



Standard Specification for Returned Fresh Concrete for Use in a New Batch of Ready-Mixed Concrete¹

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1. Scope

1.1 This specification covers returned fresh concrete for use in a new batch of ready-mixed concrete. Requirements for returned fresh concrete shall be either as hereinafter specified or as specified by the purchaser. In any case where the requirements of the purchaser differ from those in this specification, the purchaser's requirements shall govern. This specification does not cover the placement, consolidation, curing, or protection of the concrete after delivery to the purchaser.

1.2 This specification by itself shall not grant permission to the manufacturer to use returned fresh concrete in a new batch of concrete.

NOTE 1—The permission to use returned fresh concrete may be addressed in purchase documents, which may reference this specification.

1.3 Returned fresh concrete in a quantity of less than 450 kg [1000 lb] or 0.2 m³ [0.25 yd³] shall not be subject to this specification.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.5 The text of this standard references notes and footnotes, which provide explanatory information. These notes and footnotes shall not be considered as requirements of the standard.

1.6 *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 and health 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 use.²)

¹ This specification is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.40 on Ready-Mixed Concrete.

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

2. Referenced Documents

2.1 ASTM Standards:³

C94/C94M Specification for Ready-Mixed Concrete
C125 Terminology Relating to Concrete and Concrete Aggregates

C494/C494M Specification for Chemical Admixtures for Concrete

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

3. Terminology

3.1 *Definitions*—The terms used in this specification are defined in Terminology C125.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *admixture, hydration stabilizing, n*—set-retarding admixture, conforming to Specification C494/C494M Type B or D, that can predictably reduce the hydration rate of cement for applications requiring the management of time of setting of returned concrete, reducing the hydration rate of cement fines in water from concrete production, or for applications requiring extended delivery time of ready-mixed concrete.

3.2.2 *concrete, returned fresh, n*—fresh concrete not yet discharged from a ready-mixed concrete transportation unit when it is returned to the manufacturer.

4. Ordering Information

4.1 The new batch of concrete containing returned fresh concrete shall meet all requirements of the purchaser.

NOTE 2—The requirements of this specification are in addition to those of the purchaser and the specification of the new batch of concrete containing returned fresh concrete.

NOTE 3—If using Specification C94/C94M for concrete potentially incorporating returned fresh concrete, it is recommended the purchaser select Option A. In this option, the manufacturer has responsibility for making necessary adjustments to mixture proportions to ensure the new concrete batch containing returned fresh concrete will meet the requirements of the purchaser.

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

4.2 At the request of the purchaser, the manufacturer shall furnish information on procedures used to reuse returned fresh concrete.

5. Measuring Materials

5.1 The amount of returned fresh concrete shall be determined by mass or volume with equipment capable of measuring within an accuracy of ± 450 kg [1000 lb] or ± 0.2 m³ [0.25 yd³].

5.2 If necessary to convert between the mass and volume of returned fresh concrete, it shall be permissible to use the measured or design density of the returned fresh concrete.

5.3 Water added to the returned fresh concrete after the original loading of the returned fresh concrete until loading of the new batch of concrete shall be measured to an accuracy of ± 3 % of the amount added or 4 liters [1.0 gal], whichever is greater.

5.4 Admixtures added to the returned fresh concrete after the original loading of the returned fresh concrete until loading of the new batch of concrete, whether in liquid or powder form, shall be measured with an accuracy of ± 3 % of the total amount added or plus or minus the amount required for 50 kg [100 lb] of hydraulic cement, whichever is greater.

5.5 Temperature of the returned fresh concrete shall be measured within 15 minutes before loading the new batch of concrete. Temperature shall be measured in accordance with Test Method C1064/C1064M or with equipment capable of measuring concrete temperature to within $\pm 1^\circ$ C [2° F] of the temperature measured by using Test Method C1064/C1064M.

6. Requirements for Use

6.1 The following shall apply to returned fresh concrete that is reused in a new batch of concrete.

6.1.1 Returned fresh concrete that has reached an age of 90 minutes after the original loading or first mixing of the returned fresh concrete shall be treated with hydration stabilizing admixture. The hydration stabilizing admixture shall be added during or after the original loading or first mixing of the returned fresh concrete.

NOTE 4—In many situations, the use of hydration stabilizing admixtures is essential to managing the time of setting of the new batch of concrete.^{4,5,6} The selection of hydration stabilizing admixture dose depends on factors including mixture proportions, concrete temperature, time of setting, and duration of time for stabilization of the concrete.

6.1.2 The manufacturer of the concrete shall be responsible for determining the dose of hydration stabilizing admixture.

⁴ ACI Manual of Concrete Practice 2010, Part 1, ACI 212.3R-04 *Chemical Admixtures for Concrete*, American Concrete Institute, P.O. Box 9094, Farmington Hills, MI 48333.

⁵ Attiogbe, E., and Farzam, H., “Extended Set Control of Concrete,” *Proceedings of the ASCE Conference on Advances in the Production and Utilization of Cement-Based Materials*, 1992, pp. 137-146.

⁶ Lobo, Colin, William F. Guthrie and Raghu Kacker, “A Study on the Reuse of Plastic Concrete Using Extended Set-Retarding Admixtures,” *Journal of Research of the National Institute of Standards and Technology*, Volume 100, Number 5, September–October 1995, pp. 575-589.

6.1.3 If hydration stabilizing admixture is used, the returned fresh concrete shall be incorporated into a new batch of concrete at a time appropriate for the dose of hydration stabilizing admixture, but in no case more than 8 hours after the original loading or first mixing of the returned fresh concrete.

6.1.4 The temperature of returned fresh concrete shall not exceed 38° C [100° F]. It shall not be permissible to cool returned fresh concrete that has exceeded 38° C [100° F]. The temperature of the new concrete batch containing returned fresh concrete shall comply with project specifications.

6.1.5 The specified strength of the returned fresh concrete shall be equal to or greater than that of the new batch of concrete.

6.2 The volume of returned fresh concrete incorporated into a new batch of concrete shall not exceed 50 % of the total volume of the new batch of concrete containing returned fresh concrete.

6.3 The age and number of revolutions for the new batch of concrete shall be measured from the loading of the new batch.

6.4 For the new batch of concrete containing returned fresh concrete, the returned fresh concrete and any new material added shall be mixed for a sufficient number of revolutions at the mixing speed designated by the manufacturer of the truck mixer to produce the uniformity of concrete required in Specification C94/C94M.

6.5 The proportions of materials added to create the new batch of concrete shall be adjusted to take into account the proportions and temperature of the returned fresh concrete and to meet the requirements of the purchaser.

7. Report

7.1 The manufacturer of the concrete shall indicate to the purchaser with each batch of concrete containing returned fresh concrete, before unloading at the site, the amount of returned fresh concrete in cubic meters [cubic yards].

7.2 Additional information for certification purposes as designated by the purchaser and required by the job specifications shall be furnished when requested; such information as:

7.2.1 Time loaded or of first mixing of cement and aggregates for the returned fresh concrete,

7.2.2 Information necessary to calculate the total mixing water in the returned fresh concrete in liters/m³ [gal/yd³], and

7.2.3 Temperature of the returned fresh concrete within 15 minutes before loading the new batch of concrete.

NOTE 5—If using Specification C94/C94M, these reporting requirements are in addition to those in Specification C94/C94M. If the purchaser of the new batch requires a report of the amount of individual materials batched, these amounts include the individual materials originally batched or subsequently added to the returned fresh concrete.

8. Keywords

8.1 mixing; ready-mixed concrete; returned fresh concrete; testing

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