary test procedure (see 7.2) is carried out to obtain a rough indication of the  $H_{50}$  value and to identify the first test piece from which the result will be used in a main test procedure (see 7.3).

The severity of this test method can be adjusted to suit different specification needs by changing the mass of the striker and/or the test temperature.

NOTE: It is assumed that the following test parameters are set by the standard making reference to this standard:

- a) the type of striker and striker mass [see b) of 4.1 and a) of 7.1];
- b) the test and conditioning temperatures and the conditioning medium (see 4.2 and clause 6);
- c) the method of sampling (see 5.1);
- d) if appropriate, the number of test pieces to be used (see 5.2 and clause 7);
- e) if applicable, the position of impact on the test piece and/or any alternative or additional criteria [see b), c) and d) of 7.1];
- f) if applicable, the initial drop height to be used in place of the preliminary test procedure [see e) of 7.1];
- g) the required  $H_{50}$  value for the pipe [see a) of 7.2.1].

#### 4 Apparatus

4.1 A falling weight impact testing machine incorporating the following basic components (see figure 1):

- a) **main frame**, with guide rails or a guiding tube rigidly fixed in the vertical position, to accommodate a striker [see b)] and release it to fall vertically and freely such that the speed of the striker at the moment of hitting the pipe is not less than 95 % of the theoretical speed;
- b) **striker**, having a nose comprising all or part of a hemispherical form combined with a cylindrical stem at least 10 mm long and having dimensions conforming to table 1 and figure 2, depending upon the mass of the striker. The mass of the striker, including any associated weights, shall be selected from table 2. Below the stem, the nose shall be of steel with a minimum wall thickness of 5 mm and the striking surface shall be free from imperfections that could influence the results.

Table 1: Dimensions for the nose of the striker (see figure 2)

| Type             | $R_s$<br>mm | $d$<br>mm  | $d_s$<br>mm | $\alpha$ |
|------------------|-------------|------------|-------------|----------|
| d25              | 50          | $25 \pm 1$ | *)          | *)       |
| d90              | 50          | $90 \pm 1$ | *)          | *)       |
| *) Not specified |             |            |             |          |

Table 2: Masses of strikers

Masses in kilograms

| Mass of striker<br>$\pm 0,005$ kg |      |     |     |      |      |
|-----------------------------------|------|-----|-----|------|------|
| Type                              | Type |     |     |      |      |
| d25                               | d90  |     |     |      |      |
| 0,25                              | 1,0  | 2,0 | 4,0 | 8,0  | 16,0 |
| 0,5                               | 1,25 | 2,5 | 5,0 | 10,0 |      |
| 0,8                               | 1,6  | 3,2 | 6,3 | 12,5 |      |

c) **rigid test piece support**, having one of the following forms as applicable.

1) For pipes having a circular external cross section, consisting of a  $120^\circ$  V-block of steel at least 200 mm long, positioned so that the axis of the line of fall of the nose of the striker shall intersect the axes of the V to within  $\pm 2,5$  mm (see figure 1).

2) For pipes with a flat bottom, a horizontal support of flat steel together with guides to ensure that the line of fall of the striker shall intercept it to within  $\pm 2,5$  mm the striking point specified on the test piece by the referring standard.

The support construction shall be sufficiently rigid not to cushion the effect of the impact.

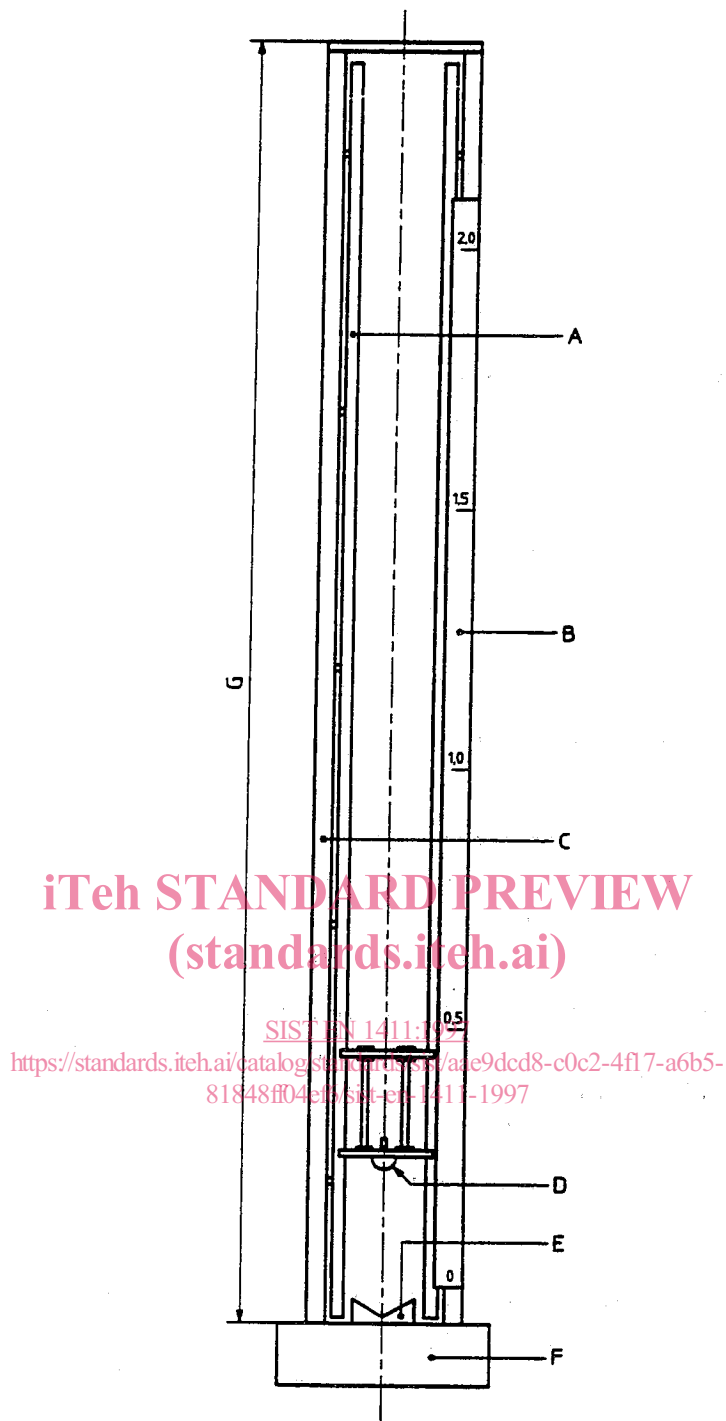
d) **release mechanism**, such that the striker can fall from a variable height which can be adjusted up to 2 m, as measured from the top surface of the test piece with an accuracy of 10 mm. The drop height shall be a multiple of 100 mm.

4.2 A liquid bath or air cabinet, capable of maintaining one of the following conditioning temperatures for testing at the temperature as specified in the referring standard.

For testing at  $0^\circ\text{C}$ , the conditioning temperature shall be  $(0 \pm 1)^\circ\text{C}$ .

For testing at  $-20^\circ\text{C}$ , the conditioning temperature shall be  $(-20 \pm 2)^\circ\text{C}$ .

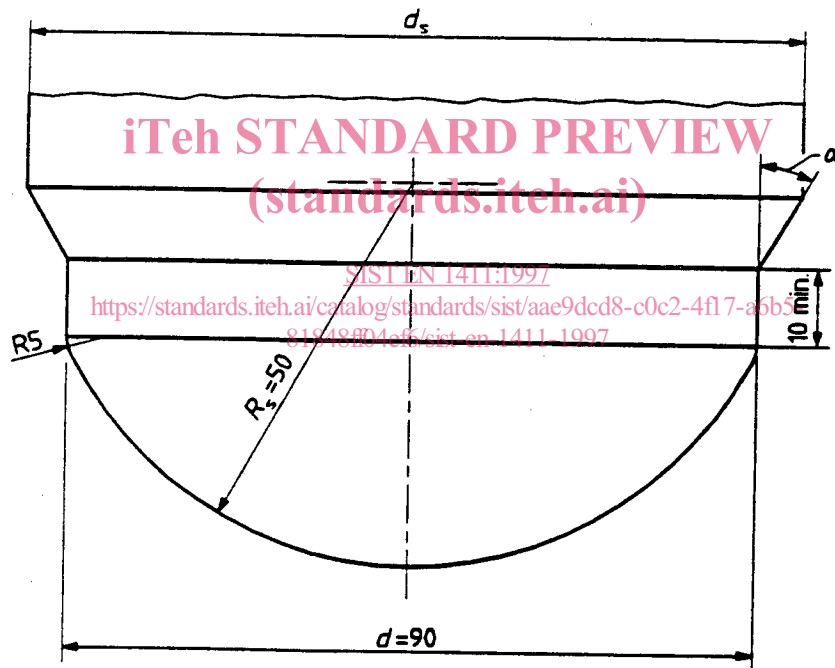
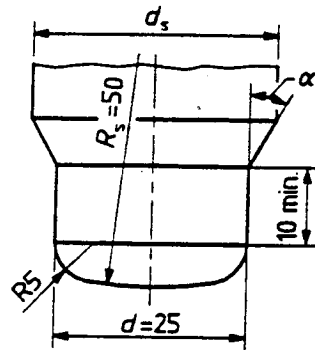
For testing at  $+23^\circ\text{C}$ , the conditioning temperature shall be  $(+23 \pm 2)^\circ\text{C}$ .



- A Guide
- B Graduated scale, vertically adjustable for different sizes of pipe
- C Main frame
- D Striker
- E Steel block 120°, V-shaped or flat [see c) of 4.1]
- F Solid base
- G Sufficient to give a clear height from striker to pipe of at least 2 m.

Figure 1: Typical impact testing machine





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Dimensions in millimetres

Figure 2: Dimensions of strikers