



Standard Test Method for Measuring Adhesion of Organic Coatings in the Laboratory by Direct Tensile Method¹

This standard is issued under the fixed designation D5179; 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 (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This test method covers the laboratory determination of organic coating adhesion to plastic substrates by mounting and removing a metal stud from the surface of the coating and measuring the force required to break the coating/substrate bond with a tensile tester. This test method may also be applied to substrates other than plastic.

1.2 This test method requires that the metal stud be adhered directly to the surface of a coated, cured panel (Fig. 1).

1.3 This test method is used to compare the adhesion of coatings to plastic or other substrates, thus allowing for a quantitative comparison of various coating/substrate combinations in laboratory conditions.

1.4 Other tensile test methods are Test Methods D4541, D7234, D7522, and ISO 4624 (but are not technically equivalent).

1.5 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

1.6 *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:²

D4541 Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

D7234 Test Method for Pull-Off Adhesion Strength of Coat-

ings on Concrete Using Portable Pull-Off Adhesion Testers

D7522 Test Method for Pull-Off Strength for FRP Laminate Systems Bonded to Concrete Substrate

2.2 Other Standard:

ISO 4624 Paints and Varnishes—Pull-off test for adhesion³

3. Summary of Test Method

3.1 A metal stud is bonded directly to a coated cured panel. The adhesive is allowed to cure according to manufacturer's recommendations. The specimen is then subjected to test on a tensile tester equipped with an upper coupling adapter (Fig. 2), and a restraining device (Fig. 3).

3.2 If a coating is to fulfill its function of protecting or decorating a substrate, it must adhere to it for the expected service life. Because the substrate and its surface preparation (or lack of it) has a drastic effect on the adhesion of coatings, a method of evaluating the adhesion of a coating to different substrates or surface treatments, or of different coatings to the same substrate and treatment, is of considerable usefulness in the industry.

4. Significance and Use

4.1 The pull-off strength (commonly referred to as adhesion) of a coating is an important performance property that has been used in specifications. This test method serves as a means for uniformly preparing and testing organic coatings on plastic or other substrates.⁴ Further information may be found in Appendix X1.

5. Apparatus and Materials

5.1 *Tensile Tester*—A properly calibrated testing machine that can be operated at constant rates of crosshead motion, and in which the error in the load measuring system shall not exceed $\pm 1\%$ of the maximum load expected to be measured.

NOTE 1—A computer-controlled machine is preferable.

¹ This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.23 on Physical Properties of Applied Paint Films.

Current edition approved April 1, 2016. Published June 2016. Originally approved in 1991. Last previous edition approved in 2008 as D5179 – 02 (2008). DOI: 10.1520/D5179-16.

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.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁴ Gray, K. N., Buckley, S. E., and Nelson, G. L., "Assessing Measurement Standards for Coating Adhesion to Plastics," *Modern Paint and Coatings Journal*, Vol 75, No. 10, October 1985, p. 160.