SLOVENSKI STANDARD
SIST EN 1394:1997

01-februar-1997

Cevni sistemi iz polimernih materialov - Cevi iz duromernih materialov, ojačenih s steklenimi vlakni (GRP) - Določanje navidezne začetne natezne trdnosti v obodni smeri

Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of the apparent initial circumferential tensile strength

Kunststoff-Rohrleitungssysteme - Rohre aus glasfaserverstärkten duroplastischen Kunststoffen (GFK) - Bestimmung der scheinbaren Anfangs-Zugfestigkeit in Umfangsrichtung

Systemes de canalisations en plastiques - Tubes en plastiques thermodurcissables renforcés de verre (PRV) - Détermination de la résistance en traction circonférentielle initiale apparente

Ta slovenski standard je istoveten z: **EN 1394:1996**

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83.120	Ojačani polimeri	Reinforced plastics

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English version

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This European Standard was approved by CEN on 1996-05-09. 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.

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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

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.

This standard is based on the draft International Standard ISO/DP 8521.2 "Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Test method for determination of the initial apparent circumferential tensile strength", prepared by the International Organization for Standardization (ISO). It is a modification of ISO/DP 8521.2 for reasons of possible applicability to other test conditions and alignment with texts of other standards on test methods.

The modifications are as follows:

- test parameters (pressure, time, temperature) are not specified;
- requirements are not given;
- editorial changes have been introduced.

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 March 1997, and conflicting national standards shall be withdrawn at the latest by March 1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of 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 and the United Kingdom.

1 Scope

This standard specifies six test methods for the determination of the apparent initial tensile strength in the circumferential direction per unit length of glass-reinforced thermosetting plastics (GRP) pipes.

The burst test (method A) is suitable for all types and sizes of pipes. It is the preferred method for pipes up to and including DN 600. For pipes larger than DN 600 one of the following methods may be preferred.

The split disc test (method B) may not be suitable for pipes with helically wound reinforcing layers.

The strip test (method C) and the modified strip test (method D) are suitable for pipes with a nominal size of DN 600 and greater, and are applicable where the split disc test is not suitable.

The restrained strip test (method E) is suitable for all types of pipes with a nominal size greater than DN 600.

The notched plate test (method F) is primarily intended for use for helically wound pipes of nominal size greater than DN 600 with a winding angle other than approximately 90°. This method may be used also for other types of pipe with nominal sizes greater than DN 600.

Results from one method are not necessarily equal to the results derived from any of the alternative methods. However, all methods have equal validity.

2 Definitions

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

2.1 apparent initial circumferential strength (σ_{cA}^*, σ_{cB}^*, σ_{cC}^*, σ_{cD}^*, σ_{cE}^*, σ_{cF}^*): Ultimate circumferential tensile force per unit length in the circumferential direction (the upper-case subscripts denote the method of test used).

It is expressed in newtons per millimetre of circumference.

2.2 burst pressure (p_{ult}): The internal pressure at bursting.

It is expressed in bars[1)] (or megapascals).

2.3 bursting: Failure by rupture of the pipe wall.

2.4 ultimate tensile force (F_{ult}): The tensile force at failure.

It is expressed in newtons.

2.5 width (b): The width of the test piece.

It is expressed in millimetres.

2.6 winding angle ($\varnothing$): The angle between the direction of the reinforcement and the longitudinal axis of the pipe.

It is expressed in degrees.

3 Principles

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

a) for method A the length between end sealing devices (see 5.1);

b) for methods B, C, D and E the width of the test piece (see 5.2, 5.3, 5.4 and 5.5);

c) for methods C and E the total width of the test piece (see 5.3 and 5.5);

d) for method F the dimensions of the plate to be tested (see 5.6);

e) the number of test pieces (see 5.7);

f) the requirements for conditioning (see clause 6);

g) the test temperature (see clause 7).

3.1 Method A

The apparent initial circumferential strength, $\sigma_{cA}{}^{*}$, is determined by a burst test.

Cut lengths of pipe are subjected to an increasing internal pressure which, within a specified time, causes bursting (see 2.3).

The test conditions are such that a mainly uniaxial circumferential stress is obtained.

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1) 1 bar = 10^5 N/m^2 = 0,1 MPa

3.2 Method B

The apparent initial circumferential strength, σ_{cB}^*, is determined by a split disc test.

Rings cut from separate pipes are subjected to an increasing tensile force by means of a split disc within the ring until rupture occurs, within a specified time.

3.3 Methods C, D and E

The apparent initial circumferential strength, σ_{cC}^*, σ_{cD}^*, σ_{cE}^*, is determined by a strip test.

Strips cut from the pipe wall in the circumferential direction are subjected to an increasing tensile force until rupture occurs within a specified time.

3.4 Method F

The apparent initial circumferential strength, σ_{cF}^*, is determined by a notched plate test.

Plates cut from the pipe wall are subjected to an increasing tensile force until rupture occurs within a specified time.

4 Apparatus

4.1 For method A

4.1.1 Hydrostatic pressurizing system, capable of causing failure of the test piece between 1 min and 3 min after commencing the pressurization.

NOTE: For nominal sizes greater than DN 600 the duration of the test may be increased.

The pressurizing system shall prevent air entering the test piece during pressurization to failure.

4.1.2 Pressure measuring device with an accuracy of ± 2,0 % of the test pressure at failure.

NOTE: The pressure measuring device should indicate the pressure to within ± 1,0 % of its maximum reading.

4.1.3 End sealing devices for the test pieces, such that either a mainly uniaxial state of stress in the circumferential direction will be induced (e.g. type 2 or type 3 of figure 1) or a mainly biaxial state of stress will be induced (e.g. type 1 of figure 1).

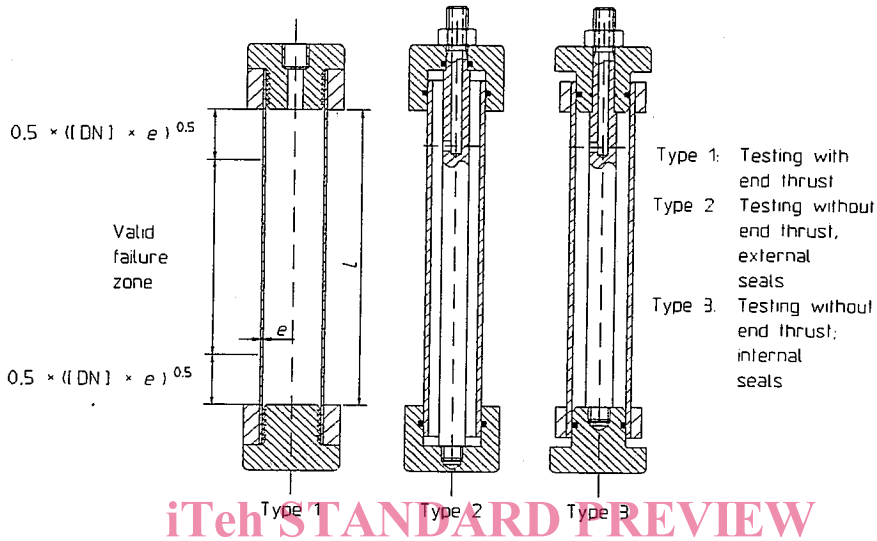

Figure 1: Typical arrangement for pressure testing of pipes

4.1.4 Test piece support, to minimize deformation due to the weight of the test piece and its contents.

4.1.5 Flexible membrane (if used as a barrier system to prevent weeping) which does not reduce the stress in the pipewall by more than 1 %.

The flexible membrane may be of a different material from the pipe, e.g. elastomeric or thermoplastic sheet or a flexible coating.

4.2 For method B

4.2.1 Testing machine, of the type capable of producing a progressive separation of the split disc, incorporating the following components:

a) a fixed or virtually fixed part;

b) a moveable part;

c) a drive mechanism capable of imparting a constant speed to the moving part so that rupture can be reached between 1 min and 3 min after initial loading;

d) a load indicator capable of measuring the force applied. This shall be virtually free from inertia at the specified rate of testing and shall indicate the force to an accuracy of within 1 % of the measured value.

4.2.2 Rigid split discs as shown in figure 2, capable of making even contact with the internal diameter of the test piece. The diameter of the two segments of the split disk shall be not less than 98 % of the internal diameter of the pipe with which they are intended to be used.

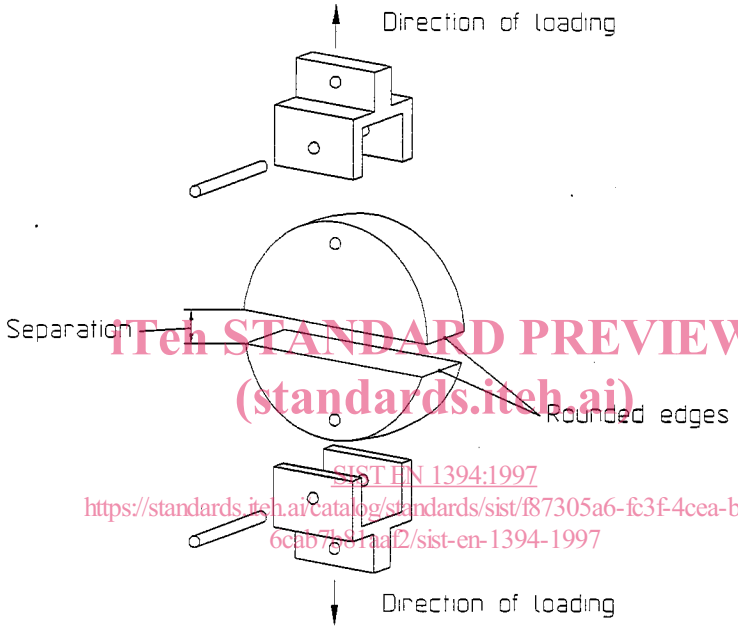

Figure 2: Typical arrangement for the split disk

4.2.3 Dimension measurement devices, capable of measuring the necessary dimensions of the test piece (e.g. length, wall thickness) to an accuracy of half the accuracy required in clause 8 for measurements, e.g. measuring accuracy ± 0,1 mm requires a device accuracy of ± 0,05 mm.

4.3 For method C

4.3.1 Testing machine of the type with constant separating speed, incorporating the following components:

a) a fixed, or virtually fixed, part with a grip to hold one end of a test piece;

b) a moveable part, incorporating a second grip to hold the other end of the test piece. The grips holding the ends of the test piece shall do so as far as possible without slipping and/or crushing.

Grips which tighten automatically may be used.

The fixed and moving parts and their associated grips shall enable the test piece to be aligned when a force is applied so that the axis of the test piece is coincident with that of the force;

c) a drive mechanism capable of imparting a constant speed to the moving part, so that failure can be reached between 1 min and 3 min after initial loading;

d) a load indicator capable of measuring the force applied. The mechanism shall be virtually free from inertia lag at the specified rate of testing and shall show the force with an accuracy of within 1 % of the measured value.

4.3.2 Dimensional measuring device(s), for measuring the width, *b*, and the free length, *l*, of the test piece (see figure 5) to an accuracy of ± 0,1 mm.

4.4 For method D

4.4.1 Testing machine conforming to 4.3.1.

4.4.2 Dimensional measuring device(s), capable of measuring the width, *b*, and the thickness, *e*, of the test piece (see figure 6) to an accuracy of ± 0,1 mm.

4.5 For method E

4.5.1 Testing machine conforming to 4.3.1.

4.5.2 Dimensional measuring device(s), capable of measuring the width, *b*, and the length, *l*, of the test piece (see figure 7) to an accuracy of ± 0,1 mm.

4.5.3 A restraining fixture that prevents the test piece bending. The radius of curvature of the support plate shall be half the nominal size, DN, expressed in millimetres, ± 5 %. An example of such a fixture is shown in figure 3.

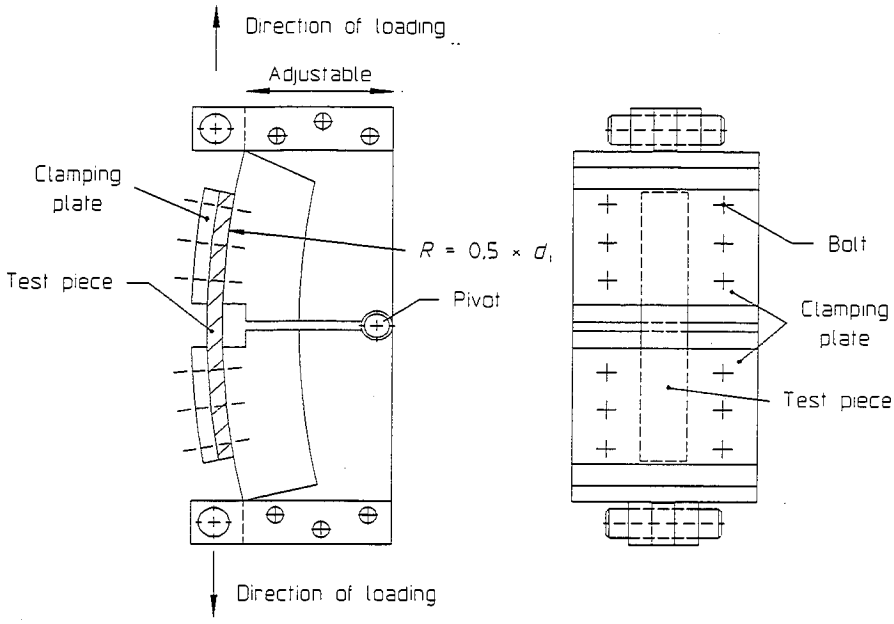

Figure 3: Typical arrangement for restrained strip test with a split support

4.6 For method F

4.6.1 Testing machine conforming to 4.3.1.

4.6.2 A load indicator capable of indicating the force applied to the test piece to an accuracy of ± 1 % of the indicated value.

4.6.3 A means of measuring the width, b, (see figure 8) of the test piece to an accuracy of ± 0,1 mm and the winding angle, θ, to an accuracy of ± 1°.

5 Test pieces

5.1 For method A

The test piece shall be a cut length of pipe whose length between the end sealing devices shall be as specified in the referring standard.