CONCRETE, HARDENED:
DIMENSIONS OF TEST SPECIMENS

1. SCOPE AND FIELD OF APPLICATION

This NORDTEST method defines the recommended dimensions of test specimens of hardened concrete, made in the shape of a cube or a cylinder. Furthermore, the method specifies how to determine the shape- and size deviations of test specimens.

The method may be used both for cast test specimens and specimens taken from an object made of concrete.

The nominal measures and the measure indications used in the method are given in Fig. 1. The measures in Fig. 1 agree with the corresponding measures listed in ISO 1920, but it is recommended that the Comments should also be read. These are used acc. to Fig. 1 to state the nominal measures of the test specimens.

The points of measurement acc. to Fig. 2 are the same as in ISO 4012.
2. REFERENCES

NT BUILD 191 CONCRETE, FRESH: SAMPLING
NT BUILD 201 CONCRETE: MAKING AND CURING OF MOULDED TEST SPECIMENS FOR STRENGTH TESTS
NT BUILD 202 CONCRETE, HARDENED: SAMPLING AND TREATMENT OF CORES FOR STRENGTH TESTS
ISO 1920-1976 Concrete tests- Dimensions, tolerances and applicability of test specimens
ISO 4012-1978 Concrete - Determination of compressive strength of test specimens

3. SAMPLING

If nothing otherwise is indicated in the test report, the test specimens shall be taken acc. to NT BUILD 191 or 202.

4. METHOD OF TEST

4.1 Principle

The procedure acc. to 4.4 is intended to ascertain that
- the measures d and h lie within ± 1.0 % of the measures acc. to Fig. 2
- the deviation of the flatness of the load bearing surfaces of cubes and cylinders is within ± 0.0005 d, the figures being rounded off to the nearest 0.05 or 0.1 mm
- the tolerance on the generatrix of the cylinders should be within ± 0.002 d. In split tests the two opposite generatrices should have tolerances of ± 0.001 d
- angles between adjacent surfaces (between pressure areas and cylinder jackets) are 90 ± 0.5°.

Test specimens that do not fullfil these requirements should be treated acc. to 4.3, if the conditions thereby would be full-filled.
4.2 Apparatus

Measuring apparatus for the determination of $d$ and $h$ acc. to Fig. 1 and 2, having an accuracy within ±0.2 mm. The measuring devices may be replaced by maximum and minimum gauges with the corresponding accuracy.

Measuring apparatus for determination of flatness and straightness deviations, e.g. a feeler gauge and a steel ruler.

Set-squares for the determination of angles. These should have an accuracy of ±0.1°, acc. to Fig. 4. The set-square may be replaced by a maximum set-square and a minimum set-square with accuracies of $90.4 ± 0.1°$ and $89.6 ± 0.1°$ respectively.

Stone saw.

Surface grinding equipment.

Levelling plates of steel (at least 10 mm thick) or stone levelling plates (at least 40 mm thick) with a deviation of flatness determined acc. to 4.4.2 within ±0.0004 $d$ for levelling acc. to the Annex.

4.3 Preparation of Test Samples

If necessary, the test specimens may be sawn and ground in order to comply with the requirements stated in 4.1.

Alternatively, the test specimens may be smoothened with the aid of cement- or sulphur mortar, see Annex.

4.4 Procedure

4.4.1 Linear measure

The length, width, diameter and height of a test specimen should be measured acc. to Fig. 2. One should disregard any single top or cavity in the surfaces. The results should be expressed in mm without decimal figures.
4.4.2 Flatness and straightness

The deviation of the flatness of a load-bearing surface and of the straightness of a cylinder jacket should be determined as the greatest distance from the surface to an (imagined) straight line at whatever point on the surface, while disregarding any single cavities in the surface. The deviation is noted in mm with two decimal figures, with the last figure rounded off to 0 or 5.

4.4.3 Squareness

Those angles whose deviation from 90° should be determined, are shown in Fig. 3. Fig. 4 shows an example of how one may determine a square deviation.

4.4.4 Gauges

If gauges are used, acc. to 4.2, it should be noted if the conditions acc. to 4.1 are being fulfilled or not.

4.5 Test Report

If a test report is submitted, it should contain at least the following information (see Note 1):

a) Name and address of the testing laboratory
b) Date and identification symbols of the report
c) Test method (number and title)
d) Any deviation from the test method
e) Name and address of the person or institution who ordered the test
f) Name and address of the person performing the test
g) Name of the manufacturer of the concrete
h) The identification symbols of the concrete
i) Date when the test was performed
j) Test results

Note 1 Usually the shapes and measures of the test specimens are stated in connection with the specific results obtained during the testing of them.
k) Any other information of importance for the evaluation of the test results

1) Evaluation of the test results, if this is required in the request for the test

Comments

The method deviates from the corresponding ISO methods with regard to the editing and the content of the test report and on the following points:

Point 4.1 ISO 1920 states that the straightness deviation of the lines of generatrix should be within ± 0.001 d.

Point 4.2 ISO 1920 does not list the apparatus needed for the measuring.

Point 4.4.2 ISO 1920 does not state how the deviations from flatness and straightness should be determined.

Fig. 1 ISO 1920 permits the use of more test specimens and also indicates the nominal measure for beams.

Nominal measures, d

<table>
<thead>
<tr>
<th>Cubes</th>
<th>Cylinders</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>h</td>
</tr>
<tr>
<td>70</td>
<td>h = 2d</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>150</td>
<td>150</td>
</tr>
</tbody>
</table>

Fig. 1 Test specimens. Indications and nominal measures. If the measure of a test specimen lies within ± 10 % of the measures given above, the nominal measures should be used when describing the shape and size of the test specimens.
Fig. 2. The measurement of the length, width, diameter and height of a test specimen.

Fig. 3. Examination of angles.

The deviation should be measured with a feeler gauge or similar instrument.

Fig. 4. An example of the examination of angles.
Annex

The load-bearing surfaces may be capped with cement mortar acc. to A) or with sulphuric mortar B) under the following conditions:

- capping material should have at least the same strength as the concrete in the test specimen has during the time for the test.
- the thickness of the capping material of cement mortar should be at the most 8 mm and in the case of sulphuric mortar, 2 mm.

One should avoid to cap load-bearing surfaces of test specimens taken from concrete with a pressure strength higher than about 45 MPa.

A) Capping with cement mortar

The capping should be completed 1 - 3 days, preferably 2 days, prior to the testing. If one expects a high pressure strength the surface should be capped 2 - 3 days prior to the testing.

The mortar shall consist of equal parts (equal weights) of cement and sand passing through a sieve with a 1 mm aperture. Water should be added to the mortar during mixing until a plastic consistency has been obtained.

Dry load-bearing surfaces should be moistened for a short period with wet pieces of cloth or similar material, surplus water should be dried off and the mortar should be applied between oiled levelling plates. The total construction should be pressed together so that the surfaces are in so parallel a position that the demands for squareness acc. to 4.1 are fullfilled. Mortar that has been squeezed out should be scraped off.

After a period of about 24 hours the plates should be removed by means of light taps of a mallet or with a similar instrument.
B) Capping with sulphuric mortar

One should avoid the use of sulphuric mortar in capping of load-bearing surfaces of test specimens taken from concrete with a compressive strength higher than about 30 MPa.

The capping should be performed at least two hours prior to the test.

The sulphuric mortar shall consist of 55 - 70 per cent of evaporable material and 35 - 45 per cent of non-evaporable. The compressive strength should be determined from a cube with 50 mm long sides and the compressive strength shall reach about 35 MPa after two hours.

The sulphuric mortar should be handled with observance of the safety instructions with regard to ventilation, fire and protection against moisture. No part of the sulphuric mortar may be used more than five times.

The sulphuric mortar should be heated to 135°C. The levelling plate should be slightly heated prior to use so that the hardening of the sulphur is delayed in order to manufacture the levelling layer.

Load-bearing surfaces of water cured test specimens should be so dry that no pockets of water-steam with a larger size than about 6 mm are created either under the capping layer or in it.

The levelling-plate should be oiled and the sulphur poured onto the plate. The test specimen should then be pressed against the plate and kept there until the layer of sulphur mortar has hardened. At that time the test specimen should be removed from the plate. The plate should then be cleaned and the whole procedure should be repeated with the other load-bearing surface.