Construction Standard
Testing Concrete

Volume 2

Amendment sheet no. 1206: June 2005

The following amendment is added to CS 1:1990, Volume 2:

Section 22

DETERMINATION OF FLOW

22.1 SCOPE

This section describes the method of determining the flow of fresh concrete, made with aggregate having a maximum size not exceeding 63 mm. It is not applicable to foamed concrete or no-fines concrete.

This flow table test determines the consistency of fresh concrete by measuring the spread of concrete on a flat plate which is subjected to jolting. This test is suitable for concrete mix corresponding to flow values between 340mm and 600mm. Other methods of determining the consistency should be considered if the flow values are beyond these extremes.

22.2 APPARATUS

The following apparatus is required:

(a) Flow table	(see Cl. E1, Figure 18)
(b) Mould	(see Cl. E2, Figure 19)
(c) Compacting or tamping bar	(see Cl. E3, Figure 20)
(d) Rule	(see Cl. E4)

(e) Remixing container (see Cl. E5)
(f) Square-mouthed shovel
(g) Moist cloth
(h) Scoop (see Cl. C4 in APPENDIX C, CS 1 : 1990)
(i) Stop-watch or stop-clock (see Cl. E6)

Further details of the apparatus are given in Appendix C and E respectively.

22.3 PROCEDURE

The flow table shall be placed 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 fails 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 21), parallel to the table edges and record the two measurements to the nearest 10 mm.

Check the concrete spread for segregation. The cement paste may segregate from the coarse aggregate to give a ring of paste extending several millimeters 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. The flow table and metal mould should also be kept/stored in a sheltered area.*

22.4 EXPRESSION OF RESULTS

The flow value, $(d_1+d_2)/2$, shall be recorded to the nearest 10 mm, see Figure 21.

22.5 REPORT

The report shall affirm that the test was made in accordance with this Standard and shall include the followings:

(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 also include the followings:

(h) The temperature of the concrete specimen at time of test.
(i) The time of performance of the test.

APPENDIX E - FLOW TABLE

E1 Flow Table

The flow table consisting of a moving table made from a flat plate with plane area of (700±2) mm × (700±2) 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±0.5) 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±1) 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±1) 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.

E2 Mould

The mould shall be 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±2) mm;
- diameter of top: (130±2) mm;
- height: (200±2) 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.

E3 Compacting bar

The compacting bar shall be made of hard material, having a square section of side (40±1) 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.

E4 Rule

The rule shall be graduated from 0 mm to 700 mm at 5 mm maximum intervals, the zero point being at one end of the rule.

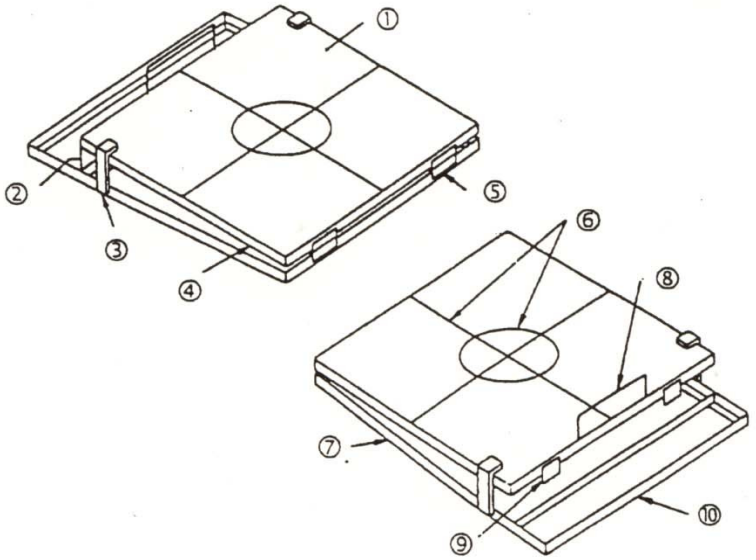
E5 Remixing container

The remixing container shall be a 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.

E6 Stop-watch or stop-clock

The stop-watch or stop-clock shall be accurate to 1 second.

Dimensions in millimetres



Key

1) Metal plate
2) Travel limited to 40 ± 1
3) Upper stop
4) Table top
5) External hinges
6) Markings
7) Base frame
8) Lifing handle
9) Lower stop
10) Toe board

Figure 18 — **Typical flow table**

Dimensions in millimetres

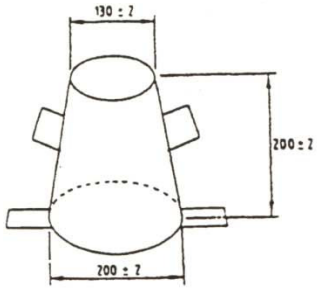


Figure 19 — **Concrete mould**

Dimensions in millimetres

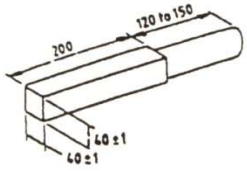


Figure 20 — **Tamping bar**

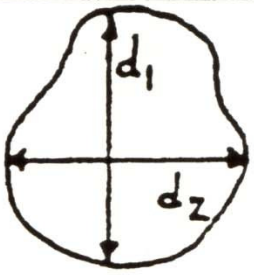


Figure 21 — **Measurement of spread**