SLOVENSKI STANDARD
SIST EN 1862:1999

01-julij-1999

Cevni sistemi iz polimernih materialov - Cevi iz duromernih materialov, okrepljenih s steklenimi vlakni (GRP) - Določanje relativnega pregibnega koeficienta lezenja po izpostavljanju kemičnim vplivom

Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of the relative flexural creep factor following exposure to a chemical environment

Kunststoff-Rohrleitungssysteme - Rohre aus glasfaserverstärkten duroplastischen Kunststoffen (GFK) - Ermittlung des relativen Kriechfaktors bei Biegung nach Lagerung in einer chemischen Umgebung

Systemes de canalisations en plastiques - Tubes en plastiques thermodurcissables renforcés de verre (PRV) - Détermination du facteur de fluage relatif en flexion a la suite d'une exposition a un environnement chimique

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English version

Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of the relative flexural creep factor following exposure to a chemical environment

Systèmes de canalisations en plastiques - Tubes en plastiques thermodurcissables renforcés de verre (PRV) - Détermination du facteur de fluage relatif en flexion à la suite d'une exposition à un environnement chimique

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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

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

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Foreword

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

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

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of an identical text or by endorsement, at the latest by February 1998, and conflicting national standards shall be withdrawn at the latest by February 1998.

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

1 Scope

This standard specifies a method for determination of the relative creep factor of glass-reinforced thermosetting plastics (GRP) pipes following exposure of the inside to a chemical environment.

This standard is applicable to pipes having a nominal size up to and including DN 600.

2 Normative references

This 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 standard only when incorporated in it by amendment or revision.

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

EN 761 Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of the creep factor under dry conditions

EN 1228 Plastics piping systems - Glass-reinforced thermosetting plastics GRP) pipes - Determination of initial specific ring stiffness

3 Definitions

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

3.1 control specimen: A cut piece of the pipe to be tested which is not exposed to the test chemical.

3.2 test specimen: A cut piece of the pipe to be tested which is exposed to the test chemical.

3.3 test piece: A cut piece of either the control specimen (see 3.1) or the test specimen (see 3.2) to be physically/mechanically tested.

3.4 creep factor (Rc): The ratio between the ring stiffness (see 3.5) after 24 h to the ring stiffness after 1 h calculated using the following equation

$$R_c = \frac{S_{24h}}{S_{1h}} \times 100 \quad \text{...(1)}$$

where:

Rc is the creep factor, expressed in percent;

S1h is the ring stiffness at time t = 1 h;

S24h is the ring stiffness at time t = 24 h

or the ratio between the vertical deflection (see 3.7) after 1 h to the vertical deflection after 24 h calculated using the following equation

$$R_c = \frac{f_{24h} \times y_{1h}}{f_{1h} \times y_{24h}} \times 100 \quad ...(2)$$

where:

Rc is the creep factor, expressed in percent;

f1h is the deflection coefficient (see 3.9) at time t = 1 h;

y1h is the deflection at time t = 1 h;

f24h is the deflection coefficient (see 3.9) at time t = 24 h;

y24h is the deflection at time t = 24 h.

It is expressed in percent.

3.5 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 in accordance with EN 1228 and is defined, in newtons per square metre, by the equation:

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

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;

dm is the mean diameter (see 3.6) of the pipe, in metres.

3.6 mean diameter (dm): 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:

$$dm = di + em$$

$$dm = de - em$$

where:

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

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

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

3.7 vertical deflection (y): The vertical change in diameter of a horizontal pipe in response to a vertical compressive load (see 3.8).

It is expressed in metres.

3.8 compressive load (F): The load applied to a horizontal pipe to cause a vertical deflection.

It is expressed in newtons.

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

$$f = (1860 + 2500 \times y/dm) \times 10^{-5} \quad \text{... (3)}$$

where:

y is the vertical deflection, in metres;

dm is the mean diameter, in metres.

3.10 relative creep factor (RF2): The ratio of the creep factor of the test specimen to the creep factor of the control specimen given by the following equation:

$$R_{F2} = \frac{R_{c,t}}{R_{c,0}} \quad \text{...(4)}$$

where:

Rc,t is the creep factor of the test specimen (see 3.2 and 3.4);

Rc,0 is the creep factor of the control specimen (see 3.1 and 3.4).

4 Principle

A test specimen comprising a cut length of pipe with closed ends and approximately half filled with a chemical liquid is stored vertically for a specified period of time under specified conditions.

After storage ring test pieces cut from the specimen are tested to determine the change in creep factor of the test specimen compared, as a ratio, to that of a control specimen which has not been exposed to the chemical liquid.

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

a) the number of test specimens and control specimens (see 6.1);

b) the length of the specimen (see 6.2);

c) the conditioning requirements, if applicable (see clause 7);

d) the composition of the test liquid (see 8.1);

e) the test temperature (see 8.2.1);

f) the test period(s) (see 8.2.2);

g) the test method for creep tests (see 9.1);

h) the number of test pieces (see 9.2.1);

i) the length of the test pieces (see 9.2.2).

5 Apparatus

5.1 Heating device, if required, comprising an oven or other device capable of keeping the test liquid at a specified test temperature within the required tolerances.

5.2 Compressive loading machine, comprising a system by means of which one or more test pieces can be compressed by compressive load (see 9.3) determined to an accuracy of 1 % of the maximum indicated applied value via two parallel load application surfaces conforming to 5.3.

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

5.3 Load application surfaces

5.3.1 General arrangement

The surfaces shall be provided by a pair of plates (see 5.3.2), or a pair of beam bars (see 5.3.3), 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.

Plates and beam bars shall have a length at least equal to the test piece (see 9.2.2) and have a thickness such that visible deformation does not occur during the test.

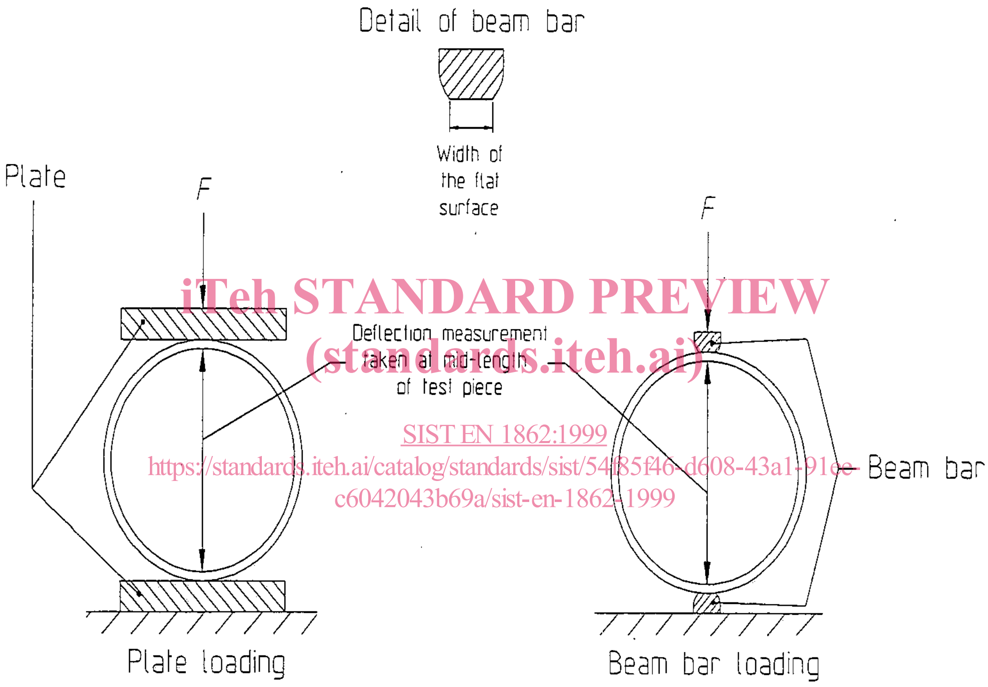

Figure 1: Schematic diagram of the apparatus

5.3.2 Plates

The plate(s) shall have a width of at least 100 mm.

5.3.3 Beam bars

Each beam bar shall have rounded edges, a flat face (see figure 1) without sharp edges and a width dependent upon the nominal size of the pipe as follows:

a) for pipes with a nominal size not greater than 300 the width shall be (20 ± 5) mm;
b) for pipes of nominal sizes greater than 300 the width shall be (50 ± 5) mm.

The beam bars shall be so constructed and supported that no other surface of the beam bar structure shall come into contact with the test piece during the test.