Designation: C1768/C1768M – 25

Standard Practice for Accelerated Curing of Concrete Cylinders[1]

This standard is issued under the fixed designation C1768/C1768M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This practice covers two procedures for making and curing cylindrical specimens of concrete under conditions that increase the rate of hydration at early ages. The procedures are: A—Warm Water Method and B—Autogenous Curing Method.

1.2 The text of this standard refers to notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* (**Warning—***Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.*[2])

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

C31/C31M Practice for Making and Curing Concrete Test Specimens in the Field

C39/C39M Test Method for Compressive Strength of Cylindrical Concrete Specimens

C125 Terminology Relating to Concrete and Concrete Aggregates

C143/C143M Test Method for Slump of Hydraulic-Cement Concrete

C172/C172M Practice for Sampling Freshly Mixed Concrete

C173/C173M Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

C192/C192M Practice for Making and Curing Concrete Test Specimens in the Laboratory

C231/C231M Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

C470/C470M Specification for Molds for Forming Concrete Test Cylinders Vertically

C918/C918M Test Method for Measuring Early-Age Compressive Strength and Projecting Later-Age Strength

C1064/C1064M Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete

C1231/C1231M Practice for Use of Unbonded Caps in Determination of Compressive Strength of Hardened Cylindrical Concrete Specimens

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this practice, refer to Terminology C125.

4. Summary of Practice

4.1 Molded concrete cylindrical specimens are cured under conditions that increase the early-age concrete temperature and the rate of hydration. This permits the specimens to develop a significant portion of their ultimate properties within a time period ranging from 24 h to 49 h, depending upon the procedure used. In Procedure A, specimens are stored in a warm water bath for 24 h. In Procedure B, specimens are stored for 48 h in insulated curing containers in which the elevated curing temperature is obtained from heat of hydration of the cement. If specimens are to be used for estimating strength

[1] This practice is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.61 on Testing for Strength.

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[2] See Section on Safety Precautions, Manual of Aggregate and Concrete Testing, *Annual Book of ASTM Standards*, Vol. 04.02.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard**

potential in accordance with Test Method C918/C918M, specimen temperature is monitored during the accelerated curing period.

4.2 Table 1 summarizes important characteristics of these curing procedures.

5. Significance and Use

5.1 By increasing the concrete temperature, the rate of hydration increases and a larger portion of the later-age properties of the concrete can be attained during the short curing period compared with standard temperature curing as described in Practice C31/C31M and Practice C192/C192M.

5.2 Specimens subjected to accelerated curing can be used to estimate the later-age strength under standard-curing conditions by using this practice in conjunction with Test Method C918/C918M. The temperature history of the test specimens is recorded and the maturity index at the time of testing is calculated. Based on the measured maturity index and the early-age strength test results, the later age strength (such as at 28 days) under standard curing can be estimated from a previously established strength-maturity relationship for that concrete mixture. Thus accelerated curing procedures can provide, at the earliest practical time, an indication of the potential strength of the concrete sample. These early-age strength tests also provide information on the variability of the production process for use in quality control, so that necessary adjustments in mixture proportions can be made in a timely manner.

5.3 The user shall select the procedure to use on the basis of experience and local conditions. These procedures, in general, will be practical if a field laboratory is available to house the curing containers and the testing equipment to measure compressive strength within the specified time limits.

6. Apparatus

6.1 *Small Tools and Equipment*—For fabricating specimens shall conform to Practice C31/C31M or Practice C192/C192M, whichever is applicable.

6.2 *Cylinder Molds*—Shall conform to Specification C470/C470M. Paper molds are not permitted. Procedure B requires single-use molds.

6.3 *Curing Apparatus:*

TABLE 1 Characteristics of Accelerated Curing Procedures

Procedure	Molds	Accelerated Curing Temperature °C [°F]	Duration of Accelerated Curing	Age at Testing
A. Warm Water	Reusable or single-use	35 [95]	23.5 h ± 30 min	24 h ± 15 min
B. Autogenous Curing	Single-use	Initial concrete temperature augmented by heat of hydration	48 h ± 15 min	49 h ± 15 min

6.3.1 *Accelerated Curing Tank for Procedure A-Warm Water Method:*

6.3.1.1 The tank is of any configuration suitable for the number of cylinders to be cured. Arrange the cylinders in a configuration that provides a clearance of at least 50 mm [2 in.] between the surface of each cylinder and the wall of the tank, and at least 100 mm [4 in.] between adjacent cylinders. Maintain the water level at least 100 mm [4 in.] above the tops of the cylinders.

NOTE 1—It may be convenient to have an overflow pipe for controlling the water depth in the tank. A number of different tanks have been used successfully. A schematic of a suitable curing tank is given in Appendix X1.

6.3.1.2 Equip the tank with environmental control element(s) capable of: *(1)* maintaining the water temperature at 35 °C ± 3 °C [95 °F ± 5 °F] at any point in the water; and *(2)* limiting the temperature drop, after immersion of specimens, to less than 3 °C [5 °F]; and *(3)* returning to the specified water temperature within 15 min after immersion of specimens. A temperature recording device, independent of the thermostat, is required to monitor the water temperature.

NOTE 2—Depending upon the design features of the tank, insulation or mechanical agitation, or both, might be necessary to meet the specified temperature requirements. Electrical immersion heaters controlled by a thermostat have been used successfully to meet the water temperature requirements. The size of the heating element(s) required will depend upon the size of the tank and the number and size of specimens to be cured at one time. A lid may be provided to reduce evaporation and heat loss.

6.3.1.3 The support for the specimens is designed to permit circulation of water within the tank.

6.3.2 *Curing Container for Procedure B-Autogenous Curing Method:*

6.3.2.1 The container consists of thermal insulation that surrounds closely the concrete specimen or specimens. Any configuration is acceptable provided the curing container meets the heat retention and other requirements of Annex A1.

6.3.2.2 The container is capable of holding one or more specimens.

6.3.2.3 The container is capable of being opened to permit insertion and withdrawal of the specimen(s) and has an outer casing and inner liner to protect the insulation from mechanical damage.

6.3.2.4 The container has a temperature sensor that is not insulated from the molded specimen. The temperature sensor is connected to a data logger or other device for a continuous record of the temperature history within the container. The maximum interval between temperature measurements is 30 min.

6.3.2.5 The container has a lid or other means to provide secure closure during the specified curing period. The lid includes a heat seal that satisfies the requirements of Annex A1.

NOTE 3—Schematics of suitable containers are included in Appendix X1.

7. Sampling

7.1 Sample the freshly mixed concrete in accordance with Practice C172/C172M unless another procedure is required by