
**Cement — Test methods —
Determination of setting time and
soundness**

*Ciments — Méthodes d'essais — Détermination du temps de prise et
de la stabilité*

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 9597 was prepared by Technical Committee ISO/TC 74, *Cement and lime*.

This second edition cancels and replaces the first edition (ISO 9597:1989), the following clauses and subclauses of which have been technically revised, based on comments received by the secretariat.

- 4.1: Requirement for the laboratory relative humidity is reduced to a minimum of 50 % from a minimum of 65 %.
- 4.2.5: Drinking water is permitted for storing and boiling test specimens, drinking water is no longer permitted in the production of paste since such water varies in quality between places and even with time in the same laboratory.
- 5.1: The Vicat mould is permitted to have a cylindrical, in addition to truncated conical, shape.
- 5.2.1: The time permitted for scraping paste from the sides and bottom of the mixing bowl is increased from 15 s to 30 s.
- 5.2.3: The end-point for the determination of standard consistence is increased to (6 ± 2) mm from (6 ± 1) mm.
- Clause 6: The determination of the setting time is carried out whilst the specimen is immersed in water.
- 6.1.1: In the determination of the setting time, the use of automatic apparatus conforming to the requirements of the reference method is permitted.
- 6.1.3: In the determination of the setting time, the tolerance on storage temperature for specimens is reduced to $(20,0 \pm 1,0)$ °C from (20 ± 1) °C.
- 6.2.2: The end-point for the determination of the initial setting time is increased to (6 ± 3) mm from (4 ± 1) mm.
- 6.3.1: It is required to confirm the end-point for the determination of the final setting time by testing at two additional positions in the test specimen.
- 7.1.1: The material for the construction of the Le Chatelier apparatus to determine the soundness is extended to any non-corrodible spring metal.

- 7.1.3: The minimum relative humidity in which specimens for determination of soundness are stored is reduced to 90 % from 98 %.
- 7.2: The determination of soundness is carried out once.
- 7.4: Where a retest of the determination of soundness is required, the relative humidity at which the cement sample is stored is reduced to 50 % from 65 %.
- Annex A: An alternative method for testing the setting times of slow-setting cements is included.

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Cement — Test methods — Determination of setting time and soundness

1 Scope

This International Standard specifies the methods for determining standard consistence, setting times and soundness of cements.

The method applies to common cements and to other cements and materials, the standards for which call up this method. It might not apply to other cement types that have, for example, a very short initial setting time. The method is used for assessing whether the setting time and soundness of a cement is in conformity with its specification.

This International Standard describes the reference methods and allows the use of alternative procedures and equipment, as indicated, provided that they have been calibrated against the reference methods. In the event of a dispute, only the reference equipment and procedures described in this International Standard can be used, excluding any alternatives.

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 679, *Cement — Test methods — Determination of strength*

3 Principles

Cement paste of standard consistence has a specified resistance to penetration by a standard plunger. The water required for such a paste is determined by trial penetrations of pastes with different water contents.

The setting time is determined by observing the penetration of a needle into cement paste of standard consistence until it reaches a specified value.

The soundness is determined by observing the volume expansion of cement paste of standard consistence as indicated by the relative movement of two needles.

4 Laboratory, equipment and materials

4.1 Laboratory

The laboratory in which specimens are prepared and tested shall be maintained at a temperature of (20 ± 2) °C and a relative humidity of not less than 50 %.

A laboratory temperature of (25 ± 2) °C or (27 ± 2) °C may be maintained in warm countries, provided the temperature is stated in the test report.

The temperature and relative humidity of the air in the laboratory and the temperature of the water in the storage containers shall be recorded at least once per day during working hours.

Cement, water and apparatus used to make and test specimens shall be at the laboratory temperature.

NOTE See Annex A for storage conditions applied when testing setting times by an alternative method.

Where temperature ranges are given, the target temperature at which the controls are set shall be the middle value of the range.

4.2 Equipment and materials

4.2.1 General requirements

The tolerances shown in Figures 1 and 2 are important for the correct operation of the equipment in the testing procedure. When regular control measurements show that the tolerances are not met, the equipment shall be rejected, adjusted or repaired. Records of control measurements shall be kept.

Acceptance measurements on new equipment shall cover mass, volume and dimensions to the extent that these are indicated in this International Standard, paying particular attention to those critical dimensions for which tolerances are specified.

In those cases when the material of the equipment can influence the results, the material is specified and shall be used.

The approximate dimensions shown in the figures are provided as guidance to equipment manufacturers or operators. Dimensions that include tolerances are obligatory.

4.2.2 **Balance**, capable of weighing to an accuracy of ± 1 g.

4.2.3 **Graduated cylinder or burette**, capable of dispensing to an accuracy of ± 1 ml.

4.2.4 **Mixer**, conforming to ISO 679.

NOTE A more homogeneous paste is produced at the lower limit of tolerance for the clearance between the blade and the bowl.

4.2.5 **Water**, distilled or deionized, shall be used for making the specimens.

Drinking water may be used for storing and boiling specimens.

4.2.6 **Timer**, capable of measuring to an accuracy of ± 1 s.

4.2.7 **Ruler**, capable of measuring to an accuracy of $\pm 0,5$ mm.

5 Standard consistence test

5.1 Apparatus

Use the manual Vicat apparatus as shown in Figure 1 a) and 1 b) with the plunger as shown in Figure 1 c). The plunger shall be of non-corrodible metal in the form of a right cylinder of at least 45 mm effective length and of $(10,00 \pm 0,05)$ mm diameter. The total mass of moving parts shall be (300 ± 1) g. Their movement shall be truly vertical and without appreciable friction, and their axis shall coincide with that of the plunger.

The Vicat mould [see Figure 1 a)] to contain the paste under test shall be of hard rubber, plastics or brass. It shall be of cylindrical or preferably truncated conical form $(40,0 \pm 0,2)$ mm deep and shall have an internal diameter of (75 ± 10) mm. It shall be adequately rigid and shall be provided with a base-plate larger than the

mould and at least 2,5 mm thick, constructed of impermeable material resistant to attack by cement paste, e.g. plane glass.

Moulds of other metal may be used, provided that they are of the specified depth and that their use has been calibrated against the specified mould.

It is recommended that a laboratory uses base-plates of equal thickness so that it is necessary only to adjust the scale of the Vicat apparatus once for several determinations.

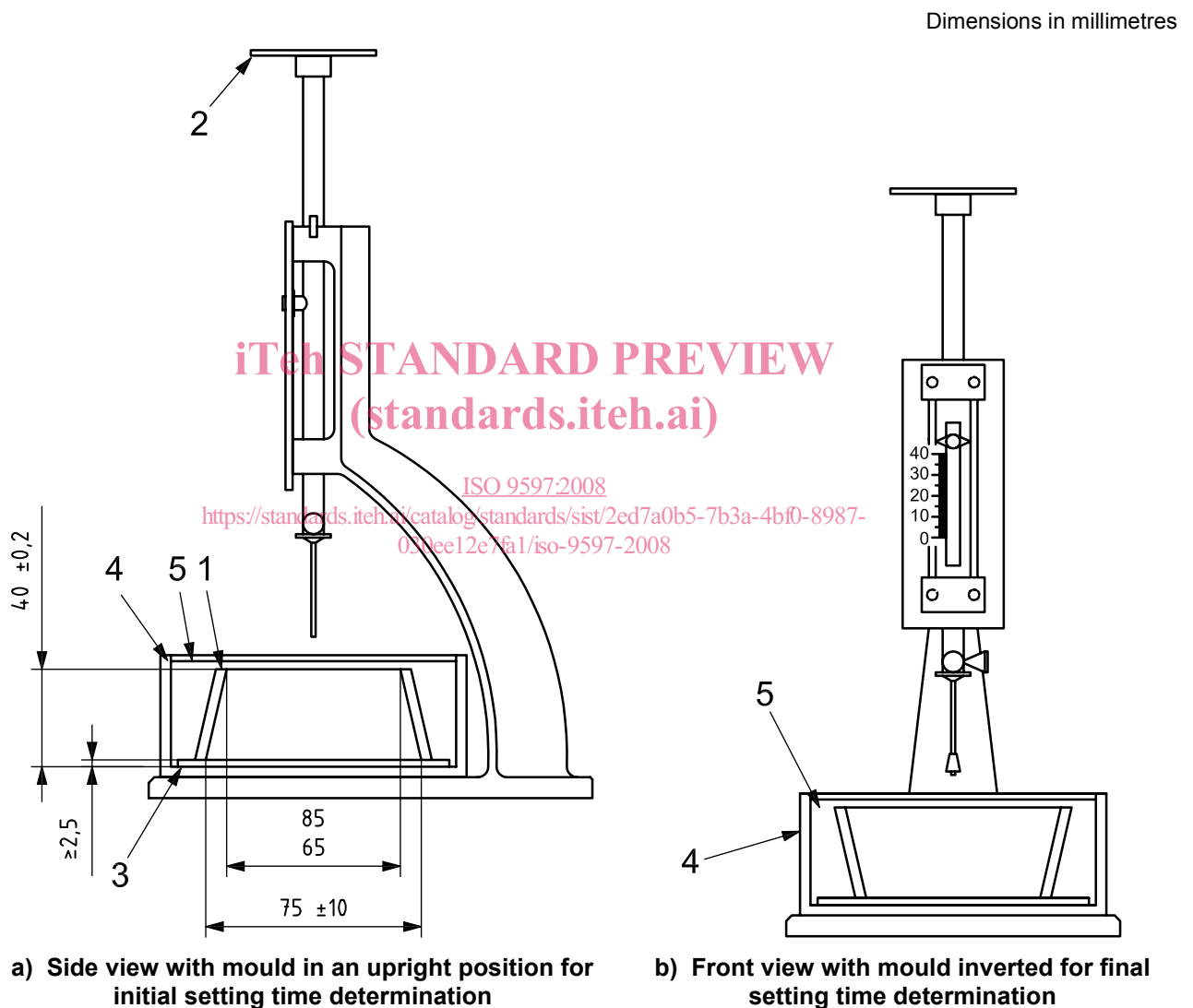


Figure 1 (continued)