



Designation: C1688/C1688M – 10

# Standard Test Method for Density and Void Content of Freshly Mixed Pervious Concrete<sup>1</sup>

This standard is issued under the fixed designation C1688/C1688M; 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 test method covers determining the density of freshly mixed pervious concrete under standardized conditions and gives formulas for calculating the void content of pervious concrete. Test results are not intended to represent the in-place density and void content.

1.2 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 non-conformance with the standard.

1.3 *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 exposure.<sup>2</sup>)*

1.4 The text of this test method references notes and footnotes that provide explanatory information. These notes and footnotes (excluding those in tables) shall not be considered as requirements of this test method.

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>3</sup>

C29/C29M Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate

C125 Terminology Relating to Concrete and Concrete Aggregates

C127 Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate

C128 Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate

C150 Specification for Portland Cement

C172 Practice for Sampling Freshly Mixed Concrete

C188 Test Method for Density of Hydraulic Cement

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

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

C311 Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete

C595 Specification for Blended Hydraulic Cements

C989 Specification for Slag Cement for Use in Concrete and Mortars

C1157 Performance Specification for Hydraulic Cement

C1240 Specification for Silica Fume Used in Cementitious Mixtures

D698 Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))

## 3. Terminology

3.1 *Definitions:*

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

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *concrete, pervious, n*—hydraulic cement concrete with distributed, interconnected macroscopic voids that allow water to pass through the material with little resistance.

3.3 *Symbols:*

$D$	=	density (unit weight) of concrete kg/m <sup>3</sup> [lb/ft <sup>3</sup> ]
$M_s$	=	total mass of all materials batched, kg [lb] (see Note 1)
$M_c$	=	mass of the measure filled with concrete, kg [lb]
$M_m$	=	mass of the measure, kg [lb]
$T$	=	theoretical density of the concrete computed on an airfree basis, kg/m <sup>3</sup> [lb/ft <sup>3</sup> ] (see Note 1)
$U$	=	percentage of voids in the fresh pervious concrete, including entrained and entrapped air voids in the cement paste.
$V_s$	=	sum of the absolute volumes of the component ingredients in the batch, m <sup>3</sup> [ft <sup>3</sup> ]
$V_m$	=	volume of the measure, m <sup>3</sup> [ft <sup>3</sup> ]

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.49 on Pervious Concrete.

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<sup>2</sup> Section on Safety Precautions, Manual of Aggregate and Concrete Testing, *Annual Book of ASTM Standards*, Vol 04.02.

<sup>3</sup> 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.