INTERNATIONAL STANDARD

ISO 1920-14

First edition
2019-11

Testing of concrete —

Part 14: Setting time of concrete mixtures by resistance to penetration

Essais du béton —
Partie 14: Temps de prise des mélanges de béton selon l'essai de résistance à la pénétration

Reference number
ISO 1920-14:2019(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 71, *Concrete, reinforced concrete and pre-stressed concrete*, Subcommittee SC 1, *Test methods for concrete*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

A list of all parts in the ISO 1920 series can be found on the ISO website.

Testing of concrete —

Part 14: Setting time of concrete mixtures by resistance to penetration

1 Scope

This document covers the method for determining the setting time of concrete with slump greater than zero, by testing mortar sieved from the concrete mixture. The initial setting time and the final setting time are the time intervals required for the mortar sieved from the concrete mixture to reach the specified values of penetration resistance after the initial contact of cement and water.

The method can be used for determining the effect of variables such as temperature, type and content of cement, concrete mix proportions and admixtures, on the time of setting and hardening characteristics of concrete.

This test method is applicable under controlled laboratory conditions, as well as under field conditions.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
initial setting time
time elapsed, after the initial contact of cement and water, till the mortar (sieved from the concrete) acquires a penetration resistance of 3,5 N/mm^2

3.2
final setting time
time elapsed, after the initial contact of cement and water, till the mortar (sieved from the concrete) acquires a penetration resistance of 27,6 N/mm^2

4 Principle

A mortar sample is obtained by sieving a representative sample of fresh concrete. The mortar sample is placed in a container and stored at a specified ambient temperature. The resistance of the mortar to penetration by standard needles is measured at regular time intervals. The time of initial and final setting are determined from a plot of penetration resistance versus elapsed time.

5 Apparatus

5.1 Containers for mortar specimens, rigid, watertight, non-absorptive, free of oil/grease, either cylindrical or rectangular in cross-section, with minimum lateral dimension 150 mm and height at least 150 mm.

The container for the mortar specimens from the concrete mixture shall provide enough mortar surfaces for ten undisturbed readings of penetration resistance in accordance with clear distance requirements specified in Clause 9.

5.2 Penetration resistance apparatus, of spring reaction type, graduated from 50 N to 600 N in increments of 10 N or less, or hydraulic reaction-type apparatus with pressure gauge of 700 N to 900 N capacity, graduated in increments of 10 N or less.

Indications of actual needle loads by these apparatus shall be accurate to 10 N. Removable needles of 645 mm^2, 323 mm^2, 161 mm^2, 65 mm^2, 32 mm^2, and 16 mm^2 bearing areas shall be provided. Each needle shank shall be scribed peripherally at a distance of 25 mm above the bearing face. The length of the 16 mm^2 needle shall be not more than 90 mm to minimize bending. The apparatus shall be recalibrated periodically.

NOTE National specifications can also exist regarding cross-sectional area.

5.3 Pipette, or other suitable instrument for drawing off free water from the surface of the test specimens.

5.4 Tamping rod, round, straight, steel rod 16 mm ± 1 mm in diameter and approximately 600 mm ± 5 mm in length, having the tamping end or both ends rounded to a hemispherical tip, the diameter of which is 16 mm.

NOTE National specifications can also exist regarding the size of the tamping rod.

5.5 Thermometer, capable of measuring the temperature of the fresh mortar to ±0,5 °C.

Glass thermometers having a temperature range from 0 °C to 100 °C are satisfactory. Other thermometers of the required accuracy, including the metal immersion type, are acceptable.

6 Preparation of mortar specimens

6.1 From the concrete mixture under test, select a representative sample of concrete of sufficient volume to provide enough mortar to fill the test container, or containers, to a depth of at least 140 mm. Remove essentially all of the mortar from the sample of concrete by sieving it through a 5 mm (or 4,75 mm) sieve onto a non-absorptive surface.

6.2 Thoroughly mix the mortar manually on the non-absorptive surface. Measure and record the temperature of the mortar. Place the mortar in the container, or containers, using a single layer. Consolidate the mortar to eliminate air pockets in the specimen and level the top surface. This may be accomplished by rocking the container back and forth on a solid surface, and by tapping the sides of the container. Sieved mortar is generally of fluid consistency and air pockets are readily removed by this method of compaction.

For stiffer mortars, alternative methods such as the use of vibrating table or rodding, should be followed. When using vibrating table, use low amplitude vibration so that portions of the sample are not ejected from the container.

If rodding is used, tamp the mortar by the hemispherical end of the tamping rod. Place the mortar in the container(s) in layers of 50 mm each, and compact by tamping each layer. Tamp the mortar once for each 6,5 cm^2 of top surface area of the specimen and distribute the strokes uniformly over the cross-

