SLOVENSKI STANDARD
SIST EN 1771:2004

01-december-2004

Proizvodi in sistemi za zaġļ ito in popravilo betonskih konstrukcij ï Preskusne metode ï Doloļ evanje sposobnosti za injektiranje s preskusom s peġļ enim stolpcem

Products and systems for the protection and repair of concrete structures - Test methods - Determination of injectability and splitting test

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken - Prüfverfahren - Bestimmung der Injektionsfähigkeit und Prüfung der Spaltzugfestigkeit

Produits et systemes pour la protection et la réparation des structures en béton - Méthodes d'essai - Détermination de l'injectabilité et essai de fendage

Ta slovenski standard je istoveten z: **EN 1771:2004**

ICS:

91.080.40	Betonske konstrukcije	Concrete structures

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English version

Products and systems for the protection and repair of concrete structures - Test methods - Determination of injectability using the sand column test

Produits et systèmes pour la protection et la réparation des structures en béton - Méthodes d'essai - Détermination de l'injectabilité et essai de fendage

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken - Prüfverfahren - Bestimmung der Injektionsfähigkeit und Prüfung der Spaltzugfestigkeit

This European Standard was approved by CEN on 27 February 2004.

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This European Standard exists 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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 1771:2004) has been prepared by Technical Committee CEN /TC 104, "Concrete and related products", the secretariat of which is held by DIN.

It has been prepared by Sub-committee 8 "Products and systems for the protection and repair of concrete structures" (Secretariat AFNOR).

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 2005, and conflicting national standards shall be withdrawn at the latest by February 2005.

It is generally recognised that it is difficult to generate cracks of a controlled width in concrete and difficult to make objective measurements of the ease with which such cracks may be injected with various materials. This test, developed at the LCPC [1)] and by RILEM [2)], circumvents these difficulties by measuring the rate of flow of the injection agent through a column of graded sand. The sand grading specified is carefully chosen to have interconnecting voids providing a tortuous path for a flow of the injection agent. These having a similar resistance to flow to that provided by a 0,2 mm crack in concrete (other gradings of sand could be chosen to simulate the flow in wider cracks, if desired).

The detailed method of injection uses a fixed quantity of mixed reactive injection agent in a vessel maintained at a closely controlled pressure, to provide the injection force. Thus, any limitations on the practical usage of the grout imposed by thickening/gelation of the mixed product in the injection vessel will be recorded. The method could be modified to permit the assessment of grouts dispensed and injected by twin-pump metering and mixing machines, provided the same fine degree of pressure control can be exercised.

As a supplement to the injectability test, the column of grouted sand, when fully cured, is sawn into cylinders which are then subjected to indirect tensile strength measurement (Brazilian splitting test). This can provide a useful comparison between materials, giving some indication of the strength of bond achievable.

This document includes a Bibliography.

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

1) Laboratoire Central des Ponts et Chaussées.

2) Réunion Internationale de Laboratoires d'Essais et de recherches sur les Matériaux.

1 Scope

This document specifies a method for determining the injectability of a product in a capillary network and its adhesion to concrete by measurement of the splitting strength of cylindrical mortar samples resulting from a sand column injection.

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.

EN 196-1, *Methods of testing cement - Part 1: Determination of strength.*

EN 196-3, *Methods of testing cement - Part 3: Determination of setting time and soundness*.

EN ISO 9514, *Paints and varnishes - Determination of the pot-life of liquid systems - Preparation and conditioning of samples and guidelines for testing (ISO 9514:1992).*

ISO 565, *Test sieves – Metal wire cloth, perforated metal plate and electroformed sheet – Nominal sizes of openings.*

3 Test principle

The principle of the test consists on injecting, under a constant pressure, the product in a transparent plastic (polymethylmethacrylate) tube filled with graded sand and kept in a vertical position.

The column is injected from its lower end; one measures the time taken by the product to attain the different reference marks drawn along the tube.

4 General requirements for testing

4.1 Apparatus

The apparatus used is illustrated in Figure 1.

The total length of the rising tube, the joining flexible tube and the connecting branches is (900 ± 5) mm; the inner diameter is (6 ± 0,1) mm.

The difference in level between the bottom of the column and the bottom of the injection pot is (400 ± 5) mm in length.

The distance between the end of the rising tube and the bottom of the metal container is (20 ± 1) mm. The tube end is cut square. The injection column is fitted with rubber plugs perforated in their centre. The lower plug has passing through it a copper tube, 6 mm internal diameter - 8 mm external diameter, and (50 ± 10) mm in length to which the flexible pipe is fitted.

4.2 Other equipment

In addition to the above mentioned device, the following equipment is necessary to carry out the test:

— transparent tubes not affected by the products involved (e.g. polymethylmethacrylate) (22,2 ± 0,3) mm in inner diameter and 390 mm in length;

— a scale 400 mm long graduated in millimetres;

— a balance accurate to within 0,1 g;

— a stopwatch reading to 1/10 s;

— a thermometer graduated from 0 °C to 200 °C and accurate within 1 °C;

— a supply of compressed air at a pressure of at least 0,5 MPa;

— wire mesh with 0,5 mm mesh (modulus 28) according to ISO 565;

— a metal container approximately 80 mm in diameter 175 mm high;

— a measuring vessel;

— a tube to join end of column and measuring vessel;

— a flexible tube suitable with the pressure;

— a clamp for the flexible tube;

— a pressure vessel about 3 l with safe working pressure at least that of the air supply ; it shall be fitted with pressure gauge to accurately measure pressures up to at least 0,075 MPa with a precision of 0,0025 MPa;

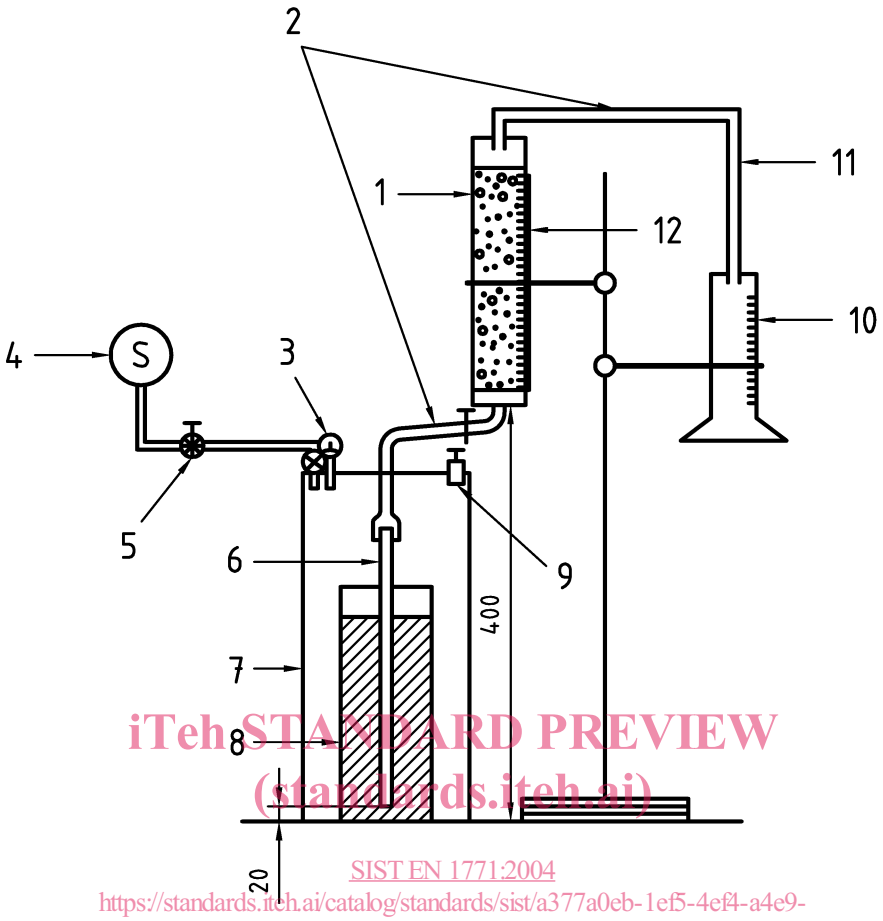
— a supply of compressed air controlled by a pressure regulating valve.

4.3 Sand

— sand in accordance with EN 196-1 for cement tests; instead of siliceous sand, for special purposes crushed cement mortar of the same grading may be used (for instance if the simulation of concrete capillary is intended);

— sieves with 0,63 mm, 0,80 mm, 1,00 mm, 1,25 mm mesh (see ISO 565).

Dimensions in millimetres



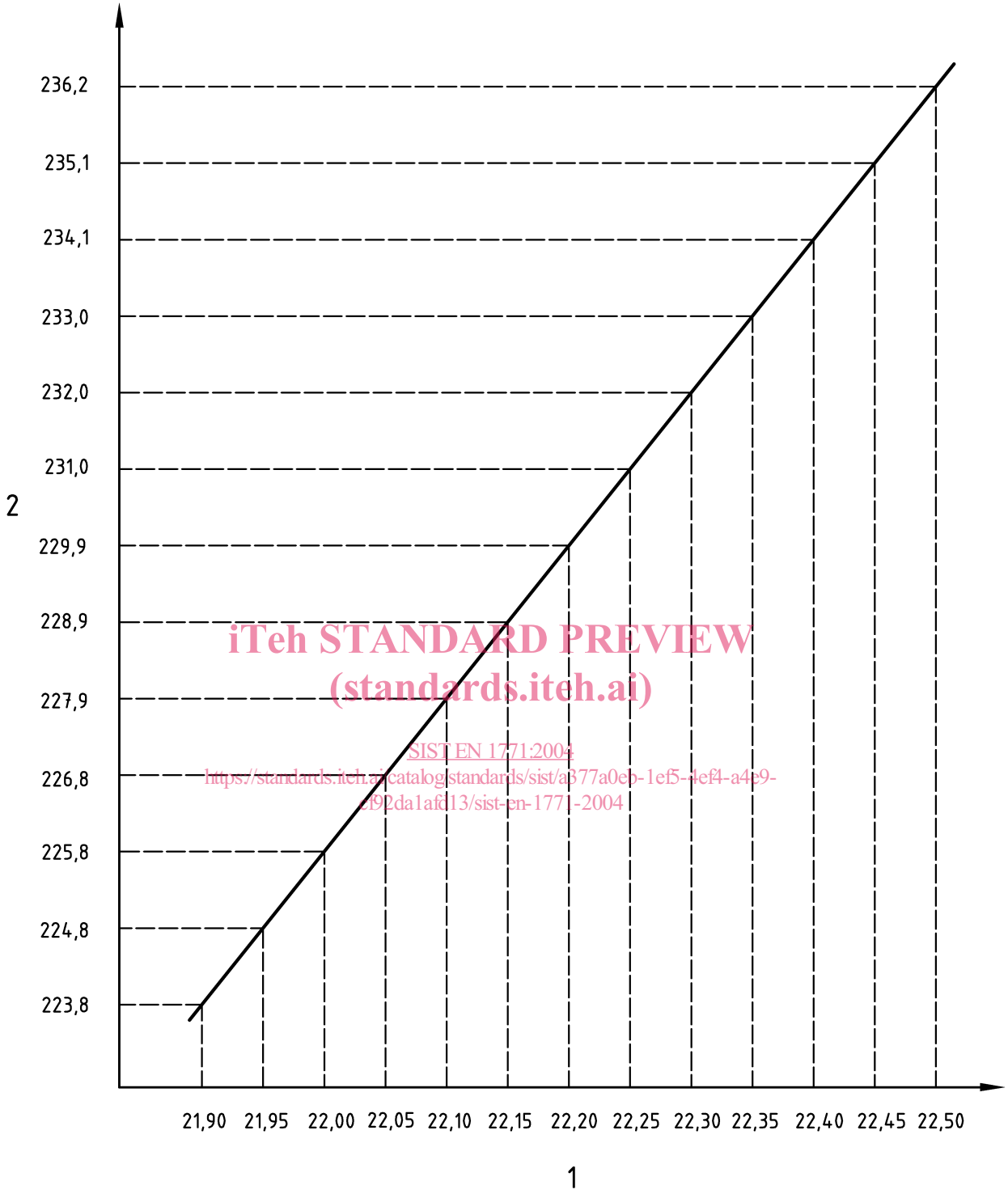
Key

1 Injection column
2 Flexible joining tube (6 mm, length 600 mm)
3 Control measuring gauge
4 Compressed air supply
5 Pressure regulation valve
6 Rising tube
7 Pressure vessel
8 Metal container
9 Safety valve
10 Measuring vessel
11 Overflow tube
12 Scale

Figure 1 — Test configuration

Table 1 — Grading curve of the reference sand

Sieves meshes in mm	0,63	0,80	1,00	1,25
Cumulative passing percentage	0	33	63	100



Key

1 Inner tube diameter, in millimetres
2 Weight of normal 0,63/1,25 mm sand, in g

Figure 2 — Weight determination the reference sand to be introduced into the tube according to its inner diameter