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# Testing of concrete —

# Part 6:
# Sampling, preparing and testing of concrete cores

(Revision of ISO/DIS 7034)

*Essais du béton —*

*Partie 6: Échantillonnage, préparation et essais sur des carottes de béton*



ICS 91.100.30



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## Contents

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

# Testing of concrete —

# Part 6:
Sampling, preparing and testing of concrete cores

## 1 Scope

This Standard specifies a method for taking cores from hardened concrete, their examination, preparation for testing and determination of compressive strength.

The Standard does not give guidance on the decision to drill cores or on the locations for drilling.

This Standard does not provide procedures for interpreting the core strength results.

NOTE It is recommended that before coring, full agreement should be reached by all parties on the need for core testing and how the results should be interpreted.

## 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 4: Strength of hardened concrete.*



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

EN 12390-4: 2000 *Testing hardened Concrete—Part 4: Compressive strength - Specification for testing machines*



## 3 Definitions

For the purpose of this International Standard the following definition applies:

**3.1**
**core strength:**
the compressive strength of the cored specimen, as determined by the test defined in this Standard

## 4 Apparatus

The apparatus shall be as follows :

### 4.1 Core drill

Equipment capable of extracting cores from the hardened concrete to the dimensions set out in Clause 5.3 to the tolerances set out in Clause 7.

### 4.2 Compression testing machine

Compressioon testing equipment complying with EN 12390–Part 4 and related to the size of specimens and their expected failure load.

### 4.3 Balance or scale

A balannce or scale capable of determining the mass of the core, as tested, to an accuracy of 0.1% of the mass.

### 4.4 Callipers and / or rules

Calipers and capable of measuring the dimensions of the core and the steel reinforcement to a tolerance of ± 1%

### 4.5 Gauge

A gauge capable of establishing that the relevant flatness of the specimen is within the requirements of Clause 7.

### 4.6 Squares and gauges (or other means)

Squares and gauges capable of establishing that the perpendicularity and parallelism of specimens and moulds are within the requirements of Clause 7.

### 4.7 Calibration of the apparatus

All apparatus shall be in calibration at the time of the test.

## 5 Taking of cores

### 5.1 Location

Possible structural implications resulting from taking a core should be considered prior to drilling. Cores should preferably be taken at points not near to joints or edges of the concrete element and where there is little or no reinforcement.



### 5.2 Drilling

Unless specified otherwise, the cores shall be drilled perpendicular to the surface in such a manner as not to damage the cores. The drill shall be kept rigidly positioned during coring.



### 5.3 Diameter of cores

The ratio of diameter to the maximum aggregate size should generally be greater than 3. The core diameter should generally be 100 mm ± 10 mm or 125 mm ± 10mm or 150 mm ± 10mm, with the preferred diameter being 100 mm. Other smaller diameters, which will make drilling easier and reduce the damage to the element, may be used, provided the effect this has on the accuracy of the result is taken into account.

NOTE Concrete compression testing machines complying with EN 12390–Part 4 may need adaptation to test cores smaller than 90 mm diameter in compression.

### 5.4 Length of cores

The length of cores taken shall take into account:

a. the diameter of the core

b. the possible method of adjustment

c. whether comparison is to be made with cube strength or cylinder strength.

Immediately after drilling, each core shall be clearly and indelibly marked. Its location and orientation within the element from which it has been drilled shall be recorded. If a core is subsequently cut to produce a number of specimens, each specimen shall be marked to indicate its position and orientation within the original core.

### 5.6 Reinforcement

Drilling through reinforcement should be avoided wherever possible. Cores shall not contain more reinforcing bar

## 6 Examination

### 6.1 Visual inspection

Visual examination of the cored specimen shall be carried out to identify abnormalities.

### 6.2 Measurements

The measurements shall be as follows :

a) *Core diameter*: the average diameter $d_m$ shall be determined to within ±1% from pairs of measurements taken at right angles, at the half and quarter points of the length of the core. Each measurement shall be recorded.

b) *Core length*: the maximum and minimum lengths as received and the length after completion of the end preparation in accordance with Clause 7 shall be determined to ±1%. Each measurement shall be recorded.

c) *Mass*: each specimen should be weighed as received and/or saturated. The mass shall be recorded to the nearest 0.1% of the mass of the specimen.

d) *Density*: the density of each specimen should be determined as received and/or saturated in accordance with



e) *Reinforcement*: the position and size of any reinforcement shall be determined and recorded by measurement from the centre of the exposed bar to the top and/or axis of the core both as received and after end preparation.



## 7 Preparation of cores

The ends of cores for compression tests shall be prepared in accordance with Annex B of ISO 1920 part 4.

The preferred method of preparing the ends of cores is by grinding.

The preferred length diameter/ratios are:

a) If the strength result is to be compared to cylinder strength, 2.0 ± 5%

b) If the strength result is to be compared to cube strength, 1.0 ± 5%

NOTE In the case of using a specimen with a ratio of length to diameter smaller than 2.0, it is permissible to convert, by an appropriate method, the test value of the compressive strength to a value with a ratio of length to diameter of 2.0.

*Tolerances*: the tolerances of the prepared specimen shall be:

a) *Flatness*: the flatness tolerance for the prepared end surfaces shall be $0.0003d_m$.

datum shall be 0.5 mm.

c) *Parallelism*: the parallelism tolerance for the prepared top surface with respect to the bottom surface of the specimen as datum shall be 1.0 mm.

d) *Straightness*: the straightness tolerance of the generatrix for the core shall be 3% of the average core diameter.

NOTE If other smaller diameter cores are tested (See Clause 5.3) then the tolerances above should be considered with regard to their adequacy and narrowed if necessary: for example, reduced in proportion to the actual specimen diameter of 100 mm.

## 8 Compression test

### 8.1 Storage

The storage condition(s) of the core shall be noted.

If it is required to test saturated specimens, before testing the specimen shall be soaked in water at 20°C ± 2°C for at least 40 h.

Specimens to be tested air-dry shall be stored in laboratory air conditions for at least 40 hours prior to testing.

### 8.2 Testing

Testing shall be carried out in accordance with ISO 1920 part 4 using a calibrated compression testing machine complying with the Standard. (See the Note to Clause 5.3.)

Cores with cracked, hollow, or loose caps shall not be tested.

Any loose sand or other material on the surface of the specimen shall be removed.

If the specimen is to be tested whilst it is still wet, any surface water shall be removed.

The surface moisture condition (wet/dry) of the core at the time of test shall be noted.



## 9 Test results

The compressive strength of each core shall be determined by dividing the maximum load by the cross-sectional area, calculated from the average diameter and the results expressed to the nearest 0.5 MPa.

## 10 Test report

The report shall include:

a) description and unambiguous identification of the test specimen.

b) date and time of receipt.

c) characterization of test specimen (if supplied): cement content and water/cement ratio, maximal nominal size of aggregate, type of admixture,date of casting, date of coring.

d) condition of test specimen on receipt: average diameter (mm), maximum length (mm), minimum length (mm), mass in air (g) (if appropriate), mass in water (g) (if appropriate), density (kg/m$^3$) (if appropriate).

e) visual inspection noting any abnormalities identified

f) reinforcement (when appropriate) : size(s) (mm), position(s),

g) method used in preparation of specimen : cutting/grinding/capping.

h) dimensions of prepared specimen : average length (mm), average diameter (mm), length/diameter ratio.

i) Storage : on receipt, prior to end preparation, after end preparation.

j) surface moisture condition at time of test

k) date of performance of test

l) Test result : maximum load (N or kN), average area ($mm^2$), core compressive strength (MPa)

m) any deviations from the standard method of examination or compression testing.

n) a declaration by the person responsible for the examination and testing that these were done in accordance with ISO 1920 part 6 except as detailed in Clause 10.m.