



Designation: D6944 – 15 (Reapproved 2020)

# Standard Practice for Determining the Resistance of Cured Coatings to Thermal Cycling<sup>1</sup>

This standard is issued under the fixed designation D6944; 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 practice determines the resistance of cured coatings or coating systems to repeated thermal cycles and is designed to assess the effect of thermal cycling on the properties of a coating or coating system. These properties may include adhesion, resistance to checking, cracking, blistering, or others. This procedure is not intended to provide a quantitative measure of the service life that can be expected from a specific coating system on a given substrate.

1.2 *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.*

1.3 *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:*<sup>2</sup>

- D660 Test Method for Evaluating Degree of Checking of Exterior Paints
- D661 Test Method for Evaluating Degree of Cracking of Exterior Paints
- D714 Test Method for Evaluating Degree of Blistering of Paints
- D3359 Test Methods for Rating Adhesion by Tape Test
- D4541 Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.46 on Industrial Protective Coatings.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- D6132 Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Using an Ultrasonic Coating Thickness Gage
- D6677 Test Method for Evaluating Adhesion by Knife
- D7091 Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals
- D7234 Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
- G147 Practice for Conditioning and Handling of Nonmetallic Materials for Natural and Artificial Weathering Tests

## 3. Summary of Test Methods

3.1 *Test Method A*—Cured test specimens are subjected to 30 thermal cycles of immersion, freezing and heating.

3.2 *Test Method B*—Cured test specimens are subjected to 30 thermal cycles of freezing and heating.

## 4. Significance and Use

4.1 The purpose of this test is to obtain information on the ability of a coating system to adhere to substrates under thermal stress. It is assumed that the coating systems tested are applied and cured according to the coating manufacturer's instructions.

### TEST METHOD A—FREEZE/THAW/IMMERSION

## 5. Apparatus

5.1 *Thermal Cycling Apparatus:*

5.1.1 The thermal cycling apparatus shall consist of a suitable chamber or chambers in which the test specimens may undergo the specified cycle. Ideally, a chamber which contains heating and refrigeration equipment and immersion capabilities in the same unit should be used. This chamber shall have the ability to maintain continuous reproducible cycles within the specified temperature requirements. In the event that an apparatus having freezing, heating, and immersion capabilities is not available, separate equipment for freezing, heating and immersion may be used.