Designation: D1654 – 08 (Reapproved 2016)

Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments[1]

This standard is issued under the fixed designation D1654; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method covers the treatment of previously painted or coated specimens for accelerated and atmospheric exposure tests and their subsequent evaluation in respect to corrosion, blistering associated with corrosion, loss of adhesion at a scribe mark, or other film failure.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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 whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

B117 Practice for Operating Salt Spray (Fog) Apparatus
D610 Practice for Evaluating Degree of Rusting on Painted Steel Surfaces
D714 Test Method for Evaluating Degree of Blistering of Paints
D822 Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
D870 Practice for Testing Water Resistance of Coatings Using Water Immersion
D1014 Practice for Conducting Exterior Exposure Tests of Paints and Coatings on Metal Substrates
D1735 Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus
D2247 Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity
D2803 Guide for Testing Filiform Corrosion Resistance of Organic Coatings on Metal
D4141 Practice for Conducting Black Box and Solar Concentrating Exposures of Coatings
D4585 Practice for Testing Water Resistance of Coatings Using Controlled Condensation
D4587 Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings
D5894 Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)
D6695 Practice for Xenon-Arc Exposures of Paint and Related Coatings
D7087 Test Method for An Imaging Technique to Measure Rust Creepage at Scribe on Coated Test Panels Subjected to Corrosive Environments
E3 Guide for Preparation of Metallographic Specimens
G85 Practice for Modified Salt Spray (Fog) Testing
G87 Practice for Conducting Moist SO_2 Tests

2.2 *ANSI Standard:*[3]

B94.50 Single-Point Cutting Tools, Basic Nomenclature and Definitions for

3. Terminology

3.1 *paint removal material, n*—a device or substance that is used to remove loose coating around a scribe.

3.2 *rust creepage or undercutting, n*—corrosion of a substrate that occurs around a damaged area of a coated material.

3.3 *scribe, n*—a linear, intentionally prepared damaged area on a coated material that extends down to the substrate.

3.4 *scribing tool, n*—a tool used to prepare a scribe on a coated material.

3.5 *zone of corrosion, n*—area of corrosion of a substrate.

[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 D01.25 on Evaluation of Weathering Effects.

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[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. Significance and Use

4.1 This method provides a means of evaluating and comparing basic corrosion performance of the substrate, pretreatment, or coating system, or combination thereof, after exposure to corrosive environments.

5. Apparatus

5.1 *Scribing Tools:*

5.1.1 *Lathe Tool Type*—High speed tool steel or tungsten carbide thread cutting lathe tool bit with a cutting tip having a 60° included angle. ANSI B94.50, Style E has been found to meet these requirements. (See Fig. 1.) The tool bit is typically mounted in a holder such as a wooden file handle to facilitate the scribing operation.

5.1.2 *Pencil Type*—Pencil shaped device, with a high speed tool steel or tungsten carbide scribing tip. Typically the gripping surface is knurled. The tip may be replaceable or permanent.

5.1.3 *Motorized Circular Blade*—A motor fitted with a 1 to 2 mm wide circular cutting device.

5.1.4 *Other Types*—Other types of scribing instruments which use a knife type blade such as a scalpel, razor blade, box cutter knife, or other sharp pointed tool are acceptable if agreed upon between the producer and the user.

5.2 *Straightedge*—Any straightedge of sufficient length and rigidity to guide the scribing tool in a straight line.

5.3 *Paint Removal Materials*—The following materials can be used to remove the coating around the scribe.

5.3.1 *Spatula.*

5.3.2 *Knife or similar instrument*—the sharpness of blade shall be agreed upon between purchaser and seller.

5.3.3 *Paint Stripper or strong solvent.*

5.3.4 *Materials for removal by air:*

5.3.4.1 *Air Source*—A source of compressed air capable of delivering at least 4.72 L/s (10 ft^3/min) at 552 kPa (80 psi).

5.3.4.2 *Air Gun*—An air dusting gun and nozzle combination. The following configuration has been found to be successful:

Air Consumption, m^3/min (ft^3/min)	Pressure, kPa (psi)	Nozzle Diameter, mm (in.)
0.24 (8.4)	550 (80)	3.0 (0.12)

5.3.5 *Power Washer* capable of delivering 3500 psi.

5.4 *Scale*—Any rule with 1-mm divisions.

6. Preliminary Treatment of Test Specimens

6.1 *Scribed Specimens:*

6.1.1 Where specified or agreed upon, prepare each specimen for testing by scribing it in such a manner that the scribe can be exposed lengthwise when positioned in the test cabinet. This position will allow solution droplets to run lengthwise along the scribe.

6.1.2 Scribe the specimen by holding the tool at approximately a 70 to 90° angle to the surface with the upper end of tool holder inclined toward the operator. Position the tool so that only the tip is in contact with the surface. (See Fig. 2.) Pull the scribing tool to obtain a uniform V-cut through the coating that is being tested. The endpoints of the scribe shall be at least 1.25 cm (0.5 in.) from the edge of the panel. Inspect the tool frequently, using low power magnification, for dulling, chipping or wear and replace or repair as needed. The scribe should be of sufficient length to cover the significant test area, but should not contact the edge of the specimen. The scribe must penetrate all organic coating layers on the metal, leaving a uniformly bright line. The extent of scribe penetration through metal coatings, such as galvanize, should be agreed upon between the producer and user. The coil coating industry typically requires scribes to penetrate all organic coating layers but not penetrate the metal coating layers. The automotive industry typically requires scribes to penetrate all organic and metal coating layers. The pencil type may be less effective than the lathe tool type when scribing coating systems consisting of multiple layers of organic coatings or coating systems including metal layers. When scribing coating systems consisting of multiple layers of organic coatings or coating systems including metal layers the depth and quality of scribe technique should be evaluated using the cross section, castable plastic mount, polishing technique described in Practice E3. Quality of the scribe technique may also be observed with the aid of low-power magnification. Note, mark, and describe defects, coding, and flaws that may affect results. If a motorized circular blade is used, position the test specimen to allow for a straight, linear cut at the desired length. The blade shall be positioned to a depth such that it is able to cut into the substrate. This type of blade will result in a rectangular cut rather than a V-cut.

6.1.3 One cut may not be sufficient to cut multi-layer protective coatings down to the metal. The use of more than

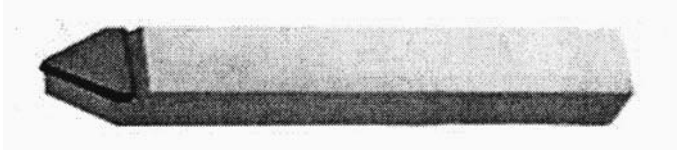

FIG. 1 Scribe Tool

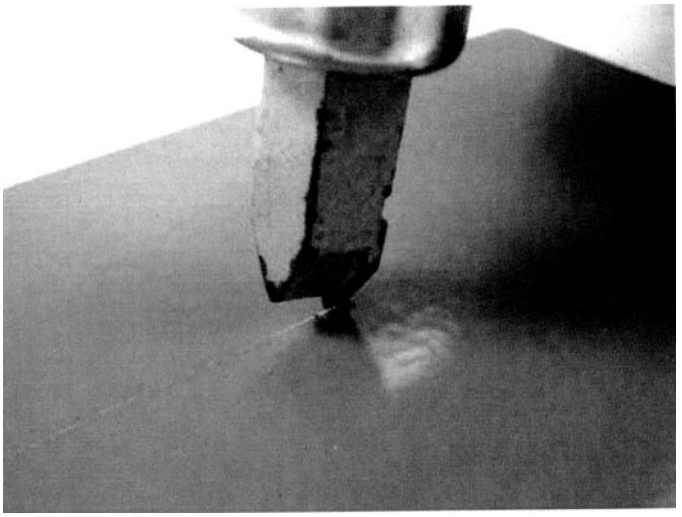

FIG. 2 Scribing Tool in Action