BRITISH STANDARD

BS 1881-104: 1983

Incorporating Amendment Nos. 1 and 2

Testing concrete —

Part 104: Method for determination of Vebe time

UDC 666.972.017:691.32:620.1

Committees responsible for this British Standard

This British Standard was published under the direction of the Cement, Gypsum, Aggregates and Quarry Products Standards Committee CAB/-. Its preparation was entrusted to Technical Committee CAB/4 upon which the following bodies were represented:

British Aggregate Construction Materials Industries
British Precast Concrete Federation Ltd.
British Ready Mixed Concrete Association
Cement Admixtures Association
Cement and Concrete Association
Cement Makers' Federation
Concrete Society Limited
County Surveyor's Society
Department of the Environment (PSA)
Department of the Environment (Building Research Establishment)
Department of the Environment (Transport and Road Research Laboratory)
Department of Transport
Electricity Supply Industry in England and Wales
Federation of Civil Engineering Contractors
Greater London Council
Institute of Concrete Technology
Institution of Civil Engineers
Institution of Highway Engineers
Institution of Municipal Engineers
Institution of Structural Engineers
Institution of Water Engineers and Scientists
National Federation of Building Trades Employers
Royal Institute of British Architects
Royal Institution of Chartered Surveyors
Sand and Gravel Association Limited
Society of Chemical Industry

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

British Civil Engineering Test Equipment Manufacturers' Association
Coopted members

This British Standard, having been prepared under the direction of the Cement, Gypsum, Aggregates and Quarry Products Standards Committee, was published under the authority of the Board of BSI and comes into effect on
31 May 1983

ISBN 0 580 11924 6

Amendments issued since publication

Amd. No.	Date of issue	Comments
6088	July 1989	
6725	July 1991	Indicated by a sideline in the margin

Contents

Foreword

This Part of this British Standard, prepared under the direction of the Cement, Gypsum, Aggregates and Quarry Products Standards Committee, is a revision of clause **4** of BS 1881-2:1970. Minor modifications have been made to the method for determination of Vebe time.

Testing in accordance with this Part of this standard will comply with ISO 4110. Together with Parts 102, 103, 106 and 107, this Part of BS 1881 supersedes BS 1881-2:1970, which is withdrawn.

Four methods of determining the workability of concrete are given in BS 1881, these being the slump, compacting factor, Vebe and flow. The methods are appropriate to concrete mixes of different workability as follows:

Workability	Method
Very low	Vebe time
Low	Vebe time, compacting factor
Medium	Compacting factor, slump
High	Compacting factor, slump, flow
Very high	Flow

There are no unique relationships between the values yielded by the four tests. Relationships depend upon such factors as the shape of the aggregate, the sand fraction and the presence of entrained air. This test is not suitable for concrete having a measured Vebe time of less than 3 s nor more than 30 s.

No estimate of repeatability or reproducibility is given in this Part of this British Standard. Reference should be made to BS 5497-1 for further information on the determination of repeatability and reproducibility.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 4, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of this British Standard describes a method for determination of Vebe time of concrete of very low to low workability. The method applies to plain and air-entrained concrete made with lightweight, normal weight or heavy aggregates having a nominal maximum size of 40 mm or less but not to aerated concrete, no-fines concrete and concrete which cannot be compacted by vibration alone.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard the definitions given in BS 5328 and BS 1881-101 apply.

3 Apparatus

3.1 *Consistometer.* Consistometer comprising a container, a mould, a transparent disc and a vibrating table; the consistometer and its essential dimensions are shown in Figure 1.

The container (A) shall be made of metal not readily attacked by cement paste. It shall be of cylindrical shape, the thickness of the wall being 3 mm and of the base being 7.5 mm. The container shall have an internal diameter of 240 ± 5 mm and a height of 200 mm and shall be watertight and of sufficient rigidity to retain its shape under rough usage. It shall be fitted with handles and with brackets, the latter enabling it to be clamped to the top of the vibrating table (G) by wing nuts (H).

The mould (B) shall be rigid and made of metal[1)] 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:	100 ± 2 mm
height:	300 ± 2 mm

The base and 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 about 250 mm from the base.

The transparent disc (C) shall be horizontal and attached to the end of a rod (J) which slides vertically through a guide sleeve (E) mounted on a swivel arm (N). The guide sleeve (E) shall be fitted with a screw (Q) to enable the rod (J) to be fixed in position. The swivel arm (N) also carries a funnel (D) the bottom of which locates on the top of the mould (B) when this is positioned concentrically in the container (A). The swivel arm (N) is located by a holder (M) and can be fixed in position by a set screw (F). When in the appropriate positions, the axes of the rod (J) and of the funnel (D) shall be coincident with the axis of the container. The transparent disc shall be 230 ± 2 mm in diameter and 10 ± 2 mm in thickness. A weight (P) shall be located directly above the disc such that the moving assembly, comprising rod, disc and weight, shall weigh 2750 ± 50 g. The rod shall be provided with a scale to enable the slump of the concrete to be recorded.

The vibrating table (G) shall be 380 mm in length and 260 mm in width and shall be supported on four rubber shock absorbers. A vibrator unit (L), carried on a base (K) resting on three rubber feet, shall be securely fixed beneath it. The vibrator shall operate at a frequency of 50 Hz and the vertical amplitude of the table, with the empty container clamped to it, shall be approximately ± 0.35 mm about the mean position.

3.2 *Scoop,* about 100 mm wide.

3.3 *Sampling tray,* minimum dimensions 5 900 mm × 900 mm × 50 mm deep, of rigid construction and made from a non-absorbent material not readily attacked by cement paste.

3.4 *Square mouthed shovel,* size 2 in accordance with BS 3388.

3.5 *Tamping rod,* made out of straight iron or steel bar of circular cross section, 16 ± 1 mm diameter and 600 ± 5 mm long, with both ends hemispherical.

3.6 *Stop watch or stop clock,* accurate to 0.5 s.

4 Sampling

Obtain the sample of fresh concrete by the procedure given in BS 1881-101 or BS 1881-125. Commence the determination of Vebe time as soon as possible after sampling.

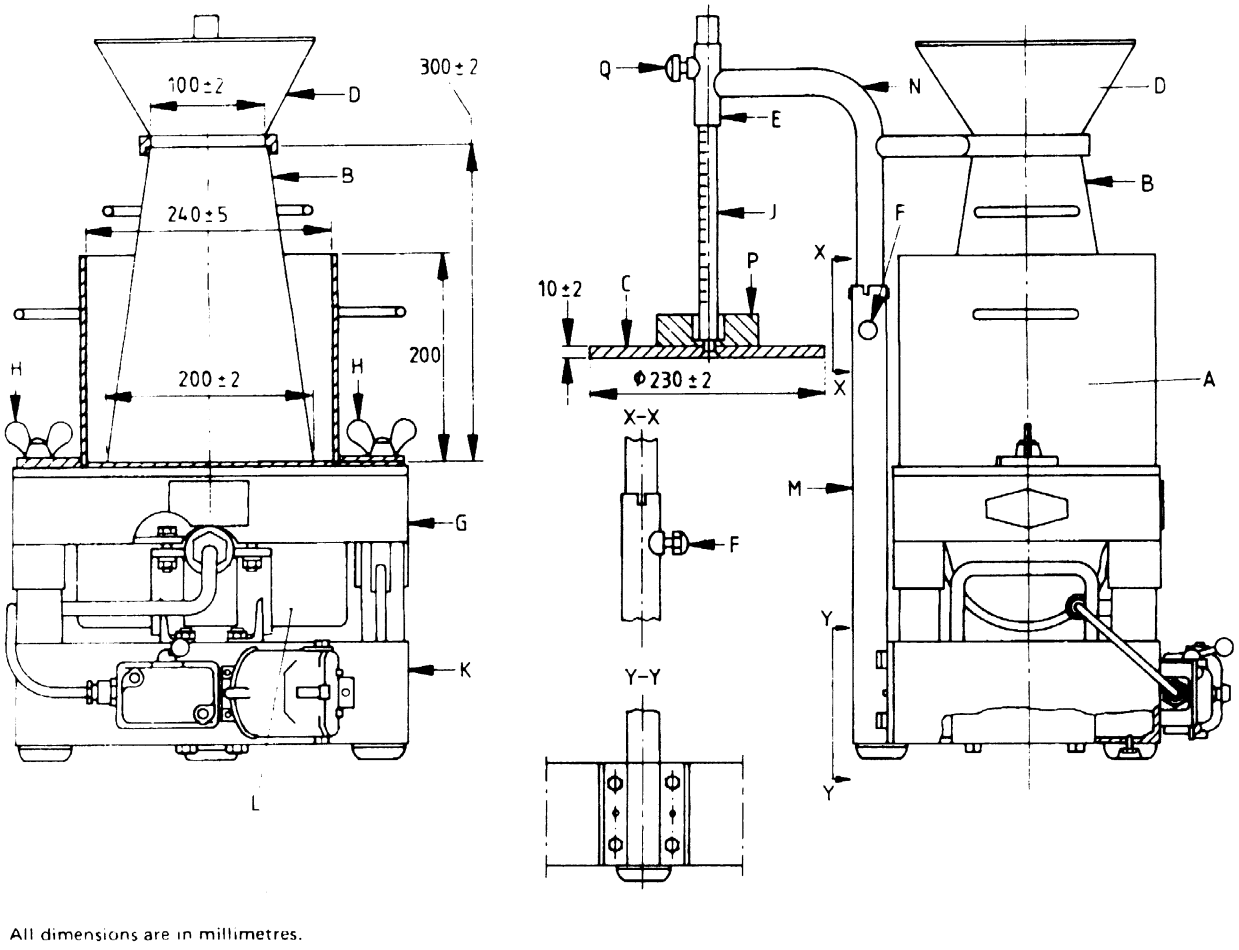
5 Preparing the sample for test

Empty the sample from the container(s) onto the sampling tray. Ensure that no more than a light covering of slurry is left adhering to the container(s).

[1)] Galvanized steel is suitable.

Thoroughly mix the sample by shovelling it to form a cone on the sampling tray and turning this over with the shovel to form a new cone, the operation being carried out three times. When forming the cones deposit each shovelful of the material on the apex of the cone so that the portions which slide down the sides are distributed as evenly as possible and so that the centre of the cone is not displaced. Flatten the third cone by repeated vertical insertion of the shovel across the apex of the cone, lifting the shovel clear of the concrete after each insertion.

CAUTION. When cement is mixed with water, alkali is released. Take precautions to avoid dry cement entering the eyes, mouth and nose when 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.



All dimensions are in millimetres.

Figure 1 — Vebe apparatus

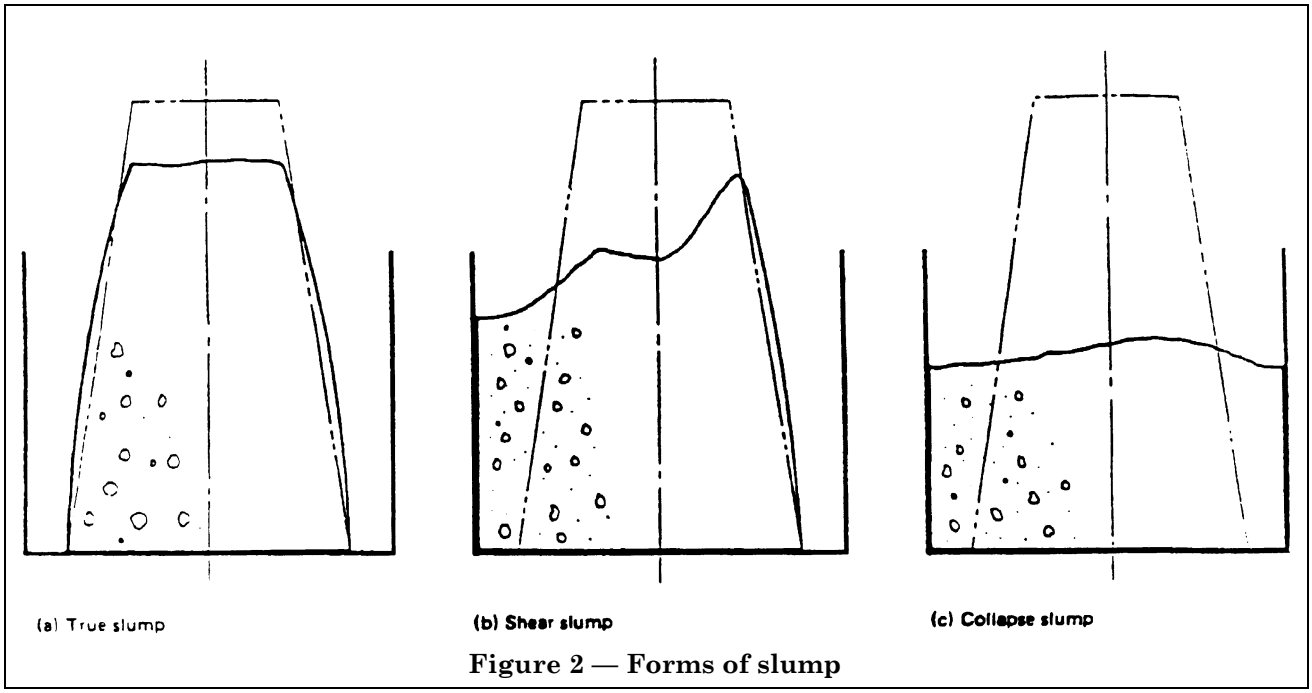


Figure 2 — Forms of slump

6 Procedure

Place the vibrating table (G) on a rigid, horizontal surface free from external vibration or shock. Clamp the container (A), which shall be clean, to the table (G) by means of the two wing nuts (H). Place the mould (B), the inner surface of which shall be clean and damp but free from superfluous moisture, concentrically in the container (A) and lower the funnel (D) on to the mould. Tighten the screw (F) so that the mould (B) is held in contact with the base of the container (A).

Fill the mould (B) with concrete in three layers, each approximately one-third of the height of the mould when tamped. Tamp each layer with 25 strokes of the tamping rod, the strokes being distributed uniformly over the cross-section of the layer. Tamp each layer to its full depth, ensuring that the tamping rod does not forcibly strike the bottom of the container when tamping the first layer and just passes through the second and top layers into the layers immediately below. Heap the concrete above the mould before the top layer is tamped. If necessary, add further concrete to maintain an excess above the top of the mould throughout the tamping operation. After the top layer has been tamped, loosen the screw (F), raise and swing the funnel (D) through 90° and tighten the screw (F). Strike off the concrete level with the top of the mould with a sawing and rolling motion of the tamping rod. When striking off the concrete, do not allow the mould (B) to rise nor any concrete to fall into the container (A).

Remove the mould (B) from the concrete by raising it vertically slowly and carefully, in 5 s to 10 s, in such a manner as to impose minimum lateral or torsional movement to the concrete. Having removed the mould (B), loosen the screw (F), swing the transparent disc (C) over the container, tighten the screw (F) and lower the disc to touch the highest point of the slumped concrete.

If the concrete shears, as shown in Figure 2(b), collapses, as shown in Figure 2(c), or slumps to the extent that it touches the wall of the container (A), the disc (C) shall be allowed to rest upon the subsided concrete with screw (Q) loose.

If the concrete has not slumped into contact with the wall of the container (A) and a true slump, as shown in Figure 2(a) has been obtained, tighten the screw (Q) when the disc (C) just touches the highest point of the concrete without disturbing it. Read the slump from the scale (J) and then loosen the screw (Q) to allow the disc (C) to rest upon the concrete.

Simultaneously start the vibration and the stop watch or clock. Observe the remoulding of the concrete through the transparent disc (C). Stop the watch or clock immediately the lower surface of the disc (C) is completely coated with cement grout and record the time taken. Complete the procedure within a period of 5 min from the commencement of filling the mould (B).

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

7 Expression of results

Record the Vebe time, indicated by the stop watch or clock, to the nearest second.

8 Report

8.1 General. The report shall affirm that the Vebe time was determined in accordance with this Part of this British Standard. The report shall state whether or not a certificate of sampling is available. If available, a copy of the certificate shall be provided.

8.2 Information to be included in the test report

8.2.1 *Mandatory information.* The following information shall be included in the test report:

a) date, time and place of sampling and sample identity number;

b) time and place of test;

c) form of slump, whether true, shear or collapse, or into contact with wall of the container;

d) slump, if true slump was measured and concrete did not come into contact with wall of the container;

e) Vebe time;

f) name of person carrying out test.

8.2.2 *Optional information.* If requested the following information shall be included in the test report:

a) name of project and place where concrete used;

b) name of supplier and source of concrete;

c) date and time of production of concrete or delivery to site;

d) specification of concrete mix (e.g. strength grade).

Publications referred to

BS 1881, *Testing concrete.*
BS 1881-101, *Method of sampling fresh concrete on site.*
BS 1881-102, *Method for determination of slump*[2)].
BS 1881-103, *Method for determination of compacting factor*[2)].
BS 1881-106, *Method for determination of air content of fresh concrete*[2)].
BS 1881-107, *Method for determination of density of compacted fresh concrete*[2)].
BS 1881-125, *Methods for mixing and sampling fresh concrete in the laboratory.*
BS 3388, *Forks, shovels and spades.*
BS 5328, *Methods for specifying concrete, including ready-mixed concrete.*
BS 5497, *Precision of test methods*[2)].
BS 5497-1, *Guide for the determination of repeatability and reproducibility for a standard test method.*
ISO 4110, *Fresh concrete — Determination of consistency — Vebe test*[2)].

[2)] Referred to in the foreword only.

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