SLOVENSKI STANDARD
SIST EN 761:1997

01-februar-1997

Cevni sistemi iz polimernih materialov - Cevi iz duromernih materialov, ojačenih s steklenimi vlakni (GRP) - Določanje koeficienta lezenja v suhem

Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of the creep factor under dry conditions

Kunststoff-Rohrleitungssysteme - Rohre aus glasfaserverstärkten duroplastischen Kunststoffen (GFK) - Bestimmung des Kriechfaktors im trockenen Zustand

Systemes de canalisations plastiques - Tubes plastiques thermodurcissables renforcés de verre (PRV) - Détermination du coefficient de fluage en condition seche

Ta slovenski standard je istoveten z: **EN 761:1994**

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English version

Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of the creep factor under dry conditions

Systèmes de canalisations plastiques - Tubes plastiques thermodurcissables renforcés de verre (PRV) - Détermination du coéfficient de fluage en condition sèche

Kunststoff-Rohrleitungssysteme - Rohre aus glasfaserverstärkten duroplastischen Kunststoffen (GFK) - Bestimmung des Kriechfaktors im trockenen Zustand

This European Standard was approved by CEN on 1994-04-27. 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.

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CEN

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

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Foreword

This standard was prepared by CEN/TC 155 "Plastics piping systems and ducting systems".

This standard is based on document N 129 "Glass reinforced thermosetting plastics (GRP) pipes and fittings - Test method for the determination of creep factor of pipes under dry conditions" prepared by working group 1 of Subcommittee 6 of Technical Committee 138 of the International Organization for Standardization (ISO). It is a modification of document ISO/TC 138/SC 6/WG 1 N 129 for reasons of possible applicability to other test conditions and alignment with texts of other standards on test methods.

The modifications are:

- test parameters are omitted;
- material-dependent requirements are not given;
- editorial changes have been introduced.

The material-dependent test parameters and/or performance requirements are incorporated in the referring standard.

Annex A, which is informative, is given to assist the scheduling of data measurement.

No existing European Standard is superseded by this standard.

This standard is one of a series of standards on test methods which support System Standards for plastics piping 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 October 1994, and conflicting national standards shall be withdrawn at the latest by October 1994.

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 European Standard specifies a method for determining the dry creep factor of glass-reinforced plastics pipes.

It is applicable to pipes with an initial specific ring stiffness of not less than 630 N/m^2, when determined by the method specified in the referring standard.

NOTE: For this purpose plates or beam bars are considered to be equally valid for loading the test piece up to a relative deflection of 28 %. When it is expected that the relative deflection will be more than 28 %, then the test is to be conducted using beam bars (see 8.3).

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter.

For dated references, subsequent amendments to, or revisions of, any of these publications apply to this European Standard only when incorporated in it by amendment or revision.

For undated references the latest edition of the publication referred to applies.

EN 1228:0000[1)] — *Plastics piping systems - Glass-reinforced thermosetting plastics pipes - Determination of the initial specific ring stiffness*

EN 705:1993 — *Plastics piping systems - Glass-reinforced thermosetting plastics pipes and fittings - Methods for regression analysis and their use*

1) at present prEN 1228

3 Definitions

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

3.1 specific ring stiffness (S): A physical characteristic of the pipe which is a measure of the resistance to ring deflection under external load.

This characteristic is determined by testing and is defined, in newtons per square metre, by the equation:

$$S = \frac{E \cdot I}{d_m^3}$$

where:

E is the apparent modulus of elasticity as determined in the ring stiffness test, in newtons per square metre;

I is the moment of inertia (the second moment of area) in the longitudinal direction per metre length, expressed in metres to the fourth power per metre, i.e.:

$$I = \frac{e^3}{12}$$

where:

e is the wall thickness of the pipe, in metres;

d_m is the mean diameter (see 3.2) of the pipe, in metres.

3.2 mean diameter (d_m): The diameter of the circle corresponding with the middle of the pipe wall cross section.

It is given, in metres, by either of the following equations:

$$d_m = d_i + e$$

$$d_m = d_e - e$$

where:

d_i is the average of the measured internal diameters, in metres;

d_e is the average of the measured external diameters, in metres;

e is the average of the measured wall thicknesses of the pipe, in metres.

3.3 initial specific ring stiffness (S_0): The specific ring stiffness when measured 3 min after beginning of loading.

It is expressed in newtons per square metre.

3.4 compressive load (F): A load applied to the horizontal pipe to cause a vertical deflection.

It is expressed in newtons.

3.5 vertical deflection (y): The vertical change in diameter of a pipe in a horizontal position in response to a vertical compressive load (see 3.4).

It is expressed in metres.

3.6 initial deflection ($y_{3\ min}$): The vertical deflection caused by the compressive load and measured 3 min (i.e. 0,05 h) after the beginning of loading.

It is expressed in metres.

3.7 long-term vertical deflection uder dry conditions ($y_{x,dry}$): The estimated vertical deflection after x years, obtained by extrapolation of long-term deflection measurements at a constant load under dry conditions.

It is expressed in metres.

3.8 dry conditions: The test environment in air at the prevailing humidity.

3.9 dry creep factor ($\alpha_{x,dry}$): The factor given by the following equation:

$$\alpha_{x,dry} = \frac{y_{3\ min}}{y_{x,dry}} \cdot \frac{f_x}{f_{3\ min}}$$

where:

x indicates a specified period of time, in years;

f is the applicable deflection coefficient.

3.10 deflection coefficient (f): The coefficient which takes into account the 2nd order theory and of which the value is given by the following equation:

$$f = \{1860 + (2500 \cdot y/d_m)\} \cdot 10^{-5}$$

4 Principle

A cut length of pipe is subjected to a constant load along its length to compress it diametrically for a period of not less than 1000 h. Its deflection is measured at intervals. The deflection after a specified time of x years is estimated by extrapolation.

The creep factor under dry conditions is determined from the relationship between the initial deflection and the deflection after x years of the same test piece (see 3.7 and 3.8).

NOTE 1: If it is required to predict the deflection at 50 years this requires extrapolating approximately 2,5 decades (2,5 increments of lg t, where t is time in hours). In order to improve the reliability of the prediction the creep test may be extended beyond 1000 h.

NOTE 2: It is assumed that the following test parameters are set by the standard making reference to this standard:

a) the time to which the values are to be extrapolated (see 3.6, 3.7, 3.9 and clause 9);

b) the length of each test piece (see 6.1);

c) the number of test pieces (see 6.2);

d) if applicable, the conditioning atmosphere and period (see clause 7);

e) the test temperature and relative humidity (see 8.1);

f) the periods of test pieces under load (see 8.4).

5 Apparatus

5.1 **Compressive loading machine**, comprising a system by means of which one or more test pieces can be compressed by compressive load determined to an accuracy of 1 % of the maximum indicated applied value via two parallel load application surfaces conforming to 5.2.

NOTE: Care may be necessary to ensure that the applied load is not affected by friction effects.

5.2 Load application surfaces

5.2.1 General

The surfaces shall be provided by a pair of plates conforming to 5.2.2, or a pair of beam bars conforming to 5.2.3, or a combination of one such plate and one such bar, with their major axes perpendicular to and centred on the direction of application of load *F* by the compressive loading machine, as shown in figure 1. The surfaces to be in contact with the test piece shall be flat, smooth, clean and parallel.

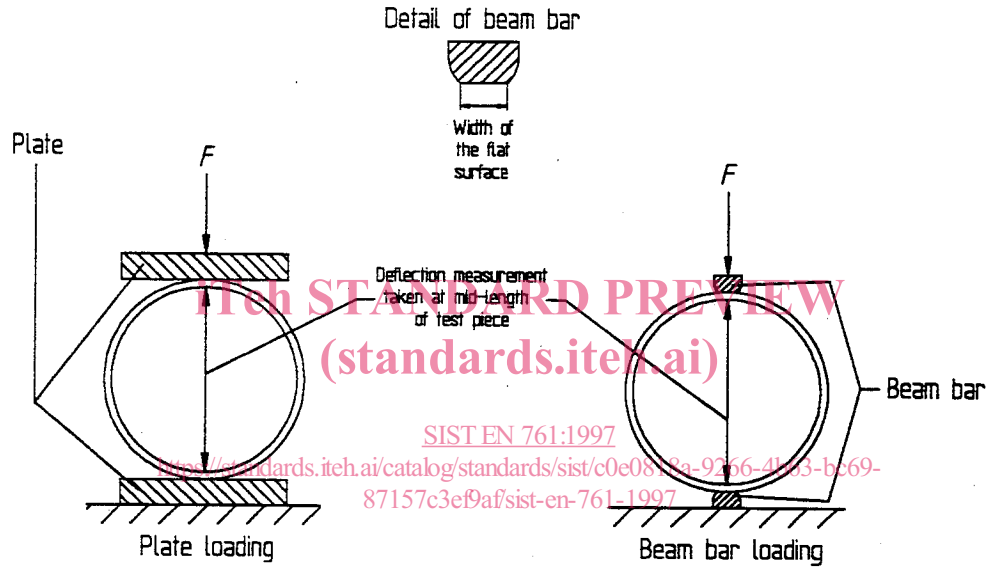

Figure 1: Schematic diagramm of the apparatus

5.2.2 Plate

Each plate shall have a length at least equal to the length of the test piece (see 6.1), a width of at least 100 mm and a thickness such that no visible bending or deformation of the plate shall occur during the test.

5.2.3 Beam bar

Each beam bar shall be rigid, have rounded edges and shall have a length at least equal to the length of the test piece (see 6.1). For pipes with a nominal size of not more than 300 the width of the bar shall be (20 ± 5) mm. For pipes with a nominal size greater than 300 the width of the bar shall be (50 ± 5) mm. Each bar shall be so constructed and