

# Testing fresh concrete —

## Part 5: Flow table test

The European Standard EN 12350-5:1999 has the status of a  
British Standard

ICS 91.100.30

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## National foreword

This British Standard is the English language version of EN 12350-5:1999. It will supersede BS 1881-105:1984 which will be withdrawn in 2003 when the full package of concrete standards is available.

The UK participation in its preparation was entrusted by Technical Committee B/517, Concrete, to Subcommittee B/517/1, Concrete production and testing, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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### Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 5 and a back cover.

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English version

## Testing fresh concrete — Part 5: Flow table test

Essai pour béton frais —  
Partie 5: Essai d'étalement à la table à chocs

Prüfung von Frischbeton —  
Teil 5: Ausbreitmaß

This European Standard was approved by CEN on 5 September 1999.

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**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

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Ref. No. EN 12350-5:1999 E

**Foreword**

This European Standard has been prepared by Technical Committee CEN/TC 104, Concrete performance, production, placing and compliance criteria), the Secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2000, and conflicting national standards shall be withdrawn at the latest by December 2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This standard is one of a series concerned with testing fresh concrete.

It is based on the proposed draft International standard ISO DP 9812: *Fresh concrete — Determination of the consistency — Flow test*.

A draft for this standard was published in 1996 for CEN enquiry as prEN 12358. It was one of a series of individually numbered test methods for fresh or hardened concrete. For convenience it has now been decided to combine these separate draft standards into three new standards with separate parts for each methods, as follows:

- *Testing fresh concrete* (EN 12350:1999);
- *Testing hardened concrete* (prEN 12390:1999);
- *Testing concrete in structures* (prEN 12504:1999).

This series EN 12350 includes the following parts where the brackets give the numbers under which particular test methods were published for CEN enquiry:

- EN 12350: *Testing fresh concrete*
- Part 1: *Sampling* (former prEN 12378:1996).
- Part 2: *Slump test* (former prEN 12382:1996).
- Part 3: *Vebe test* (former prEN 12350:1996).
- Part 4: *Degree of compactability* (former prEN 12357:1996).
- Part 5: *Flow table test* (former prEN 12358:1996).
- Part 6: *Density* (former prEN 12383:1996).
- Part 7: *Air content — Pressure methods* (former prEN 12395:1996).

**CAUTION.** When cement is mixed with water, alkali is released. Take precautions to avoid dry cement entering the eyes, mouth and nose whilst mixing concrete. Prevent skin contact with wet cement or concrete by wearing suitable protective clothing. If cement or concrete enters the eye, immediately wash it out thoroughly with clean water and seek medical treatment without delay. Wash wet concrete off the skin immediately.

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## 1 Scope

This European standard specifies a method for determining the flow of fresh concrete. It is not applicable to foamed concrete or no-fines concrete, nor to concrete with maximum aggregate size exceeding 63 mm.

**NOTE** The flow test is sensitive to changes in the consistency of concrete which correspond to flow values between 340 mm and 600 mm. Beyond these extremes the flow table test may be unsuitable and other methods of determining the consistency should be considered.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 12350-1:1999, *Testing fresh concrete — Part 1: Sampling*.

## 3 Principle

This test determines the consistency of fresh concrete by measuring the spread of concrete on a flat plate which is subjected to jolting.

## 4 Apparatus

**4.1 Flow Table** (see Figure 1) consisting of: a moving table made from a flat plate with a plane area of  $(700 \pm 2) \text{ mm} \times (700 \pm 2) \text{ mm}$ , on which concrete can be placed, hinged to a rigid base onto which it can fall from a fixed height.

The flow table top shall have a flat metal surface with a minimum thickness of 2 mm. The metal surface shall not be readily attacked by cement paste or be liable to rusting. The flow table top shall have a mass of  $(16 \pm 0,5) \text{ kg}$  and may be attached using a pin-hinge to allow weighing. The construction of the plate shall be such as to prevent distortion of the upper surface. The table top shall be hinged to the base in such a way that no aggregate can become trapped between the hinged surfaces.

The centre of the table shall be scribed with a cross, the lines of which run parallel to the edges of the plate and with a central circle  $(210 \pm 1) \text{ mm}$  in diameter.

At the front corners of the plate two hard rigid blocks shall be firmly attached to the underside. They should not deform when wet and be non-absorbent. These stops shall transfer the load of the table top to the base without distorting the table. The base frame shall be constructed so that this load is transferred directly to the surface on which the apparatus is placed. This minimizes the tendency for the table top to bounce when allowed to fall freely.

Foot rests shall be provided to assist in stabilizing the table in use.

The fall height of the table top measured at the centre line of the front edge of the top plate shall be limited to  $(40 \pm 1) \text{ mm}$  by means of one or more stops.

For lifting the table top, a handle or lifting mechanism shall be provided to ensure that the top is lifted without jerking and allowed to fall freely over the entire lifting height.

**4.2 Mould**, to form the test specimen, made of metal not readily attacked by cement paste and not thinner than 1,5 mm. The interior of the mould shall be smooth and free from projections, such as protruding rivets and shall be free from dents. The mould shall be in the form of a hollow frustum of a cone having the following internal dimensions:

- diameter of base:  $(200 \pm 2) \text{ mm}$ ;
- diameter of top:  $(130 \pm 2) \text{ mm}$ ;
- height:  $(200 \pm 2) \text{ mm}$ .

The base and the top shall be open and parallel to each other and at right angles to the axis of the cone. The mould shall be provided with two handles, on the upper portion, and fixing clamps or foot pieces on the bottom portion to hold it steady. A mould which can be clamped to the base is acceptable provided the clamping arrangement can be fully released without movement of the mould or interference with the slumping concrete.

**NOTE** Magnets can be used to assist in positioning the mould.

**4.3 Compacting bar**, made of hard material, having a square section of side  $(40 \pm 1) \text{ mm}$  and a length of approximately 200 mm. A further 120 mm to 150 mm may be turned to a circular section to form a handle to the bar (see Figure 3).

**4.4 Rule**, of minimum length 700 mm and having 5 mm sub-divisions along its entire length.

**4.5 Remixing container**, flat tray of rigid construction and made from a non-absorbent material not readily attacked by cement paste. It shall be of appropriate dimensions such that the concrete can be thoroughly re-mixed, using the square-mouthed shovel.

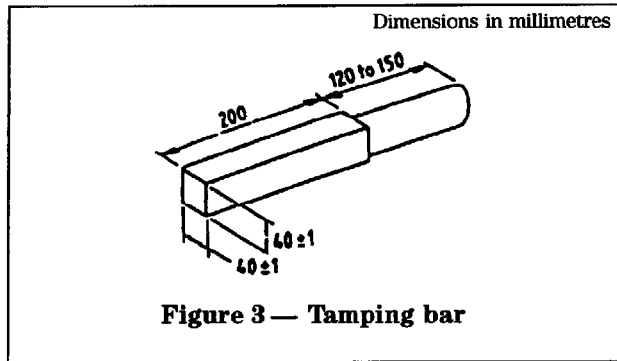
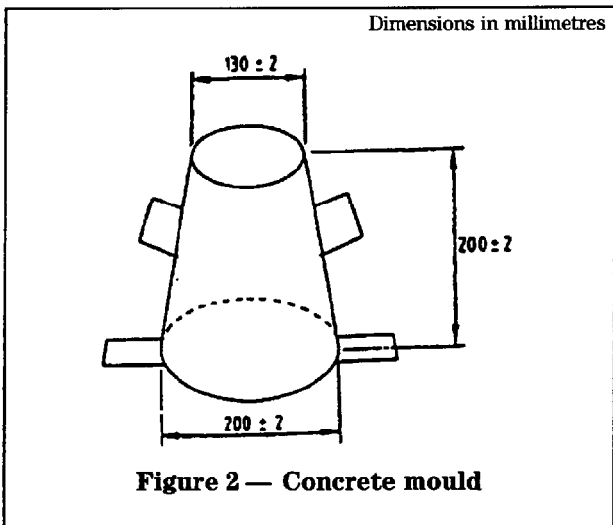
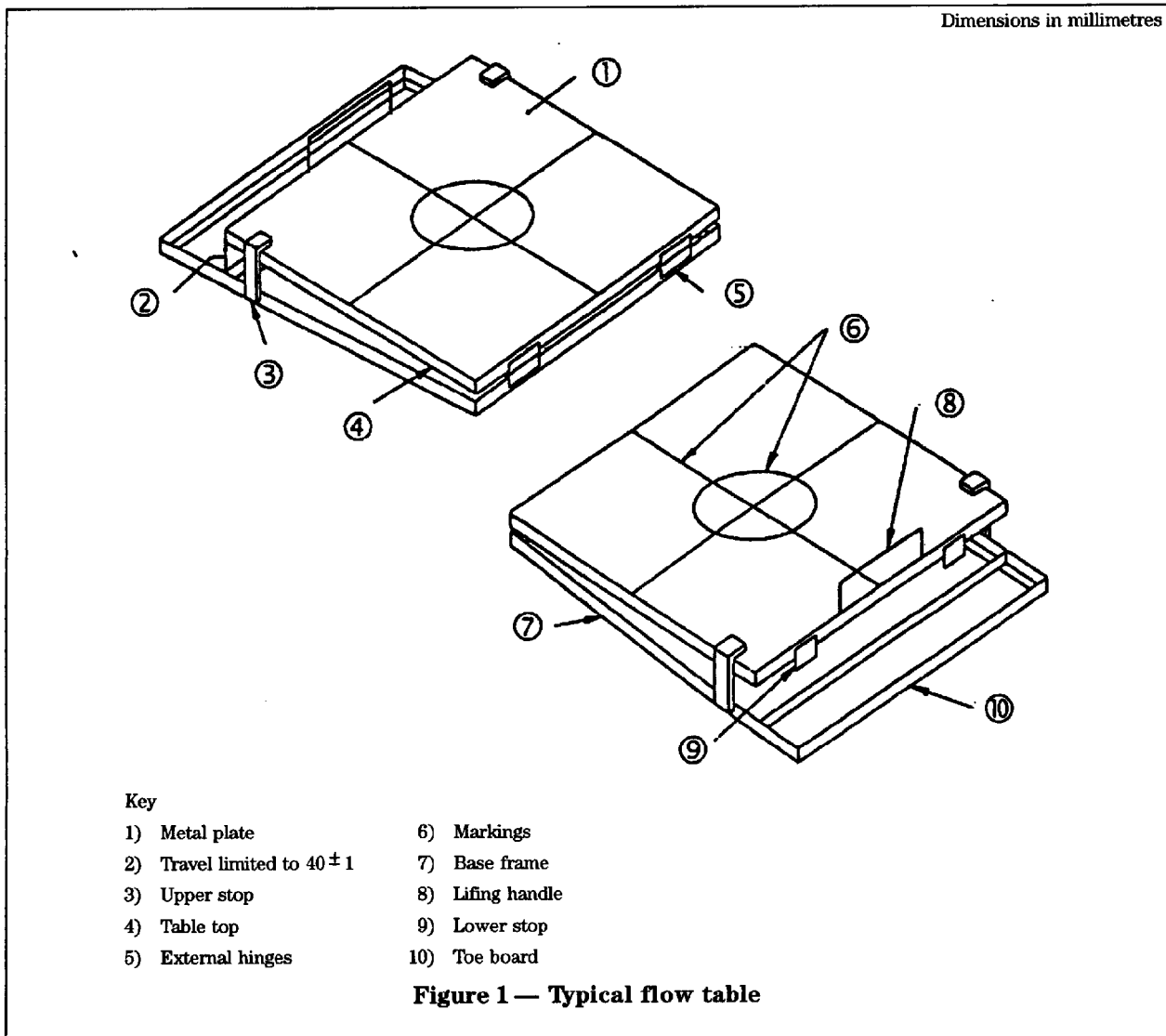
**4.6 Shovel**, with square mouth.

**NOTE** The square mouth is required to ensure proper mixing of concrete on the remixing container.

**4.7 Moist cloth**.

**4.8 Scoop**, approximately 100 mm in width.

**4.9 Timer or watch**, capable of measuring time to 1 s.



**5 Sampling**

The sample of the concrete shall be obtained in accordance with EN 12350-1:1999.

The sample shall be re-mixed before carrying out the test using the remixing container and the square mouthed shovel.

**6 Procedure**

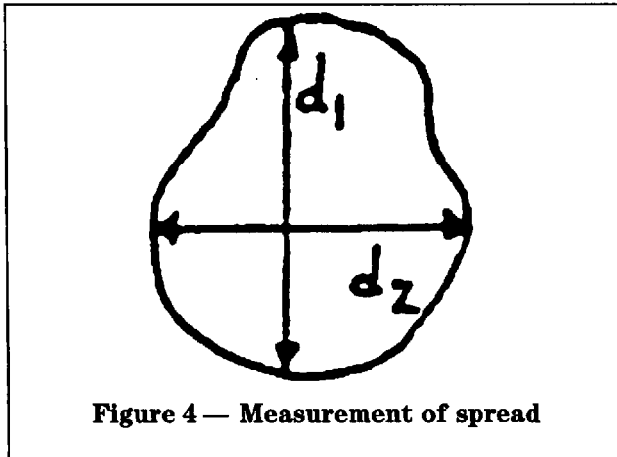
Place the flow table on a flat and horizontal surface free from external vibration or shock. Ensure that the hinged top of the table can be lifted to the correct limit of its travel and is then free to fall to the lower stop. Support the table in such a way that when the top of the table falls to the lower stop, there is minimal tendency for the top to bounce.

Clean the table and the mould and dampen immediately prior to testing, but keep free from superfluous moisture.

Keep the contact blocks clean. Place the mould centrally on the table top and hold in position by standing on the two foot pieces, or by using magnets.

Fill the mould with concrete in two equal layers using the scoop, levelling each layer by tamping lightly ten times with the tamping bar. If necessary add more concrete to the second layer to maintain an excess above the top of the mould. Using the tamping bar, strike off the concrete level with the upper edge of the mould and clean the area of the table top of any excess concrete.

After waiting 30 s from striking off the concrete, raise the mould vertically by the handles, over a period of 3 s to 6 s. Stabilize the flow table by standing on the toe board at the front of the table and slowly raise the table top till it reaches the upper stop in such a manner that the table top does not impact hard against the upper stop. Allow the table top to fall freely to the lower stop. Repeat this cycle to give a total of 15 drops, each cycle taking not less than 2 s nor more than 5 s. With the rule, measure the maximum dimension of the concrete spread in the two directions,  $d_1$  and  $d_2$ , (see Figure 4), parallel to the table edges and record the two measurements to the nearest 10 mm.



**Figure 4 — Measurement of spread**

Check the concrete spread for segregation. The cement paste may segregate from the coarse aggregate to give a ring of paste extending several millimetres beyond the coarse aggregate. Report that segregation has occurred and that the test was therefore unsatisfactory.

NOTE The consistency of a concrete mix changes with time, due to hydration of the cement and, possibly, loss of moisture. Tests on different samples should be carried out at a constant time interval after mixing, if strictly comparable results are to be obtained.

**7 Test results**

Determine the flow value  $(d_1 + d_2)/2$  and record the value to the nearest 10 mm.

**8 Test report**

The report shall include:

- a) identification of the test sample;
- b) location of performance of test;
- c) date of performance of the test;
- d) any indication of segregation of the concrete;
- e) the test result;
- f) any deviation from standard test method;
- g) a declaration by the person carrying out the test that it was carried out in accordance with this standard, except as noted in item f).

The report may include:

- h) the temperature of the concrete specimen at time of test;
- i) the time of performance of the test.

**9 Precision**

Precision data are given in Table 1. These apply to flow measurements made on concrete taken from the same sample and when each test result is obtained from a single flow determination.

**Table 1 — Precision data for flow measurement**

Level mm	Repeatability conditions		Reproducibility conditions	
	$S_r$ mm	$r$ mm	$S_R$ mm	$R$ mm
555	24,6	69	32,5	91

NOTE 1 The precision data were determined as part of an experiment carried out in the UK, in 1987 in which precision data were obtained for several tests then described in BS 1881. The experiment involved 16 operators. The concretes were made using an ordinary Portland cement, Thames Valley sand, and Thames Valley 10 mm and 20 mm coarse aggregates.

NOTE 2 The difference between two test results from the same sample by one operator using the same apparatus within the shortest feasible time interval will exceed the repeatability value  $r$  on average not more than once in 20 cases in the normal and correct operation of the method.

NOTE 3 Test results on the same sample obtained within the shortest feasible time interval by two operators each using their own apparatus will differ by the reproducibility value  $R$  on average not more than once in 20 cases in the normal and correct operation of the method.

NOTE 4 For further information on precision, and for definitions of the statistical terms used in connection with precision, see ISO 5725.

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