



Designation: C1884 – 23

Standard Specification for Manufactured Concrete Ballast Units¹

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1. Scope*

1.1 This specification covers dry-cast, manufactured concrete units that are primarily used for ballast applications. 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 units 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.

NOTE 2—Previously, there were two standards that covered units used for ballast. Specification C1491 was for concrete roof pavers, primarily used for roof ballast and protection of roof membrane. Specification C1884 was for units for ballast for rooftop equipment. Due to the similarity in these units and application, this standard now serves as the single standard for manufactured concrete units used in all ballast applications.

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.*

¹ 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.

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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 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
- C1491 Specification for Concrete Roof Pavers

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 unit, n*—a manufactured concrete unit used primarily to provide weight for stabilizing materials.

3.2.1.1 *Discussion*—Example applications for concrete ballast units are ballast for photovoltaic arrays, or paving to protect roofing membranes.

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 (CaCO_3) content, shall be permitted to be

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

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.

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 3—The grading requirements of Specifications C33/C33M and C331/C331M may not be suitable for concrete ballast unit 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 ballast units 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 conjunction with concrete ballast units.

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 4—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 units. The time of delivery to the purchaser is FOB plant when the purchaser or the purchaser’s agent transports the concrete ballast units, or at the time unloaded at the worksite if the manufacturer or the manufacturer’s agent transports the concrete ballast units.

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 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 The average oven-dry weight of the three specimens tested shall not be less than 90 %, nor more than 110 %, of the specified weight.

6.2.1 When ballast weight is specified in terms of lb/ft² (kg/m²), calculated the specified weight by multiplying the specified ballast weight by the surface area of the unit.

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, oven-dry 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, Annex A9, and within 12 months of production of the units.

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

TABLE 1 Physical Requirements

Density Classification	Oven-Dry Density of Concrete lb/ft ³ (kg/m ³)	Maximum Water Absorption, lb/ft ³ (kg/m ³)		Minimum Net Area Compressive Strength, lb/in. ² (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)	17 (272)	3000 (20.7)	2500 (17.2)
Normal Weight	125 (2000) or more	13 (208)	15 (240)	3000 (20.7)	2500 (17.2)