

Designation: C1141/C1141M - 08

# StandardSpecification for Admixtures for Shotcrete<sup>1</sup>

This standard is issued under the fixed designation C1141/C1141M; 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  $(\varepsilon)$  indicates an editorial change since the last revision or reapproval.

# 1. Scope\*

- 1.1 This specification covers materials proposed for use as admixtures to be added to a portland-cement shotcrete mixture for the purpose of altering the properties of the mixture.
- 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.

### 2. Referenced Documents

- 2.1 ASTM Standards:<sup>2</sup>
- C125 Terminology Relating to Concrete and Concrete Ag-
- C136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
- C138/C138M Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
  - C173/C173M Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
  - C183 Practice for Sampling and the Amount of Testing of Hydraulic Cement
  - C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
  - C260 Specification for Air-Entraining Admixtures for Con-
  - C311 Test Methods for Sampling and Testing Fly Ash or

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregatesand is the direct responsibility of Subcommittee C09.46 on Shotcrete.

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<sup>2</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.

- Natural Pozzolans for Use in Portland-Cement Concrete C494/C494M Specification for Chemical Admixtures for Concrete
- C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- C979 Specification for Pigments for Integrally Colored Con-
- C989 Specification for Slag Cement for Use in Concrete and **Mortars**
- C1240 Specification for Silica Fume Used in Cementitious **Mixtures**
- C1398 Test Method for The Laboratory Determination of the Time of Setting of Hydraulic-Cement Mortars Containing Additives for Shotcrete by the Use of Gillmore Needles (Withdrawn 2010)<sup>3</sup>
- C1438 Specification for Latex and Powder Polymer Modifiers in Hydraulic Cement Concrete and Mortar
- D98 Specification for Calcium Chloride
- 2.2 ACI Documents:
- 318 Building Code Requirements for Structural Concrete<sup>4</sup>

#### 3. Terminology

3.1 For definitions of terms used in this standard, refer to Terminology C125. 3606c13/astm-c1141-c1141m-08

#### 4. Classification

- 4.1 This specification recognizes grades of admixtures, used in shotcrete made by either of two processes, as follows:
  - 4.1.1 *Type I*—Dry mix shotcrete.
  - 4.1.1.1 *Grade 1*—Accelerating admixture, conventional.
  - 4.1.1.2 *Grade* 2—Retarding admixture.
  - 4.1.1.3 *Grade 3*—Pozzolanic admixture.
  - 4.1.1.4 *Grade 4*—Metallic iron admixture.
  - 4.1.1.5 *Grade 5*—Coloring admixture.
  - 4.1.1.6 *Grade* 6—Organic polymer admixture.
  - 4.1.1.7 Grade 7—Not applicable.
  - 4.1.1.8 Grade 8—Not applicable.
  - 4.1.1.9 *Grade* 9—Accelerating admixture, quick-setting.
  - 4.1.2 Type II—Wet-mix shotcrete.

<sup>&</sup>lt;sup>3</sup> The last approved version of this historical standard is referenced on www.astm.org.

<sup>&</sup>lt;sup>4</sup> Available from American Concrete Institute (ACI), P.O. Box 9094, Farmington Hills, MI 48333-9094, http://www.concrete.org.

- 4.1.2.1 *Grade 1*—Accelerating admixture, conventional.
- 4.1.2.2 *Grade* 2—Retarding admixture.
- 4.1.2.3 Grade 3—Pozzolanic admixture.
- 4.1.2.4 *Grade 4*—Metallic iron admixture.
- 4.1.2.5 *Grade 5*—Coloring admixture.
- 4.1.2.6 *Grade* 6—Organic polymer admixture.
- 4.1.2.7 Grade 7—Water reducing admixture.
- 4.1.2.8 *Grade* 8—Air-entraining admixture.
- 4.1.2.9 Grade 9—Accelerating admixture, quick-setting.
- 4.1.3 Each of the above grades is further classified by identifying it according to the following classes:
  - 4.1.3.1 *Class A*—Liquid.
  - 4.1.3.2 Class B—Non-liquid.

#### 5. Ordering Information

- 5.1 The purchaser shall include the following information in the contract or purchase order, if applicable:
  - 5.1.1 The specification designation and date of issue,
  - 5.1.2 Type of shotcrete, grade and class of admixture,
  - 5.1.3 Quantity of admixture required,
  - 5.1.4 Special packaging and package marking requirements,
  - 5.1.5 Special sampling for inspection requirements, and
  - 5.1.6 Any supplementary requirements.

## 6. Requirements

- 6.1 Shotcrete admixtures shall conform to the requirements for the applicable type and grade as given in Table 1.
- 6.2 At the request of the purchaser, the manufacturer shall state in writing that the admixture supplied is essentially identical in concentration, composition, and performance to the admixture previously tested under this specification and found to comply with the applicable requirements thereof.
- 6.3 Requirements for establishing compositional or chemical equivalence of a lot or of a subsequent lot relative to a previous lot that was subjected to quality tests and found to comply with the applicable requirements may be determined by agreement between the purchaser and the manufacturer. At the request of the purchaser, the manufacturer shall recommend appropriate test procedures, such as infrared spectrophotometry, pH value, and solids content, for establishing the equivalence of material from different lots or different portions of the same lot.
- 6.4 At the request of the purchaser, the manufacturer shall state in writing the chloride content of the admixture.

Note 1—Ultraviolet absorption of solutions and infrared spectroscopy of dried residues have been found to be valuable for these purposes. The

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TABLE 1 Shotcrete Admixture Requirements

		TABLE 1 Shotcrete Ac	dmixture Requirements
	(III)	Type I—Dry-	Mix Shotcrete Control of the Control
Grade	Admixture	ASTM Standard	Other Limits
1	Accelerating, conventional	D98, C494/C494M Type C or E	DROTTION
2	Retarding	C494/C494M Type B or D	
3	Pozzolanic	C618, C989, C1240	
4	Metallic iron	Not established	The metallic particles shall be ground iron free from rust, oil, foreign materials,
			and nonferrous metal particles. The grading of the metallic aggregates shall be as follows when tested according to C136:
			U.S. Sieve No. <sup>4</sup> %Passing %Passing 100 1 - 01141m-08
			4.73 11111 (100. 4)
			2.36 mm (No. 8) 90–100
			1.18 mm (No. 16) 70–85
			600 μm (No. 30) 20–35
			300 μm (No. 50) 0–10
			150 μm (No. 100) 0–5
5	Coloring	C979	Even when using materials conforming to C979, it may be difficult to obtain un formity of coloring because of the placement procedures in dry-mix shotcreting
6	Organic Polymer	C1438	
9	Accelerating, quick-setting	C1398	Initial time of setting 1 to 3 min and final time of setting not more than 12 min two of every three tests and chloride limits of ACI 318 shall not be exceeded.
		Type II—Wet-	-Mix Shotcrete
Grade	Admixture	ASTM Standard	Other Limits
1	Accelerating, conventional	D98, C494/C494M Types C or	
		E	
2	Retarding	C494/C494M, Type B, D or G	
3	Pozzolanic	C618, C989, C1240	
4	Metallic iron	Not established	See Type I, Grade 4
5	Coloring	C979	
6	Organic Polymer	C1438	
7	Water reducing	C494/C494M, Types A, D, E, F, or G	
8	Air-entraining	C260	
9	Accelerating, quick-setting	C1398	See Type I. Grade 9

<sup>&</sup>lt;sup>A</sup>The sieve designations in parentheses are provided for information only; the only standard sieve sizes are those stated in SI units.