

SMI, Inc.

12219 SW 131 Avenue
Miami, Florida 33186-6401 USA

Phone: (305) 971-7047
Fax: (305) 971-7048

Attn: Dan Reid
HR Toughguard, LLC
9430 SW Coral Street, Suite 202B
Tigard, OR 97223

Date: 22-Mar-2012

SMI/REF: 1201-227

Product: **TOUGHGUARD "STEP 1 POLARIZING WASH"** (received 02-Feb-2012)

Dilution: Concentrate (neat) and 2 ounces per gallon

Page 1 of 3

BOEING D6-17487 REVISION R
Exterior and General Cleaners and Liquid Waxes,
Polishes and Polishing Compounds

Sandwich Corrosion Test

Conforms

Acrylic Crazing Test

Conforms

Paint Softening Test

Conforms

Hydrogen Embrittlement Test

Conforms

Respectfully submitted,



Patricia D. Viani, SMI, Inc.

Client: HR Toughguard, LLC
 Product: **TOUGHGUARD "STEP 1 POLARIZING WASH"**
 Dilution: Concentrate (neat) and 2 ounces per gallon
 Boeing D6-17487, Revision R

Date: 12-Mar-2012
 SMI/REF: 1201-227

Sandwich Corrosion Test: Specimen preparation, testing, and interpretation shall be in accordance with ASTM F1110 using the following materials and with the following exceptions:

1. Reagents and materials exception:
 - (1). Clad 7075-T6 aluminum alloy in accordance with QQ-A-250/13 (AMS 4049 or AMS-QQ-A-250/13 optional) (2024-T3 Alclad specimens are neither required nor optional.)
 - (2). Bare 7075-T6 aluminum alloy in accordance with QQ-A-250/12 (AMS 4045 or AMS-Q-A-250/12 optional) anodized in accordance with BAC 5019 or MIL-A-8625, Type I. Anodize shall be sealed. (2024-T3 nonclad specimens are neither required nor optional).
 - (3). Distilled or deionized water may be used in place of ASTM F1193, Type IV reagent grade water for control specimens.
 - (4). The filter paper may be Whatman No. 5 or equivalent in place of Whatman GFA glass fiber paper.
2. Procedure exceptions:
 - (1) The filter paper strips shall be 1 by 3 inches and shall be placed in the center of the sandwiched specimens.
 - (2) Each sandwich specimen shall be held together with waterproof tape, with no more than 1 piece of tape (maximum width 0.75 inch) on each of two opposite edges.
3. Interpretation of result exceptions:
 - (1) Leaching or lightening of the chromate sealed anodize coating shall not be cause for rejection.
 - (2) Deposits or residues from the material being tested that are not products of corrosion of the test panel surface shall not be cause for rejection.
 - (3) Special procedure for evaluation of fire extinguishing foams and liquids.
 - (4) Panels shall have a rating of 1 (no more than 5 percent of the surface area shall be corroded) or better in accordance with ASTM F 1110. The preferred method of determining the corroded area is by using image analysis. Other means approved by the purchaser may be substituted.
 - (5) Any corrosion in excess of that shown by the control group shall be cause for rejection.

	Bare 7075-T6 (AMS 4045) Anodized per BAC 5019 (chromate seal) or MIL-A-8625 Type I with Dichromate Seal	Clad 7075-T6 Aluminum (AMS 4049)
CONCENTRATE	1	1
DILUTE	1	1
CONTROL	1	1

Result Conforms

Acrylic Craziing Test:

The material being tested shall not craze, crack, or etch acrylic test specimens when tested in accordance with ASTM F 484 using Type C (stretched acrylic plastic in accordance with MIL-P-25690) stressed to an outer fiber stress of 4500 psi.

**Type C (MIL-P-25690) Concentrate: No crazing, cracking or etching.
Dilute: No crazing, cracking, or etching.**

Result Conforms

Paint Softening Test:

a. Testing shall be in accordance with ASTM F502 using the following coating systems.

Paint system 1: BMS 10-79, Type II primer applied in accordance with BAC 5882 plus BMS 10-60, Type II enamel in accordance with BAC 5845.

Paint system 2: BMS 10-79, Type III primer applied in accordance with BAC 5882, plus BMS 10-100 coating in accordance with BAC 5795.

b. Three specimens conforming to Section 13a.(1) and three specimens conforming to Section 13a(2) shall be used for each test condition.

c. The material being tested shall not produce a decrease in film hardness greater than two pencils, or any discoloration or staining.

NOTE: Slight darkening of the BMS 10-100 surface is acceptable.

Concentrate: Paint system 1: 0 pencil hardness change after 24 hour post-exposure dry time.
Paint system 2: 0 pencil hardness change after 24 hour post-exposure dry time.

Dilute: Paint system 1: 0 pencil hardness change after 24 hour post-exposure dry time.
Paint system 2: 0 pencil hardness change after 24 hour post-exposure dry time.

Result Conforms

Hydrogen Embrittlement Test:

Hydrogen Embrittlement testing shall be in accordance with ASTM F 519-93, using cadmium plated Type 1a, 1c, or 2a specimens. All requirements of ASTM F519-93 for specimens, preparation, testing, and reporting shall apply. Type 1a specimens shall meet the requirements of D6-4307.

Specimens: Type 1c, cadmium plated per MIL-STD-870.

Parameters: 45% load, immersed 150 hours,max; 22°C – 27°C

Concentrate: No failures occurred within 150 hours.

Dilute: No failures occurred within 150 hours.

Result Conforms

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Attn: Dan Reid
HR Toughguard, LLC
9430 SW Coral Street, Suite 202B
Tigard, OR 97223

Date: 26-Mar-2012

SMI/REF: 1201-215

Product: **TOUGHGUARD "STEP 2 PAINT PROTECTION SYSTEM"**
(received 02-Feb-2012 / 23-Feb-2012)

Dilution: As received

Page 1 of 3

BOEING D6-17487 REVISION R

*Exterior and General Cleaners and Liquid Waxes,
Polishes and Polishing Compounds*

Sandwich Corrosion Test

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Conforms

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Conforms

Hydrogen Embrittlement Test

Conforms

Respectfully submitted,



Patricia D. Viani, SMI, Inc.

Client: HR Toughguard, LLC Date: 26-Mar-2012
 Product: TOUGHGUARD "STEP 2 PAINT PROTECTION SYSTEM"
 Dilution: As received SMI/REF: 1201-215
 BOEING D6-17487 REVISION R (Exterior & General) Page 2 of 3

Sandwich Corrosion Test: Specimen preparation, testing, and interpretation shall be in accordance with ASTM F1110 using the following materials and with the following exceptions:

1. Reagents and materials exception:
 - (1). Clad 7075-T6 aluminum alloy in accordance with QQ-A-250/13 (AMS 4049 or AMS-QQ-A-250/13 optional) (2024-T3 Alclad specimens are neither required nor optional.)
 - (2). Bare 7075-T6 aluminum alloy in accordance with QQ-A-250/12 (AMS 4045 or AMS-Q-A-250/12 optional) anodized in accordance with BAC 5019 or MIL-A-8625, Type I. Anodize shall be sealed. (2024-T3 nonclad specimens are neither required nor optional).
 - (3). Distilled or deionized water may be used in place of ASTM F1193, Type IV reagent grade water for control specimens.
 - (4). The filter paper may be Whatman No. 5 or equivalent in place of Whatman GFA glass fiber paper.
2. Procedure exceptions:
 - (1). The filter paper strips shall be 1 by 3 inches and shall be placed in the center of the sandwiched specimens.
 - (2). Each sandwich specimen shall be held together with waterproof tape, with no more than 1 piece of tape (maximum width 0.75 inch) on each of two opposite edges.
3. Interpretation of result exceptions:
 - (1). Leaching or lightening of the chromate sealed anodize coating shall not be cause for rejection.
 - (2). Deposits or residues from the material being tested that are not products of corrosion of the test panel surface shall not be cause for rejection.
 - (3). Special procedure for evaluation of fire extinguishing foams and liquids.
 - (4). Panels shall have a rating of 1 (no more than 5 percent of the surface area shall be corroded) or better in accordance with ASTM F 1110. The preferred method of determining the corroded area is by using image analysis. Other means approved by the purchaser may be substituted.
 - (5). Any corrosion in excess of that shown by the control group shall be cause for rejection.

	Bare 7075-T6 (AMS 4045) Anodized per BAC 5019 (Type 3 chromate seal)	Clad 7075-T6 Aluminum (AMS 4049)
PRODUCT	1	1
Control	1	1

Result Conforms

Client: HR Toughguard, LLC Date: 26-Mar-2012
Product: TOUGHGUARD "STEP 2 PAINT PROTECTION SYSTEM"
Dilution: As received SMI/REF: 1201-215
BOEING D6-17487 REVISION R (Exterior & General) Page 3 of 3

Acrylic Crazing Test:

The material being tested shall not craze, crack, or etch acrylic test specimens when tested in accordance with ASTM F 484 using Type C (stretched acrylic plastic in accordance with MIL-P-25690) stressed to an outer fiber stress of 4500 psi.

Type C (MIL-P-25690): No crazing, cracking, or etching

Result Conforms

Paint Softening Test Procedure:

- a. Testing shall be in accordance with ASTM F502 using the following coating systems.
- (1) BMS 10-79, Type II primer applied in accordance with BAC 5882 plus BMS 10-60, Type II enamel in accordance with BAC 5845.
 - (2) BMS 10-79, Type III primer applied in accordance with BAC 5882, plus BMS 10-100 coating in accordance with BAC 5795.
- b. Three specimens conforming to Section 13a.(1) and three specimens conforming to Section 13a(2) shall be used for each test condition.
- c. The material being tested shall not produce a decrease in film hardness greater than two pencils, or any discoloration or staining.

NOTE: Slight darkening of the BMS 10-100 surface is acceptable.

As received:

Paint system 1: 0 pencil hardness change after 24 hour post-exposure dry time. No discoloration or staining.

Paint system 2: 0 pencil hardness change after 24 hour post-exposure dry time. No discoloration or staining.

Result Conforms

Hydrogen Embrittlement Test:

Hydrogen Embrittlement testing shall be in accordance with ASTM F 519-93, using cadmium plated Type 1a, 1c, or 2a specimens. All requirements of ASTM F519-93 for specimens, preparation, testing, and reporting shall apply. Type 1a specimens shall meet the requirements of D6-4307.

Specimens: Type 1c, cadmium plated per MIL-STD-870.

(45% load, 150 hours, notched immersed for the duration, room temp.)

**As received: #1: No failure occurred within 150 hours.
#2: No failure occurred within 150 hours.
#3: No failure occurred within 150 hours.
#4: No failure occurred within 150 hours.**

Result Conforms