



Designation: D 2651 – 90 (Reapproved 1995)

## Standard Guide for Preparation of Metal Surfaces for Adhesive Bonding<sup>1</sup>

This standard is issued under the fixed designation D 2651; 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 Department of Defense.*

### INTRODUCTION

It is impossible and impractical to present a single surface-preparation method for a metal group, such as aluminum alloys, stainless steels, magnesium alloys, etc. The wide variety of individual alloys and heat treatments under each group, the fact that certain adhesives exhibit specific compatibilities with surface preparation and the complexity and nature of parts being bonded preclude the use of an all-inclusive procedure for a metal group. Procedures for aluminum alloys are well standardized, possibly because more bonding has been done with these alloys. Preliminary tests should be conducted with the specific adhesive and the exact lot of metals to determine performance. This is especially true for stainless steel. The adhesive manufacturers' recommendation should also be considered.

### 1. Scope

1.1 This guide covers procedures that have proved satisfactory for preparing various wrought metal surfaces for adhesive bonding. It does not address the preparation of cast metals.

1.2 Surface preparation methods are included for:

| Metal                    | Section |
|--------------------------|---------|
| Aluminum Alloys          | 7       |
| Stainless Steel          | 8       |
| Carbon Steel             | 9       |
| Titanium Alloys          | 10      |
| Magnesium Alloys         | 11      |
| Copper and Copper Alloys | 12      |

1.3 Procedures included herein are based on the commercial practice of numerous agencies and organizations. The methods may be revised or supplemented, as necessary, to include methods based on proven performance.

1.4 The surface preparation of metal systems used for qualification and quality control testing of the adhesive should be agreed upon by both manufacturer and user.

1.5 *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.*<sup>2</sup>

### 2. Referenced Documents

#### 2.1 ASTM Standards:

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee D-14 on Adhesives and is the direct responsibility of Subcommittee D14.80 on Metal Bonding Adhesives.

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<sup>2</sup> A surfactant that has been found suitable for this purpose consists of a 50 % mixture of a cationic and a fluochemical surfactant such as Zonyl FSC manufactured by E.I. DuPont, Wilmington, DE 19898.

D 907 Terminology Relating to Adhesives<sup>3</sup>

D 1125 Test Methods for Electrical Conductivity and Resistivity of Water<sup>4</sup>

D 2674 Methods of Analysis of Sulfochromate Etch Solution Used in Surface Preparation of Aluminum<sup>3</sup>

D 3933 Guide for Preparation of Aluminum Surfaces for Structural Adhesives Bonding (Phosphoric Acid Anodizing)<sup>3</sup>

2.2 *ASM International Document*:<sup>5</sup>

Metals Handbook Volume V

2.3 *Military Specifications*:<sup>6</sup>

MIL-A-8625 Type II, Anodic Coatings for Aluminum and Aluminum Alloys

MIL-M-3171 Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion

MIL-M-45202 Magnesium Alloy, Anodic Treatment of

2.4 *SAE Standards*:<sup>7</sup>

Aerospace Material Specification 2470—Anodic Treatment of Aluminum Base Alloy, Chromic Acid Treatment

### 3. Terminology

3.1 *Definitions*—Many of the terms in this guide are defined in Terminology D 907.

### 4. Apparatus

4.1 *Trays or Pans*, suitable for preparation of laboratory specimens and small parts. Generally in production, a series of

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 15.06.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 11.01.

<sup>5</sup> Available from ASM International, Metals Park, OH 44073.

<sup>6</sup> Available from Standardization Documents, Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111, Attn: NPODS.

<sup>7</sup> Available from the Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096.