SLOVENSKI STANDARD
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Preskušanje betona v konstrukcijah - 2. del: Neporušitveno preskušanje - Ugotavljanje sklerometričnega indeksa

Testing concrete in structures - Part 2: Non-destructive testing - Determination of rebound number

Prüfung von Beton in Bauwerken - Teil 2: Zerstörungsfreie Prüfung - Bestimmung der Rückprallzahl

Essais pour béton dans les structures - Partie 2 : Essais non destructifs - Détermination de l'indice de rebondissement

Ta slovenski standard je istoveten z: **EN 12504-2:2021**

ICS:

19.100	Neporušitveno preskušanje	Non-destructive testing
91.100.30	Beton in betonski izdelki	Concrete and concrete products

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EUROPEAN STANDARD

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English Version

Testing concrete in structures - Part 2: Non-destructive testing - Determination of rebound number

Essais pour béton dans les structures - Partie 2 : Essais non destructifs - Détermination de l'indice de rebondissement

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This European Standard was approved by CEN on 14 June 2021.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 12504-2:2021) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by SN.

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of an identical text or by endorsement, at the latest by January 2022, and conflicting national standards shall be withdrawn at the latest by January 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12504-2:2012.

The following amendments have been made in comparison to the former edition:

— a recommendation that two different reference anvils are used for calibrating the equipment.

— the allowable range of results has been tightened.

This document is based on the International Standard ISO 1920-7, *Testing of concrete – Part 7: Non-destructive tests on hardened concrete,* and reference has been made to ASTM C805, *Standard Test Method for Rebound number of hardened concrete.*

This document has been framed around the use of a Type N, spring driven steel hammer, originally designed by Schmidt.

This document is one of a series on testing concrete.

EN 12504, *Testing concrete in structures*, consists of the following parts:

— Part 1: *Cored specimens – Taking, examining and testing in compression;*

— Part 2: *Non-destructive testing – Determination of rebound number;*

— Part 3: *Determination of pull-out force;*

— Part 4: *Determination of ultrasonic pulse velocity.*

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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

1 Scope

This document specifies a method for determining the rebound number of an area of hardened concrete using a spring-driven hammer.

NOTE 1 The rebound number determined by this method can be used to assess the uniformity of concrete *in situ*, to delineate zones or areas of poor quality or deteriorated concrete in structures.

NOTE 2 The test method is not intended as an alternative for the compressive strength determination of concrete (EN 12390-3), but with suitable correlation, it can provide an estimate of *in situ* compressive strength. For the assessment of *in situ* compressive strength, see EN 13791.

NOTE 3 The hammer can be used for comparative testing, referenced against a concrete with known strength or against a concrete which has been shown that it has come from a defined volume of concrete with a population verified as conforming to a particular strength class.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method (ISO 6508-1)*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

4 Principle

A mass propelled by a spring strikes a plunger in contact with the surface of the structure or specimen to be tested. The test result is expressed as a number in terms of the rebound distance of the mass. A number may also be obtained in terms of the energy or velocity differential before and after impact of the mass.

5 Apparatus

5.1 Rebound hammer

Consisting of a spring-loaded hammer mass which, when released, strikes a plunger in contact with the surface to be tested. The rebound distance of the hammer mass from the plunger or other rebound values shall be measured.

NOTE Several types and sizes of rebound hammers are commercially available for testing various strength classes and types of concrete. Each type and size of hammer can only be used with the strength classes and types of concrete for which it is intended.

5.2 Reference anvil

Steel reference anvil for verification of the hammer, with an impact area having a hardness of minimum 52 HRC when tested in accordance with EN ISO 6508-1 and a mass of (16 ± 1) kg and a diameter of approximately 150 mm.

Other anvils may be used if it can be demonstrated that the readings are within the tolerance given in 7.3.

The manufacturer's instructions and any other equipment shall be used to ensure the longitudinal axis of the plunger is perpendicular to the surface of the anvil at impact.

Different hammers with the same rebound value on the reference anvil may not give identical results on site if the rebound value obtained lies above the normal working range of the hammer.

NOTE 1 An improved verification can be obtained by additionally using an anvil with a lower hardness that provides a second rebound value within the normal working range of the hammer ($30 < R < 60$ or $30 < Q < 70$ where R is the rebound distance and Q is the energy or velocity measurement depending on the type of hammer used). This will ensure that different hammers obtain similar results.

NOTE 2 If the smaller anvil is used for daily verification checks on site, it is important to verify the hammer on the reference anvil at regular intervals.

5.3 Abrasive stone

A medium-grain texture silicon carbide stone or equivalent material.

6 Test location

6.1 Selection

Concrete elements to be tested shall be at least 100 mm thick and fixed within a structure. Smaller elements or specimens may be tested provided they are rigidly supported. Areas exhibiting honeycombing, scaling, rough texture, or high porosity should be avoided.

In selecting an area to be tested, the following factors should be considered:

a) the strength of the concrete;

b) type of surface (e.g. formed or unformed);

c) type of concrete (e.g. normal or lightweight);

d) moisture condition of the surface;

e) carbonation (if appropriate);

f) direction of test;

g) other appropriate factors.

A test location should be approximately 300 mm × 300 mm.

6.2 Preparation

Using the abrasive stone, grind heavily textured or soft surfaces, or surfaces with loose mortar, until they are smooth and free of loose material. Smooth-formed or trowelled surfaces may be tested without grinding.

Remove any water present on the surface of the concrete.

7 Procedure

7.1 Preliminary preparation

7.1.1 Use the hammer in accordance with the manufacturer's instructions for its operation.

7.1.2 Before a sequence of tests on a concrete surface, clean the impact surfaces of the reference anvil and plunger. Perform at least five impacts on the steel reference anvil and record the readings from the next five impacts. If the readings from the last five impacts are not within ± 3 of the value given by the manufacturer, clean and/or adjust the hammer in accordance with the manufacturer's instructions and repeat the above.

7.1.3 The hammer shall only be operated at a temperature within the range 0 °C to 50 °C.

7.2 Operations

At the time of the test, the hammer shall meet the requirements defined in 7.1.2.

Hold the hammer firmly in a position that allows the plunger to impact perpendicularly to the surface being tested.

Gradually increase the pressure on the plunger until the hammer impacts (see 7.1.1).

After impact, record the rebound number based on the rebound distance and/or energy or velocity measurements.

Examine each impression made on the surface after impact and if the impact has crushed or broken through a near-to-surface void, discount the result.

Take a minimum of nine valid readings to obtain a reliable estimate of the rebound number for a test location.

Record the position and orientation of the hammer for each set of readings.

Ensure that no two impact points are closer than 25 mm and none are within 25 mm of an edge.

NOTE It is preferable to draw a regular grid of lines 25 mm to 50 mm apart and take the intersections of the lines as the test points.

7.3 Reference checking

After performing the tests, take five readings using the steel reference anvil. If the readings are not within ± 3 of the value given by the manufacturer, clean and/or adjust the hammer according to the manufacturer's instruction and repeat the test.

8 Test result

The rebound number of the test location shall be taken as the median of all the readings, adjusted if necessary to take into account the orientation of the hammer in accordance with the manufacturer's instructions. The rebound number shall be expressed as a whole number.

If more than 20 % of all the readings differ from the median by more than 25 % the entire set of readings shall be discarded.

NOTE If more than one hammer is to be used, a sufficient number of tests can be made on similar concrete surfaces with all hammers, to determine the variation in the results obtained.

9 Test report

The report shall include:

a) a reference to this document, including its year of publication;

b) identification of the concrete structure/element;

c) identification of test location(s);

d) the type and identification of the rebound hammer;

e) description of preparation of test location(s);

f) details of concrete (if known) and its condition;

g) date/time of performance of the test;

h) rebound number (median of test result readings) adjusted for hammer orientation (if appropriate) for each test location;

i) any deviation from the standard test method e.g. presence of water on surface (see 6.2), temperature outside acceptable range (see 7.1.3);

j) a declaration by the person technically responsible for the test that it was carried out in accordance with this document, except as noted in item i).

The report may include:

k) individual rebound hammer readings, if required;

l) specification of the rebound hammer, if known.

10 Precision

There are no precision data available for this test.

Bibliography

[1] EN 12390-3, *Testing hardened concrete – Part 3: Compressive strength of test specimens*

[2] EN 13791, *Assessment of in-situ compressive strength in structures and precast concrete components*

[3] ISO 1920-7, *Testing of concrete - Part 7: Non-destructive tests on hardened concrete*

[4] ASTM C805, *Standard Test Method for Rebound Number of Hardened Concrete*