Designation: C887 – 20

Standard Specification for Packaged, Dry, Combined Materials for Surface Bonding Mortar[1]

This standard is issued under the fixed designation C887; 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 specification covers the materials, properties, and packaging of dry, combined materials for use as surface bonding mortar with concrete masonry units that have not been prefaced, coated, or painted.

1.2 This specification does not cover design or application. Consult the manufacturer for specific recommendations.

1.3 Appendix X1 of this specification contains the recommended tests for evaluation of surface bonded masonry assemblages used to establish design loads for the composite wall.

1.4 Appendix X2 through Appendix X5 of this specification contain additional tests that may be performed on surface bonding mortar.

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* This hazard statement applies only to Section 9 of this specification.

1.7 *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:*[2]

C91/C91M Specification for Masonry Cement

C109/C109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens)

C138/C138M Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

C144 Specification for Aggregate for Masonry Mortar

C150/C150M Specification for Portland Cement

C187 Test Method for Amount of Water Required for Normal Consistency of Hydraulic Cement Paste

C191 Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle

C207 Specification for Hydrated Lime for Masonry Purposes

C260/C260M Specification for Air-Entraining Admixtures for Concrete

C305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency

C348 Test Method for Flexural Strength of Hydraulic-Cement Mortars

C349 Test Method for Compressive Strength of Hydraulic-Cement Mortars (Using Portions of Prisms Broken in Flexure)

C359 Test Method for Early Stiffening of Hydraulic Cement (Mortar Method)

C494/C494M Specification for Chemical Admixtures for Concrete

C511 Specification for Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes

C595/C595M Specification for Blended Hydraulic Cements

[1] This specification is under the jurisdiction of ASTM Committee C12 on Mortars and Grouts for Unit Masonry and is the direct responsibility of Subcommittee C12.06 on Surface Bonding.

Current edition approved June 15, 2020. Published July 2020. Originally approved in 1979. Last previous edition approved in 2019 as C887 – 19a. DOI: 10.1520/C0887-20.

[2] 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.

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

C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
C666/C666M Test Method for Resistance of Concrete to Rapid Freezing and Thawing
C1157/C1157M Performance Specification for Hydraulic Cement
C1180 Terminology of Mortar and Grout for Unit Masonry
C1232 Terminology for Masonry
C1600/C1600M Specification for Rapid Hardening Hydraulic Cement
E72 Test Methods of Conducting Strength Tests of Panels for Building Construction
E96/E96M Test Methods for Water Vapor Transmission of Materials
E119 Test Methods for Fire Tests of Building Construction and Materials
E447 Test Method for Compressive Strength of Laboratory Constructed Masonry Prisms (Withdrawn 1997)[3]
E514/E514M Test Method for Water Penetration and Leakage Through Masonry
E518/E518M Test Methods for Flexural Bond Strength of Masonry
E519/E519M Test Method for Diagonal Tension (Shear) in Masonry Assemblages

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, refer to Terminology C1180 and Terminology C1232.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *surface bonding mortar, n*—a product containing hydraulic cement, glass fiber reinforcement with or without inorganic fillers, or organic modifiers in a prepackaged form requiring only the addition of water prior to application.

4. Materials and Manufacture

4.1 The materials used as ingredients in packaged, dry, combined materials for surface bonding mortar shall conform to the following requirements:

4.1.1 *Hydraulic Cements*—Hydraulic cements used shall conform to the following ASTM specifications:

4.1.1.1 *Portland Cement*—Type I, IA, II, IIA, III, or IIIA of Specification C150/C150M.

4.1.1.2 *Blended Hydraulic Cements*—Type IS, ISA, IP, or IPA of Specification C595/C595M.

4.1.1.3 *Hydraulic Cement*—Type GU, HE, MS, or MH of Specification C1157/C1157M.

4.1.1.4 *Masonry Cement*—Specification C91/C91M.

4.1.1.5 *Rapid Hardening Hydraulic Cement,* Type GRH, MRH, VRH, or URH of Specification C1600/C1600M.

4.1.2 *Hydrated Lime*—Type S or SA of Specification C207.

4.1.3 *Pozzolan*—Class N, F, or C of Specification C618.

4.1.4 *Aggregates*—Aggregates shall conform to Specification C144 with the exception of grading. The maximum allowable particle size shall not exceed one third of the recommended application thickness of the surface bonding mortar with uniform distribution of particle size.

4.1.4.1 All aggregates shall be dried, without decomposition, to a moisture content of less than 0.1 weight %, computed on material dried substantially to constant weight at 221 to 230°F (105 to 110°C).

4.1.5 *Glass Fibers*—Glass fibers shall be chopped strands of a minimum ½-in. (13-mm) length to provide significant reinforcement in a cementitious matrix.

4.1.5.1 Glass fibers for use in surface bonding mortar, that will be subjected to wetting, humid atmosphere, or contact with moist ground have the potential to react with the available alkalies present in the portland-cement matrix, causing strength reduction of the surface bonding mortar.

4.1.5.2 The producer shall show evidence satisfactory to the purchaser that glass composition, cement matrix, or both, have been designed to reduce significantly or eliminate this unfavorable reaction.

4.1.6 *Additives*—Additives may be added as part of the packaged, dry, combined materials for purposes such as plasticity, air entrainment, water repellency, set acceleration, chemical bonding, and coloring. See Specifications C260/C260M and C494/C494M.

4.1.6.1 Admixtures or mortar colors shall not be added to the surface bonding mortars at the time of mixing unless provided for in the contract specifications, and, after the materials are so added, the surface bonding mortars shall conform to the physical requirements prescribed in Table 1.

4.1.6.2 *Antifreeze Compounds*—No antifreeze liquid, salts, or other substances shall be used in surface bonding mortar to lower the freezing point.

NOTE 1—Calcium chloride, when provided for in the contract specifications, and expressly recommended by the manufacturer, may be used as an accelerator in amounts not exceeding ½ % by weight of the total bag weight.

5. Proportioning

5.1 The proportions of materials such as hydraulic cements, aggregate, and glass fibers shall be such that the requirements

TABLE 1 Physical Requirements

Flexural Strength[A] (average of three prisms)		
The flexural strength of prisms of surface bonding mortar prepared and tested in accordance with this specification shall be equal to or higher than the values specified for the ages indicated as follows:		
	psi	(MPa)
1 day	450	3.1
7 days	700	4.8
28 days	800	5.5
Compressive Strength (average of prisms broken in flexure)		
The compressive strength of modified cubes of surface bonding mortar prepared and tested in accordance with this specification shall be equal to or higher than the values specified for the ages indicated as follows:		
	psi	(MPa)
1 day	1600	11
28 days	3500	24.1
Time of setting, Vicat needle, initial set, minimum, min		45
final set, max, h		8
Water retention flow after suction, min, % of original flow, min		75

[3] The last approved version of this historical standard is referenced on www.astm.org.

of Table 1 will be met when an amount of mixing water is used that is recommended by the manufacturer to produce a working consistency or that produces a consistency penetration of 65 to 75 mm by the Cone Penetrometer Test Method of Annex A2.

6. Physical Requirements

6.1 Packaged, dry, combined materials for surface bonding mortar shall conform to requirements for physical properties prescribed in Table 1, when the prescribed amount of water is added.

7. Sampling and Testing

7.1 *Accuracy of Measurement:*

7.1.1 Weigh all surface bonding mortar on scales conforming to the applicable sections of National Institute of Standards and Technology Handbook 44, "Specifications, Tolerances and Other Technical Requirements for Weighing and Measuring Devices."

NOTE 2—New and reconditioned scales should be accurate to ±0.1 % of the total capacity of the scale. When scales have been in use, they should be accurate to ±0.4 % of the total capacity of the scale.

7.1.2 Record all weights in pounds or kilograms to a minimum accuracy of 0.1 lb (0.05 kg). Record all weights in grams to an accuracy of 1 g or 0.1 %, whichever is greater.

8. Sampling Surface Bonding Mortar

8.1 Use the contents of an entire package of surface bonding mortar as a sample. Weigh the package, then place it in a clean, watertight container. Open the package by cutting it down one side and across the top and bottom. Empty the contents of the package into the container then carefully remove and weigh the empty bag. Mix the contents thoroughly by hand, using a scoop or trowel, then secure a representative sample weighing not less than 9 lb (4 kg) nor more than 12 lb (5.4 kg). If the package from which the sample is secured weighs 20 lb (9 kg) or more, reduce its contents to the required weight by quartering.

9. Mixing and Testing Surface Bonding Mortar

9.1 Mortar mixing equipment shall be as specified in Practice C305, except that the clearance adjustment bracket shall be set for the largest size aggregate in the mix being tested. The mixing procedure shall be as given in Annex A1.

9.2 Determine the surface bonding mortar plastic and hardened properties using the following appended test methods:

9.2.1 Annex A3—Flexural Strength of Surface Bonding Mortar.

9.2.2 Annex A4—Compressive Strength of Surface Bonding Mortar.

9.2.3 Annex A5—Time of Setting of Surface Bonding Mortar.

9.2.4 Annex A6—Water Retention of Surface Bonding Mortar.

9.3 Mix a representative portion of the sample of the dry, combined surface bonding mortar weighing 3000 ± 3 g. Use a proportionate amount of the water recommended by the manufacturer to produce a working consistency or a sufficient amount of mixing water to produce a cone penetration of 2½ to 3 in. (65 to 75 mm). Determine the consistency and weight of 400 mL of the mortar, in accordance with Annex A2, then mold 1.575 by 1.575 by 6.3-in. (40 by 40 by 160-mm) prisms in the quantity necessary to test for the desired ages. If insufficient mortar is available, make further batches of mortars using the same water to achieve the required consistency.

9.3.1 Calculate the unit weight in pounds per cubic foot (kilograms per cubic metre) and yield in cubic feet (cubic metres) or the yield in square feet per inch (square metres per millimetre) of thickness, from the weight of the mortar in the 400-mL measure used for the consistency test in Annex A2.

9.3.2 Specimens for flexural strength shall be 1.575 by 1.575 by 6.3-in. (40 by 40 by 160-mm) prisms molded, cured, and tested in accordance with Annex A3, with the broken halves of prisms tested in compression as modified cubes in accordance with Annex A4.

9.3.3 Determine the time of setting by Vicat needles in accordance with Annex A5.

9.3.4 Determine the water retention in accordance with Annex A6.

9.4 The report of the tests shall include the following:

9.4.1 Net weight of dry, combined material in the bag determined to 0.1 lb (0.05 kg), by subtracting the weight of the empty bag from the gross weight of the package.

9.4.2 Amount of mixing water, W, calculated in pounds (kilograms) per bag based on printed weight of the bag (Note 3).

9.4.3 Unit weight, U, in pounds per cubic foot (kilograms per cubic metre) in accordance with Test Method C138/C138M (Note 3).

9.4.4 Yield, Y, of surface bonding mortar calculated from the unit weight in cubic feet (cubic metres) per bag, based on printed weight of bag (Note 1).

NOTE 3—Calculate W, U, and Y as follows:

$$W = R_w B \quad (1)$$

$$U = 0.156\, W_m$$

$$Y = (1 + R_w)\, B/U$$

where:

R_w = ratio of weight of mixing water to weight of dry, combined material in batch of surface bonding mortar calculated to three decimal places,
B = the printed bag weight, and
W_m = weight in grams of surface bonding mortar in the 400-mL measure.

9.4.5 Water retention in percent.

9.4.6 Flexural Strength at ages specified in Table 1.

9.4.7 Compressive strength at ages specified in Table 1.

9.4.8 Time of setting, initial and final in hours.

10. Rejection

10.1 The purchaser has the right to reject material that fails to conform to the requirements of this specification. Rejection shall be reported to the producer or supplier in writing.