CONCRETE: MAKING AND CURING OF MOULDED TEST SPECIMENS FOR STRENGTH TESTS

1. SCOPE AND FIELD OF APPLICATION

This NORDTEST method is intended for the making and curing of cast test specimens made from concrete containing naturally existing rock-type material, which are intended for strength tests.

The method presupposes that the maximum nominal particle size in the concrete is at the most 1/3 of the smallest measure of the intended test specimen and that the consistency of the fresh concrete is more fluid than 20 Vebe acc. to NT BUILD 193.

In the main, the method agrees with ISO/DIS 2736/2.3. With regard to deviations see Comments.

2. REFERENCES

NT BUILD 191 CONCRETE, FRESH: SAMPLING
NT BUILD 193 CONCRETE, FRESH: CONSISTENCY - VEBE TEST
NT BUILD 200 CONCRETE, HARDENED: DIMENSIONS OF TEST SPECIMENS
NT BUILD 205 CONCRETE, HARDENED: MODULUS OF ELASTICITY IN COMPRESSION
ISO/DIS 2736/2.3 Concrete tests- Making of test specimens - Part 2:
Making and curing of test specimens for strength tests
3. SAMPLING

If nothing otherwise is indicated in the test report, the concrete shall be sampled as indicated in NT BUILD 191.

4. METHOD OF TEST

4.1 Apparatus

Moulds so constructed that test specimens fulfilling the demands stated in NT BUILD 200 can be made in them. The moulds should be water tight, concrete-resistant and made from a non-absorbent material.

Filling hopper (optional) which closely fits the top edges of the moulds may be used to facilitate the filling of the moulds.

Compaction equipment consisting of

- vibrating table (see Note 1), e.g., the vibrating table used in connection with a Vebe consistency meter, acc. to NT BUILD 193 or
- internal vibrator (see Note 2), with a diameter that is, at the most, 1/4 of the smallest measure of the test specimen or
- tamping rod with a length of 600 mm and a diameter of 16 mm having rounded ends

Water container, water-tight, thermostatically controlled for 20 ± 2°C for the curing of the test specimens under water

Temperature gauge if the temperature shall be determined.

4.2 Procedure

4.2.1 Making of test specimens - general information

The inside of the moulds should be oiled with a thin layer of mould oil or any other non-reactive medium in order to prevent

Note 1 The frequency of about 50 Hz and about 0.5 mm vertical amplitude without loading is recommended.

Note 2 The frequency 150 - 250 Hz is recommended.
any sticking of the concrete to the moulds. Moulds with a high heat capacity, e.g. steel moulds, should have about the same temperature as the concrete.

Cubical test specimens may be made in moulds intended for several specimens provided that all test specimens in the moulds are made at the same time.

If a filling hopper is used, enough concrete should be used to provide for a layer of fresh concrete with the height of 10 - 20 % of the height of the test specimen to be left in the hopper when the concrete is being compacted.

There should be at least two layers of concrete in the moulds. The thickness of any layer must not exceed the height of the test specimen, or 200 mm. The compacting of each layer should be made in such a way that the concrete obtains the intended degree of compaction.

4.2.2 Compaction through vibration

Compaction with a vibration table. The form should be attached to, or firmly pressed against the vibration table. Vibration of each layer shall continue for so long a time that a thin layer of cement mortar covers all larger particles of aggregate and that larger airbubbles are no longer released from the surface of the concrete. Over-vibration should be avoided.

Compaction with internal vibrator. The internal vibrator should be inserted vertically and rather quickly into the concrete until a depth of 20 mm above the bottom of the moulds has been reached. It should be kept in this position until a thin layer of cement mortar covers all larger particles of aggregate, or when larger airbubbles are no longer released from the surface of the concrete. The internal vibrator is then slowly withdrawn so that no cavities are formed. If several layers are vibrated, the internal vibrator must not be permitted to penetrate more than 20 mm into the lower layer.
4.2.3 Compacting by hand

Each layer should be compacted by at least 25 strokes with the tamping rod. The tamping rod must penetrate through the whole layer that lies below the one that is being compacted.

4.2.4 Common continuation

After the compacting has been completed, the filling hopper is removed. The concrete above the top surface of the mould is removed and is levelled, e.g., by means of a sawing and rolling motion of the tamping rod.

At the latest, half an hour after the compacting of the cylindrical test specimens, the lid is put on. They are cured and transported in a horizontal position until the concrete has hardened unless other instructions are given in the test method, see for instance, NT BUILD 205.

4.2.5 Marking

The test-specimens should be permanently marked after manufacture, or after demoulding, so that the identity is known from the beginning of preparation of the specimens to the actual testing of the specimens.

4.2.6 Storing

Test specimens for the control of concrete manufacture should be stored, while being protected against drying out, in an ambient temperature of 20 ± 4 °C for at least the first 16 hours. During this time they should be kept in their moulds.

At the latest 72 hours after the casting, the test specimens are demoulded and should then be stored under water at a temperature of 20 ± 2 °C until they are to be tested, (see Note 3).

Note 3 In Sweden one deviates from this point acc. to SS 13 72 10 and -53.
4.2.7 Transport

The transport of moulds containing fresh concrete from the place of manufacture to the storing place should be made with care so that the concrete is not damaged.

The transport from the storing place to the testing laboratory should take place, at the latest, 48 hours prior to the testing, to provide for any test preparation acc. to NT BUILD 200.

During the transport, the test specimens should be so packed that they are protected against drying, frost and strong heat and against any mechanical damage. Immediately after the arrival to the testing laboratory, the test specimens should be stored acc. to 4.2.6.

4.3 Test Report

If a test report is submitted, it should contain at least the following information:

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 and address of the manufacturer of the concrete
h) The identification symbols of the concrete. If a reference test has been performed, the composition and temperature of the concrete should also be noted
i) Date and the hour when the test was performed
j) The composition of the concrete if possible
k) Any other information of importance for the evaluation of the test results
l) Evaluation of the test results, if this is required in the request for the test
Comments

The method deviates from ISO/DIS 2736/2.3 with regard to the editing and the content of the test report and on the following points:

Point 4.1 ISO does not recommend frequencies and amplitudes for the vibration equipment.

Point 4.2.3 ISO states that each layer should be compacted at least one time for each 1000 mm$^2$ of area.

Point 4.2.6 ISO permits storage in a room with at least 90% R.H.

Point ISO states that test specimens for the checking of the development of strength in a concrete object should be stored at temperature and R.H. conditions as close as possible to those that are valid for the concrete object.

Point 4.2.7 ISO does not state any detailed rules for the transport.