



Designation: D5139 – 19

Standard Specification for Sample Preparation for Qualification Testing of Coatings to be Used in Nuclear Power Plants¹

This standard is issued under the fixed designation D5139; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This specification defines the size, composition, surface preparation, and coating application variables for preparing samples for evaluating coatings and linings over various substrates.

1.2 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.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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

- A36/A36M Specification for Carbon Structural Steel
- C33/C33M Specification for Concrete Aggregates
- C150/C150M Specification for Portland Cement
- C192/C192M Practice for Making and Curing Concrete Test Specimens in the Laboratory
- C260 Specification for Air-Entraining Admixtures for Concrete
- C494/C494M Specification for Chemical Admixtures for Concrete

¹ This specification is under the jurisdiction of ASTM Committee D33 on Protective Coating and Lining Work for Power Generation Facilities and is the direct responsibility of Subcommittee D33.02 on Service and Material Parameters.

Current edition approved June 1, 2019. Published June 2019. Originally approved in 1990. Last previous edition approved in 2012 as D5139 – 12. DOI: 10.1520/D5139-19.

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.

- C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- D3912 Test Method for Chemical Resistance of Coatings and Linings for Use in Nuclear Power Plants
- D4258 Practice for Surface Cleaning Concrete for Coating
- D4259 Practice for Preparation of Concrete by Abrasion Prior to Coating Application
- D4260 Practice for Liquid and Gelled Acid Etching of Concrete
- D4538 Terminology Relating to Protective Coating and Lining Work for Power Generation Facilities
- D4541 Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
- D7234 Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers

2.2 American Concrete Institute:³

- ACI 308 Guide to Curing Concrete
- ACI Cement and Concrete Terminology

2.3 American National Standards Institute (ANSI):⁴

- ANSI N5.12–1974 Protective Coatings (Paints) for the Nuclear Industry, paragraph 7.4.3

3. Terminology

3.1 *Definitions*—Definitions for use with this standard are shown in Terminology D4538 or other applicable standards.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *bughole (surface air void), n*—a small regular or irregular cavity, usually not exceeding 1.5 mm in diameter, resulting from entrapment of air bubbles in the surface of formed concrete during placement and consolidation (ACI Cement and Concrete Terminology).

3.2.2 *curing compound, n*—a liquid that can be applied as a coating to the surface of newly placed concrete to retard the loss of water and, in the case of pigmented compounds, to reflect heat so as to provide an opportunity for the concrete to

³ Available from American Concrete Institute (ACI), P.O. Box 9094, Farmington Hills, MI 48333-9094, <http://www.concrete.org>.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

develop its properties in a favorable temperature and moisture environment (ACI Cement and Concrete Terminology).

4. Significance and Use

4.1 This specification provides uniform requirements for the preparation of test samples used for testing of coatings and linings to be used in nuclear power plants.

4.2 At the users discretion, this standard may also be used when preparing samples to be tested for the purpose of assessing performance attributes for coating and lining systems that may be applied in other types of power plants or for other industrial facilities.

4.3 Users of this guide must ensure that coatings work complies not only with this guide, but also with the licensee’s plant-specific quality assurance program and licensing commitments.

5. Steel Panels

5.1 Panel size shall be a minimum of 2-in. wide by 4-in. long by 1/8-in. thick (50.8-mm wide by 101.6-mm long by 3.175-mm thick) unless otherwise stated in the referenced test method. Edges and corners may be rounded. A suitably located 1/4 in. (6.35 mm) diameter hole may be provided in the test panel as appropriate when required by the test method.

5.1.1 For Test Method D4541 the minimum size shall be 3-in. wide by 5-in. long by 1/4-in. thick (76.2-mm wide by 127-mm long by 6.35-mm thick).

5.2 Unless otherwise required, all panels shall be carbon steel, meeting the requirements of Specification A36/A36M.

6. Concrete Blocks

6.1 The minimum size shall be 2-in. wide by 2-in. deep by 4-in. long (50.8-mm wide by 50.8-mm deep by 101.6-mm long) unless otherwise stated in the referenced test method. The edges may be chamfered up to 1/4 in. (6.35 mm) maximum.

6.1.1 The dimensions of the block to be tested should be sufficient to accommodate the adhesion tester to be used (for example, Test Method D7234).

6.2 Composition shall be as follows:

Cement	Specification C150/C150M, Type I or Type II low alkali as required by the licensee	7 sacks/yd ³
Gravel	Specification C33/C33M, size 3/8 in.	45 % by volume
Sand	Specification C33/C33M	55 % by volume
Air-entraining admixture	Specification C260	As recommended 4 to 7 %
Water-reducing admixture	Specification C494/C494M	As recommended
Pozzolan	Specification C618	As recommended to 15 % amount
Water, demineralized or distilled		3 in. slump
		Nominal 1 Cubic Foot Batch
Cement	Specification C150/C150M, Type I or Type II low alkali as required by the licensee	22.2 lb (10.07 kg)
Gravel	Specification C33/C33M, Size 3/8 in.	45.3 lb (20.55 kg)
Sand	Specification C33/C33M	55.5 lb (25.17 kg)
Air-entraining admixture	Specification C260	1.05 fl oz (31 mL)
Pozzolan	Specification C618	2.2 lb (1.0 kg)
Water-reducing admixture (Type A)	Specification C494/C494M	As recommended by the manufacturer
Water, demineralized or distilled		As required to produce 3-in. (76.2-mm) slump (approximately)

6.3 Blocks shall be cast horizontally in forms using release agents that are compatible with the coatings/linings to be used. The top surface, as cast, shall be given a broom finish, unless otherwise specified in the project specification. The block surface is to be covered with plastic during the first 24 hours to simulate water curing unless otherwise specified.

6.4 The block shall be removed from the form after 24 hours and wet cured in accordance with ACI 308 or Practice C192/C192M.

6.5 If a curing compound is to be used, apply the compound to the top surface immediately after finishing and to all other surfaces of the block within 2 hours after its removal from the form.

6.6 Allow the block to cure for 28 days in accordance with ACI 308 before application of the coating system unless otherwise specified.

6.7 A suitable hanger compatible with the testing apparatus shall be affixed at the mid-point of one end of the block as appropriate when required by the test method.

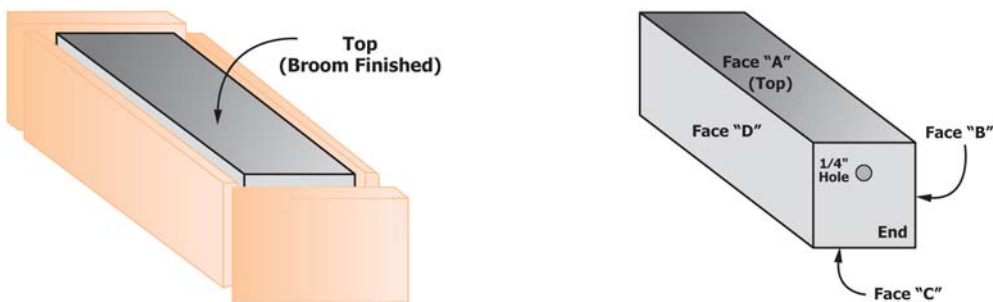


FIG. 1 Concrete Test Block Face Designation