



SLOVENSKI STANDARD
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Injekcijska masa za prednapete kable - Metode preskušanja

Grout for prestressing tendons - Test methods

Einpreßmörtel für Spannglieder - Prüfverfahren

Coulis pour câble de précontrainte - Méthode d'essais

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EUROPEAN STANDARD

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English version

Grout for prestressing tendons - Test methods

Coulis pour câble de précontrainte - Méthode
d'essais

Einpreßmörtel für Spannglieder - Prüfverfahren

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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 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

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Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 104 "Concrete - Performance, production, placing and compliance criteria", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by September 1996, and conflicting national standards shall be withdrawn at the latest by September 1996.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 and the United Kingdom.

0 Introduction

In post-tensioned prestressed concrete construction, the grouting of tendons is an important operation. This European Standard provides methods of test for grout specified in EN 447. Some tests given here in are alternatives and it will be necessary to relate the chosen test method to the specified requirements.

1 Scope

This European Standard describes the methods of test for grout specified in EN 447.

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 196-1 : 1987

Methods of testing cement – Determination of strength

EN 447

Grout for prestressing tendons – Specification for common grout ¹⁾

ISO 4012

Concret – Determination of compressive strength of test specimens

3 The testing of grout

3.1 General conditions

The grouts shall be tested by competent personnel experienced in the subject. The normal conditions of temperature and relative humidity at test shall be as follows:

- Temperature (20 ± 2) °C
- Relative humidity > 65 %

These conditions are for the specification of the grout. Variations in temperature and humidity on site may cause variations in the test results and shall be reported.

The grout for the tests shall be made from materials specified in clause 4 of EN 447 and mixed in accordance with clause 6 of EN 447. The temperature of the freshly mixed grout is to be given in all test reports.

¹⁾ At present at the draft stage.

3.2 Fluidity test

3.2.1 Immersion method

3.2.1.1 Principle

The test consists of measuring the time a plunger needs to drop through a defined amount of grout in a tube.

3.2.1.2 Apparatus

- a) Calibrated immersion equipment according to figure 1.
- b) A 0,5 m spacer rod according to figure 1.
- c) A stopwatch

3.2.1.3 Calibration procedure

The immersion equipment shall be calibrated with glycerol (analytical grade) having a density of $1,226 \text{ g/cm}^3$ at $(20 \pm 0,5) \text{ }^\circ\text{C}$. The temperature of the room, immersion equipment and glycerol shall be $(20 \pm 0,5) \text{ }^\circ\text{C}$ during the calibration.

The cylinder shall be filled with about 1,9 litre glycerol up to approximately 260 mm below the rim. After filling the immersion equipment the glycerol shall be allowed to rest for about 1 hour. Then the plunger shall be immersed to expel the air bubbles from the glycerol, which may have been introduced into the glycerol during the filling of the cylinder.

After at least 1 hour the plunger is positioned so that its stop on the tail rod lies on the spacer placed at the top of the tube. The spacer then is pulled away to allow the plunger to sink to the stop of the tube. This time shall be recorded to the nearest second.

The calibration shall be repeated at least 3 times.

The mean value of all measured immersion times shall be $(34 \pm 1) \text{ s}$. If the test result deviates from this value the weight of the plunger shall be increased where $t > 35 \text{ s}$ or reduced where $t < 33 \text{ s}$. This is done by varying the quantity of the lead pellets in the plunger. Delay repeating the calibration procedure for at least 30 minutes to ensure that no air bubbles are in the glycerol resulting from the preceding calibration procedure.

3.2.1.4 Test procedure

Preparation

The adjustment of the immersion equipment shall be tested before it is used. Adjustment of the immersion equipment shall be tested subsequently once a year and/or after any damage.

Directly before the test the equipment shall be placed vertically and the inside of the tube and the plunger shall be dampened so that the surface is moist but without free water.

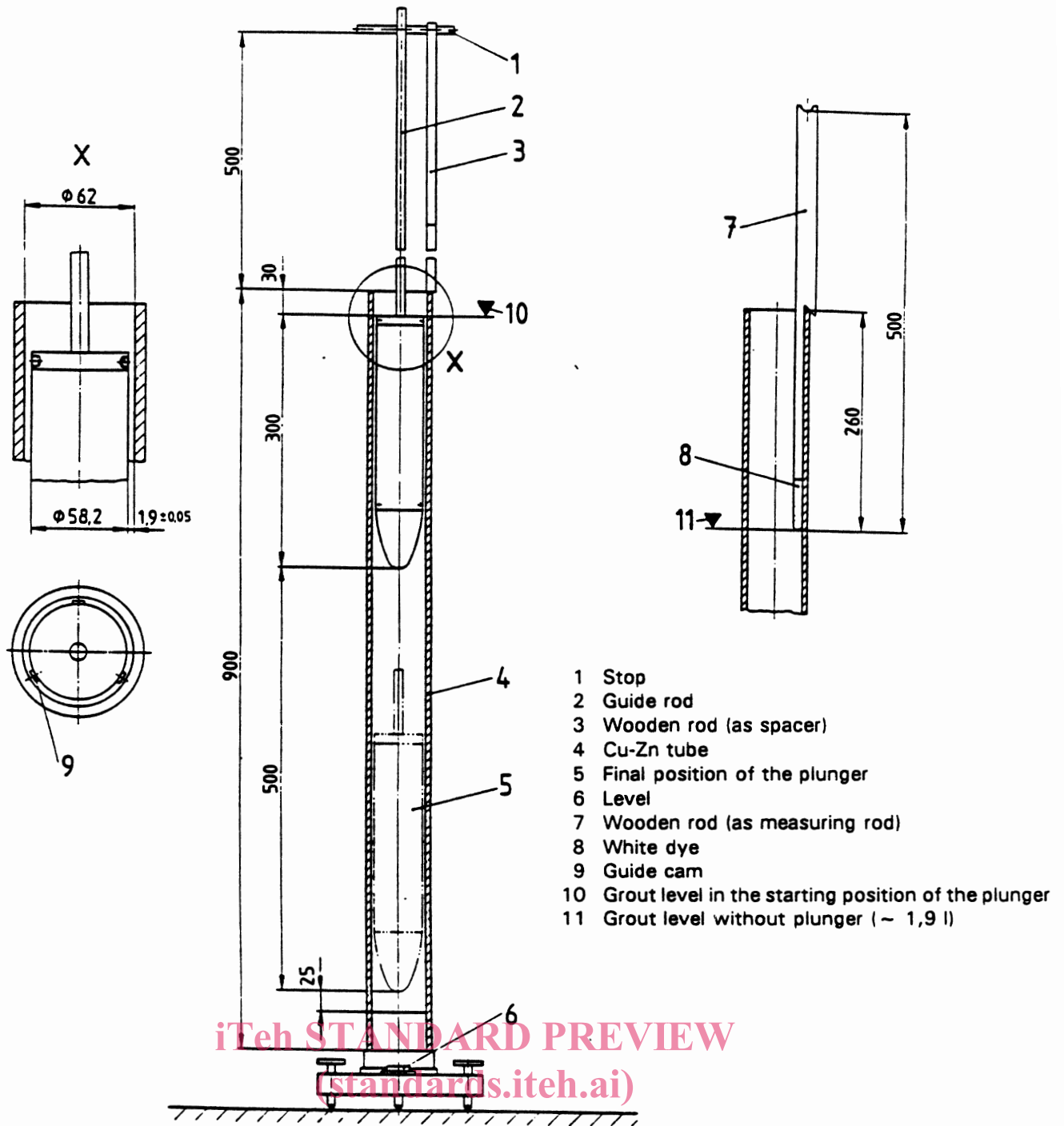
Procedure

The cylinder shall be filled with approximately 1,9 litre grout up to approximately 260 mm below the rim, so that the plunger is fully immersed on introduction if its stop on the tail rod lies on the spacer placed at the top of the tube. The spacer is then pulled away and the plunger sinks to the stop in the tube. Then the plunger is raised back to its initial position, the spacer is inserted, again pulled away and the time measured until the stop lies on the tube. The immersion times of the grout shall be measured immediately after the mixing process and after 30 minutes.

For the test after 30 minutes, grout from the same mix as that used for the immersion test immediately after the mixing process shall be used; the grout is to be kept in motion with the stirrer until the carrying out of the test after 30 minutes. Each test is carried out three times in succession with the same filling.

3.2.1.5 Reporting of results

Report the result as the average of the immersion times to the nearest second of the second and third immersion, ignoring the first immersion time.



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Figure 1: Immersion equipment for determining the immersion time

3.2.2 Cone method

3.2.2.1 Principle

The fluidity of grout, expressed in seconds, measured by the time necessary for a stated quantity of grout to pass through the orifice of the cone, under stated conditions.

3.2.2.2 Apparatus

The following apparatus is required for the test:

a) Cone

A cone of the dimensions given in figure 2. It shall be robust and manufactured from materials not reactive with any materials specified in clause 4 of EN 447. The volume of the cone (excluding the cylindrical portions at top and bottom) shall be 1,7 litres \pm 10 %.

b) Sieving medium

The sieving medium aperture shall be 1,5 mm and the sieving medium shall be fitted as shown in figure, and be removable

c) Stopwatch

d) Container of 1 litre capacity

3.2.2.3 Test procedure

Preparation

Mount the cone with its axis vertical and its largest diameter uppermost. Fix the sieving medium at the position indicated in figure 2. During the test prevent the cone from vibrating. Place the container under the cone outlet. All surfaces of the cone shall be clean and shall be dampened so that the surface are moist but without free water. Close the lower cone orifice.

Procedure

Pour the grout through the sieving medium to fill the conical section of the cone. The grout shall be poured sufficiently slowly to prevent the build-up of air in the grout in the cone. Open the lower cone orifice and at the same time, start the stopwatch. Measure the time taken to the nearest 0,5 s to fill the container. The presence of lumps on the sieving medium shall be reported. Three tests shall be carried out, the first immediately after the grout is mixed and the remaining two tests 30 minutes after the grout is mixed. While testing is in progress the grout shall be kept agitated.

3.2.2.4 Reporting of results

Report the time taken to the nearest 0,5 s. Report also the presence of lumps.

Report the result as the average of the times determined to the nearest 0,5 s of the second and third tests, ignoring the results of the first test.

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Dimensions in mm

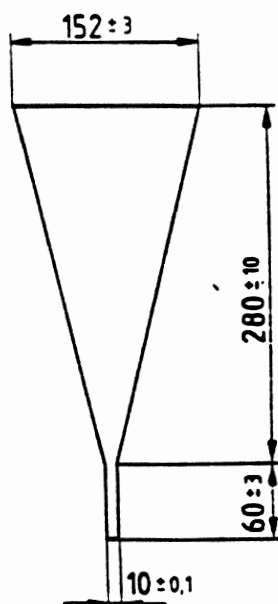


Figure 2: Cone for fluidity test

3.3 Bleeding test

3.3.1 Principle

The test consists in measuring the quantity of water remaining on the surface of the grout which has been allowed to stand protected from evaporation.

3.3.2 Apparatus

A transparent 100 ml cylinder 25 mm in diameter and 250 mm in height graduated in ml. Alternatively a transparent cylinder 50 mm in diameter and 200 mm in height graduated in mm.

3.3.3 Procedure

Preparation

Place the cylinder on a surface free from shocks or vibration. The grout used should be from the same batch as that used for the fluidity test.

Procedure for 25 mm diameter cylinder

Pour 95 to 100 ml of grout into the cylinder. Note the level of the grout (v) ignoring the meniscus. After 3 hours, measure the quantity of water on top of the grout (v_1), taking appropriate measures to prevent evaporation. The test is carried out on one sample of grout.

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Procedure for 50 mm diameter cylinder

Pour grout into the cylinder to a height of approximately 150 mm. Note the height to the top of the grout (h) ignoring the meniscus. After 3 hours, measure the height of water on top of the grout (h_1) taking appropriate measures to prevent evaporation. The test is carried out on one sample of grout.