



Designation: C1884 – 18

## Standard Specification for Concrete Ballast Block<sup>1</sup>

This standard is issued under the fixed designation C1884; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers dry-cast concrete ballast blocks that are primarily used for ballast of rooftop equipment. These units are machine-made from hydraulic cement, water, and suitable mineral aggregates with or without the inclusion of other materials.

NOTE 1—The design of concrete ballast block systems for resisting wind uplift is beyond the scope of this specification. Building codes and other standards should be consulted in designing for wind uplift resistance.

1.2 The text of this standard references 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 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.

1.4 *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.*

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:

- C33/C33M Specification for Concrete Aggregates
- C140/C140M Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
- C150/C150M Specification for Portland Cement
- C331/C331M Specification for Lightweight Aggregates for

#### Concrete Masonry Units

- C595/C595M Specification for Blended Hydraulic Cements
- C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- C979/C979M Specification for Pigments for Integrally Colored Concrete
- C989/C989M Specification for Slag Cement for Use in Concrete and Mortars
- C1157/C1157M Performance Specification for Hydraulic Cement
- C1232 Terminology for Masonry
- C1240 Specification for Silica Fume Used in Cementitious Mixtures
- C1262/C1262M Test Method for Evaluating the Freeze-Thaw Durability of Dry-Cast Segmental Retaining Wall Units and Related Concrete Units

### 3. Terminology

3.1 Terminology defined in Terminology C1232 shall apply to this specification.

#### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *concrete ballast block, n*—a manufactured concrete unit used primarily to provide weight for stabilizing rooftop equipment.

3.2.1.1 *Discussion*—An example application for concrete ballast block is ballast for photovoltaic arrays.

### 4. Material

4.1 *Cementitious Materials*—Materials shall conform to the following applicable specifications:

4.1.1 *Portland Cement*—Specification C150/C150M.

4.1.2 *Modified Portland Cement*—Portland cement conforming to Specification C150/C150M, modified as follows:

4.1.2.1 *Limestone*—Limestone, with a minimum 85 % calcium carbonate ( $\text{CaCO}_3$ ) content, shall be permitted to be added to the cement, provided the requirements of Specification C150/C150M are modified as follows:

(1) *Limitation on Insoluble Residue*—1.5 %.

(2) *Limitation on Air Content of Mortar*—Volume percent, 22 % max.

(3) *Limitation on Loss on Ignition*—7 %.

4.1.3 *Blended Cements*—Specification C595/C595M.

4.1.4 *Hydraulic Cement*—Specification C1157/C1157M.

4.1.5 *Pozzolans*—Specification C618.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee C15 on Manufactured Masonry Units and is the direct responsibility of Subcommittee C15.03 on Concrete Masonry Units and Related Units.

Current edition approved Dec. 1, 2018. Published December 2018. DOI: 10.1520/C1884-18

4.1.6 *Blast Furnace Slag Cement*—Specification **C989/C989M**.

4.1.7 *Silica Fume*—Specification **C1240**.

4.2 *Aggregates*—Aggregates shall conform to the following specifications, except for grading requirements:

4.2.1 *Normal Weight Aggregates*—Specification **C33/C33M**.

4.2.2 *Lightweight Aggregates*—Specification **C331/C331M**.

NOTE 2—The grading requirements of Specifications **C33/C33M** and **C331/C331M** may not be suitable for concrete ballast block production. Because of this, producers are allowed to modify grading to meet their needs and the requirements of this specification.

4.3 *Pigments for Integrally Colored Concrete*—Specification **C979/C979M**.

4.4 *Other Constituents*—Air-entraining agents, integral water repellents, and other constituents shall be previously established as suitable for use in concrete roof pavers and shall conform to applicable ASTM standards or shall be shown by test or experience satisfactory to the purchaser to be not detrimental to the durability of the units or any material customarily used in concrete roof pavers.

## 5. Physical Requirements

5.1 At the time of delivery to the purchaser, the units shall conform to the physical requirements of **Table 1** when tested in accordance with **7.2**.

NOTE 3—The purchaser is the public body or authority, association, corporation, partnership, or individual entering into a contract or agreement to purchase or install, or both, concrete ballast block. The time of delivery to the purchaser is FOB plant when the purchaser or the purchaser's agent transports the concrete ballast block, or at the time unloaded at the worksite if the manufacturer or the manufacturer's agent transports the concrete ballast block.

5.2 *Freeze-Thaw Durability*—In areas where repeated freezing and thawing under saturated conditions occur, freeze-thaw durability shall be demonstrated by test or by proven field performance that the concrete ballast block units have adequate durability for the intended use. When testing is required by the specifier to demonstrate freeze thaw durability, the units shall be tested in accordance with **7.3**.

5.2.1 The weight loss of each of five test specimens at the conclusion of 100 cycles in tap water shall not exceed 5 % of its initial weight.

5.3 All units shall be sound and free of cracks or other defects that would interfere with the proper placement of the unit or would significantly impair the strength or permanence of the construction. Minor cracks incidental to the usual method of manufacture or minor chipping resulting from

customary methods of handling in shipment and delivery are not grounds for rejection.

5.4 A shipment shall not contain more than 5 % of units, including broken units, that do not meet the requirements of **6.1**.

## 6. Permissible Variations in Dimension and Weight

6.1 Overall dimensions for width, height, and length shall not differ by more than  $\pm 1/8$  in. (3.2 mm) from the specified standard dimensions.

6.2 For concrete ballast block, the average oven-dry weight of the three specimens tested shall meet or exceed the specified minimum weight, with no individual unit less than 90 % of the specified minimum weight.

## 7. Sampling and Testing

7.1 The purchaser or authorized representative shall be accorded proper facilities to inspect and sample the units at the place of manufacture from the lots ready for delivery.

7.2 Compressive strength, absorption, density, ballast weight and dimensional tolerances shall be based on tests of units of any configuration or dimensions made with the same materials, concrete mix design, manufacturing process, and curing method, conducted in accordance with Test Methods **C140/C140M** and within 12 months of production of the units.

7.2.1 Concrete ballast block shall be tested in accordance with Annex A3 of Test Methods **C140/C140M**.

7.3 When required, freeze-thaw durability shall be based on tests of units of any configuration or dimension made with the same materials, concrete mix design, manufacturing process, and curing method, conducted in accordance with Test Method **C1262/C1262M** and within 24 months of production of the units.

## 8. Compliance

8.1 If a sample fails to conform to the specified requirements, the manufacturer shall be permitted to remove units from the shipment. A new sample shall be selected by the purchaser from remaining units from the shipment with a similar configuration and dimension and tested at the expense of the manufacturer. If the second sample meets the specified requirements, the remaining portion of the shipment represented by the sample meets the specified requirements. If the second sample fails to meet the specified requirements, the remaining portion of the shipment represented by the sample fails to meet the specified requirements.

**TABLE 1 Physical Requirements**

Density Classification	Oven-Dry Density of Concrete lb/ft <sup>3</sup> (kg/m <sup>3</sup> )	Maximum Water Absorption, lb/ft <sup>3</sup> (kg/m <sup>3</sup> )		Minimum Net Area Compressive Strength, lb/in. <sup>2</sup> (MPa)	
	Average of 3 units	Average of 3 units	Individual Unit	Average of 3 units	Individual Unit
Lightweight	Less than 105 (1680)	18 (288)	20 (288)	3000 (20.7)	2500 (17.2)
Medium Weight	105 to less than 125 (1680 to 2000)	15 (240)	15 (240)	3000 (20.7)	2500 (17.2)
Normal Weight	125 (2000) or more	13 (208)	13 (208)	3000 (20.7)	2500 (17.2)

NOTE 4—Unless otherwise specified in the purchase order, the cost of tests is typically borne as follows: (1) If the results of the tests show that the units do not conform to the requirements of this specification, the cost is typically borne by the seller. (2) If the results of the tests show that the units conform to the specification requirements, the cost is typically borne by the purchaser.

## 9. Keywords

9.1 absorption; aggregates; ballast weight; cementitious; compressive strength; concrete ballast block; durability; limestone; portland cement

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