CONCRETE, HARDENED:
TENSILE STRENGTH OF TEST SPECIMENS

1. SCOPE AND FIELD OF APPLICATION

This NORDTEST method is intended for the determination of the
tensile strength of cast or core drilled test specimens of
hardened concrete made with normally existing rock-type aggregate,
see Comments.

The tensile strength of hardened concrete determined according to
this method refers to the medium tensile load of a cylindric test
specimen, when the load is determined acc. to 4.4.

The method does not indicate the number of test specimens or their
age at the time of testing.

2. REFERENCES

NT BUILD 191 CONCRETE, FRESH: SAMPLING
NT BUILD 200 CONCRETE, HARDENED: DIMENSIONS OF TEST SPECIMENS
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
NT MECH 001 TESTING MACHINES: CALIBRATION
3. SAMPLING

See NT BUILD 191 or NT BUILD 202.

Cast test specimens should be made and cured acc. to NT BUILD 201. The measure of the smallest cross section shall be four times larger than the nominal maximum particle size in the concrete and \( h \) should equal \( 2 \ d \) acc. to NT BUILD 201.

Core drilled test specimens shall prior to the test preparation acc. to 4.3 have a length that is greater than twice the diameter of the specimen. After having been sampled, they shall be kept in water up to the time of testing.

4. METHOD OF TEST

4.1 Principle

The tensile strength of the test specimen is determined by pulling the specimen until the ultimate tensile strength is reached in a tensile strength testing machine.

4.2 Apparatus

Tensile strength testing machine of class 3 or better acc. to NT MECH 001 which, within the expected area for the tensile load, permits determination of the load with an accuracy within ± 3 \% and an adjustment of the load increase within the area of 0 - 0.05 MPa/s.

Moulds for the manufacture of cylindrical test specimen acc. to NT BUILD 201 or equipment for the core drilling acc. to NT BUILD 202.

Steel platens (two for each test specimen) acc. to Fig. 1. The surface that is to be glued shall be so flat that the deviation acc. to NT BUILD 200 lies within ± 0.05 mm. The other surface shall be equipped with a device permitting a centric tensile strength device to be fastened perpendicularly to the surface of the plate. See ex. in the Fig. 1.
Glue that fastens steel to concrete.

The steel platens and the glue may be replaced with other types of equipment with the condition that the excentricity does not increase on account of this change.

4.3 Preparation of Test Samples

The test specimens are sawn in both ends so that their lengths after the sawing and the subsequent grinding are at least $2 \times \sqrt{A}$, where $A$ is the area of the cross section.

During the preparation the test specimens should be protected against drying, water stored test specimens should be protected with wet towels - or with similar arrangements.

The end surfaces are ground so that the demands for flatness acc. to NT BUILD 200 are fullfilled.

Prior to the glueing of the steel platens against the end surfaces, the test specimens should be dried in air for as long time as is required for the concrete to become light in colour.

The glueing should be made according to the instructions by the glue manufacturer. While the glue is setting, the cylinder jackets should be protected against drying. After the glue has set, the test specimens should be stored in water until the time of testing.

4.4 Procedure

The following should be performed for each test specimen:

- The cross area of each test specimen is determined by measuring it acc. to NT BUILD 200.

- The test specimen is placed in a centric position in the tensile strength testing machine with an accuracy within $\pm 1$ mm.

- The tensile load is continuously increased at the rate of 0.05 MPa/s. The greatest tensile strength is noted as the
ultimate tensile strength. Tests where a break occurs in the glued joint are discarded.

- The tensile strength is calculated as the tensile load divided by the cross section area.

4.5 **Expression of Results**

The tensile strength is expressed in MPa (N/mm²) with two decimal figures, the last figure should be rounded off to 0 or 5.

4.6 **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, composition and age, if possible
i) Date and the hour when the test was performed
j) Test results
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 is based on RILEM CPC 7 Direct tension.
Fig. 1. An example on an attachment to a steel platen with small eccentricity. The diameter of the test specimen = d.