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Testing of concrete —

Part 3:
Making and curing test specimens

(Revision of ISO 1920:1976 and ISO 2736-2:1986)

Essais du béton —

Partie 3: Confection et conservation des éprouvettes

ICS 91.100.30

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Foreword

This Standard is one of a series of standards concerned with testing concrete.

The standards in the series are:

ISO 1920, Testing Concrete—Part 1: Sampling of fresh concrete.

ISO 1920, Testing Concrete— Part 2: Properties of fresh concrete.

ISO 1920, Testing Concrete— Part 3: Making and curing of test specimens.

ISO 1920, Testing Concrete— Part 4: Strength of hardened concrete.

ISO 1920, Testing Concrete— Part 5: Properties of hardened concrete other than strength.

ISO 1920, Testing Concrete— Part 6: Sampling, preparing and testing concrete cores.

ISO 1920, Testing Concrete— Part 7: Non-destructive tests of hardened concrete.

This series of Draft International Standards was prepared based on ISO standards and drafts and on the CEN Standards dealing with test methods of concrete.

This edition of DIS was amended as decided at the 2nd meeting of ISO/TC 71 SC 1 held in Sep. 2000 in Tokyo.

Caution: Some concrete specimens might be to heavy to carry by one person and appropriate means should be arranged to carry them.

Testing of concrete —

Part 3:
Making and curing test specimens

1 Scope

This Standard specifies the shape and dimensions of concrete test specimens for strength tests. The standard specifies the methods of making and curing these 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.

ISO 1920. *Testing Concrete— Part 1: Sampling of fresh concrete*

ISO 1920. *Testing Concrete— Part 2: Properties of fresh concrete*

ISO 1101 :1983 *Technical drawings — Geometrical tolerancing - Tolerancing of form, orientation, location and run out - Generalities, definitions, symbols, indications on drawings*

3 Terms and definitions

For the purpose of this Standard the terms and definitions set out in ISO 1101:1983apply, together with the following :

3.1
nominal sizes of specimens
a range of commonly used specimen sizes amongst which a preferred size is indicated in this standard

3.2
designated size of specimens
the specimen size in millimetres selected and declared by the user of this standard from amongst the allowed range of nominal sizes

3.3
maximum size of aggregate
the nominal size of the sieve that most of the aggregates pass through, and not more than 15% of the aggregates are retained on it.

4 Shape, dimensions and tolerances of specimens and moulds

4.1 General

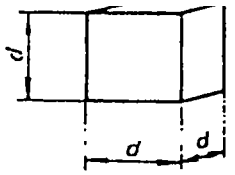
For each shape of test specimen, cube, cylinder, and prism, the basic dimension *d* should be chosen to be at least four times the maximum size of the aggregate in the concrete.

NOTE A procedure for wet screening as described in Annex A may be used when the maximum size of the aggregate is larger than 1/4 of the basic dimension, d.

For the definitions of flatness, parallelism, perpendicularity and straightness, see Annex B.

4.2 Cubes

4.2.1 Nominal sizes (see figure 1)



d, mm	100	120	150	200	250	300

Figure 1 – Cube – nominal sizes

The preferred sizes are 100 mm and 150 mm.

4.2.2 Designated sizes,

The designated sizes shall not be different from the nominal sizes.

4.2.3 Tolerances

a) The tolerance on the designated size (d) shall be 0.5%.

b) The tolerance on the flatness of the load-bearing surfaces shall be 0.0005d, in mm.

c) The load-bearing surfaces shall be parallel to a tolerance of 1.0 mm.

d) The tolerance on the perpendicularity of the sides of the cube, with reference to the base shall be 0.5 mm.

4.3 Cylinders

4.3.1 Nominal sizes (see figure 2)

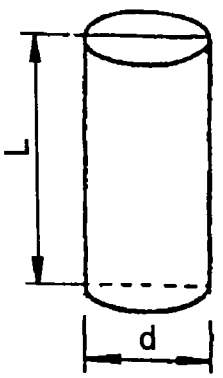


Figure 2 – Cylinder – nominal sizes

The preferred sizes are 100 mm x 200 mm, 125 mm x 250 mm and 150 mm x 300 mm.

Strength test	Compressive strength	Flexural strength	Tensile splitting test
L	2d	2d	≥ d ; ≤ 2d

NOTE The value of 113 has a load-bearing area 10,000 mm^2.

4.3.2 Designated sizes,

Designated sizes may be selected within ± 10% of the nominal size.

4.3.3 Tolerances

a) The tolerance on the designated diameter (d) shall be 0.5%.

b) The tolerance on the flatness of the load-bearing surfaces shall be 0.0005d, in mm, except as mentioned below.
The tolerance on the flatness of the load-bearing surfaces of cylinders tested by unbonded capping methods, such as sand box or elastomeric pads shall be 0.02d, in mm.

c) The load-bearing surfaces shall be parallel to a tolerance of 1.0 mm.

d) The tolerance on the perpendicularity of the sides of the cylinder, with reference to the base shall be 0.5 mm.

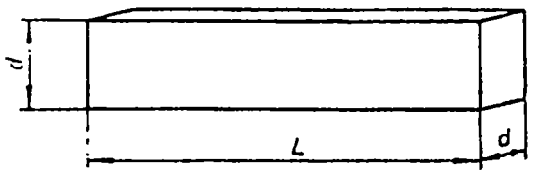
e) The tolerance on the height of cylinders shall be 5%.

f) The straightness tolerance on the generatrix of cylinders to be used in compression tests shall be 0.5 mm.

g) The straightness tolerance on the generatrix of cylinders to be used in splitting tests shall be 0.2 mm

4.4 Prisms

4.4.1 Nominal sizes (see figure 3)



$L \geq 3.5d$

d, mm	100	150	200	250	300

Figure 3 – Prism – nominal sizes

The preferred sizes are 100 mm x 100 mm x 400 mm and 150 mm x 150 mm x 600 mm.

4.4.2 Designated sizes

a) The designated depth and width (d) of prisms shall not be different from nominal sizes.

b) The designated length (L) of prisms may be selected within 10% of the nominal dimension.

4.4.3 Tolerances

a) The tolerance on the designated depth and width shall be 0.5%.

b) The tolerance on the designated length (L) of prisms shall be 5%.

c) The tolerance on the flatness of the load-bearing area of prisms to be used for compression tests shall be 0.0005d, in mm.

d) The load-bearing surfaces shall be parallel to a tolerance of 1.0 mm, for specimens for compressive, flexural and tensile splitting strength tests.

e) The tolerance on the perpendicularity of the sides of the prism with reference to the base shall be 0.5 mm.

f) The tolerance on the straightness of the load-bearing area for specimens to be used for bending (flexural) tests shall be 0.2 mm.

5 Apparatus

The apparatus shall be as follows :

5.1 Apparatus for measuring the test specimens

5.1.1 Callipers and / or rules

Calipers and rules capable of establishing the relevant dimensions of specimens or moulds to within ± 0.5% of the dimension.

5.1.2 Gauge

A gauge capable of establishing that the relevant flatness of specimens or moulds is within ± 0,0005d, in mm.

5.1.3 Squares and gauges

Squares and gauges (or other similar means), capable of establishing the perpendicularity and parallelism of specimens and moulds are within ± 0.5 mm.

5.2 Apparatus for making test specimens

5.2.1 Moulds

The moulds used shall be capable of providing test specimens the dimensions and tolerances of which conform to this standard.

The moulds shall be made of steel or cast-iron which shall be the reference materials. If moulds are manufactured from other materials, performance test data shall be available which demonstrates equivalence with steel or cast-iron moulds. Lightweight cylindrical moulds shall comply with Annex C.

Moulds shall be watertight and shall be non-absorbent.

Moulds shall be calibrated at interval of not more than 1 year. If the mould is in calibration at time of use, the checking of parallelism, verticality and flatness of specimens is not required, provided the size measurements are within tolerance.

Moulds should be identified by an identification number either welded on the mould body or securely tagged to the moulds

5.2.2 Filling frame

Filling of the moulds may be simplified by using a filing frame fitted tightly to the mould. The use of a filling frame is optional, and shall be stated in the test report (see Clause 9).

5.2.3 Means of compaction

The means for compacting the concrete in the mould shall be one of the following:

a) internal vibrator, with a minimum frequency of 120 Hz (7,200 cycles per minutes). The diameter of the tube shall not exceed 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, straight, made of steel, having a diameter of 16 mm ± 1 mm, 600 mm ± 5 mm length, and with rounded, roughly hemispherical, ends;

d) compacting bar, made of steel having a square or circular cross section of square and mass greater than 1.8 kg.

5.2.4 General tools

a) scoop, approximately 100 mm wide.

b) two plasterer's steel floats.

c) sampling tray, minimum dimensions 900 mm x 900 mm x 50 mm deep of rigid construction and made from a non-absorbent material not readily attacked by cement paste.

d) square mouthed shovel.

e) non-reactive release material.

f) mallet.

g) timer, having an accuracy of ± 1s.

6 Preparation of test specimens

6.1 Sampling

The samples shall be remixed before filling of the mould. Concrete mixed in a laboratory need not be remixed.

6.2 Preparation and filling of the mould

Before filling, the inner surface of the mould shall be covered with a thin film of mineral oil or any other non-reactive release material to prevent the concrete from adhering to the mould.

The mould should be placed on a firm and level area free from vibration and possible disturbance.

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.

6.3 Compaction of the concrete

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 Annex D.

Test specimens compacted by hand shall be compacted in layers approximately 50 mm deep, or 1/3 of the height of the mould, (the larger value of the two values).

6.4 Surface levelling

If a filling frame is used, it shall be removed immediately after compaction.

The concrete above the upper edge of the mould shall be removed using two steel floats brought together with a sawing action and the surface carefully levelled.

A satisfactory surface can be produced by using one or two steel trowels.

The use of a straight edge is also permitted for striking off the concrete from the mould.

6.5 Marking

The test specimens shall be identified with a clear and durable marking, without damaging the specimen.

Records shall be kept which ensure the specimen identity is known from sampling to testing.

7 Curing of test specimens

Test specimens shall remain in the mould for at least 16 hours, but not longer than three days, protected against shock, vibration and water evaporation at a temperature of 20°C ± 5°C (or 25°C ± 5°C when the climate is hot).

After removal from the mould, the test specimens shall be stored in water or in relative humidity of at least 95% until immediately before testing at a temperature of 20°C ± 2°C.

Loss of moisture and deviations from the required curing temperature shall be avoided at all stages of transport. The test specimens should therefore be packed, for example, in wet sand or wet sawdust or wet cloths, or sealed in plastic bags containing water.

8 Measurement of dimensions and shape

8.1 Specimens made in calibrated moulds

If specimens have documentation to show that they had been made in calibrated moulds it is unnecessary to verify by measurement their compliance with the tolerances for flatness, perpendicularity, parallelism and straightness.

Specimens shall be checked to establish that each dimension is within 0.5% of the designated size.

NOTE Go/no-go gauges may be used to check dimensio ns.

8.2 Specimens made in uncalibrated moulds

If specimens are not made in calibrated moulds, or there is no documentation to verify that they were made in calibrated moulds, then:

a) each dimension shall be checked and the actual dimensions shall be recorded in the event of non-compliance.

b) the flatness of all the potential load-bearing surfaces shall be checked and compliance or non-compliance recorded.

c) the parallelism of all the potential load-bearing surfaces shall be checked and compliance or non-compliance recorded.

NOTE A set of potential load-bearing surfaces can be exempted from the checking by suitable marking.

d) the perpendicularity of the sides shall be checked and compliance or non-compliance recorded.

e) the straightness of the generatrix of cylinders shall be checked and compliance or non-compliance recorded.

9 Report

9.1 The report in respect of making the specimens shall include:

a) unambiguous identification of the test sample;

b) reason for making the specimens (eg: compression testing);

c) time of making the specimen(s);

d) temperature of the remixed concrete (optional);

e) density of the concrete (optional);

f) time passing between sampling and making test specimens;

g) method of compaction of the concrete in the mould(s);

h) depending on the method of compaction, either the duration of compaction or the number of tamps;

i) any deviation from the standard method of making specimen(s) (if appropriate).