



Designation: E1826 – 23

Standard Specification for Low Volatile Organic Compound (VOC) Corrosion-Inhibiting Adhesive Primer for Aluminum Alloys to Be Adhesively Bonded in Honeycomb Shelter Panels¹

This standard is issued under the fixed designation E1826; 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 specification covers pigmented, sprayable, low volatile organic compound (VOC) corrosion-inhibiting adhesive primers for use on aluminum alloys that are to be adhesively bonded in the fabrication of panels for tactical shelters. When applied to a properly prepared surface of aluminum alloy, the primer imparts corrosion resistance and forms a surface suitable for structural bonding and for coating with shelter paint finishes.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units 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

B117 Practice for Operating Salt Spray (Fog) Apparatus
B209/B209M Specification for Aluminum and Aluminum-Alloy Sheet and Plate

¹ This specification is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.53 on Materials and Processes for Durable Rigidwall Relocatable Structures.

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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.

D1002 Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal)

D3167 Test Method for Floating Roller Peel Resistance of Adhesives

E631 Terminology of Building Constructions

E864 Practice for Surface Preparation of Aluminum Alloys to Be Adhesively Bonded in Honeycomb Shelter Panels

E865 Specification for Structural Film Adhesives for Honeycomb Sandwich Panels

E874 Practice for Adhesive Bonding of Aluminum Facings to Nonmetallic Honeycomb Core for Shelter Panels

E1749 Terminology Relating to Rigid Wall Relocatable Shelters

2.2 *Federal Specifications:*³

QQ-A-250/8d Aluminum Alloy 5052 H34 Plate and Sheet

QQ-A-250/11d Aluminum Alloy 6061 T6 Plate and Sheet

2.3 *Government Document:*⁴

Rule 1124 Aerospace Assembly and Component Manufacturing Operations, South Coast Air Quality Management District

3. Terminology

3.1 *Definitions*—For definitions of general terms related to building construction used in this specification, refer to Terminology **E631**, and for general terms related to rigid wall relocatable shelters, refer to Terminology **E1749**.

4. Materials and Manufacturer

4.1 The primer shall be a pigmented liquid composed of a modified epoxy phenolic or other resin system compounded to be spray-applied to produce a continuous, uniform coating without dilution.

³ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111, <http://quicksearch.dla.mil>.

⁴ Available from South Coast Air Quality Management District (AQMD), 21865 Copley Dr., Diamond Bar, CA 91765, <http://www.aqmd.gov>.

5. Physical Properties

5.1 The uncured primer shall be tested as specified in 6.1 and meet the requirement of Table 1.

5.2 *Properties of Cured Film*—When applied and cured in accordance with 6.1.8, the cured film shall meet the requirements of Tables 2 and 3 when tested as specified in 6.2 and 6.3.

5.3 *Storage Stability*—Primer stored in accordance with 6.1.3 shall meet the requirements for normal- and low-temperature floating roller peel in Table 3 when cured in accordance with 6.1.8 and tested as specified in 6.3.7 and 6.3.8.

5.4 *Shelf Life*—The shelf life of the primer at 25 °C ± 7 °C (77 °F ± 12 °F) shall be at least four days. After four days, when tested according to 6.1.4, the primer shall meet the requirements for normal- and low-temperature floating roller peel in Table 3 when cured in accordance with 6.1.8 and tested as specified in 6.3.7 and 6.3.8.

5.5 *Film Thickness*—The average, minimum, and maximum film thicknesses shall be between 0.0025 mm and 0.010 mm (0.0001 in. and 0.0004 in.) ±15 % coefficient of variation. At least five thickness readings shall be made with no more than one in any 645 mm² (1 in.²) area.

5.6 *VOC Content*—The volatile organic compound (VOC) is any volatile compound containing the element of carbon, excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonates, as stated in Rule 1124. The VOC content shall meet the requirement in Table 1 when determined in accordance with 6.1.9.

6. Test Methods

6.1 Uncured Primer:

6.1.1 *Solids Content*—Determine the solids content by heating a 2 g sample of thoroughly mixed primer in an ignition-loss crucible with cover at 121 °C ± 5 °C (250 °F ± 9 °F) for not less than 90 min. Cool the crucible to room temperature in a desiccator. Weighings before and after heating shall be accurate to ±0.001 g. Calculate the mass of solids remaining as a percentage of the initial sample mass as follows:

$$\text{Percent solids content} = \frac{\text{mass of nonvolatile residue}}{\text{initial sample mass}} \times 100 \quad (1)$$

6.1.2 *Ash Content*—Place the crucibles containing the solids content samples in a furnace at 565 °C ± 28 °C (1050 °F ± 82 °F) for not less than 60 min. Cool the crucible to room temperature in a desiccator. Weighings before and after heating shall be accurate to ±0.001 g. Calculate the ash content remaining as a percentage of the solids content as follows:

$$\text{Percent ash content} = \frac{\text{mass of ash residue}}{\text{mass of nonvolatile residue}} \times 100 \quad (2)$$

TABLE 1 Physical Properties of Uncured Liquid Polymer

Test	Requirement
Solids content, %	Report only
Ash content, %	Report only
Color	Easily visible film
VOC content	250 g/L max

TABLE 2 Physical Property of Cured Film on Primed Surfaces

Test	Requirement
Smooth uniform coating	0.0025 mm to 0.010 mm (0.0001 in. to 0.0004 in.) ± 15 % coefficient of variation

TABLE 3 Physical Properties of Bonded Specimens

Test	Requirements (min)
Normal-temperature lap shear, 24 °C (77 °F), MPa (psi)	20.0 (2903)
Low-temperature lap shear, –55 °C (–67 °F), MPa (psi)	20.0 (2903)
High-temperature lap shear, 93 °C (200 °F), MPa (psi)	13.0 (1890)
Humidity exposure lap shear, 93 °C (200 °F), MPa (psi)	8.0 (1161)
Salt spray exposure lap shear, 35 °C (95 °F), MPa (psi)	16.0 (2322)
Normal-temperature floating roller peel strength, 24 °C (75 °F), N/m (lbf/in.)	4400 (25.1)
Low-temperature floating roller peel strength, –55 °C (–67 °F), N/m (lbf/in.)	2625 (15.0)

6.1.3 *Storage Stability*—Store a sample of the primer for three months from the date of manufacture at a temperature recommended by the manufacturer. The stored sample shall meet the requirements for normal- and low-temperature floating roller peel in Table 3 when cured in accordance with 6.1.8 and tested as specified in 6.3.7 and 6.3.8.

6.1.4 *Shelf Life*—Store a sample of the primer for four days at 25 °C ± 7 °C (77 °F ± 13 °F). The aged sample shall meet the requirements for normal- and low-temperature floating roller peel in Table 3 when cured in accordance with 6.1.8 and tested as specified in 6.3.7 and 6.3.8.

6.1.5 *Film Thickness*—The cured primer film thickness shall be determined with a eddy-current instrument as specified in 6.2.2.

6.1.6 *Color*—During spray application, there shall be a discernible color change for the primer thickness specified in 5.5.

6.1.7 *Sprayability*—The primer shall be capable of being readily applied in accordance with the manufacturer’s instructions to all test panels of either 6061 T6 or 5052 H34 aluminum alloy (Fed. Spec. QQ-A-250/11d or QQ-A-250/8d, respectively, or Specification B209/B209M) and cleaned in accordance with Practice E864 for each of the tests described in 6.1.8 – 6.3.8.

6.1.8 *Curing Properties*—Test the cured film for the ability to meet the requirements listed in Tables 2 and 3. Spray the primer onto the test panels and air dry at least 20 min at 24 °C ± 5 °C (77 °F ± 9 °F); then heat in air for 65 min ± 5 min at 121 °C ± 5 °C (250 °F ± 9 °F).

6.1.9 *VOC Content*—The grams of VOC per litre of primer, less water and exempt compounds in accordance with Rule 1124, shall be determined by the adhesive primer manufacturer in accordance with Rule 1124 and meet the requirement for VOC content in Table 1.

6.2 Cured Film:

6.2.1 *Test Panels and Panel Preparation*—Test panels shall be either 6061 T6 or 5052 H34 bare aluminum alloy (Fed. Spec. QQ-A-250/11d or QQ-A-250/8d, respectively, or Specification B209/B209M) and cleaned in accordance with Practice E864.