BRITISH STANDARD

BS EN
12390-2:2009

Testing hardened concrete

Part 2: Making and curing specimens for strength tests

ICS 91.100.30

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 12390-2:2009. It supersedes BS EN 12390-2:2000 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/517/1, Concrete production and testing.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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English Version

Testing hardened concrete - Part 2: Making and curing specimens for strength tests

Essai pour béton durci - Partie 2 : Confection et conservation des éprouvettes pour essais de résistance

Prüfung von Festbeton - Teil 2: Herstellung und Lagerung von Probekörpern für Festigkeitsprüfung

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Foreword

This document (EN 12390-2:2009) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, 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of an identical text or by endorsement, at the latest by October 2009, and conflicting national standards shall be withdrawn at the latest by October 2009.

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

This document supersedes EN 12390-2:2000.

The results of a laboratory inter-comparison, part-funded by the EC under the Measurement and Testing Programme contract MATI-CT-94-0043, have been taken into account in the drafting of this European Standard.

The compaction of specimens in the moulds using hand tamping, vibrating table, or internal (poker) vibrator are accepted as equivalent. However, it was found in this programme that the use of an internal vibrator to compact specimens of air entrained fresh concrete should only be done with caution, if loss of entrained air is to be avoided.

Curing specimens in a closely regulated humidity chamber is recognised as being equivalent to curing in water.

This standard is one of a series concerned with testing concrete.

The series EN 12390 includes the following parts:

EN 12390 Testing hardened concrete –

Part 1: Shape, dimensions and other requirements of specimens and moulds;

Part 2: Making and curing specimens for strength tests;

Part 3: Compressive strength of test specimens;

Part 4: Compressive strength - Specification for testing machines;

Part 5: Flexural strength of test specimens;

Part 6: Tensile splitting strength of test specimens;

Part 7: Density of hardened concrete;

Part 8: Depth of penetration of water under pressure.

CAUTION — When cement is mixed with water, alkali is released. Take precautions to avoid dry cement entering the eyes, mouth and nose whilst mixing concrete. Prevent skin contact with wet cement or concrete by wearing suitable protective clothing. If cement or concrete enters the eye, immediately wash it out thoroughly with clean water and seek medical treatment without delay. Wash wet concrete off the skin immediately.

The following amendments have been made to the 2000-10 edition of this standard:

— editorial revision

— clarification of filling procedure of moulds

— clarification of compacting procedure of concrete.

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

1 Scope

This European Standard specifies methods for making and curing test specimens for strength tests. It covers the preparation and filling of moulds, compaction of the concrete, levelling the surface, curing of test specimens and transporting test specimens.

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 12350-1, *Testing fresh concrete – Part 1: Sampling*

EN 12390-1, *Testing hardened concrete – Part 1: Shape, dimensions and other requirements for specimens and moulds*

3 Apparatus

3.1 Moulds, conforming to EN 12390-1

3.2 Filling frame (optional)

NOTE Filling of the moulds may be simplified by using a filling frame fitted tightly to the mould

3.3 Means of compacting the concrete (one of the following)

a) Internal (poker) vibrator with a minimum frequency of 120 Hz (7 200 cycles per minute), the diameter of the internal vibrator not exceeding one-quarter of the smallest dimension of the test specimen;

b) Vibrating table with a minimum frequency of 40 Hz (2 400 cycles per minute);

c) Compacting rod of circular cross-section, made of steel, having a diameter of approximately 16 mm, of length approximately 600 mm and with rounded ends;

d) Compacting bar, straight, made of steel having a square cross-section of approximately 25 mm x 25 mm and length approximately 380 mm;

3.4 Scoop, with width approximately 100 mm;

3.5 Steel trowel of float;

3.6 Remixing container, a flat tray of rigid construction and made from a non-absorbent material not readily attacked by cement paste. It shall be of appropriate dimensions such that the concrete can be thoroughly re-mixed, using the square-mouthed shovel;

3.7 Shovel, with square mouth;

NOTE The square mouth ensures proper mixing of material on the remixing container.

3.8 Non-reactive mould release material;

3.9 Mallet, soft faced.

4 Sampling

The sample shall be taken in accordance with EN 12350-1.

The sample shall be re-mixed, using the remixing container and square mouth shovel, before filling the moulds.

5 Procedures

5.1 Preparation and filling of the moulds

5.1.1 Where necessary, before filling the mould, the inner surface of the mould should be covered with a thin film non-reactive release material to prevent the concrete from adhering to the mould

5.1.2 Depending on the consistence of the concrete and the method of compaction, moulds shall be filled in one or more layers to achieve full compaction. In the case of self-compacting concrete, the mould shall be filled in one operation and no mechanical compaction shall be applied during filling or after the mould is filled.

5.1.3 If a filling frame is used, the amount of concrete used to fill the mould shall be such that a layer of concrete remains in the filling frame after compaction. The thickness of this layer shall be 10 % to 20 % of the height of the test specimen.

5.2 Compaction of the concrete

5.2.1 General

The concrete shall be compacted immediately after placing in the moulds in such a way as to produce full compaction of the concrete with neither excessive segregation nor laitance. Each layer shall be compacted by using one of the methods described in 5.2.2 and 5.2.3.

NOTE 1 Full compaction is achieved using mechanical vibration, when there no further appearance of large air bubbles on the surface of the concrete and the surface becomes relatively smooth with a glazed appearance, without excessive segregation.

NOTE 2 Further guidance on methods of compaction for concretes having different consistencies or cast in different sizes of moulds, may be given in national annex NA.

5.2.2 Mechanical vibration

5.2.2.1 Compacting with internal vibrator

Apply the vibration for the minimum duration necessary to achieve full compaction of the concrete. Avoid over-vibration, which may cause loss of entrained air.

NOTE 1 Care should be taken not to damage the mould. The vibrator should be vertical and not allowed to touch the bottom or sides of the mould. The use of a filling frame is recommended.

NOTE 2 Laboratory tests have shown that great care is needed if loss of entrained air is to be avoided when using an internal vibrator.

5.2.2.2 Compacting with vibrating table

Apply the vibration for the minimum duration necessary to achieve full compaction of the concrete. The mould should preferably be attached to, or firmly held against the table. Avoid over-vibration, which may cause loss of entrained air.

5.2.3 Compacting by hand with compacting rod or bar

Distribute the strokes of the compacting rod, or bar, in a uniform manner over the cross-section of the mould. Ensure that the compacting rod, or bar, does not forcibly strike the bottom of the mould when compacting the first layer, nor penetrate significantly any previous layer. Subject the concrete to a sufficient number of strokes per layer, typically 25 for concretes having a consistence equivalent to slump classes S1 and S2, in order to remove pockets of entrapped air but not the entrained air. After compaction of each layer, tap the sides of the container smartly with the mallet until large bubbles of air cease to appear on the surface and depressions left by the compacting rod or bar, are removed.

5.3 Surface levelling

5.3.1 If a filling frame is used, remove it immediately after compaction is completed.

5.3.2 Remove the excess concrete above the upper edge of the mould using the steel trowel or float and carefully level the surface.

5.4 Marking

5.4.1 The test specimens shall be marked clearly and indelibly, without damaging the specimen.

5.4.2 Records shall be kept to ensure the traceability of the specimen from sampling to testing.

5.5 Curing of test specimens

5.5.1 Leave the test specimens in the mould for at least 16 hours, but not longer than 3 days, protected against shock, vibration and dehydration at a temperature of (20 ± 5) °C (or (25 ± 5) °C in hot climates).

5.5.2 After removal from the mould, cure the test specimens till immediately before testing, in water at a temperature of (20 ± 2) °C, or in chamber at (20 ± 2) °C and relative humidity ≥ 95 %.

5.5.3 Forms of curing differing from those in 5.5.2 may be factorized to the methods described in 5.5.2.

NOTE 1 In case of dispute, curing in water shall be the reference method.

NOTE 2 Maintenance and measurement of high humidity ≥ 95 % at (20 ± 2) °C is not simple. Regular checks should be made that surfaces of specimens in the chamber are continuously wet.

5.6 Transport of test specimens

Avoid loss of moisture and deviations from the required temperature at all stages of transport, by, for example, packing the hardened test specimens in wet sand or wet sawdust or wet cloths, or sealed in plastic bags containing water.

6 Report

The report shall include:

a) identification of the test sample;

b) date and time of making the specimen(s);

c) method of compacting the concrete in the moulds and in the case of hand compaction, the number of strokes;

d) details of storage of specimens prior to de-moulding, including duration and conditions;

e) method of curing specimens after de-moulding, during transportation, (if appropriate), giving temperature range and duration of curing;

f) any deviation from the standard method of making and curing the specimen(s);

g) declaration by the person technically responsible that the specimens were prepared in accordance with this document, except as noted in item e);

The report may include:

h) temperature of the re-mixed concrete;

i) condition of specimen(s) on receipt, for curing (if appropriate).

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